

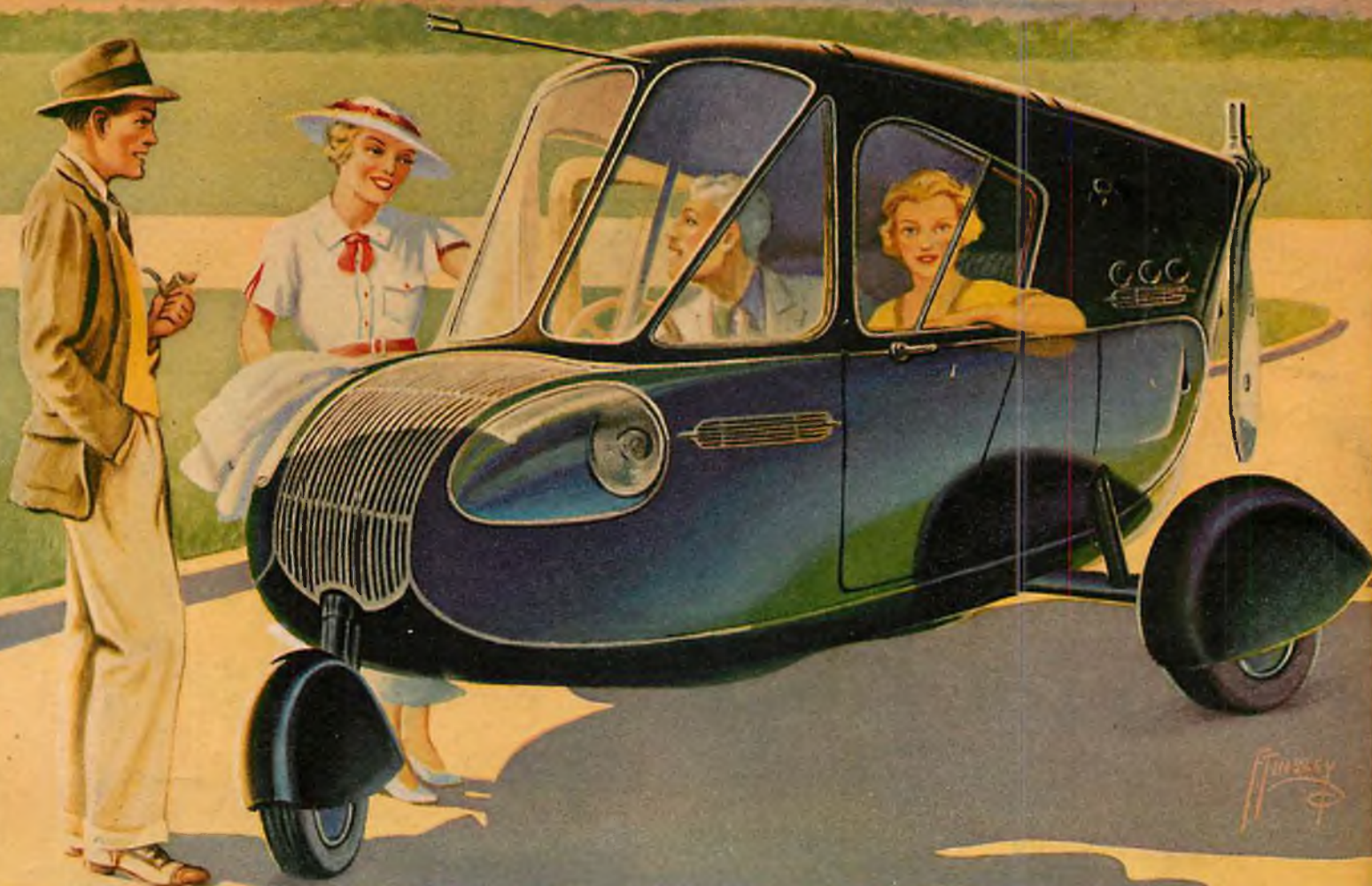
LARGEST CIRCULATION OF ANY AVIATION MAGAZINE

15¢

# AIR TRAILS

**BILL BARNES**  
AIR NOVEL

SEPT. 1937



**LIGHT PLANE FLYING CLUBS** Page 8

*You can afford to fly under this plan—*

**HIGH SCHOOL PILOTS** . . . Page 10

**GLIDING AND SOARING** . . . Page 24

**MODEL MAKING** . Page 42

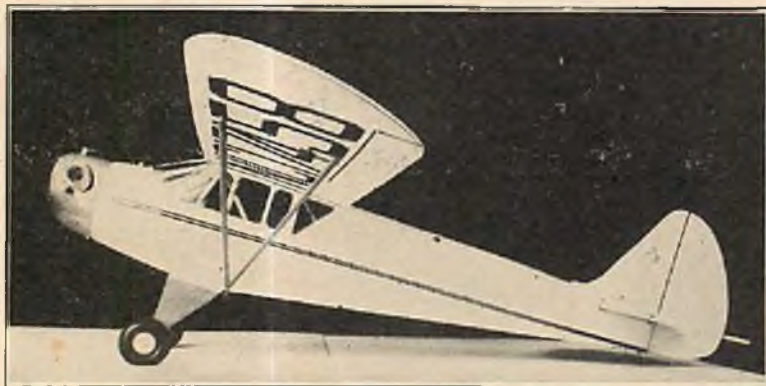
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September, 1937

# AIR TRAILS

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# How Jerry Got His Start in AVIATION

HOW'S THAT FOR A LAIRD TRANSPORT MODEL? WHAT HAVE YOU BEEN DOING LATELY, BILL? BUILT ANY MORE MODELS?

NO, JERRY. I DECIDED AVIATION WAS A BUSINESS TO MAKE MONEY IN--NOT TO FOOL AROUND WITH. I'M WORKING AT THE AIRPORT NOW. COME ON OUT.

YOU'RE IN AVIATION NOW? AND A LICENSED PILOT ALREADY? HOW COME?

LET'S TAKE A HOP. I'LL TELL YOU WHILE WE WARM UP THE MOTOR.

YOU HAD TO GIVE UP YOUR JOB, DIDN'T YOU, TO GET AVIATION TRAINING?

I DID NOT. WALTER HINTON TRAINED ME AT HOME. THEN I GOT A GROUND JOB AT THIS AIRPORT AND GOT MY FLYING INSTRUCTIONS AT A VERY LOW COST. HINTON TELLS YOU ALL ABOUT HOW TO GET INTO AVIATION IN A FREE BOOK HE'S PUBLISHED.

GEE--THIS IS GREAT. I'LL SEND FOR WALTER HINTON'S BOOK TONIGHT AND LEARN HOW HE TRAINS MEN FOR AVIATION.

WHAT A COURSE. HINTON GIVES ME THE DOPE ON MOTORS, AIR PLANE DESIGN--AIRPORT MANAGEMENT--GIVES ME THE GROUND TRAINING FOR MORE THAN FORTY DIFFERENT TYPES OF AVIATION JOBS. AND HE'S HAD MORE THAN EIGHTEEN YEARS EXPERIENCE TRAINING MEN FOR AVIATION. I'M GOING TO START TRAINING RIGHT NOW.

THIS SHIP HANDLES BETTER THAN EVER SINCE YOU'VE BEEN SERVICING IT.

THANKS BILL. HINTON CERTAINLY KNOWS HIS STUFF. I'M TAKING FLYING LESSONS NOW. I'LL SOLO NEXT WEEK.

I'M SO GLAD YOU GOT INTO AVIATION. WITH THAT NEW JOB AS PILOT FOR THE AIRLINE WE CAN GET MARRIED RIGHT AWAY.

AND THERE'S PLENTY MORE AHEAD FOR US IN AVIATION, DEAR. IT CERTAINLY IS THE INDUSTRY FOR AMBITIOUS WIDE-AWAKE MEN.

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### 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 coupon today--right now--while you're thinking about it. I'll send you my big new FREE Book--packed with interesting facts about your opportunities in Aviation. Mail Coupon NOW.

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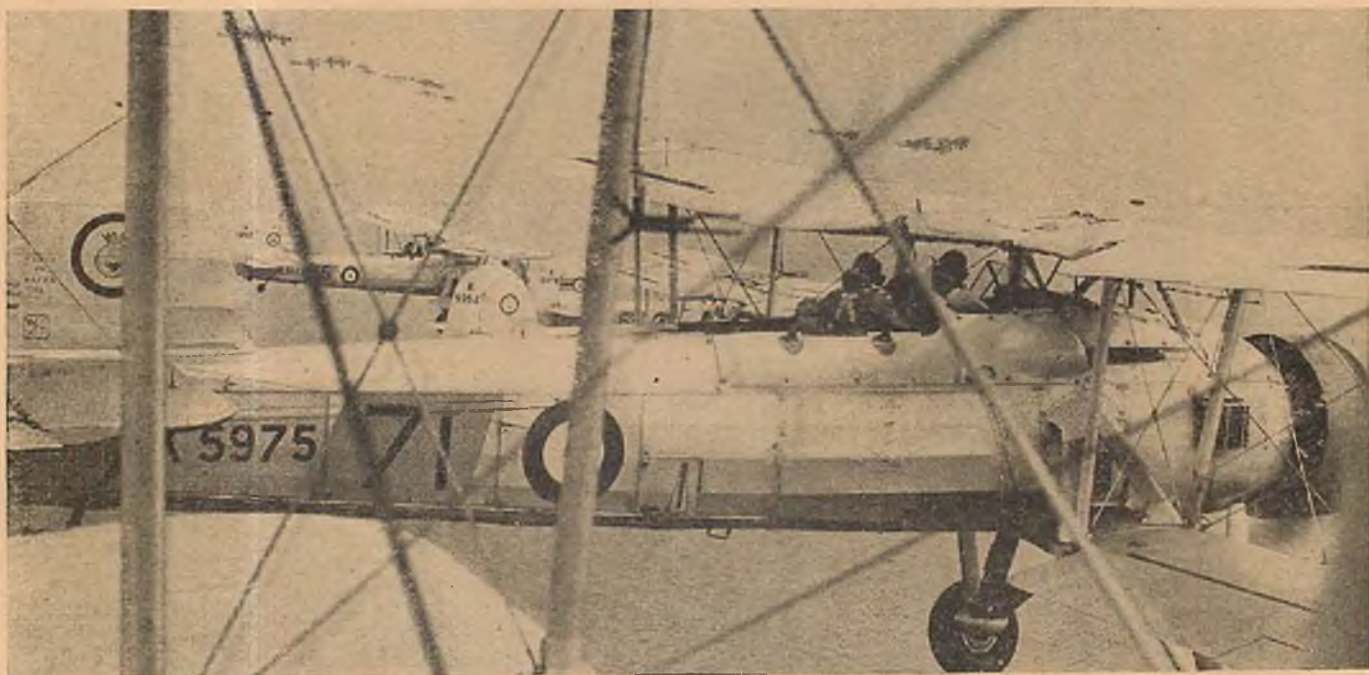
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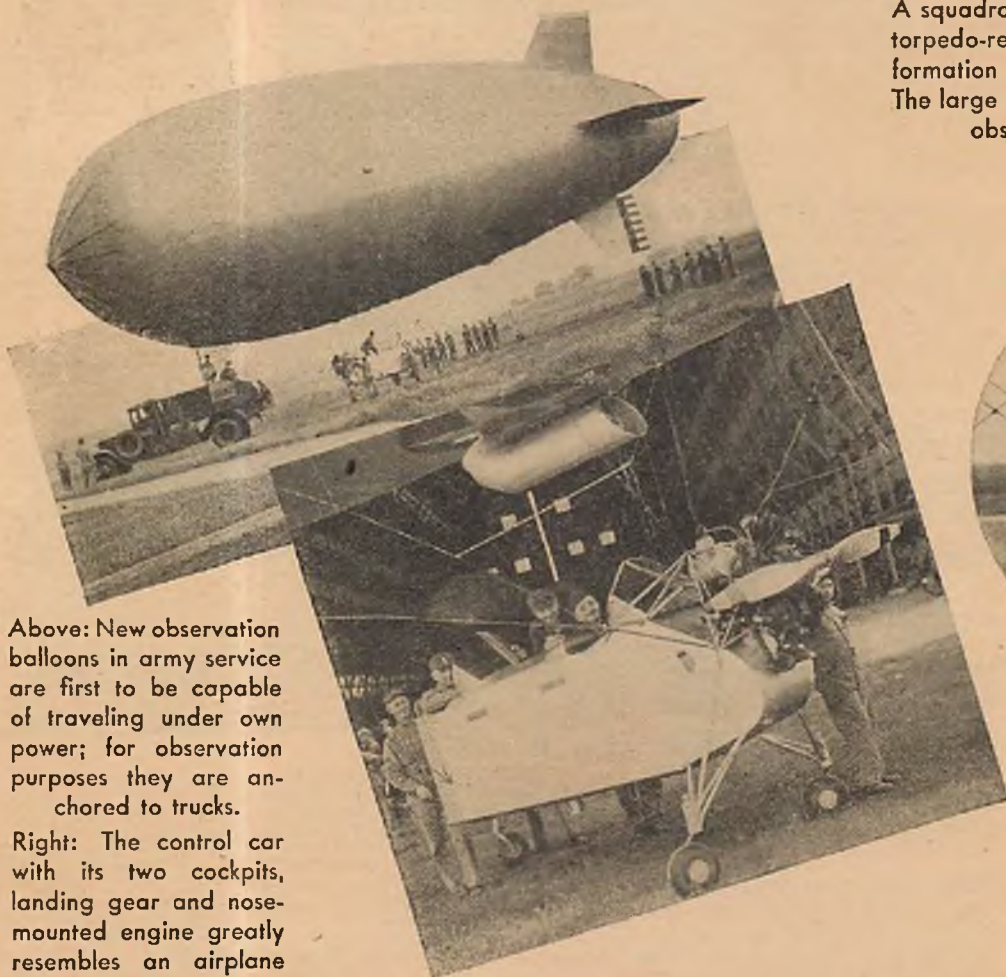
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# THIS WINGED WORLD



A squadron of Fairey "Swordfish," British torpedo-reconnaissance planes, flying in formation during Royal Naval Review. The large rear cockpit accommodates the observer and a radio man.



Above: New observation balloons in army service are first to be capable of traveling under own power; for observation purposes they are anchored to trucks.

Right: The control car with its two cockpits, landing gear and nose-mounted engine greatly resembles an airplane fuselage.

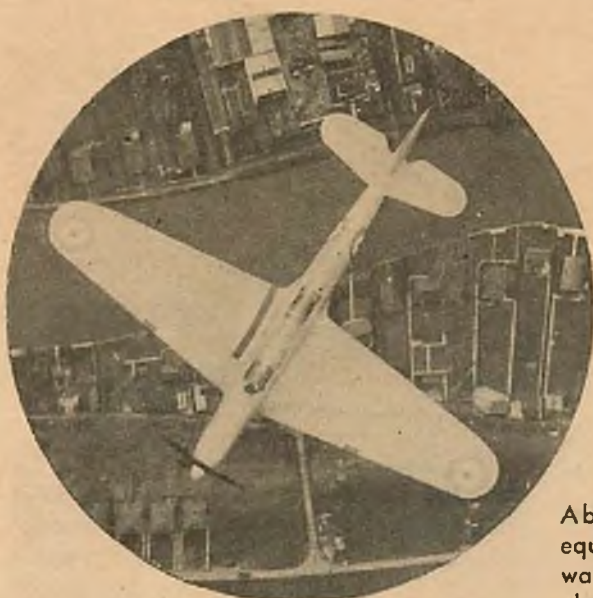


Quick-opening parachute functioned in two seconds when tested by its designer, Mr. Shuzo Higuchi of Japan.





40,000 hours is the total flying time of these four major air-line pilots. Left to right: R. S. Jones, American Airlines; P. L. Dobie, United Airlines; H. O. Hudgins, Eastern Airlines; and F. H. Smith of T. W. A.



Above: Viewed through the automatic, gunning-camera aperture of a "Swordfish" torpedo plane, this Fairey light bomber streaks beneath during R. A. F. high-speed trials.

Below: Not a deep-sea diver but Colonel Pezzi, Italian altitude ace, clad in oxygen suit and helmet essential for high-altitude flights.



Above: Camera-gun-equipped Boeing fighter was one of the many army planes engaged in mass maneuvers at Murdoc Dry Lake, California.

Right: This Martin bomber, caught in the sights of the pursuit ship above, demonstrates the training value of the device.



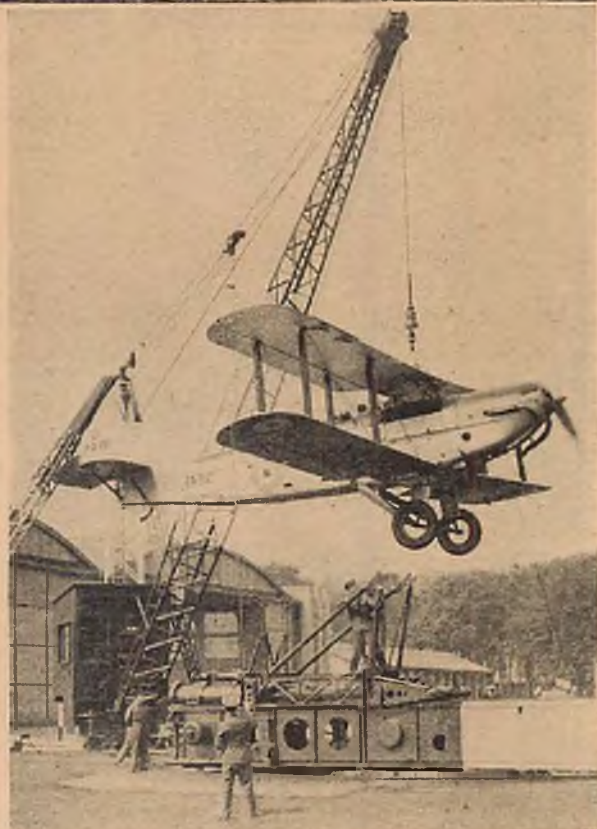
The Sikorsky-built "Bermuda Clipper" of Pan American Airways skims over the water bound for Bermuda from Port Washington, Long Island.



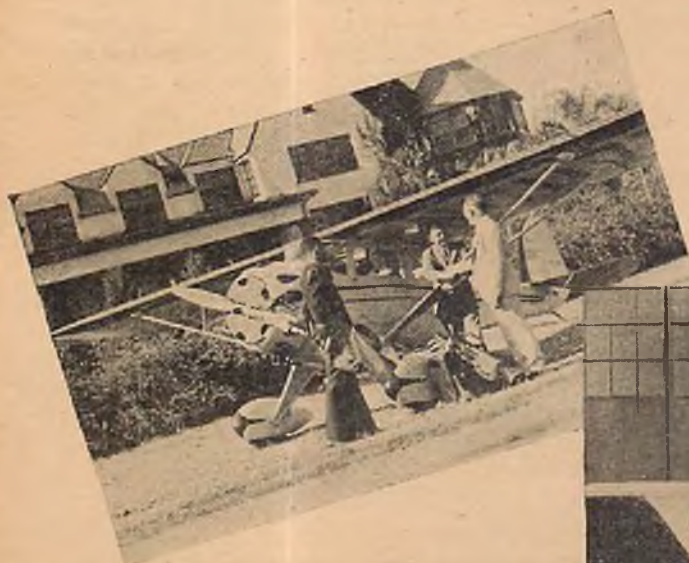


Above: This Russian sport plane, powered with a converted auto-type engine, was recently demonstrated publicly near Moscow.

Below: Modeled in silver, this 4-foot replica of the Breguet "Question Mark," first plane to fly from Paris to New York, was presented by the French government to Rockefeller Center for the French building, where it is to be permanently displayed.

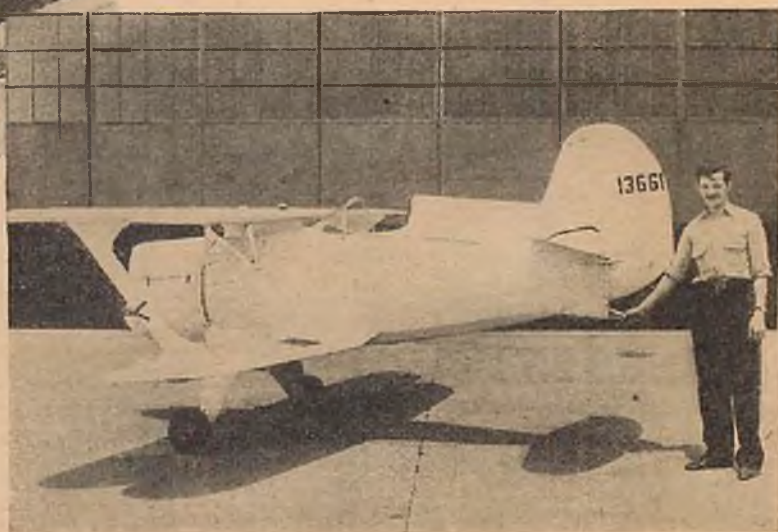


Land catapulting of a Fairey light bomber was a striking feature of Great Britain's Empire Day Display. This apparatus permits flights from fields too small for normal operations.

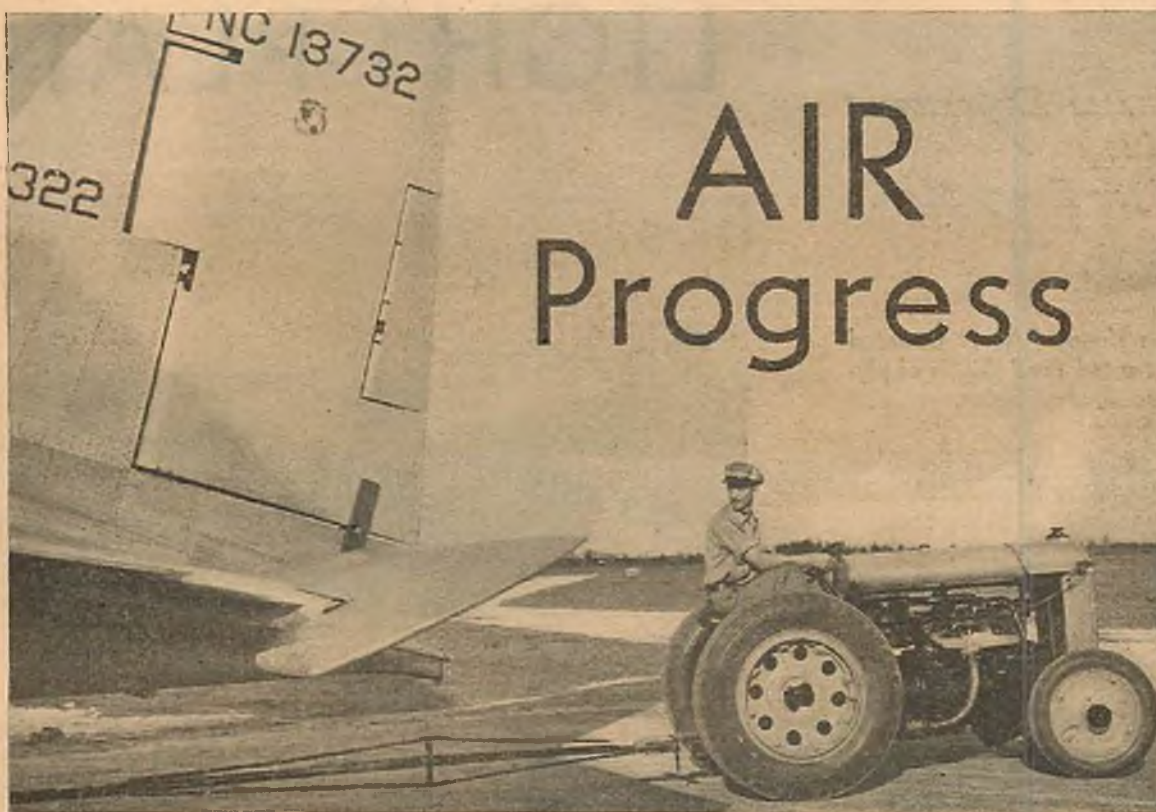


Above: Visiting by plane has become commonplace. This Florida hotel maintains a landing field for the convenience of air-minded guests.

Right: New baby biplane, spanning only 15 feet and powered by a 70 h.p. air-cooled engine, cruises at 160 m.p.h.







## A Summary of AVIATION NEWS

Among air-line operational problems is the ground handling of the great transport planes.

### TRANSPORT

The most progressive step toward regular transatlantic air travel has recently been completed by Pan-American Airways and the Imperial Airways of Great Britain, through their series of familiarization flights between Port Washington, New York, and Hamilton, Bermuda. By the time this magazine appears there is a great possibility that the first actual transatlantic crossings will have been completed over what is known as the Great Circle Route from New York to Great Britain.

So far Pan-American has been using Sikorsky S-42 Clippers on the Bermuda run and Imperial has done their half with the Short "Empire" flying boats originally designed for the Africa and India runs. As far as is known now, Pan-American has no idea of adding larger craft for some time. Even though the company has ordered 6 new Boeing flying boats presumably for transatlantic work, it is known now that these models will not be ready for actual service for many months.

On the other hand Imperial Airways has a new Short flying boat ready for flight testing, according to information from abroad, which they claim to be the most luxurious craft of its type in the world. It will be designed for larger loads and greater range than the present Short boats. In the meantime both companies will carry on their original plans with the S-42s and the Empire boats. The Pan-American ships will carry about 16 to 20 passengers on the transatlantic runs, although they were built to carry 32 on normal runs of 1,000 to 1,200 miles. The British boats will carry between 12 and 18 passengers in a cabin originally equipped for 24. The extra cabin space will be given over to extra fuel tanks which will be capable of providing a 60 per cent fuel margin in case of head winds.

It is believed that all lighter-than-air progress will be

held up for some time, owing to the *Hindenburg* disaster. Work on the new Zeppelin has had to be halted until some ruling can be obtained on the helium situation. It is believed that there is little chance that the United States government will grant Germany this safety gas for the use in airships until a more definite policy has been drawn up.

So far no definite findings have been uncovered as to the actual cause of the *Hindenburg* accident. Six members of the German commission investigating the disaster have admitted that there were 8 "possible" causes. These include propeller breakdown, sparks from one of the motors, atmospheric electric discharges, faulty electrical installations, faulty balloon-covering material, wireless confusion, or some violation of the safety rules. The instruments which would have registered some of these points were shut off during the landing operations.

Two of the new Douglas DF 32-passenger flying boats have been sold abroad, one going to Japan and one to Soviet Russia. The new British De Havilland Albatross is the first British transport having a cruising speed of more than 200 miles per hour. This new 4-engined machine is a low-wing monoplane with a long, sleek fuselage and twin fins. The ship uses the new Gypsy twelves.

Japan has a new monoplane, named the *Rising Sun* which has been designed for long-range work. The success of the *Divine Wind* on her remarkable flight from Tokyo to London has given Japan a new lease on aviation life. The new ship has a span of 91 feet and uses a motor developed by the Aeronautical Institute. It is believed that this ship will be capable of flying around the world in three hops.

The air-mail stamp hobby is finding a rival for its favor. The latest, so we understand, is (Turn to page 95)



*Introducing  
a new  
AIR TRAILS Department  
devoted to  
Flying for Every Man.*

Right: The Keane "Ace," powered by the converted Ford V-8, is of plywood construction.

Below: Organized in 1936, the West Virginia Sportsman Pilots Association already includes 175 members.



### "CAN I FLY SAFELY AND AT A REASONABLE COST?"

THAT QUESTION has been asked or considered by a million people, men and women. Aviation has reached a point where planes and licenses are available for all of us.

At a recent test planned to demonstrate the simplicity of operation, a man who had never before sat at the controls of a plane began receiving flying instructions at dawn. During the day he spent five and a half hours in the air with an instructor. He soloed successfully before sunset.

Light planes are now as reasonable in price as automobiles. A pilot's license, while it costs much more than driving instruction, is now within your reach.

Perhaps we cannot, individually, own and operate our own planes this year. But in groups of from 12 to 20 memberships we can learn to fly, get our private licenses, and keep in step with the great, new, expanding transport medium of the future.

This article is going to take something of the form of an editorial, because I want you to know how completely Air Trails covered the ground preparatory to offering you a new flying medium.

Our "Light Plane Survey" in the July issue checked 23 available American products. It gave us a bird's-eye

view of an industry which is at the point the automobile had reached 25 years ago, with Ford and Chevrolet cars bringing in a dependable, low-priced driving era.

To-day we have a quarter of a century of added experience in bringing our power plants to a point of dependable perfection. There is no reason, after 40 years of automotive traction, why we should hesitate to trust the light-plane power plants.

The World War served as a testing ground for wing and fuselage construction. The 19 years since the War have brought about refinements in streamlining, stress-analysis, and balance. Until to-day I have

never expressed the thought that aviation was ready for mass adoption, but I am saying it now.

For as little as a \$50.00 initiation fee, and dues of less than \$10.00 per month, it is possible for a flying club of 20 members to own and operate a safe, carefully attended plane. Of course, it is necessary for each member to pay a per-hour operating cost while in the air.

Country clubs and automobile clubs throughout the length and breadth of the nation are beginning to inquire as to the possibilities. I've answered a dozen such letters this month. Now I'm answering *en masse* those who have not yet written.

Yes, by all means. Every country club, and every automobile club in America which maintains a country club house should have a light-plane unit on the essential equipment list.

There have been inquiries from high schools. I am answering those inquiries in detail through the article on the next 2 pages, the delineation of the accomplishments of the Teaneck, N. J. High School in aviation. I hope every reader of Air Trails will make it a point to call this article to the attention of his local board of education. A dozen schools are already teaching aviation. By 1940 the course should be as universal as economics permit.

But the individual flying club need have no organization outside its own membership and an available flying instructor.

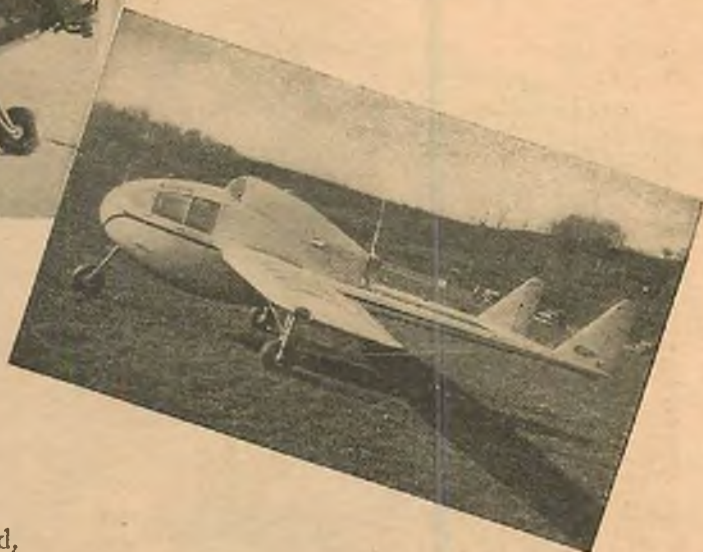


# FLYING CLUBS



Above: Although not an ultra-light plane, the Rearwin "Sportster" accommodates those desiring completeness and high performance.

Right: The experimental Campbell features metal construction.



In order to help you to expand, Air Trails is prepared, with the cooperation of the manufacturers of light planes, to answer your questions, to help with information concerning available ships, requirements, costs, etc. In return we will ask only that you keep the magazine posted as to your progress, organization, the plane you fly, and the progress you make as individuals and as a club. It will be a mutual service, with us giving you a clearing house of information through the Light-Plane Department; and you, through your news of progress, encouraging the advancement of aviation by reflecting your activities to the national audience of Air Trails.

As an example of what has been done in the last year, the West Virginia Sportsman Pilots Association of Charleston, W. Va., deserves special mention. This association, which was organized in October, 1936, by 22 members, now numbers 175, of which 50 members are pilots or flying students. No data as to its oldest member has been made public by the club, but the youngest member, Philip Allan Blood, was born on January 12, 1937.

Philip was enrolled in the association by his proud father, when he was exactly one day old, on January 13, 1937. Charles S. Blood, the doting father of this future pilot, is a transport pilot and one of the organizers of the association.

Mr. David B. Williams, president of the club, is the grandfather of the youngest member. Mr. Williams is a licensed private pilot.

Promotion of private flying at low cost and on a nonprofit basis is the announced aim of the organization. Mr. William Hickman, secretary, reports that it is oper-

ating on a basic charge of \$4.00 per flying hour, of which \$1.00 is allotted for the service and \$1.00 for depreciation.

Since the 12th of March, 1937, 5 members who had no previous flying experience have made their first solo flights. At present 11 members are receiving their basic or dual flying instruction.

## PRODUCTION BOOMING

Light-plane production is booming. The Taylor Aircraft Co., which has moved to new quarters since fire destroyed its plant, reports unfilled orders for "Cubs" exceeding the entire production in 1936.

Mr. Dee Hollowell, vice president of the Porterfield Aircraft Co., reports that in the cases of light-plane clubs already operating they have received very satisfactory reports.

(Turn to page 96)



The Porterfield "Zephyr" reflects the trend to high-wing cabin designs.

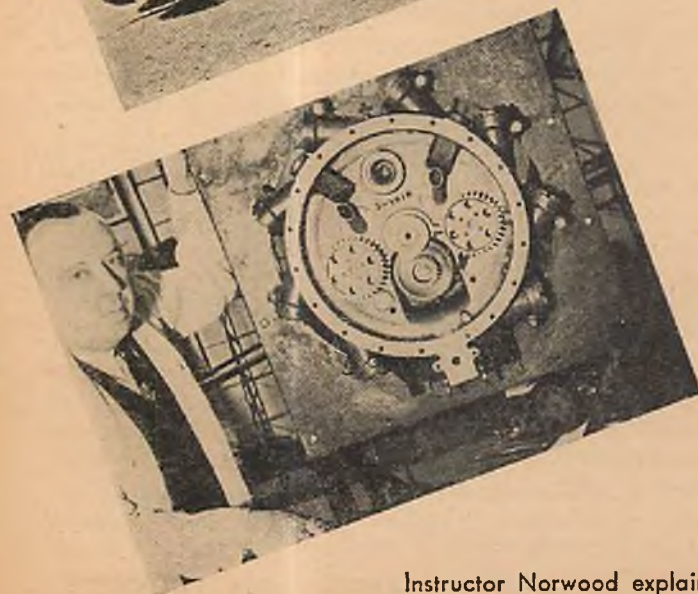


The Taylor "Silver Cub," continuing a popular line, exemplifies to potential pilots the benefits of mass production in the light-plane field.



# High School PILOTS

Below: A group of second-year students adjusting the valves on a 12-cylinder Liberty motor.  
 Insert: A class of flight students with the school plane, an Aeronca.



*Light planes have opened new training opportunities—the school-club plan offers the surest approach*

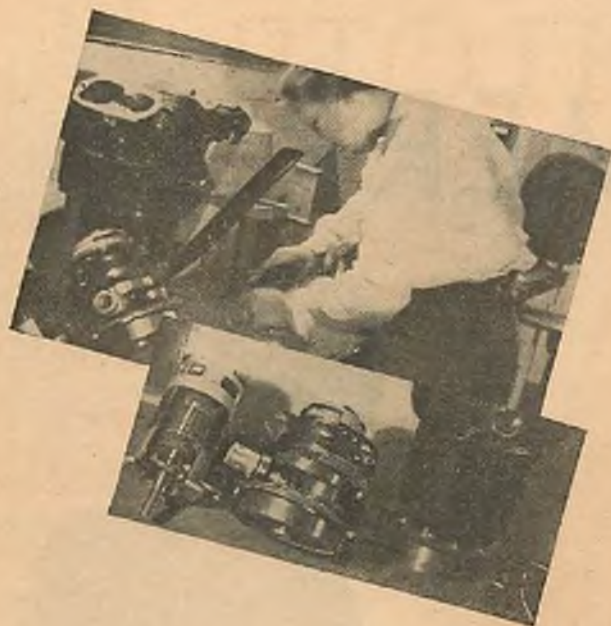
By  
 R. Kermit Hewes

LABORATORY work at the close of school." These were the instructor's parting words as the two-o'clock class came to an end. Contrary to what might have been expected, there were no complaints or groans from the twenty-five boys and girls leaving the classroom. Instead, there was a straightening of shoulders, a brightening of eyes, and a growing buzz of conversation. And no wonder. For this laboratory was not a closed room full of chemical odors, but an airport! The lab equipment was wheeled out of the hangar at three thirty. It was an Aeronca, seating two and equipped with dual controls. The first "lab experiment" of the afternoon was an important one. Dorothy Fulton was to make her first solo hop. Following her successful efforts two of the boys made practice hops of thirty minutes each, piling up precious time toward that coveted department-of-commerce pilot's license. At six thirty this group of high-school students were in their homes ready for dinner.

Does all this sound impossible? Does it seem that this might be an account of the future? It does happen here. The time: the present. The place: Teaneck High School, Teaneck, New Jersey. The cast: "Major" Norwood and about sixty-five boys and girls who are the present students in the first high-school course in aviation

Instructor Norwood explains the gear train operation of a Pratt & Whitney Hornet.





Top: This advance student assembling a distributor for a 12-cylinder engine proves that aviation mechanics are no more confusing to a girl than a boy. Above: Typical of the complete equipment available for school purposes are these sectionalized engine accessories.



anywhere in the United States. And all it costs them is a small charge for their gas and oil and hangar rent.

### HISTORY OF THE COURSE

Early in 1930 several students of Teaneck High School, avid followers of aviation, conceived the idea of forming a glider club as an extra-curricular activity in the senior high school. They discovered a resident of the town, Arthur G. Norwood, holder of a transport pilot's license, who readily agreed to work with and train such a club. It was but a short time until a glider had been built and was in operation. In these early days the major established for himself his present reputation as a strict disciplinarian. Thirty-foot ceiling for the glider did not mean fifty feet, as several of the boys discovered. Mr. Norwood expresses his reasons for such discipline when he says, "This is the only course in the school in which strict discipline is a matter of life and death. Carelessness or disobedience can have but one result!" This probably helps to explain why in fourteen hundred hours of flight and over eight thousand take-offs and landings, there has not occurred the slightest accident of any kind.

The glider club developed into an aviation club and continued in its semiofficial capacity until January 1, 1934, when a progressive and air-minded board of education, with the support of many of the parents and taxpayers, successfully established a department of aviation as a regular part of its curriculum and employed Mr. Norwood as instructor. This action has since been approved by the State Board of Education and the commissioner of education, Mr. Charles G. Elliott, and Mr. Norwood was given the first aviation teacher's license ever issued by the State of New Jersey.

A course of study written by Mr. Norwood has since been adopted by the State Board of Education for the use of any other schools that might add aviation to their

Top: Navigation students deep in the study of radio beams illustrate the completeness of a school-training program. Above: The thorough course in flight and mechanics develops a concentrated interest in each student.

curriculum. The course, as organized, consists of two years of work. Every student enrolled in the first-year course must have passed his fifteenth birthday, submit his parents' consent in writing, and pass a satisfactory physical examination by the school physician. Every student enrolled in the second-year course must have completed the first-year work with an average of "C" or better, and comply with the requirements of the United States government for a student pilot's permit. These requirements necessitate appearance before an army doctor for a physical examination. A fee of ten dollars is charged for this examination, the cost of which is assumed by the student. He must also have passed his sixteenth birthday by this time. The first-year course meets five periods per week during school hours and the second-year course meets three times, with an additional two periods of laboratory or field work.

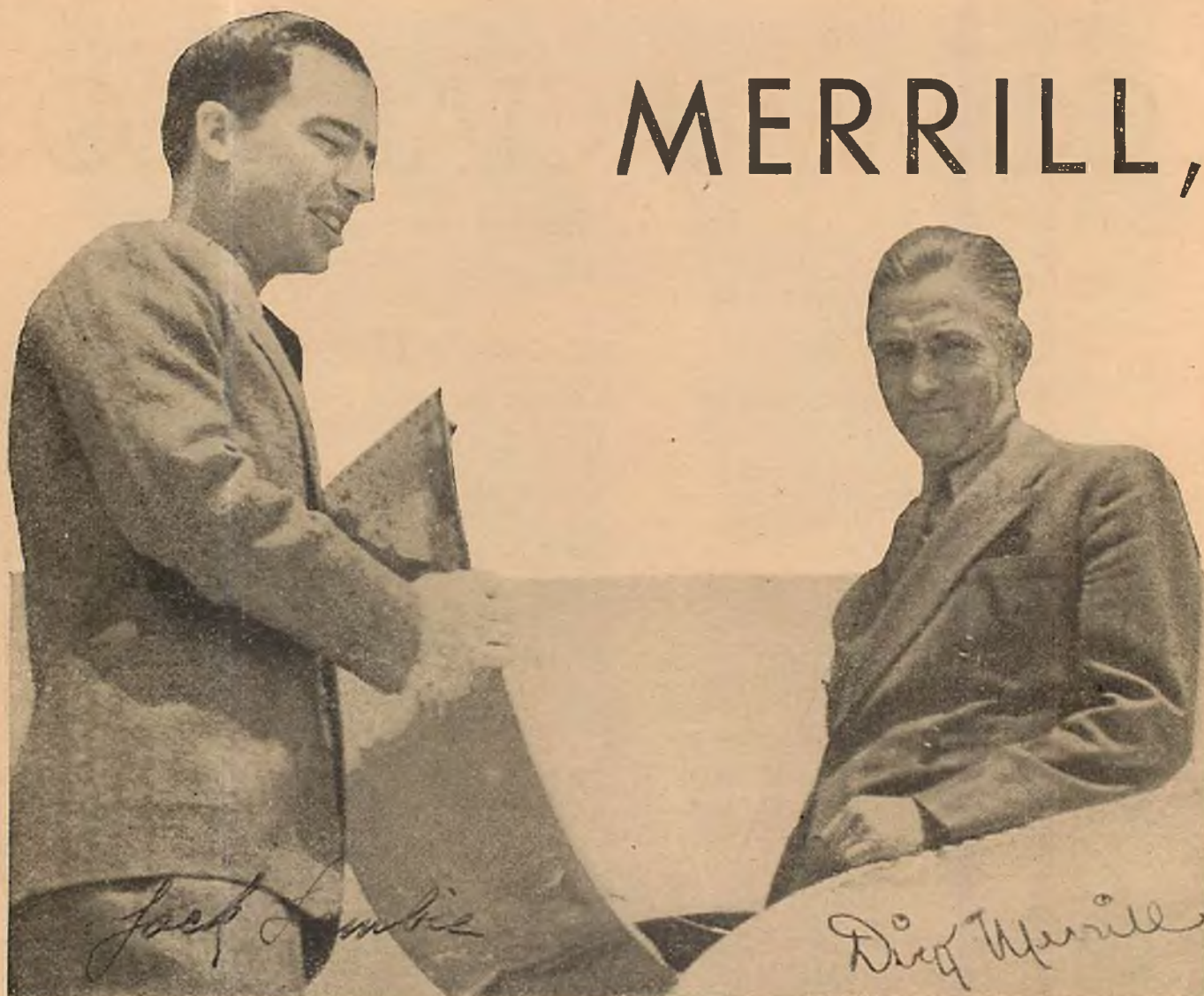
To assure practical results it soon appeared necessary to supplement the official school course with actual flight instruction. Accordingly, on March 1, 1934, the plane was delivered, but only after the instructor had tested a number of models and types for safety and suitability for student flight instruction.

The present status of the course can best be summarized as follows: ninety students have been given flight experience; twenty solo students have been developed; five students have received their Federal licenses as airplane pilots; two students have entered the aeronautical field; four students are working for their degrees as aeronautical engineers. No student has failed in general school work or has become a problem of the administration.

(Turn to page 94)



# MERRILL,



An autographed photograph of Dick Merrill and his co-pilot Jack Lambie, as they prepared to take off to obtain coronation pictures.

**T**HREE days before the coronation of his majesty, King George VI, a quiet, unassuming American in an ordinary business suit took off from Floyd Bennett Airport. His name was Mr. Henry Tindall Merrill. His destination was England—and return.

Dick Merrill's flight was no stunt, although he did return with six new records. The flight was to transport photos of the coronation. Merrill got ninety per cent of the sales returns on photos brought back and rushed to the country's press through International News Photos.

To this amazing pilot the highly adventurous round-tripping over the Atlantic was the same sort of business proposition as flying passengers to Miami. He put transatlantic, heavier-than-air flying on a big business basis. Returning, his first remark was, "Well, here we are. What's the next job?"

His chief concern on awakening from sleep after the flight was to find out from I. N. P. if the pictures were satisfactory and worth the cost of rushed air transport. When newsmen pressed for dramatic details he put them off by saying, "Wait until I get this business settled."

There you have Dick Merrill, as reliable, modern and adventurous a pilot as you'll meet. He told Air Trails

he had never felt fear in the air because he had never risked his equipment or his equipment's efficiency. Above everything else, Merrill is a precision pilot.

Merrill is a post-War pilot, reared out of, not into, those swashbuckling days of barnstorming circuses, flying crates and jellopies. He was born in Inca, Mississippi, in 1897. He attended his State university and for two years served with the navy. He got his wings from speed pilot, Jimmy Wedell, soloed July 10, 1920, and then barnstormed to the roar of gaping crowds.

But Dick wasn't looking for a hero's funeral. He went into the mail service, where even then precision was beginning to count for more than sheer cloud-busting. In those days the boys were riding the air lanes without much mechanical guidance. Dick still recalls the razzing he got when ten miles off course after flying the Greensboro route blind through soup and storms. Somebody drawled, "Have a nice time over in Bermuda?"

After that he was a test pilot. He had cold nerve, but more, he had an eye to size up a ship and just what she would take. In 1928 he went with the infant Eastern Air Lines, then known as Pitcairn Air Transport. He distinguished himself on November 11th, two years later,



# COMMERCIAL PILOT

by Thomas Calvert McClary

*Two Round-Trip Trans-Atlantic Flights—Skilled Precision  
Business Schedules—Safe Transport  
A Proud Record for an Unassuming American Airman*

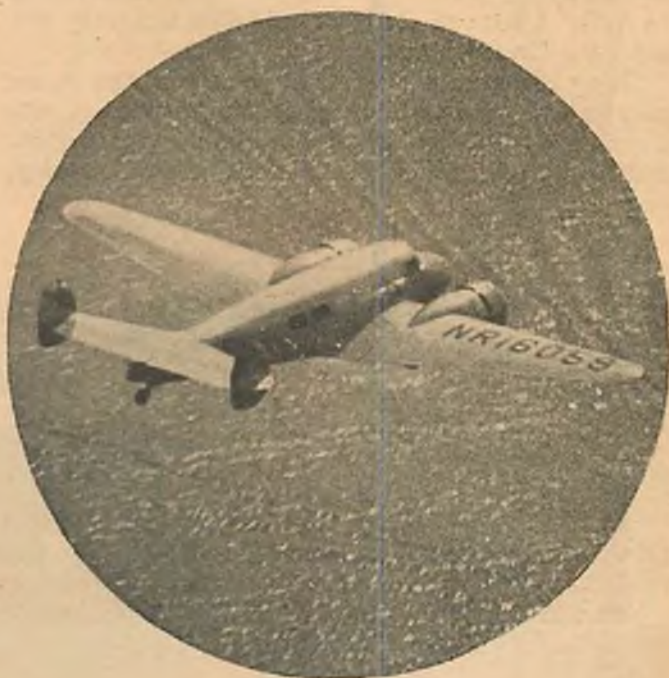
by joining the Caterpillar Club between Charlotte and Greensboro, N. C. Blown off course in a dead fog he found his radio beam off. He had little idea where he was. He missed crashing a mountain by inches. After roaming around in the soup for four and one half hours he ran out of gas. It was tough country where pilots who spoke of forced landings meant being buried in their helmets. At five thousand feet, Merrill bailed out.

It was a jump he never forgot. He dropped fifteen hundred feet before he could reach his rip cord. There was a violent jerk, a shrill, singing noise from the strained lines; he swung twice and hit a mountainside.

He located his crashed ship and got the mail into Caesar, for which he was duly commended. However, he had some painful explaining to do when the company learned he had kept a prearranged luncheon date in Shelby later the same day.

Quiet to the point of shyness, Dick drinks no alcohol, doesn't smoke, and is usually found listening on the outskirts of the crowd. But no shyness could hide his increasing precision record. Merrill's ships came in on schedule. Customers began to ask to ride with that quiet Merrill fellow. Merrill somehow gets around weather and comes through.

In December, 1935, came the startling news of Lincoln Ellsworth's crash in the antarctic with his pilot, Hubert Hollick-Kenyon. Merrill was selected to take a new Wright Cyclone powered Northrop Gamma from Kansas City to San Antonio del Deste, Argentina. It was for delivery to Sir Hubert Wilkins, who was heading the rescue search party aboard his ice ship, the *Wyatt Earp*. He took off on the risky date of December 13th.



Above: The heavily loaded Lockheed Electra winging over the Atlantic shortly after the take-off from Floyd Bennett Field.

Below: Its five-day round trip to England completed, the record-shattering plane—Merrill at the controls—taxies across Floyd Bennett Field after landing.





It was a ticklish flight and vital that the ship be gotten there quickly and in condition. Already precious time had been lost, when another pilot cracked up a ship. Merrill made the eight-thousand-seven-hundred-mile trip with W. S. Klenke, airplane engine expert. Minor engine trouble over a wild section of Ecuador forced them down.

They came down on a desolate beach to find about two hundred nearly naked and very ungentlemanly savages breaking out of the trees toward them. There was a good chance that they were head-hunters or cannibals.

Merrill turned his blue-gray eyes on Klenke and said, "Boy, isn't this a crazy world?" Then he turned to repairing their engine.

Dick had long been interested in commercial flying over the north Atlantic. "The time has come for trans-atlantic flying," he once announced. "And it's no stunt to do it. I want to see what conditions are really like along the Great Circle Course to London."

Harry Richman, night-club songster, had gone in for amateur flying and wanted to make the Atlantic hop with a good pilot. The two men teamed up in August, 1936, and bought a forty-five-thousand-dollar Vultee low-wing,



Above: Albert Lodwick, director of public relations for Curtiss Wright, played an important part in making the flight possible.



Left: Dick Merrill and Jack Lambie, to whom Merrill credits much of the success, step from the plane after finishing the first round-trip commercial-airplane flight between the United States and England.

Below: Merrill delivers the pictures of the coronation to Harry Baker of International News Photos, in New York, thereby accomplishing his prescheduled commercial conquest of the Atlantic.

all-metal monoplane with a wing spread of forty-eight feet, and a one-thousand-horse-power radial Wright Cyclone engine. It had a cruising speed of well over two hundred miles per hour.

They had special equipment, including gear to cast loose the motor and mechanism to dump gas and seal fuel tanks (to increase buoyancy), in one half minute, in case of being forced down on the Atlantic. With special extra tanks, the *Lady Peace* had a cruising radius of five thousand miles.

This flight was literally a stunt flight. Richman used all his showmanship and the publicity piled high. One improvisation was forty-one thousand ping-pong balls loaded in the wings for greater buoyancy and to be autographed souvenirs later.

Early in the morning of September 2nd, the blue-and-silver *Lady Peace* rolled heavily down (Turn to page 85)



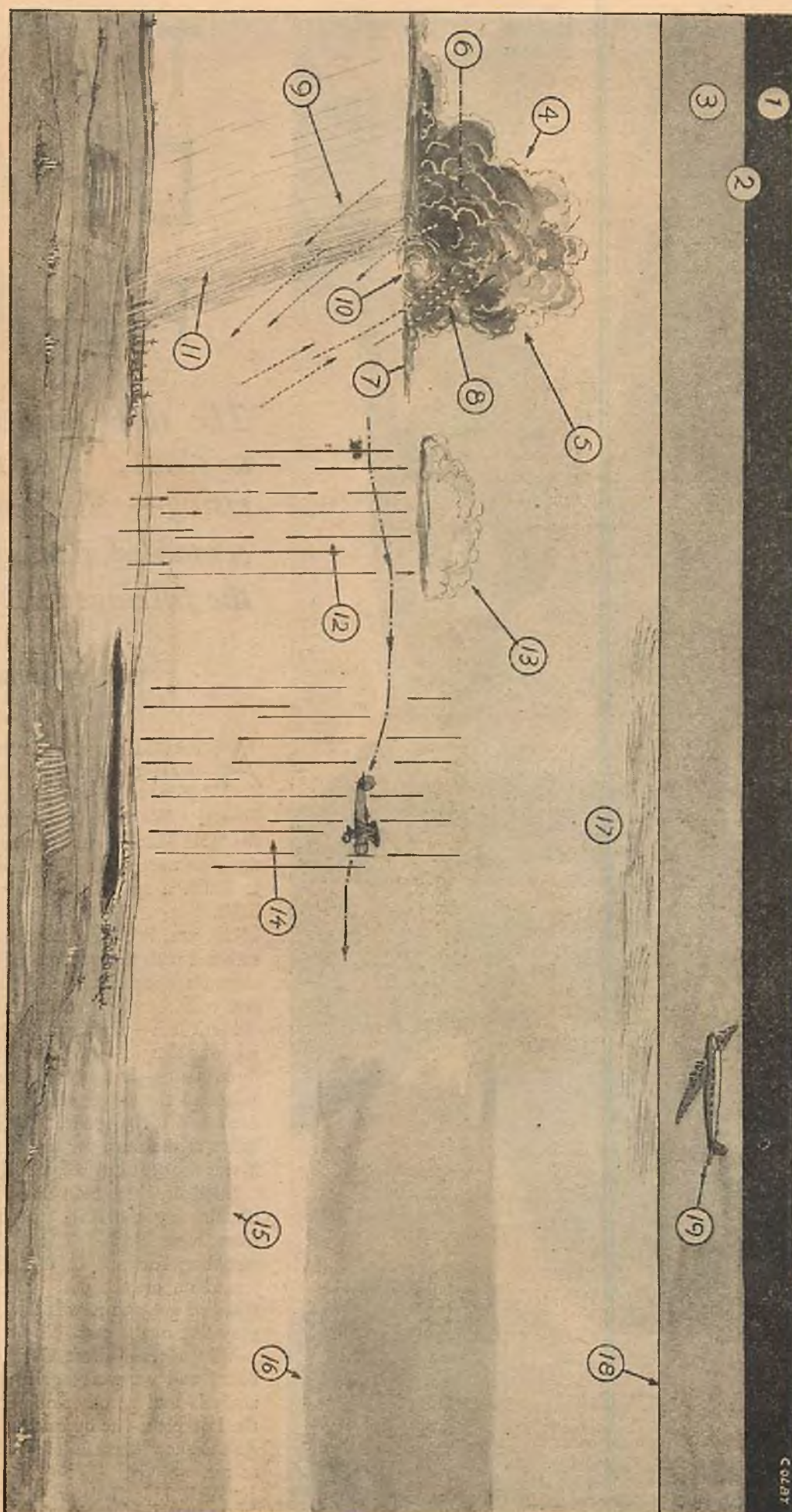


# THE FLIER'S DICTIONARY

The twenty-fourth lesson in the technical terminology of the air. Save your files!

## FLYING CONDITIONS

- 1 The *stratosphere*, as yet unused for commercial flying.
- 2 The *tropopause*, or dividing line between the stratosphere and—
- 3 The *troposphere*, which is below. This reaches an altitude of approximately ten miles at the equator and flattens out to approximately five miles at the poles, due to the rapid rotation of the earth. In this area all future commercial flying will take place.
- 4 The *cumulo-nimbus* or thundercloud is a constant menace to aviation because of the violent currents that are in and about it.
- 5 The *thunderheads* are high towers of light and dark cloud.
- 6 The direction of the thunderstorm.
- 7 The *storm collar* that precedes the thundercloud.
- 8 Violent *up currents* of air draw up into the thunderheads.
- 9 Violent *down currents* full of rain blowing down out of the thunderheads.
- 10 The *roll skud* or violently turning mass of clouds caused by the up and down currents of air No. 8, and No. 9.
- 11 The violent downfall of rain is directly behind the roll skud and accompanies the down currents.
- 12 *Thermal up currents*, on the other hand, are an aid to aviation, and are used by soaring craft for lift. Warm air heated by a sunny field or large building rises vertically until it reaches a cold layer and the moisture contained condenses forming—
- 13 *Cumulus* clouds that aid the pilot to locate up currents of this type. The up currents are the so-called "Bumps" we hear about. If strong enough they will lift the ship flying through them to a higher altitude.
- 14 *Down currents* are caused by cool air descending over lakes, wooded areas or rivers and are the so-called "pockets."
- 15 *Radiation fog* rises from the ground and may reach several hundred feet. Caused by warm air under a layer of cold air. This cold air, or "lid" as it is called, is where the air starts to become cold again and prevents the rising of the warmer air below for the time being. Condensation takes place and fog results.
- 16 *Advection fog* may be found at almost any low altitude and is caused by the joining of a warm and a cold current of air.
- 17 The highest clouds are the *cirrus* or tufted clouds which are just below the—
- 18 "Weather ceiling" which is at approximately 30,000 feet. Above this there are no clouds and only horizontal currents.
- 19 The new "Overweather" planes will fly in this area and will be above all atmospheric disturbances.







# The DEVIL'S Plaything

*The ship quivered and began to climb. The nose was slowly rising— Suddenly the left wing crumbled, slammed back against the fuselage with terrific force—*

by William Salsig

A FAINT gray line in the east forecast the inevitable return of day. Out of the little window in Craig's office you could see it throw the hangars into silhouette. We were both looking out and silently cursing the "Old Man" for not getting the expiration date on this navy contract right. This business of staying up all night to finish a special design was becoming too regular a habit.

Oh, yes, this was just a trivial matter. Craig wasn't satisfied with the strength of a belly filler between the retractable undercarriage. And when Craig wasn't satisfied with something that something was changed until it did suit him—which was only after it was perfect. This job was simple—shouldn't have taken more than two or three hours—but we ran into difficulties with the mechanism of the retractable landing gear and some relocations had to be made. Wouldn't take more than three hours at the most for the actual change to be made after it was worked out on paper.

Suddenly, the field siren blared. Lights flashed on, illuminating the field. That meant No. 3 was due in from New York. There she was, settling gracefully, rumbling forward to discharge her passengers. Four ten a. m. on the dot. She never varied. The lights snapped out and it was dark again, except for that faint gray line in the east.

With a tired effort Craig turned back to his drawing board and we were again engulfed in structures, stress analysis and aerodynamic theory. I figured we'd have the last plate out by seven. I missed by three minutes. As the shop foreman left with the last plate, Craig turned to me.

"Well, kid," he said in his tired voice. (He'd called me "kid" ever since I'd joined the company some fifteen



years ago. I suppose it was because my appearance fairly shouted "fresh from college" then.) "You hop off and get some sleep. Tests aren't until one."

I knew better than to argue; anyhow I didn't feel like it. Numbers were still running around groggily in my head and I felt like sleeping on the drafting table. I offered him a ride to his apartment but I knew he wouldn't accept. He had a few details to complete and wouldn't sleep until then. And I knew just as well he wouldn't let me help him. So I scrambled.

I WAS BACK at the field at twelve thirty. I paused at the little door marked "Chief Engineer." I

Suddenly a wing dipped—  
She slid off sickly and whipped  
into a spin—faster—faster—



knew Craig had a cot in his office and I didn't want to wake him if he was asleep. But I should have known better. He spoke from behind me just then.

"How's tricks, kid?"

I jumped around and grinned sheepishly. He looked fresh as a daisy except for his eternally tired eyes.

"Thanks," he acknowledged, and I knew he referred to my caution before entering his office. "But it's unnecessary." He smiled. "There's enough Gold Braid outside to merit a war. Let's go out and get in on the finals."

We sauntered over to the hangars. There the Old Man greeted us and introduced us to a flock of naval officers. But we weren't interested. What we were interested in was on the apron.

Yes, there she stood—the cause of all our lost sleep. "U. S. Navy" proudly stood out in white on the sides. I glanced at Craig. I always liked to see that glow on his face. And this little baby certainly deserved it. She squatted there on the apron as if she were going to spring

at somebody. Her new coats of dope shimmered silvery in the sunlight, and the colors on the insignia still glistened wetly. The short, stocky fuselage fairing smoothly into the high monoplane wing, the huge engine and stubby landing gear, the covered cockpit and snubbed tail surfaces, all combined to give her an aristocratic air of tremendous strength and power. A wave of exultation swept over me; she was almost worth losing a year of sleep over!

Craig was running his hand on the fillets, peering here and there. Finally, he climbed into the pit.

"Kid," he said enthusiastically, "this job's got better visibility than I'd even hoped for! Why, you can see grandma's cabbage patch without even turning your head!"

I grinned and walked around to the other side. There was the reason. There were no struts or braces to obscure vision. Craig had always been a believer in cantilever wings and this was certainly his masterpiece.



He climbed from the pit, came over and slapped me on the back. We fell to talking shop enthusiastically. In the midst of our discussion the Old Man beckoned. We strolled over.

It was then I first noticed the new addition to the group. He was dressed in flying togs. An old oil-splattered helmet with goggles attached hung from one hand and a yellow, grease-smeared scarf from the other. He was talking earnestly with "Banty" Fowler, our chief test pilot. I placed the man instantly. He was going to do 9 g pull-outs with our new creation.

Banty introduced us. I studied the new pilot. He had a rather youngish face, even though it was wrinkled around the eyes and mouth. I placed his age at about thirty. But his eyes were the most startling thing about him. Very old, deep-looking eyes, with a hint of hardness and sorrow in them, were surveying Craig. I didn't have time for a more lengthy study because he went off with Craig to inspect the new ship.

"Funny guy," Banty volunteered.

"Yeah," I said. "Kind of young, isn't he?"

"Twenty-eight. But you couldn't find a better pilot. Logged five thousand on the worst kind of flying."

I watched the new chap and Craig crawl over the ship.

"What's he think of it, Banty?"

"Doesn't like that cantilever wing."

Nobody did except a few harebrained engineers like ourselves. The navy frowned on it. We had a terrific time finding a pilot to do these dives. Cantilever wings had seldom been used on a fighter before—with success. The last time it had been tried the pilot had been killed. The wings had wrapped around his neck during a terminal-velocity dive.

Yet this cantilever-wing belief had been a mania with Craig. He lived by it, had proved it on other types and begged for a chance to try it on a fighter. About that time the Old Man became interested in a navy contract and our little creation, technically known as XF5F-1, was the result. It would be a supreme conquest for Craig if this ship were successful.

"Who's flying her first?" I asked Banty.

"He'll do all the flying."

I glanced toward the apron again as I heard the screech of the engine starter. The big radial spluttered, caught the first time, fired unevenly and then settled gradually to a smooth, powerful roar. The new pilot was in the cockpit. Craig stood with his clothes flattened against him by the slip stream, his head in the cockpit, still talking. He nodded his head vigorously once or twice, withdrew it, and trotted over to us.

"All set?" he asked, and I thought I caught a faint trace of tension in his voice.

The pilot climbed stiffly out of his pit and walked toward us, drawing on his helmet and goggles as he came. A few last-minute instructions from the Old Man and the naval officers were given while he fastened on his two required parachutes. Then back to the ship.

We all watched him as he revved the engine and bent his head to the instruments. Satisfied, he pulled down his goggles, released the brakes, and, with a curt wave of his hand, taxied to the runway.

He fed it the soup and a dozen heads swiveled as the gray titan rocketed down the field. Gingerly, he lifted her off and climbed conservatively to five thousand feet. Then he blew the lid off. For half an hour he tore the sky apart and the little ship stood it beautifully. Loops,

rolls, spins, every conceivable position the ship could be put in was executed. At the end of half an hour his wheels kissed the runway gently and the first test was over.

Craig reached the crate first, but I was right behind. "What a boiler!" came enthusiastically from the cockpit.

That was praise enough for any engineer from a test pilot!

"No bugs?" Craig was dubious. It was too good to be true. Ships aren't perfect on the first flight no matter how carefully engineered.

The Naval Acceptance Committee got there in time to hear from the pilot: "It was the sweetest job I ever mauled!"

A WEEK of routine load tests and the like passed rapidly. The little ship came through each with flying colors. Craig's and my spirits soared higher and higher. The terminal-velocity dives drew nearer and nearer. Then one day we were ready for the first one.

The naval lads took it matter-of-factly. They went about their work as though they were merely fastening on the barograph and accelerometer for a load or speed test. Craig didn't seem perturbed. He was talking with the Old Man as he always did before tests. I shared more of the pilot's feelings; in fact, I had a bad case of jitters.

But the pilot was having a worse time. After all it was his neck that was being risked. He tried to appear calm, but the more he tried the more he betrayed taut nerves.

Finally, the naval men finished their task. The motor spat into life, picked up and purred contentedly. I helped the pilot on with his parachutes. The fatalistic smile in his eyes made me feel a pang of sympathy. Just to say something to him I asked how he felt.

"If I'm going to pile up, why, I guess I'm just going to." He smiled thinly.

Craig helped him into his pit. It was a bit awkward with the two 'chutes flapping around his legs and chest. He settled himself and spoke to Craig, because I could see his lips move. Craig smiled and stood aside while the engine thundered. Gradually, the roar subsided and the pilot spoke again to Craig. They both grinned and Craig walked back toward us.

Once again the pilot gunned her out for a take-off, but this time there was no wave of the hand. He gunned savagely and hoicked the little fighter off in a zoom that yielded a thousand feet in one jump. Craig's lips tightened and Banty grunted something that sounded like "damn fool."

At about ten thousand feet the ship nosed over and dived, gun full on—down, down. Then it flattened into a smooth curve and was going up again. Just a small three-thousand-foot test dive, a sort of starter.

Again the long climb—up, up. He was only a speck. Somebody handed me a pair of field glasses. I watched him climb until he was only a speck in them. There he leveled off—some twenty thousand feet up. He flew level for a few seconds like a swimmer catching his breath before diving under water. Then he nosed over and dropped like a plummet—down, down, getting speed all the time. The thin, rising whine of his motor reached us on the ground. Down he came, faster. Gradually, his acceleration ceased and he dived at (Turn to page 91)

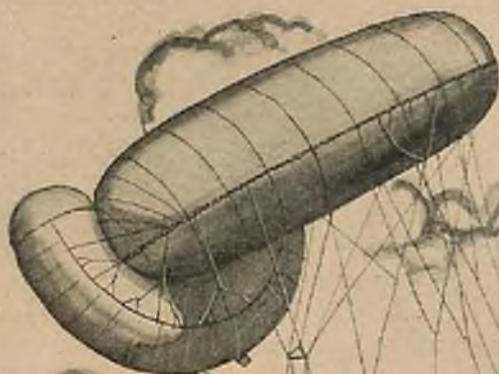


# Observation Balloon DEVELOPMENT



*ON JUNE 26, 1794 AT THE BATTLE OF FLEURUS THE FIRST OBSERVATION BALLOON WAS USED, HELD DOWN BY MAN POWER. THE LONE OBSERVER SIGNED INFORMATION BY FLAGS!*

*ABOUT 1890 THE ENGLISH USED A LARGER AND MORE RELIABLE TYPE OF BALLOON IN ARMY MANEUVERS.*

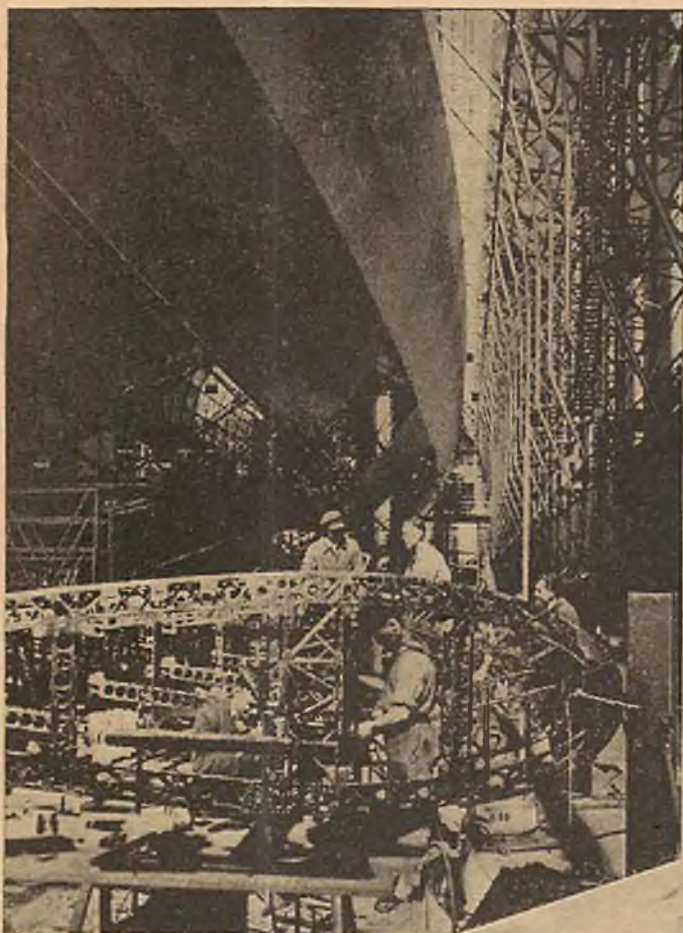


*IN 1897 MAJ. VON PARSEVAL AND CAPT. VON SIGSFELD, OF GERMANY, DEVELOPED THE FIRST STABLE "DRACHEN" BALLOON.*

*THE MODERN OBSERVATION BALLOON CONTROLLED FROM A WINCH CAR IS VERY STABLE. FILLED WITH HELIUM THEY ARE RELIABLE AND NONEXPLOSIVE.*







Germany's confidence in the dirigible is reflected by the uninterrupted construction of the new "LZ-130."

**T**HERE IS not to-day an airship in operation throughout the world.

The commercial *Graf Zeppelin*, grounded by the Reich air ministry following the *Hindenburg* disaster, was, in any event, due for semiretirement as a training ship a few weeks hence when LZ-130, sister ship of the ill-fated Nazi sky queen, was scheduled to be launched, in August.

Because of the tragic history of post-War operations, it might be argued that now is the time for airship abandonment. But first let us examine in detail the Zeppelin record. Bear in mind that, with the single exception of the *Los Angeles* after its delivery to the United States navy, when helium replaced hydrogen, every one of these ships operated throughout its life with hydrogen as its buoyant gas.

Of one hundred and eighteen airships built in Germany, less than a third were wrecked in operation; twenty-five by storm and accident; six from causes unknown. In addition, forty-six were lost in War operations. Such loss is attributable to enemy action—anti-aircraft and planes—though the hazard of hydrogen was the dominating factor of destruction. Of the remainder,

# THE

By  
Samuel Taylor Moore

*Captain U. S. Army Air Reserve*

## PART TWO



Passenger accommodations of the newest Zeppelins are complete and luxurious.

twenty-one were voluntarily dismantled as they became obsolete through service; eleven were surrendered to the Allies under the terms of the peace treaty (of these, several, notably the *Dixmude* were subsequently lost through lack of experience in operation); seven were wrecked by the Germans themselves, following the Armistice, exactly as German sailors scuttled their own warships at Scapa Flow rather than surrender them. Two remain; the obsolescent *Graf Zeppelin* and the obsolete *Los Angeles*.

How differently that record might read had helium been available from the beginning of Count Zeppelin's work must remain a matter for conjecture.

The American record would indicate a much lesser loss of life in accident had helium been used, as was the



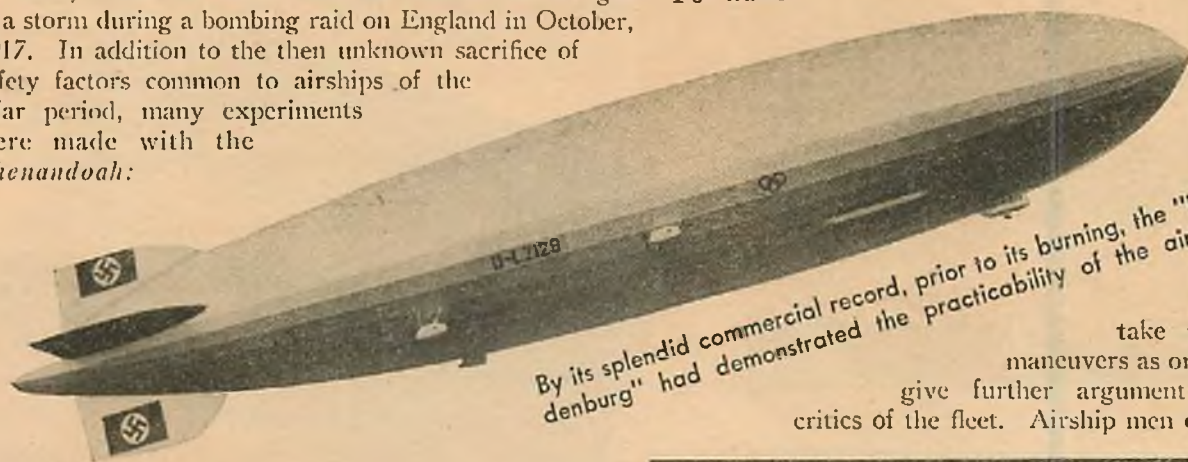
# CASE for AIRSHIPS

case in the tragedies attending the loss of our three American-built rigids. And here we might well examine each of those accidents.

Like the *R-34*, the *Shenandoah* design was based principally on plans made from a captured Zeppelin, that of the *L-49*, which was forced down in France when caught in a storm during a bombing raid on England in October, 1917. In addition to the then unknown sacrifice of safety factors common to airships of the War period, many experiments were made with the *Shenandoah*:

of events it would have been remedied. Before sound repairs could be made the airship was ordered to duty with the fleet. The airship had many critics among the sea dogs of the navy.

To have

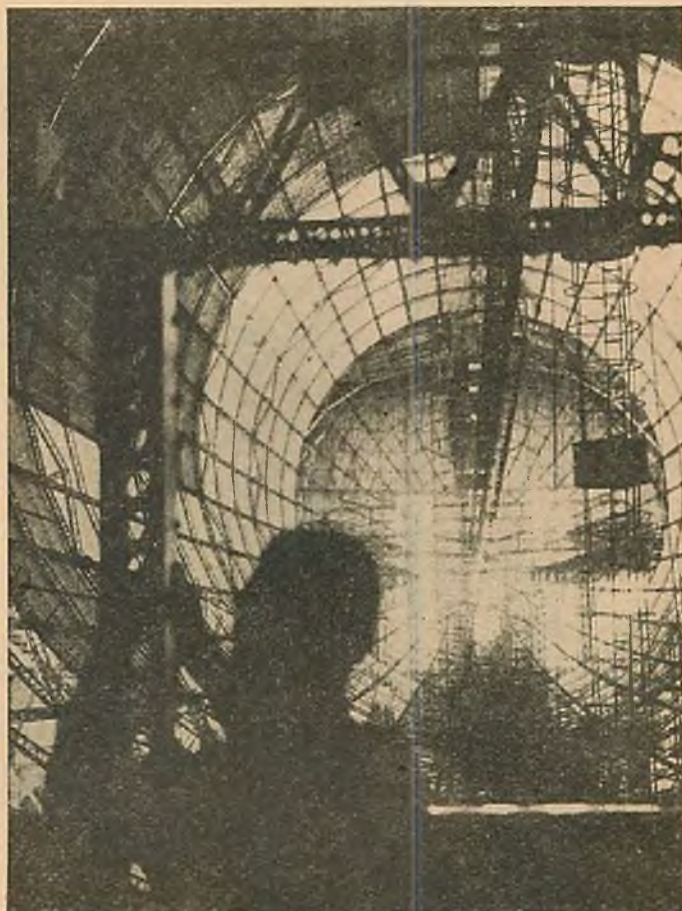


failed to take part in the maneuvers as ordered would give further argument to airship critics of the fleet. Airship men did not want

extra weight added by reason of ballast-recovery apparatus, and unconsidered precautions taken to conserve the costly helium with which she was inflated. Whether the care taken to conserve its helium was a factor in the mishap which wrecked the *Shenandoah* is not definitely known. Certainly thereafter such precaution was done away with. In any event, an airship is less adapted to overland flying than overwater operation, because of the meteorological hazards. The *Shenandoah* broke up fighting a squall. Only the men in the control car were killed, as it tore loose from the framework and crashed to earth. There was no fire and those in the separate parts of the broken hull literally free-ballooned safely to earth.

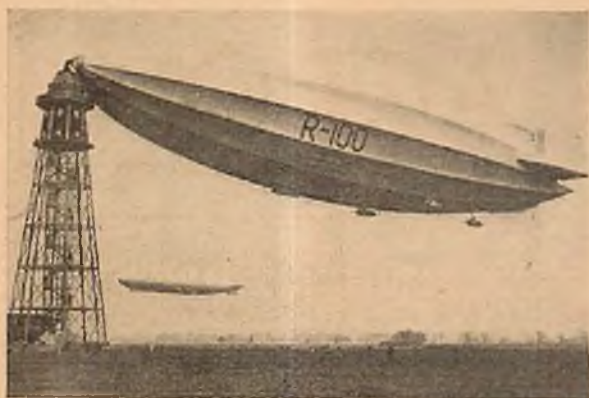
The *Akron* and the *Macon* were both free of the penalties of War design. They were built under the supervision of a famous Zeppelin engineer, Dr. Karl Arnstein, who with a staff of German experts came to this country to establish an airship industry. The loss of the *Akron* was not caused by structural failure. That disaster resulted from lack of experience in operation, what in an airplane accident is termed "pilot error." The truth is that the *Akron* was *flown into the sea*. Against such a mishap much might be said, but it is not fairly chargeable to the airship itself. Use of hydrogen hardly could have made that disaster more complete. The miracle is that even three were rescued.

In the case of the *Macon* it is undeniable that she had developed a structural weakness at a certain point. The weakness was known and in the ordinary course



Nearing completion at Friedrichshafen is the "LZ-130," greatest of all dirigibles.

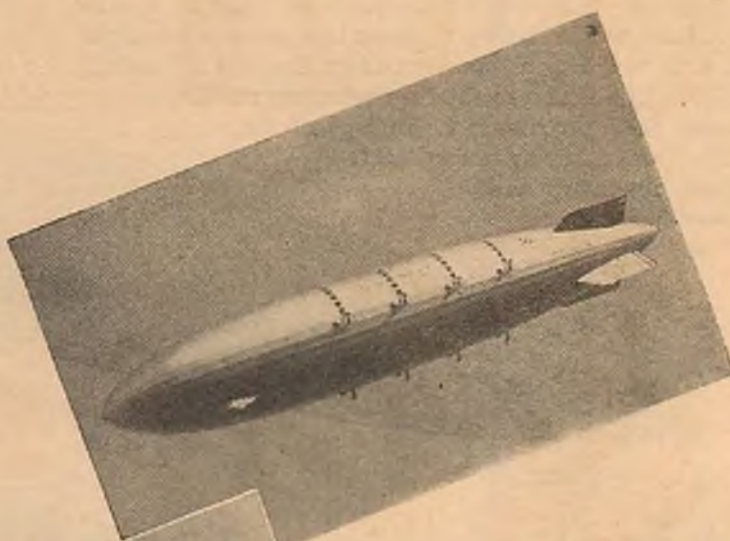




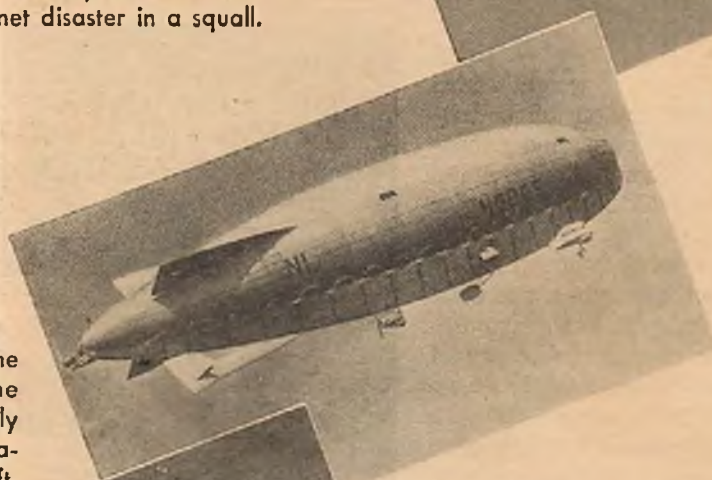
That each country ultimately attempted original structural design is noticeable in the bold relief of the British "R-100" frame.



The "Shenandoah," copied from plans of a War-time German Zeppelin, met disaster in a squall.



The "Macon," representing America's greatest engineering effort, was a great stride forward, despite its loss.



The ill-fated "Norge," lost in a Polar expedition, was representative of semirigid construction.

The "Akron," lost in the Atlantic, emphasized the need for more adequately trained men in the operation of lighter-than-air craft.



parative perfection is achieved. What can the airship do that modern heavier-than-air craft cannot? In examining the evidence, fairness demands that any comparisons between lighter and heavier-than-air craft be restricted to existing types in both branches of flying. Too often heavier-than-air critics of the airship insist upon comparing yesterday's airships with day-after-to-morrow's planes.

The record of transoceanic flying in two commercial airships shows fourteen thousand passengers for revenue safely carried in eight years, with some forty lives lost in a single airship accident. The airplane has yet to carry its first paying passenger between this country and Europe. Big flying boats will be operating across the Atlantic this year, we are told. (Turn to page 88)



# SPLIT-SECOND ACTION

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



DURING THE WAR, A LIEUTENANT IN TRAINING ATTEMPTED TO LAND HIS PLANE. AS HE CAME IN THE ENGINE WENT DEAD. HE RAPIDLY LOST ALTITUDE AND TO AVOID A CRASH TRIED TO FLY IN THE SPACE BETWEEN TWO HANGARS. A WING OF HIS "JENNY" CAUGHT IN THE HANGAR DOOR SUPPORT AND THERE THE PLANE HUNG, 20 FEET UP. THE LUCKLESS AVIATOR HAD TO DESCEND BY LADDER, AMID THE JEERS OF HIS FELLOW OFFICERS.



MILDRED KAUFMAN, DIMINUTIVE PILOT TRIED TO SET A NEW LOOP RECORD BUT FELL, INSTEAD, INTO THE CATERPILLAR CLUB WHEN SHE SLIPPED OUT OF HER SAFETY BELT AT THE TOP OF HER THIRTY-FIRST LOOP.



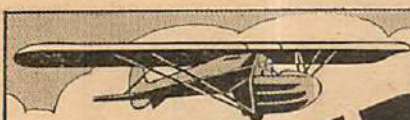
A PILOT WAS FLYING LOW OVER A COTTON FIELD WHEN HIS ENGINE WENT DEAD. ATTEMPTING TO LAND HE OVERSHOT THE FIELD JUST CLEARING A HEDGE. INSTEAD OF ANOTHER FIELD BEYOND THE HEDGE HE FOUND A DEEP RAVINE AND FLUTTERED DOWN. HE CRASHED BUT ESCAPED SERIOUS INJURY.

ON APRIL 1, 1931 VERNE W. HARSHMAN MADE A FORCED LANDING AT SEA. THE FLOTATION GEAR KEPT HIS PLANE AFLOAT FOR A WHILE. WHEN THE PLANE SANK HE INFLATED AND TOOK TO HIS RUBBER LIFEBOAT. VERY PISTOL FLARES ATTRACTED NO HELP. SHARKS AND DOLPHINS BUMPED HIS TINY CRAFT ABOUT. HE DRANK RAIN WATER CAUGHT IN HIS SCARF AND WHEN THE SUN SHONE HE HAD TO KEEP HIS BOAT FROM CRACKING BY SPLASHING WATER ON IT. A LEAK DEVELOPED AND HE PATCHED IT. HE SAW A SHIP PASS HIM BY. FOR FIVE DAYS HE FLOATED ON THE BROAD PACIFIC UNTIL RESCUED BY THE S.S. CERIGO.



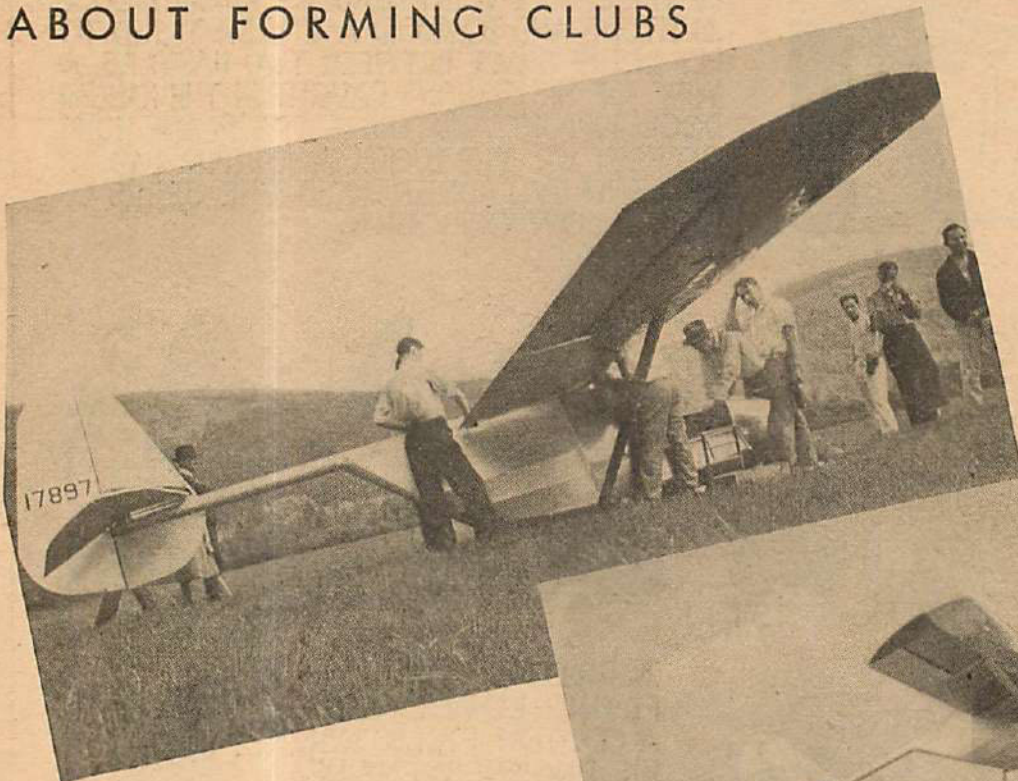
JON L. BLUMMER





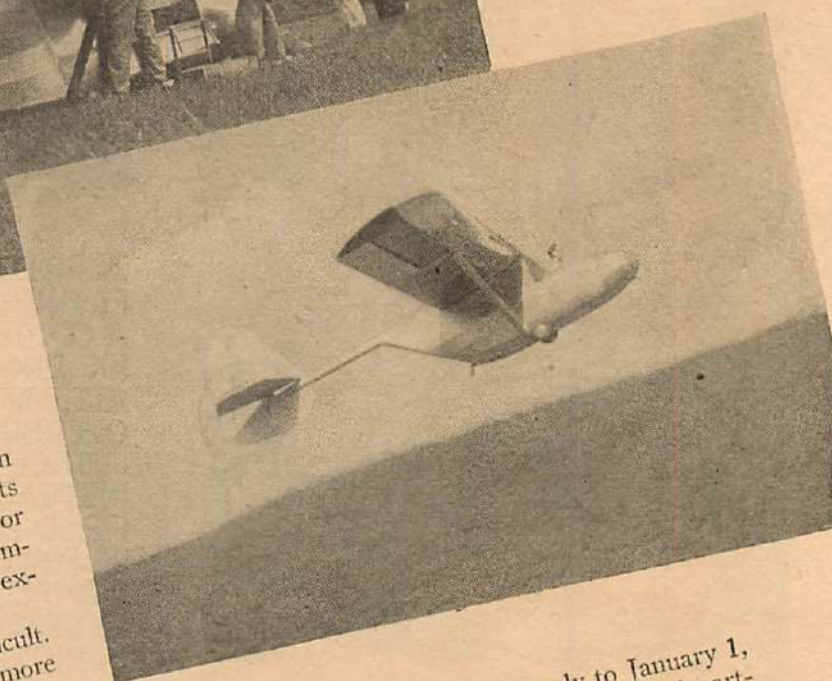
# GLIDING AND SOARING

## ABOUT FORMING CLUBS



Left: A new all-metal glider designed and built by Paul and Ernest Schweizer.

Below: Emil Lehecka, Silver "C" pilot, takes the ship aloft for a test flight.



**T**HE gliding and soaring movement is on its way to great popularity. Enthusiasts are seeking to form clubs, purchase or build ships and learn to fly them. It is important that a certain amount of care be exercised in taking these steps.

Forming a glider club itself is not difficult. The main requirement is to enlist six or more members who, by pooling their resources, can afford to buy a primary or secondary ship. For officers, elect a president, a secretary to handle correspondence and publicity, and a treasurer to collect dues. Then draw up a set of by-laws, which stipulate the amount of monthly and annual dues and contain a clause as to the club's liability in case of personal and property damages. When this is accomplished the club is ready for the question of purchasing a suitable ship.

Of the two popular types of ships, the primary costs about four hundred dollars new, while the secondary ranges around six hundred dollars at present. Secondhand craft are

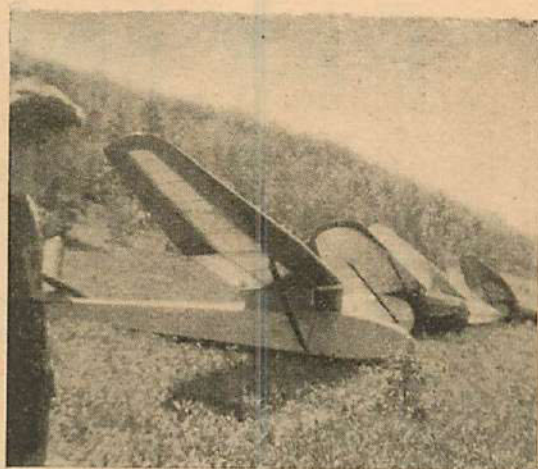
available, but only ships built previously to January 1, 1932, are licensable after being checked by the department-of-commerce inspector. All gliders built after that date must have an approved type certificate filed with the bureau of air commerce as a prerequisite to gaining a license. Some of the secondhand ships are already licensed and it might be wise to take this into consideration. In any case, whether the glider bought is old or new, be sure that it is licensable.

Building ships from plans has presented difficulties up to the present time, due to the fact that specifications for American craft have not been readily available. Builders have found it necessary to obtain plans from Germany or England. Recently, however, the Soaring Society of America has compiled two complete manuals on glider construction and operation. These





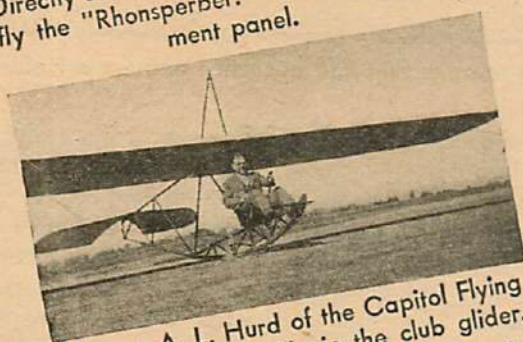
Above: The "Kestrel" and its crew, pilot "Les" Barton at the extreme right.  
Right: The "Kestrel," soaring at Ellenville, N. Y.



Sailplanes grouped on the hill at Ellenville, N. Y., during recent Metropolitan Soaring Meet.



Top: Emil Lehecka's new German sailplane, the "Rhonsperber."  
Directly above: Emil Lehecka prepares to fly the "Rhonsperber." Note the instrument panel.



Above: A. L. Hurd of the Capitol Flying Club, Albany, N. Y., in the club glider.  
Below: "Lew" Barringer, manager of the Soaring Society of America, and his Goeppingen "Wolf" sailplane.



can be obtained by writing either to the society, 1500 Locust Street, Philadelphia, Pa., or to the Department of Commerce, Branch for Aeronautics, Washington, D. C.

It would be wise, incidentally, for both clubs and individuals to join the society. This organization acts in an advisory and governing capacity for the American glider movement, sponsors major events and publishes the magazine "Soaring," its official organ. The tremendous strides gliding is making in this country may be attributed to the foundation work of the Soaring Society of America.

After the club has been organized and equipment obtained (don't forget that about six hundred feet of three-eighths-inch manila tow rope and the use of a small car, preferably one with a rumble seat, are also required), the next step is learning how to fly. Here the greatest amount of care should be observed. No attempts should be made without a competent glider instructor being present. Only an experienced man really knows when to advance his student to the next stage, and haphazard methods are apt to lead to trouble. When conducted sanely, gliding comes under the head of safe sport, but it is actually flying, and, accordingly, governed by the same laws.

#### CLUB NEWS

The Metropolitan Soaring Association meet was held over the Decoration Day week-end at Ellenville, N. Y. Attending were Mr. and Mrs. Lewin Barringer, with a Goeppingen "Wolf" sailplane; Eugene and William Placek, with their Gullwing Franklin; Les Barton, Stan Hruslinski and Tom Nilen, of the Y Flying Club of N. J., who brought their "Kestrel" ship; and Pete Bonataux, Carlton Schaub and Felix Chardon, with the latter's Franklin Utility.

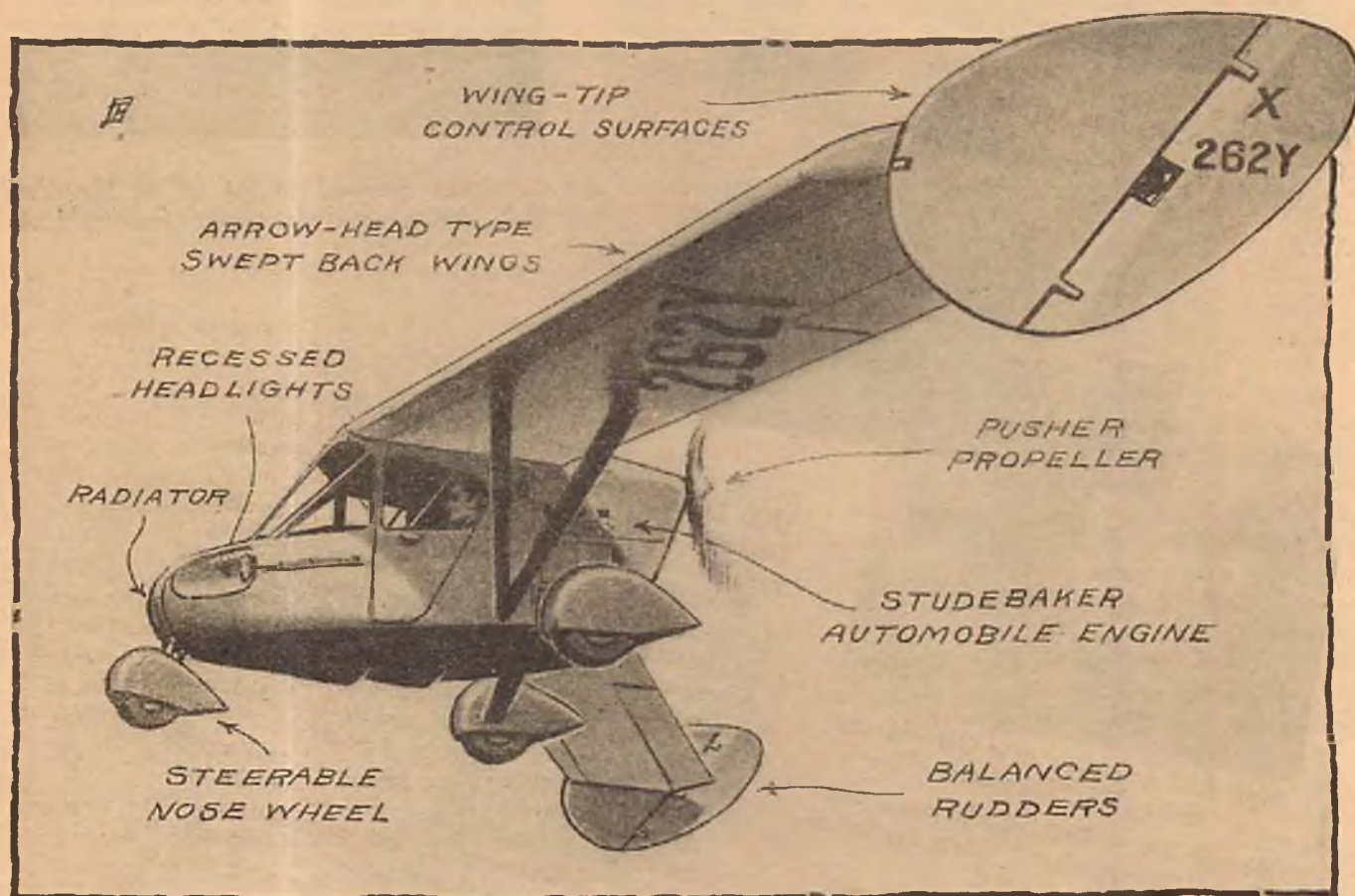
(Turn to page 90)



# FLYING AUTO

*A new roadable design by Waterman —  
the plane on the cover*

by Frank Tinsley



The roadable features of the ship reduce disadvantages inherent to ownership and operation of more orthodox craft.

EARLY IN 1933, Eugene Vidal, then director of the Bureau of Air Commerce, mailed out questionnaires to some 22,000 potential light-plane owners in the United States and thereby precipitated the famous battle of the "Seven Hundred Dollar Airplane." Vidal's query was intended to determine whether there was sufficient demand for a safe, low-cost aircraft to warrant its development and mass production. The enthusiastic response that poured back into Washington dispelled any doubts as to the desire of the man in the street to take wings unto himself and fly. Johnny Q. Public most certainly did want to fly, and, misunderstanding Vidal's logical but unguarded statement that quantity production would eventually bring the price of a light airplane down into the light-car brackets, Johnny demanded instant delivery of his seven-hundred-dollar, foolproof aerial fivver.

Blasted by this misapprehension, Vidal's really sensible scheme was doomed from the very beginning. Indignant denials that he had promised any such miracle were promptly drowned in the chorus of catcalls and wails that arose from frightened light-plane manufacturers.

Turning from the clamor, Gene went doggedly to work on the main problem of his program—the development of a safe aircraft adapted to mass-production methods. He announced a design competition based upon a set of specifications which demanded more safety features than had heretofore been embodied in any low-priced aircraft.

Of the 16 designs submitted, 5 or 6 were promising enough to merit a development contract. One of these was the Waterman "Arrowplane," which was described in the February, 1936, issue of *Air Trails*.

Waldo Waterman, a former air-line pilot, designer, and builder of numerous "safety" planes, started flying in 1909 and rates as one of America's veteran airmen. His comprehensive experience in airport management, instruction work, airplane sales and manufacturing qualified him to analyze and meet the needs of the private-plane owner. Although his Arrowplane was the first model to pass the stringent tests for acceptance by the Bureau of Air Commerce, Waterman continued his development work on the ship. He realized that in his compact, tailless fuselage he had the basic form described by engineers as the rear-engine car of to-morrow.



Determined to attempt a solution of the long-sought "flying-automobile" problem, Waterman worked out a gear shift to transfer the engine power from wheels to propeller at will. Then came an arrangement to permit the removal of the wings. A steerable nose wheel completed the transformation of the ship from airplane to car. This unusual vehicle has been christened the "Arrowbile" and is the subject of this month's cover painting.

In designing the Arrowbile, Waterman's first consideration was the reduction of initial price and operating costs. With this in mind he decided to replace the airplane-type motor with one of the more inexpensive automobile power plants. A careful survey led to the selection of a standard Studebaker 6-cylinder engine developing 100 h.p. This motor was subjected to the usual 150-hour endurance test by the Bureau of Air Commerce, passed brilliantly, and was awarded a certificate of approval. It consumes standard automobile gasoline at a rate of 16 miles to the gallon at cruising speed, both in the air and on the road, and costs but 15 per cent of the price asked for an aircraft motor of similar horse power.

Let's take a spin out to the airport in the new Arrowbile and let the craft speak for itself. Entering the Waterman garage, we find a sleekly streamlined coupélike vehicle standing alongside of the more conventional family car. At first glance, the lines of the Arrowbile seem a bit queer and unfamiliar. It is smooth and rounded in front with two recessed headlights and a radiator resembling that of the Chrysler "Air-flow" car. Instead of the front wheels of to-day's automobile, we find a single steerable airplane wheel projecting from the bottom of the radiator grille. A neat, streamlined spat replaces the familiar mud guards. Above the radiator rises a tall, wide windshield which will bring shouts of joy from motorists accustomed to goggling through the skimpy glass slits of our 1937 cars. This expanse of windshield combines with generous side windows to guarantee almost perfect visibility either aloft or on the road.

Waterman opens the door and reveals a familiar coupélike interior, which makes our motorist feel immediately at home. The designer has deliberately copied automotive practice to catch this feeling of familiarity. The seat, doors, windows, and instrument panel are all placed exactly where the car driver expects to find them. The only unusual touch is the steering wheel, which descends from the ceiling instead of springing upward from the floor.

Behind the wide, softly upholstered seat is a concealed fire wall separating the cabin from the engine compartment. At this point the exterior body lines of the machine commence a rearward sweep and converge in graceful curves toward a knife-edge tail. Streamlined rear wheels project on either side of the body just far enough to assure a steady base for landing and driving. The compact design of the Arrowbile results in over-all dimensions slightly smaller than those of the average low-priced coupé and its outward appearance closely approximates that of the rear-engine models now being developed by some of the big automobile companies.

Seating ourselves in the Ar-

rowbile, we watch Waterman go through the familiar motions of stepping on the starter, releasing the parking brake and shifting gears. A moment later we are out in the bright sunlight, bowling along the road to the airport. The machine seems roomy and comfortable in motion. Waterman explains that its unusually smooth riding qualities are due to the independent airplane-type wheel springing, which, incidentally, will be another feature of to-morrow's cars. When we hit an empty stretch of road, the designer opens up the throttle and the speedometer needle flicks up to 70 m.p.h. Slowing down again, we turn the corner of the big airport and roll up to the open door of one of the hangars.

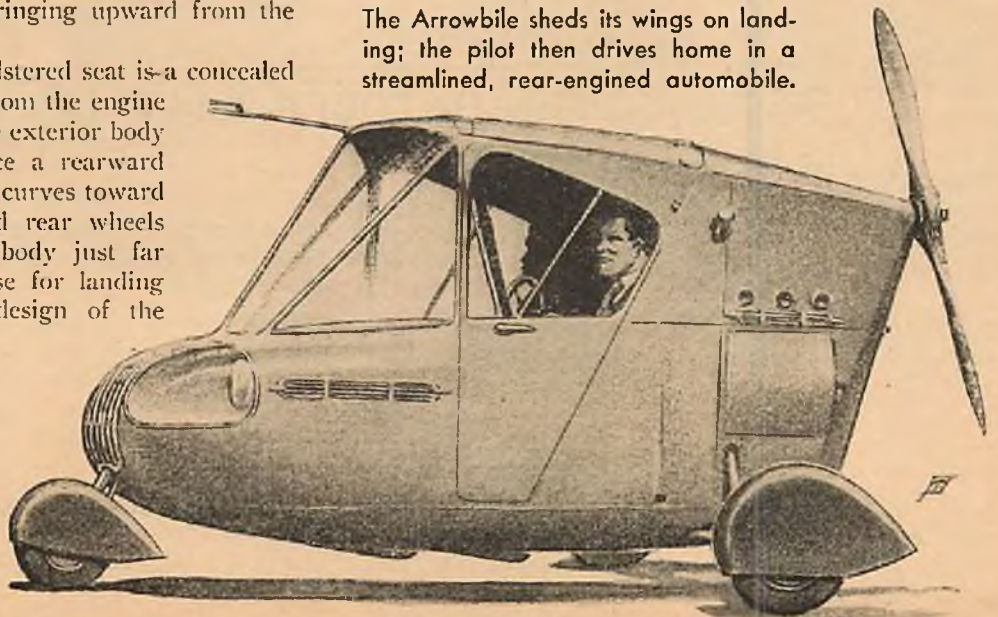
A toot on the horn brings an attendant, to whom Waterman hands his wing check. The man waves us into the hangar and we head for a special ramp over on one side of the big shed. Safely parked on the ramp, we sit and admire the practiced ease with which the two mechanics manipulate an electric hoist, lifting first one and then the other of our wings out of the racks and into position.

As the lugs move into place, Waterman reaches up and closes the safety-locking devices. As he does so he points out the advantage of not having to depend upon careless attendants in such a vital matter as wing attachment. Having checked our wings and tested the controls, we roll off the ramp and out on the apron. The entire change from car to plane has taken just under three minutes.

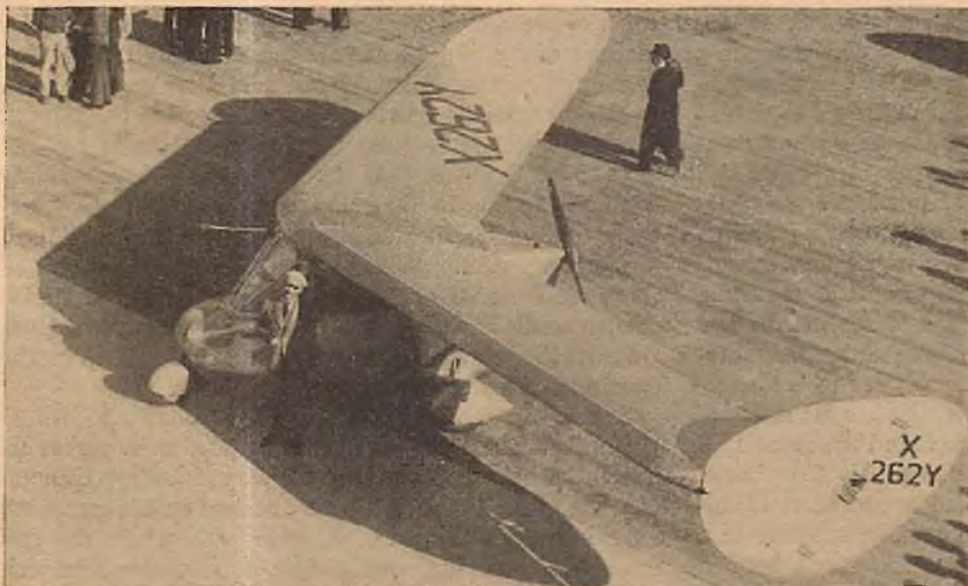
A wave from the dispatcher sends us down the runway, still under wheel power. At the far end we turn into the wind, shift the power to the propeller and start our take-off run. No delay is necessary, as the engine is already warmed up and functioning perfectly. In an amazingly short time we are off the ground and climbing rapidly. Leveling off at 2,000 feet, Waterman throws the wheel over with a grin and a "She's yours."

The Arrowbile proves very stable and easy to handle in the air. A 2-control system is used, one for banking and turning and the other for maintaining fore-and-aft control. Waterman claims that the combination of safety features, simplified control and 3-wheel landing gear eliminates about 60 per cent of the skill necessary to fly and land a conventional airplane. This is an important

The Arrowbile sheds its wings on landing; the pilot then drives home in a streamlined, rear-engined automobile.







The severe sweepback permits the elimination of conventional tail surfaces.

feature for the novice to consider, as it expedites learning and does away with the causes of many border-line accidents. Coupled with this safety we find really excellent performance, considering the extra weight of the automobile-type engine. The Arrowbile has a top speed of 120 m.p.h., cruises at 105 and lands at 45 m.p.h. The initial rate of climb is 650 ft. per min., ceiling 15,000 ft. and range 400 miles.

Circling back to the field we land, shed our wings and head for home. On the way we discuss the advantages of the Waterman ship. As an airplane the Arrowbile shows up very well indeed. It is unusually safe, easy to fly and its performance compares favorably with conventional ships of equal power. The Studebaker engine is sturdy and dependable, yet cheap to buy and operate. Automobile prices for fuel, oil, and repairs more than balance the loss of performance due to the higher-weight ratio. The roadability feature not only gives the owner a two-in-one service, but also renders him independent of air fields for fuel and mechanical assistance. He can pick a favorite Studebaker dealer, drive to his shop for minor repairs and gas on the way back. Instead of paying in the neighborhood of twenty-five dollars per month for hangaring, the wings alone can be stored at the field

for about five dollars, while the car is used and garaged at home.

The Arrowbile should prove invaluable on cross-country flights, either for business or pleasure. The salesman or executive can cover wide territories at high speed, land at the field nearest his destination, park his wings and drive to his customer's place of business in a distinctive-looking car. No more waiting for airport taxis at a cost of valuable time and temper, no shifting of luggage and sample cases from plane to cab and back again. Aerial touring becomes a convenience and pleasure with this versatile machine.

Considering all its advantages, I feel that the Waterman Arrowbile can be fairly called a long step forward in the direction of a perfect plane for the private owner. Costing slightly under three thousand dollars at the present time, the ship can be turned out for around twelve hundred dollars, in lots of ten thousand per year. That's a lot of airplanes these days, but please remember that it was considered an awful lot of cars, too, a few years back. And here's a chance to buy an airplane *plus* an automobile, at the price of either one alone. It sounds to me like a pretty good buy in any man's market.

At the present time, Waterman is building 4 special Arrowbiles for the Studebaker people. When the time comes to finish them, I should like to suggest to him the advisability of appealing to motorists with automobile colors and body finish similar to the color job shown on the cover. I also think that he should investigate the possibilities of the Everts single-bladed propeller. It looks like a natural for his type of ship—especially on the ground. I think we will all be anxious to get a close look at these ships when the projected swing around the country brings them to our town. If you do miss them don't worry, for I have a hunch that you'll see lots more like 'em before long.

## COMING IN THE OCTOBER ISSUE OF AIR TRAILS HEAVY TRANSPORT

*The growth of commercial passenger lines in America has been so fast that few of us are really familiar with the vast networks of service lines, of their comfort, facilities, safety. Don't fail to read this great, instructive feature.*

## SOARING AND GLIDING

The report of the International Contests at Elmira.

The development of American-built Sailplanes and Utilities.

The growth of the movement in the United States.

The Establishment and Presentation of the *AIR TRAILS TROPHY* for the outstanding flight made in attaining a "C" rating.

You *must* read this featured department to keep abreast of the greatest sport in the world.

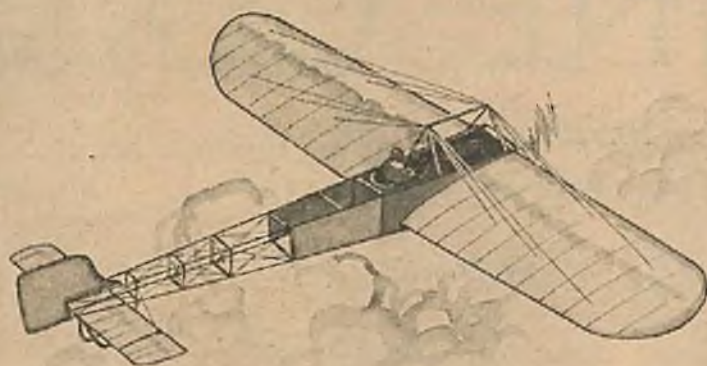


# Pictorial History of Man in the Air



**1908** DURING SEPTEMBER, WILBUR WRIGHT, IN FRANCE, FLEW TO THE UNHEARD OF ALTITUDE OF 380 FT. HE ALSO SET A NEW MARK OF 1 HR. 31 MIN. 25  $\frac{1}{2}$  SEC. FOR A TRIUMPHAL FLIGHT OF 56 MI.

**1908** DELAGRANGE, OF FRANCE, RAISES WORLD'S DURATION AND DISTANCE RECORDS FOUR TIMES IN FIVE MONTHS.

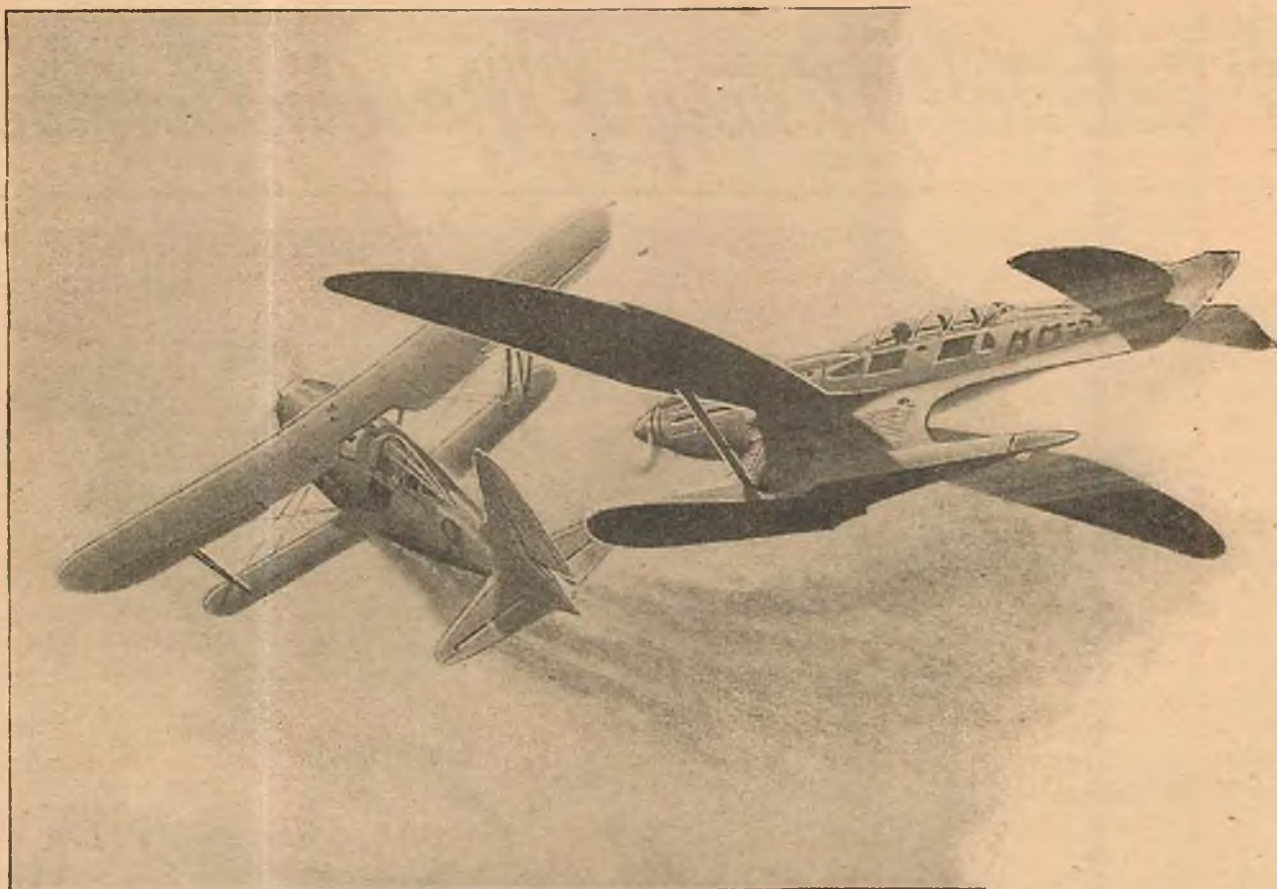


**1908** ON OCT. 31, LOUIS BLERIOT, MADE THE FIRST CROSS-COUNTRY AIRPLANE FLIGHT FROM TOURY TO ARTENAY, A TRIP OF 18 MI.

**1908** IN NOVEMBER THE GERMAN GOVERNMENT TOOK OVER ITS FIRST ZEPPELIN, THE FIRST OF A NEW AND LARGER SERIES BUILT BY THE GREAT COUNT VON ZEPPELIN







Lead and flame vomited from his machine guns and the biplane staggered like a wounded deer—

# PHILIPPINE GOLD

*Dark intrigue to dominate the air dooms  
a Barnes flier—but overlooks comradeship—*

By GEORGE L. EATON

**M**URDER and violent death seemed to lurk in the shadows of the dark, shabby buildings that make up that section of New York City that is north by east of the tip which is known as the Battery.

Here, surrounding a tiny park that was once the bowery of a Dutch settler, are a hundred buildings in which the descendants of all races mingle. Here are men and women whose pigments range from jet-black through brown and yellow to the fairest-skinned Anglo-Saxon. Here is one of the true melting pots of the world. Here, intrigue and treachery, loyalty and bravery are cheap. Here were men who traded in the wealth of Samarkand, Samothraki, and Legaspi. Here they bartered according to their code of life.

It was a late hour of a muggy night in June when a long, low, streamlined roadster came to a halt on the south side of the square. It stopped before the frowzy doorway of a brick building that was lighted by the dim glare of a fly-speckled electric bulb. Evil seemed to creep from every crevice of the shuttered building. A small

sign with nondescript lettering creaked dismally back and forth in the gentle night breeze. The two men seated in the roadster gazed with no little trepidation into the hallway of the filthy house.

"You sure you got the address right, kid?" Bill Barnes, the driver, asked as he yanked on his brake and killed his motor.

"It's on Humboldt Square," young "Sandy" Sanders said. "I'm sure this is the address he told me, Bill." His voice sounded thin and hesitant as he gazed around him at the shuttered houses. "He said it was a sort of private restaurant and just to ask the man at the door for Luigi—and not ask any questions or nose around."

"Sounds like an old-time speakeasy to me," Bill said. "Maybe it's a trap, but here goes!"

"He gave me that code word, Bill," Sandy said. "He couldn't have done that if Shorty hadn't given it to him."

"There are more ways than one to get a man to talk," Bill grunted. "Stick your gun in your side coat pocket."

They climbed out of the car and mounted the limestone



steps. A peephole slid back in the massive, scarred door in answer to their knock. An eye glittered in a tiny opening for a moment. The door swung silently open and closed on them with a grim and hollow sound. A pock-marked individual led them down a gloomy corridor, opened another door, and ushered them into a room rank with the smell of red wine, garlic, and human bodies.

From the balcony that ran around the room came the strains of soft music. A voluptuous young woman advanced to the center of the cleared space in the middle of the room. She danced with a beauty and grace that was out of place in such surroundings. Her high heels tapped the tiled floor. The castanets in her hands tapped merrily.

"The bird at the door seemed to know we were coming," Bill said to Sandy, by way of something to say.

"He told me to just take a table and he'd come and talk to us or get a message to us according to who happened to be here," Sandy said.

The muscles in Bill Barnes' bronzed face were taut as he ordered a Creole dish from a spotty waiter and inspected the room. Back in the smoke-laden dimness of the place men sat at tables in twos and threes and fours. They watched the girl on the dance floor with faces that were inscrutable masks. Their eyes rose slowly upward as the high-pitched laughter of a woman floated down from the balcony.

A thousand thoughts chased themselves through Bill's mind as his photographic eyes took in every detail of the room. He filed the positions of the windows and the doors and the tables and the people in the room away in his mind.

No one had seemed to pay any attention to him and Sandy as they entered the room. But he knew now that they were all aware of him. They were aware of him and they were waiting with a sort of stolid, breathless expectancy for the thing that was going to happen. He moved the legs of his chair a bare two inches, so that his back was nearly against the wall and his legs were nearly free of the table. He knew that later that two inches might be the slight difference between life and death.

A single man appeared in a doorway off the kitchen and came down the floor toward Bill Barnes and Sandy Sanders. He glanced at them casually and took a table next to them. He spread a newspaper out on the top of the table and appeared to be reading it.

A scattering of applause greeted the dancer as she came back for an encore. This time she preceded her dance with a song of old Spain.

"She can dance better than she can sing," young Sandy said, as the walls seemed to bulge from the volume of her voice.

Bill didn't answer. His body was tense as he felt that gentle nudge on the side of his leg. He looked at Sandy to give him a warning to be ready. Sandy was watching

the girl bellow. He glanced down and saw a shoe and the cuff of a pair of trousers. In the cuff was tucked a small folded piece of paper.

Bill let his eyes flicker surreptitiously around the room. Then, without seeming to move a muscle of his body, he plucked the little fold of paper out of the cuff. The shoe and cuff disappeared and in a moment the man at the next table got to his feet.

"All right, kid," Bill said sharply. "Let's shove!"

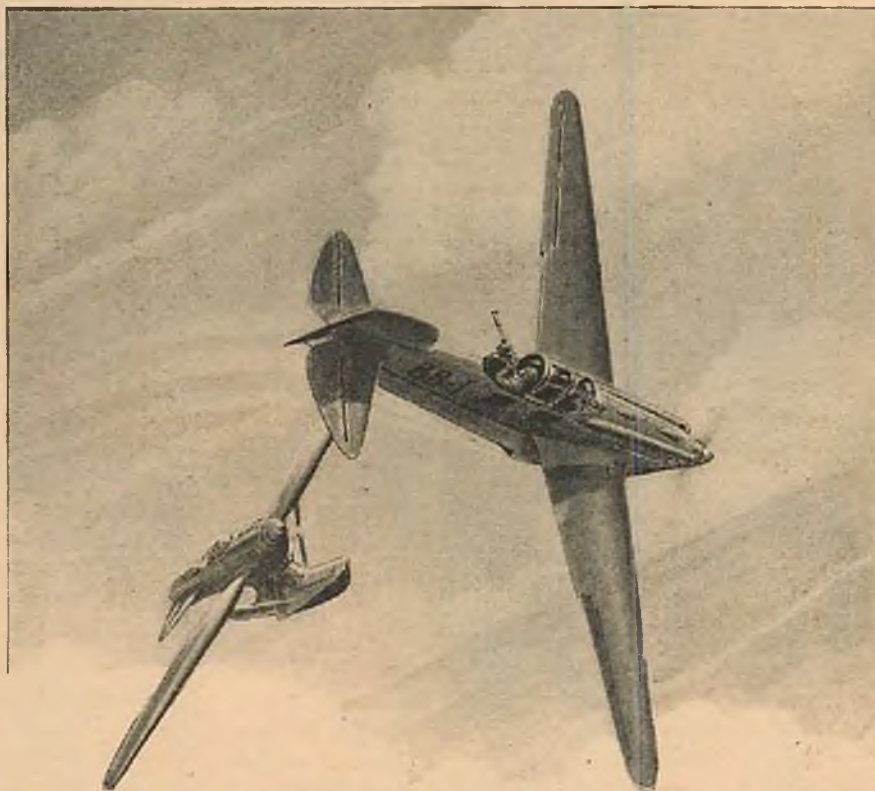
"Let's shove?" Sandy said. "Nothing has happened yet."

"Do you have to have your throat cut before you think anything has happened?" Bill asked shortly. "Plenty has happened, kid. Get on your feet and keep close to me."

Bill's eyes photographed the room again as they rose. He saw that the room was still a sea of masks but the eyes of the men were brighter. And those eyes were on Bill and Sandy as they moved toward the door.

They were halfway across the room when the lights blinked once, twice. Then the room was immersed in darkness. Voices became suddenly shrill. The occupants had seen the lights go out in that place before. And when they had come on again they had seen some rather horrible sights.

Curses and the scraping of chairs sounded all over the room. Above the babble came a sucking sound, like a

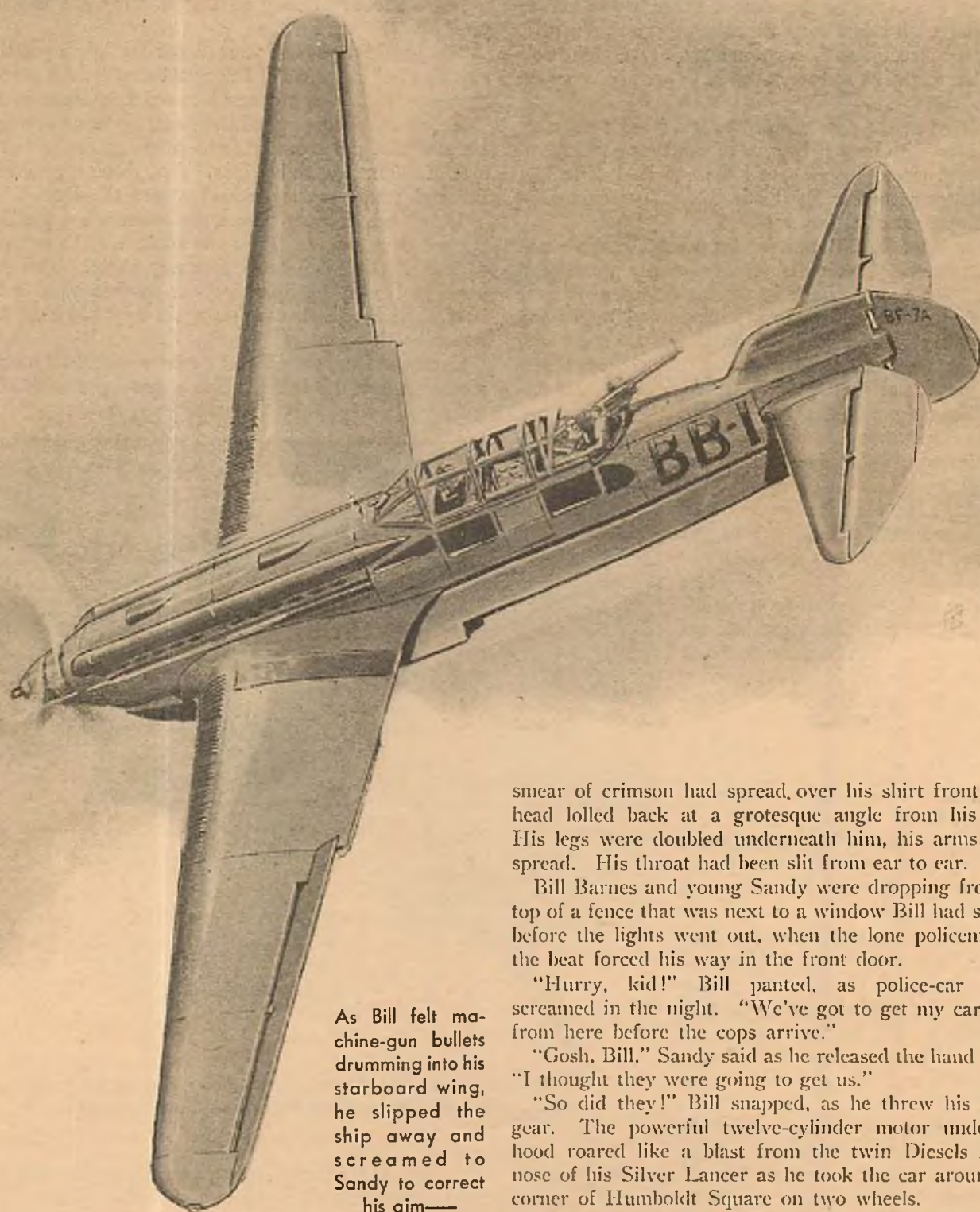


By this time he could tell that he was not going to go under him— He was concentrating his fire on the after cockpit—

man gasping for breath—then, a scream—a horrible high-pitched scream that ended in a choked gasp and a rasping gurgle.

Bill Barnes pinned young Sandy against the wall with his body as the lights went out. A gun leaped out of his pocket and belched orange flame at a groping figure near him. Lead spattered plaster on his head. Men shouted and cursed and women screamed. A whistle shrilled.





As Bill felt machine-gun bullets drumming into his starboard wing, he slipped the ship away and screamed to Sandy to correct his aim—

When the lights came on a few moments later the people in the room were flattened against the walls. And in the center of the dance floor was lying the dark-skinned man who had taken the table next to Bill. A

smear of crimson had spread over his shirt front. His head lolled back at a grotesque angle from his body. His legs were doubled underneath him, his arms wide-spread. His throat had been slit from ear to ear.

Bill Barnes and young Sandy were dropping from the top of a fence that was next to a window Bill had spotted before the lights went out, when the lone policeman on the beat forced his way in the front door.

"Hurry, kid!" Bill panted, as police-car sirens screamed in the night. "We've got to get my car away from here before the cops arrive."

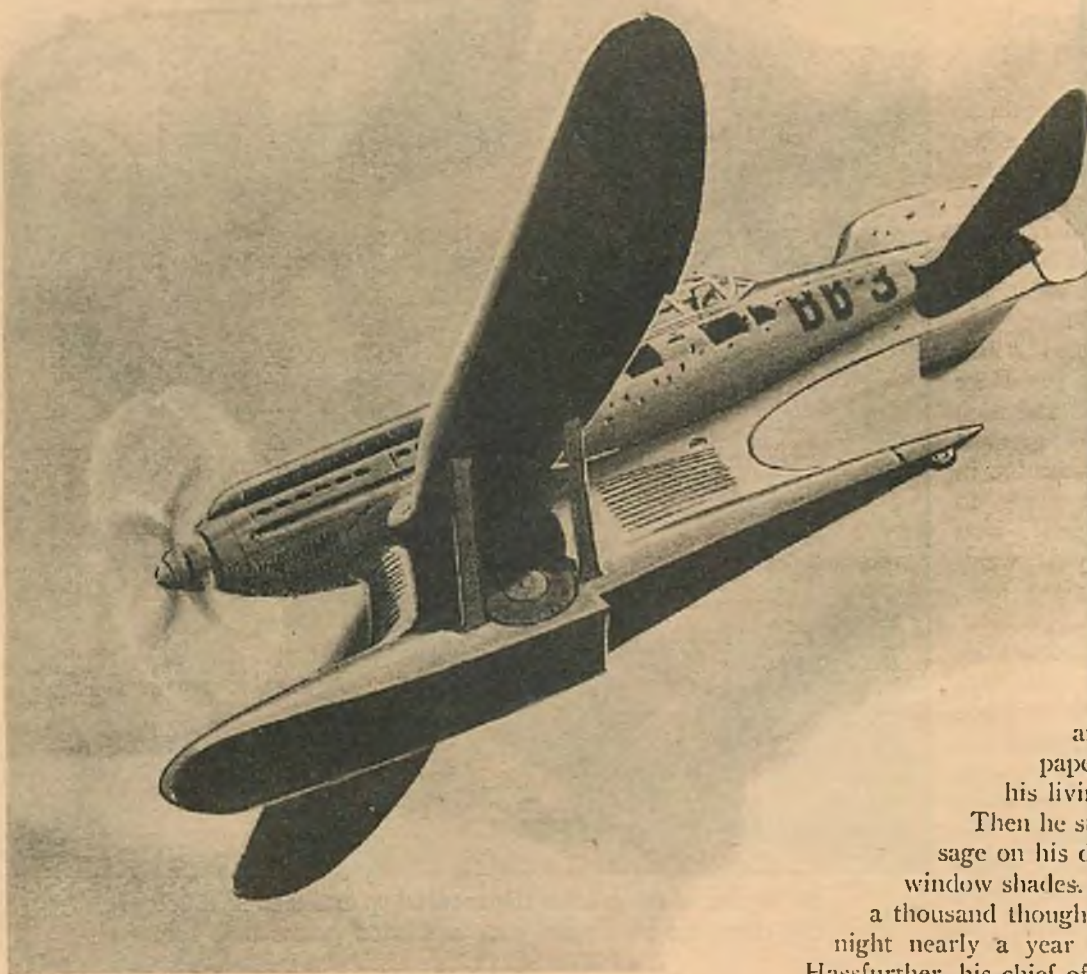
"Gosh, Bill," Sandy said as he released the hand brake. "I thought they were going to get us."

"So did they!" Bill snapped, as he threw his car in gear. The powerful twelve-cylinder motor under the hood roared like a blast from the twin Diesels in the nose of his Silver Lancer as he took the car around the corner of Humboldt Square on two wheels.

They passed two screaming police cars as they wove their way through the narrow, crooked streets. Then they were clear and on their way to an avenue that would take them to Queensboro Bridge.

"Listen, Bill," Sandy said as they were weaving their way through the night traffic across the bridge. "What





happened? All I know is the lights went out and some one tried to plug us. Where was this guy Luigi I talked to on the telephone?"

"He was sitting in a chair at a table next to us," Bill said.

"Why didn't he speak to us?" Sandy asked. "He said he had a message for you from Shorty."

"He did speak to us, kid," Bill said grimly. "And it's probably the last thing he will ever say. He slipped me a note while he was sitting next to us. Some one was watching who didn't want us to get the note. They probably killed Luigi and then tried to kill us before we could read the note."

"Baby!" Sandy said. "I didn't even know it was happening. What did the note say?"

"The lights were out," Bill said dryly, "and I can't read by the light from gunfire."

Bill Barnes drove by the sentry's tower at the Wau-chuck Road gate of his airport on Long Island and swung the car down a drive to his own bungalow. In front of it he pulled on the hand brake and said to Sandy, "Put the crate away, kid, and then come over to my rooms."

"Say, Bill," Sandy said as Bill climbed out of the car, "I'm worried about Shorty!"

"You aren't the only one," Bill said grimly.

His powerful legs took him through the doorway of his bungalow in three long strides as Sandy roared away. His hands were trembling and his blue eyes gleaming as

he snapped on a light and took the little fold of paper out of his pocket in his living room.

Then he stopped and laid the message on his desk while he pulled the window shades. Through his mind ran a thousand thoughts. He thought of that night nearly a year before when "Shorty" Hassfurther, his chief of staff, had come to him here in this same room. He thought of the curious expression on Shorty's face as he told him that he, Shorty, was going to leave the outfit. He remembered the sickening feeling he had had at the pit of his stomach as he gazed at Shorty with unbelieving eyes. The whole thing had come close to breaking Bill's heart for a time. It seemed only yesterday that Shorty had come in with that curious expression on his face.

"I—I hate like hell to tell you this, Bill," Shorty said. Something about the tone of Shorty's voice caused Bill to whirl away from the desk at which he was standing and look at him.

"What is it, fella?" Bill asked. "Have you been out hitting policemen again?"

"No," Shorty said, and there was nothing jocund about his tone. "There are no policemen in this. I feel a little like a dirty dog even before I tell you, because I know you put a certain amount of trust in me."

"What the hell are you talking about?" Bill roared.

"I'm leaving, Bill," Shorty said and his broad, Pennsylvania Dutch face was lacking its usual smile. "I'm shoving."

"Listen!" Bill snapped. "You talk like an incoherent schoolboy asking his girl to go to a movie."

"I mean," Shorty said slowly, "I'm leaving the outfit. I'm quitting. I've been thinking over a proposition for a couple of weeks and I've decided to grab it."

"You're *quitting*!" Bill said, and he stared at Shorty as though he had never seen him before. "What's the matter, fella? Are you sore? Has some one done some-



thing? You know very well that you can have the whole works if you want it, Shorty. What in hell would I ever do without you?"

He spread his hands in helpless amazement.

"No one has done anything, Bill," Shorty said. "You're the whitest guy I've ever known in my life. I wouldn't take anything in the world for the priceless years I've been with you. They'll be something to look back on in my old age. I——"

"Talk sense, Shorty!" Bill snapped. "I don't get it. Here we've gone through hell and high water building up the greatest fighting and flying organization in the world and you're going to quit! Aren't you satisfied? You can have anything you want, Shorty. You're my right arm, fella!"

"I know that, Bill," Shorty said. "That's why I hate to pull out. But this is a chance I'll never have again. After all, I'm getting on, Bill. I'm nearly forty years old. Remember, I started to fly during the War, when you weren't dry behind the ears. I've been dodging bullets for twenty years. Some day, as the prize fighter said, I'll forget to duck."

"I see," Bill said slowly. "Theoretically, you aren't supposed to be dodging bullets while you're with me."

Shorty grinned. "Theory and practice are a couple of different fellows, Bill," Shorty said. "I'm going to stop while the stopping is good."

"That is no reason why you should leave," Bill said. "You can have your niche in the organization. I can ground you. You work with Scotty MacCloskey on the ground. You'll still go on getting your share of the proceeds of every job."

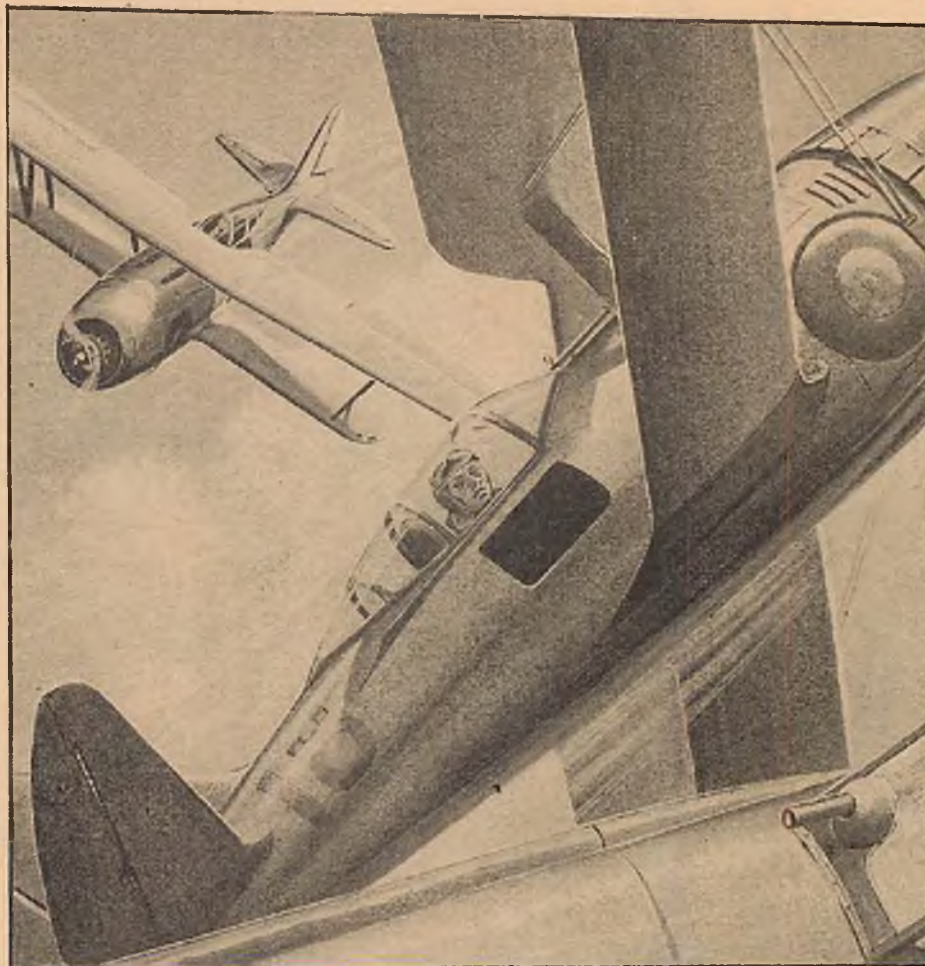
"You know I couldn't stand that, Bill," Shorty said, and his face was tense. "I've thought it all out from that angle. You know I couldn't stay on the ground when a job came along and the rest of you started out for Heaven knows where. I'd go crazy. The only thing for me to do is make a clean break, get entirely away. It will be just as tough on me as it will on you, Bill."

"I know that," Bill said, and repeated, "I know that. I just can't get the idea through my head. Here we've built Barnes Field into one of the best airports in the East. We have a crack outfit of fliers; we're way out of the red and have a flock of money in the bank." Bill was half talking to himself now. "I can't imagine the place without you around, Shorty." His face suddenly surged with anger. "Where the hell are you going?" he thundered.

"To the Philippines," Shorty said quietly.

"What for?"

"Gold," Shorty said. "I don't know whether you



As the first of the crimson ships roared up and around in a flashing chandelle he flipped over and sped across their tails—

know it or not but the Philippines are now producing more gold than any State in the union. Even more than Alaska. They've done placer mining there for centuries, but only on a small scale. Because of the rise in the price of gold it is becoming a major industry there."

"Gold!" Bill said bitterly. "As though we hadn't seen gold cause enough trouble."

"She's a siren, Bill," Shorty said softly.

"Well, by Heaven, you're not going!" Bill bellowed. "I won't let you. You owe me something."

"I've given you a lot, Bill," Shorty said, again softly. "I've made up my mind. I'm determined to go. And I'd rather go knowing that we're still friends."

Bill looked at Shorty as though he had struck him. He shook his head in a half-dazed fashion and blinked. "I'm sorry, fella," he said. "This thing is hitting me harder than anything in my life. Of course we'll be friends, always. Nothing can alter that. It just seems incredible to me."

"It's just as hard for me as it is for you, Bill," Shorty said. "But I'm not a kid any more." His face twisted into a crooked smile. "You know, to tell the truth, I've been wondering just how long I'll stick it!"

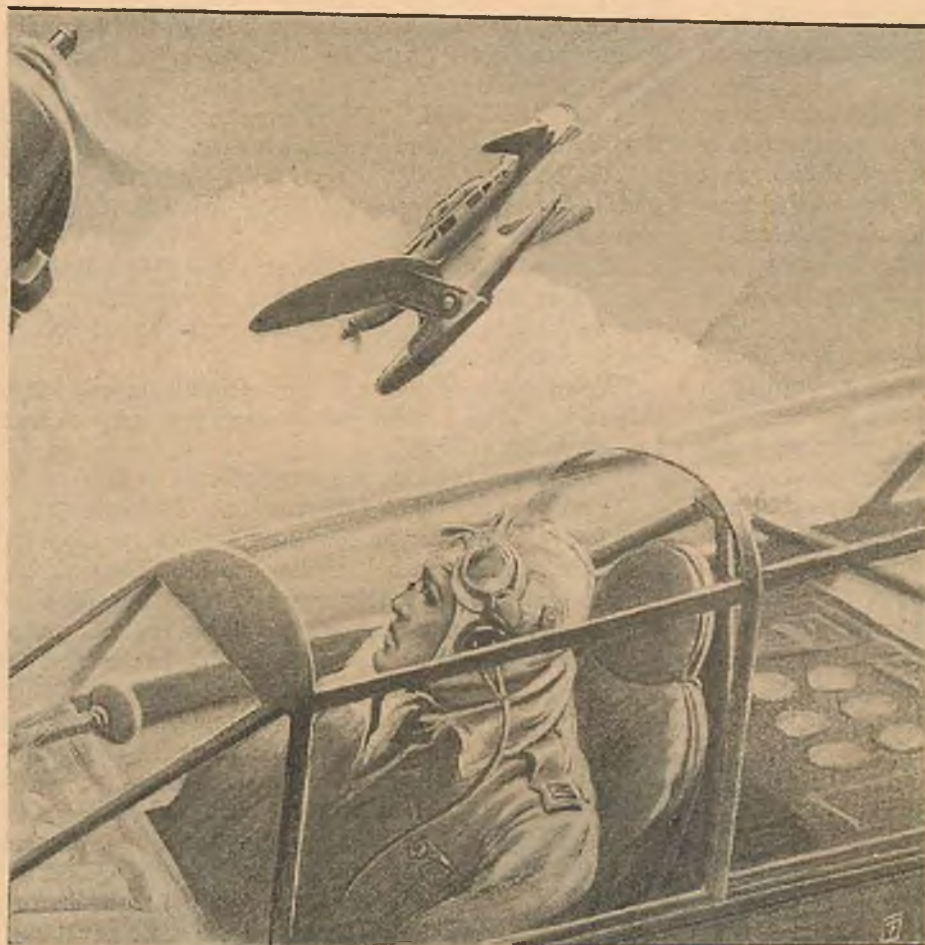
Bill's blue eyes gleamed with amusement. "That's a thought," he said.

"I want to buy my Snorter from you, Bill. I'd be lost without her. I'm going to fly her out there."

"Buy her?" Bill roared and his face was red. "You couldn't buy her! She's yours already."

And two weeks later Shorty had taken his Snorter off





Barnes Field with that reckless flourish that was characteristic of him. But before he had gone he and Bill had arranged a secret code word that was known to no one but the two of them.

"If you need help, let me know," Bill said. "We better have a word for code so we'll know it's authentic. You may run into trouble."

"O. K.," Shorty said. "What about Luzon. That's where I'm going—up in the interior."

"You might want to use that word in a regular message," Bill said.

"Right," said Shorty. "Suppose we reverse it—'Nozul.'"

"Nozul," Bill said. "Suppose we call it 'nozzle'?"

"O. K.," Shorty laughed. "Nozzle it is."

"It's a trifle screwy," Bill said. "But sometimes that's a help."

Bill turned slowly back to the little fold of white paper on his desk. He was thinking about that mysterious phone call Sandy had taken only a few hours before.

"You tell Barnes," the voice had said to Sandy, "that I have a message for him from Shorty Hassfurth. Tell him it's a matter of life and death. Tell him to come to Humboldt Square and ask for Luigi. I'll be there and I'll get the message to him some way, depending on the way things sit. You get me?"

"I get you," Sandy had said. Then he asked the voice some other questions and finally he got that queer code word over the wire.

"Tell Barnes the word is 'nozzle,'" the voice said angrily.

That was why Bill had gone to Humboldt Square that night. And now he was half afraid to open the message

he had been given there. He held it in his trembling hand for another instant and then he unfolded it.

There was another small scrap of dirty paper inside the first one, which was empty of words. The dirty little scrap had only three words on it. But they were words that burned into Bill's brain as he read them. He turned the thing over. The back was dirtier than the front. They were:

Come. Nozzle. Shorty.

That was all.

Bill was still staring at the cryptic message as the door opened and Sandy's freckled face appeared.

"What does it say, Bill?" he asked breathlessly.

Bill handed him the message and reached for a telephone.

"What does it mean?" Sandy asked.

"It means Shorty needs us," Bill said.

"Where?" Sandy asked. "I don't see how—"

"Shut up!" Bill said. "Hello, Tony," he said to Tony Lamport—chief radio operator and superintendent of communications on

Barnes Field—over the telephone. "Tell Scotty to round up every one. I want 'em all here in my rooms within an hour. . . . What? . . . I don't care where they are. Tell him to get 'em all here within an hour!"

## II—COMBAT

THE first streaks of light heralding the dawn were creeping out of the east when that grim-faced, determined little band of men prepared to break up their three-hour conference.

Bill had watched the faces of his men change from intense interest to sheer horror as he told them of the events of the evening. At first they could not believe that Shorty Hassfurth, who had been like a brother to all of them, was in trouble—in real trouble. They all thought of the hundred and one times that Shorty had led them into the air to go to the aid of some poor devil who had more trouble than he could handle. It seemed incredible that Shorty, with his abundance of self-reliance and resourcefulness, should need help.

"Red" Gleason's carrot-colored thatch of hair had seemed to bristle like the back of an angry cat as Bill unfolded his story. Red and Shorty had been pals since those days they had first taken the air together in France during the War. Those two had been real friends for twenty years.

Cy Hawkins, the leathery-faced Texan with the indolent drawl and the speed of a whippet; Beverly Bates, the brown-eyed Bostonian with the Harvard accent and the courage of a Lindbergh; Mort Henderson, the chunky mining engineer who had come out of the ground to become one of Bill's most trusted fliers; "Scotty" MacCloskey, the dour old Scot who was the major domo of



Barnes Field and Bill's chief technician; and young Sandy Sanders, the kid ace of the outfit—they were all equally affected by Bill's words.

"The things that happened to-night," Bill said, "prove that Shorty is a captive some place or is being carefully watched. It's going to be a tough job to find him. And it's going to be dangerous. Some one followed that messenger all the way from the Philippines and he knew he was being followed. They didn't want Shorty's message to get through to me. They were willing to kill the messenger to prevent it.

"That's about all we know. You all know how Shorty is about writing letters. I've hardly had a word from him since he left for the Philippines. A pen or pencil seems to give him stage fright. Consequently, we know nothing about the things that have happened out there.

"But we do know that he was going after gold and we know that anything from wholesale murder down can occur when men are seeking gold. I can think of a hundred situations that might have come up. Let's talk it over and try to find the best way to approach the thing. Has Shorty written you anything more than he has written me, Red?"

"Nothing," Red said. "He shies away from a pen like a dope away from water. It seems to me the best thing is to hop for Manila and start from there."

After hours of heated wrangling that was what they decided to do.

"If any one doesn't want to go —" Bill began. "Some one ought to stay here besides Scotty."

"Nuts!" the irrepressible Sandy said. "No one will stay here if you tell 'em to, Bill. We got to get Shorty out of this jam."

"O. K.," Bill said, smiling grimly. "That will mean the Lancer, three Snorters, and the carrier-transport on the line ready to go at dawn tomorrow morning, Scotty. You can have 'em ready?"

"They'll be ready, boy," Scotty said. "And they'll be tuned so fine you can run your watch by 'em."

From that hour on Barnes Field became a place of feverish activity. Radio men and mechanics, sheet-metal workers and grease monkeys, gun experts and instrument technicians swarmed over the five ships like so many bees. Bill Barnes and Scotty MacCloskey were everywhere, checking and rechecking. Bill knew only too well that a thousand miles out over the Pacific Ocean was no place to have trouble.

Bill had reported the incident that had occurred at Humboldt Square to the commissioner of police the night before. At noon the commissioner got him on the telephone and told him he would have to come to police headquarters to answer a few routine questions.

"If there is any way you can fix it so I don't have to come over there I'd appreciate it," Bill said to him.

"Listen, Bill," the commissioner answered. "This thing is murder. I can keep you out of it and keep your name out of the papers, but we've got to have certain things for the record. You know that."

"I'll be able to tell you more when I come back from the Philippines than I can tell you now," Bill said.

"Unless you come over and go through the necessary routine you won't go to the Philippines," the commissioner growled.

"O. K.," Bill said. "I'll fly over to the Battery. Be there in an hour. Can you have a car waiting for me?"

"It'll be there. I'm sorry, Bill," the commissioner said. "But this is necessary. Bring young Sanders with you, too, you know."

Bill found Sandy going over the little ship called the Eaglet that was carried inside the carrier-transport. He was checking his emergency equipment in the rear locker and his machine guns.

"We've got to go over to police headquarters, kid," Bill said. "And I want you to keep your trap closed. Let me do the talking."

"I didn't see anything anyway," Sandy said.

"Don't even say that," Bill growled. "C'mon."

A few minutes later he climbed into the forward cockpit of the streamlined bullet he called the Silver Lancer. He dropped into the bucket seat and revved up the tandem Diesel engines that drove the enormous twin props in different directions. For an instant he listened to their full-throated roar with his head cocked on one side.

Following his regular custom he checked over his ammunition counters and his two .50-caliber machine guns and the 37mm. cannon mounted in the V of the cylinders. His eyes ran over the flight instrument panel and the radio panel and he tested the yellow-and-green amphibian gear lights. He lifted the infra-red-ray telescope that permitted him to see through fog, clouds, or darkness, checked it and let it drop back to its folding recess in the instrument panel.

"Pin on your hat," he said into the intercockpit telephone to young Sandy and blasted the tail around.

The big sesquiplane sped down the center runway at terrific speed

and then Bill eased it into the air. He leveled off at three thousand feet and stuck the nose on the Statue of Liberty in New York Harbor. He circled once above the lower end of the island until a Staten Island ferry boat was out of his path, then, fishtailing to reduce his speed, he struck the water with a cloud of spray and roared up to the landing. The floats of the big ship slid halfway up the face of the inclined turntable. The turntable came up and swung halfway around. Five minutes later Bill and Sandy were entering the office of the police commissioner.

They answered a regular routine of questions that a captain of detectives asked them while a stenographer recorded the answers. Bill told exactly why he had gone to Humboldt Square and what had happened while they were there.

"I'll have the answer to the whole thing when I get back from the Philippines," he told the commissioner.

"You never seem to worry about the possibility of not getting back, Bill," the commissioner said.

"I let the other fellow worry," Bill said. "That gives me an advantage."

"I hope nothing serious has happened (Turn to page 68)





# 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: Could you please tell me where in Canada there are any flying schools or clubs where one can obtain a license for a moderate fee? R. B., Victoria, B. C.*

*Answer:* Considering your location, I would first get in touch with the Dominion Branch Inspection Office, 402 Pender Street, Vancouver, B. C., and get information on schools and clubs in that area. At the same time, I would get in touch with the Canadian Flying Clubs' Association, Journal Building, Ottawa, and see if they can help you.

*Question: Please give me the names of the planes that won the Schneider Cup races in the years 1928-1936. A. S., Detroit, Mich.*

*Answer:* There was no race in 1928. In 1929 it was won by the British Supermarine S-6 at a speed of 328.63 m.p.h. They won it again in 1931 (there was no race in 1930) with a Vickers Supermarine at a speed of 340.08 m.p.h. This gave the British the trophy, as they had also won it in 1927 and there has been no Schneider Trophy race since.

*Question: I wear glasses, as my eyes are defective. What chance have I as a commercial pilot? What qualifications are necessary for one to become a test pilot? Any chance for me in the air corps? R. M., Seattle, Wash.*

*Answer:* You cannot expect to get a transport pilot's ticket if you already have defective eyesight. But first inquire into your particular case with your nearest department-of-commerce physician. Test pilots require many years of experience on many types, above all. They are usually ex-service pilots who have had much acrobatics training. They, of course, are men physically suited for this hazardous work.

*Question: How much does a private flying course cost and what aviation job can be obtained after completing the course? S. S., Chicago, Ill.*

*Answer:* A good private course will cost you anywhere from \$350 to \$500. It would only guarantee your getting a private license. You would not be able to demand any licensed job in aviation with that training.

*Question: What country to-day has the largest air force? M. B., Brooklyn, N. Y.*

*Answer:* According to figures published in the 1937

edition of the Aircraft Year Book, published by the Aeronautical Chamber of Commerce, Great Britain, with 4,000 combat planes, leads the world in air strength. France is second with 3,600; Russia third with 3,400; Italy fourth with 3,200; Germany fifth with 3,000, and the United States sixth with 2,200. How much these figures have been changed in the last six months, I have no way of knowing.

*Question: What are wing flaps and how are they controlled? F. S., Hamilton, Ontario.*

*Answer:* Generally speaking, wing flaps are movable surfaces hinged along the under side of the wings along the trailing edge. They are used to change the camber of the wing and give lift. Thus they may be used to increase the rate of climb or lower the speed of landing. They are controlled by a lever or wheel in the cockpit. On large airliners they are manipulated by the co-pilot, under the chief pilot's orders.

*Question: To prevent such enormous loss of life in airplane crashes, I suggest that all cabins be constructed of live rubber one foot thick, built inside the ordinary steel framework. What do you think of this idea? C. C., Phoenix, Ariz.*

*Answer:* The idea might be all right and in a crash it might break the actual shock, but have you stopped to think how much a Douglas cabin made of rubber one foot thick would weigh? It would be impossible to get it into the air. I'm afraid. Then again, when planes hit head on, as has been the case on one or two occasions, no shock-absorbing unit in the world would be capable of taking such a thud.

*Question: Why is it considered necessary to put steps in the pontoons of seaplanes? What service do they perform? S. F. J., Milwaukee, Wis.*

*Answer:* One of the great problems in seaplane or flying-boat design is to obtain a float or pontoon that will get away from the surface of the water as quickly and as easily as possible. The suction of water is tremendous, as you may have noticed if you have ever attempted to lift a rowboat or a heavy canoe out of water. To overcome this suction drag, designers have built or cut in steps which help break this long surface of suction-affected bottom.





## The Honor Roll for September

### FLIGHT LIEUTENANTS

Bob Carr, Manasquan, N. J.  
Emanuel De Taillefer Taylor, San Francisco, Cal.  
Harold Hartnett, Little Falls, N. Y.  
Arlington S. Leininger, Robeson, Pa.  
S. M. Moore, III, Washington, D. C.  
Edward Bergethon, Brooklyn, N. Y.  
W. J. Kearns, Port Hope, Ontario, Can.  
Charles E. Duffy, Lake Hill, N. Y.  
Lester J. Dahn, Poughkeepsie, N. Y.  
H. S. Bourgoin, St. Louis, Mo.

Oldrich Foucek, Binghamton, N. Y.  
Dick Malia, Chicago, Ill.  
Robert J. Otha, Bridgeport, Conn.

### TOPOGRAPHER

Harry Myers, Tarentum, Pa.  
Harley T. Schmidt, Vancouver, B. C., Can.  
LaVerne Cressman, Kitchener, Ont., Can.  
Arlo Koontz, Onawa, Iowa  
Branon Sell, Dallas, Ga.

### PHOTOGRAPHER

Arthur Patak, Carlstadt, N. J.  
Howard Wright, West Summerland, B. C., Can.

### OBSERVER

Charley Brateres, Castle Rock, Wash.

Elizabeth Saur, San Francisco, Cal.  
Larry Miller, Brooklyn, N. Y.

### AIRPLANE MECHANIC

Bud Burchard, Oxford, N. Y.  
Fred Dieber, Glen Ellyn, Ill.  
Murray Donovan, St. John, N. B., Can.  
Walter Goff, Chicago, Ill.

### ENGINE MECHANICS

Jerome W. Cowan, Chicago, Ill.  
Jere O'Brien, Brooklyn, N. Y.  
Constance Whitmore, San Carlos, Cal.  
William J. Karges, Wheeling, W. Va.  
Bob Peifer, Chicago, Ill.  
M. H. Osborne, Ebenezer, S. C.

## Progress

**A**VIATION is becoming a major part of life so fast that it is difficult to emphasize the importance of building and maintaining a thorough familiarity with all phases of aviation history, practices, new developments and news. One of the greatest methods of building a groundwork understanding of the intricate problems of flying is the building and flying of models.



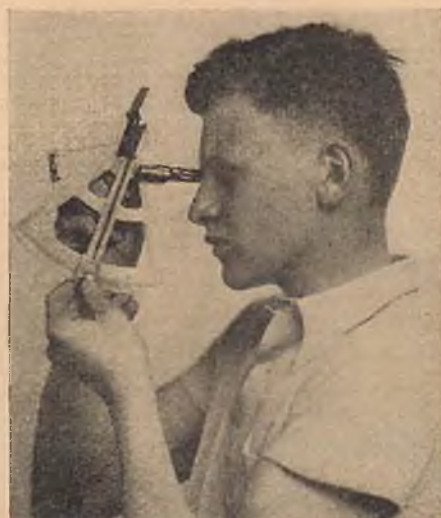
Drawn by Air  
Adventurer H.  
Haufe of Villa Park, Ill.

Step by step the Air Adventurers who have interested themselves in model building have learned the actions of thermal currents, of cross winds, of the reaction that is gained by too much or too little tail surface.

The new activity in gliding and soaring in which the Air Adventurers are playing a major part is the natural outgrowth of interest that has been maintained in model making. There is no need for any one to feel impatient because he is young. To be a well-grounded flier,

you must spend some time with models. Only when you have mastered the understanding of air currents can you safely proceed to the next step by joining a gliding-and-soaring organization.

Those of you who have qualified for the Craftsman Awards and who are qualifying as Flight Lieutenants and Flight Captains are all gaining a knowledge which will be very valuable as time passes. For ahead of you lies the greatest sport in the world: motorless flight. And ahead of that lies what will be the greatest business in the world five years from to-day: powered flight. Looking toward that day, Air Trails is starting a new department in this issue devoted to light-plane clubs.



The new low-priced sextant simplifies navigation.

The Air Adventurers include members who are seasoned pilots. They include other members who are gliding-and-soaring enthusiasts and still others who are expert model builders. In addition, the Air Adventurers include many, many members who have a thorough theoretical knowledge of aviation, but who have not, as yet, put into practice any of the actual mechanical work of construction on models or gliders. It is possible for this theoretical knowledge to serve as an excellent background for activity in the air, although, of course, it is necessary to gain actual experience and careful construction when one's feet leave the ground.

All things taken together, the Air





**Air Adventurer Robert Forrest of East Hartford, Conn., exhibits his Curtiss Hawk model.**

Adventurers are as fine a group of air-minded people as can be gathered together. Our club is built on as fine a creed as has ever been laid down, and we expect every one of our thousands upon thousands of members to live up to that creed, to help in the vast movement toward perfection and safety in flight.

If you are not a member of the Air Adventurers, you should join at once. It is a proud club, because we who are members know that the examinations are stiff and hard and represent real accomplishment if we advance our rating.

If you do not have a copy of the Air Adventurer's creed, write to me at once and ask for it. I will be very glad to send you a copy by return mail, and will also include the qualifications for the various Craftsman ratings and for the rank of Flight Lieutenant and Flight Captain. Meantime, if you believe that you can live up to the seven points of the creed—SELF-RELIANCE, COURAGE, INITIATIVE, LOYALTY, INTEGRITY, INDEPENDENCE, and OBEDIENCE—fill in the application coupon on this page and forward it to me, together with 10c to pay the cost of mailing your certificate and wings. If your application is approved, both will be mailed out at once.

I am looking forward to a lot of new members this month. Please don't hesitate. Do it now!

Happy landings!

Your Flight Commander,

*Albert J. Carlson*

#### AIR ADVENTURERS' NEWS

**W**HAT will be good news to many Air Adventurers is the recent development of a real working sextant for \$4.50.

This instrument has all the essentials, in simplified form, and enables you to shoot the sun with very fair accuracy. The expert navigator always prefers to make his final checkup with the sun, the stars, and other objects, with the sextant. It can be used in connection with surveying, small boat operation, and in other ways, many of which are extremely useful to aviators.

R. D. Laing of Overton, Texas, has been reading the Bill Barnes novels since April, 1934. He states that airplane model building has been a hobby with him since

Charles Lindbergh's memorable flight. There are not many expert modelers who can point to a longer construction record.

His present fleet, numbering twenty planes, includes many of the Bill Barnes ships. Among these are the Porpoise, Bumblebee, Eaglet, Snorter, Scarlet Stormer, Lancer, Transport, New Eaglet, and New Snorter. The Hellion is now on his assembly line.

Not to be outdone as an early Air Trails reader, Air Adventurer Robert Gray of Tyler, Texas, declares to have read each issue carefully since August, 1934. His membership in the Air Adventurers dates back to those early days. Aircraft design is his ambition; a design



**Above: Aeronca LA snapped by Robert Bahr, Oskosh, Wis. Right: Air Adventurer Clyde Douglas of Goodland, Kan.**



recently submitted to an aircraft manufacturer drew favorable comment. Although actively engaged in following aviation, Mr. Gray finds time to indulge in other hobbies, being adept at photography and coin and stamp collecting.

Air Adventurer, Michael Markovich of Scalp Level, Pennsylvania, claims to be one of the oldest Air Trails readers. As a proof, he sports a complete file of the magazine! His method of reading and filing each issue deserves comment for its efficiency. Realizing the benefits of planned reading, he not only utilizes the magazine to derive entertainment from fictional and educational reading, but keeps abreast of new developments by examining the contained plans. By maintaining a complete file, he finds references handy when some past event becomes hazy.

#### (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 October 15, 1937.)



# AIR TRAILS GALLERY

*A Picture Page of Modern Planes for the Collector*



The newest Seversky fighter, 1,000 h.p. Twin Wasp, is experimental model for the navy. Retractable housing streamlines wheels when retracted.



Israel Redhead racer, 250 h.p. Menasco B-6, is a popular performer at the National Air Races.



The Taylorcraft Model A, popular sport plane fitted with the 40 h.p. Continental A-4 engine, features side-by-side seating. Span, 36 ft.; length, 22 ft.; height, 6 ft. 8 in.



The DeHavilland Albatross, four Gypsy Twelves, is one of two designed for Imperial Airways and is to be used for transatlantic air-line experimentation. Cruising range is 4,000 miles at 200 m.p.h.



Grumman G-21 amphibian, two 400 h.p. Wasp Juniors hits 205 m.p.h. top; cruises 1,150 miles at 184 m.p.h. Span, 49 ft.; length, 38 ft. 3 in.; height, 12 ft. 2 in.



Northrop X-2J Attack, 500 h.p. Wasp Junior, is fitted with special retracting gunner's pit, hinged beneath the fuselage. Wing flaps are perforated to reduce "buffeting."



Beechcraft JB-1, 285 h.p. Jacobs, is intended for navy transportation of high officers; it is similar to civil model in outward details.

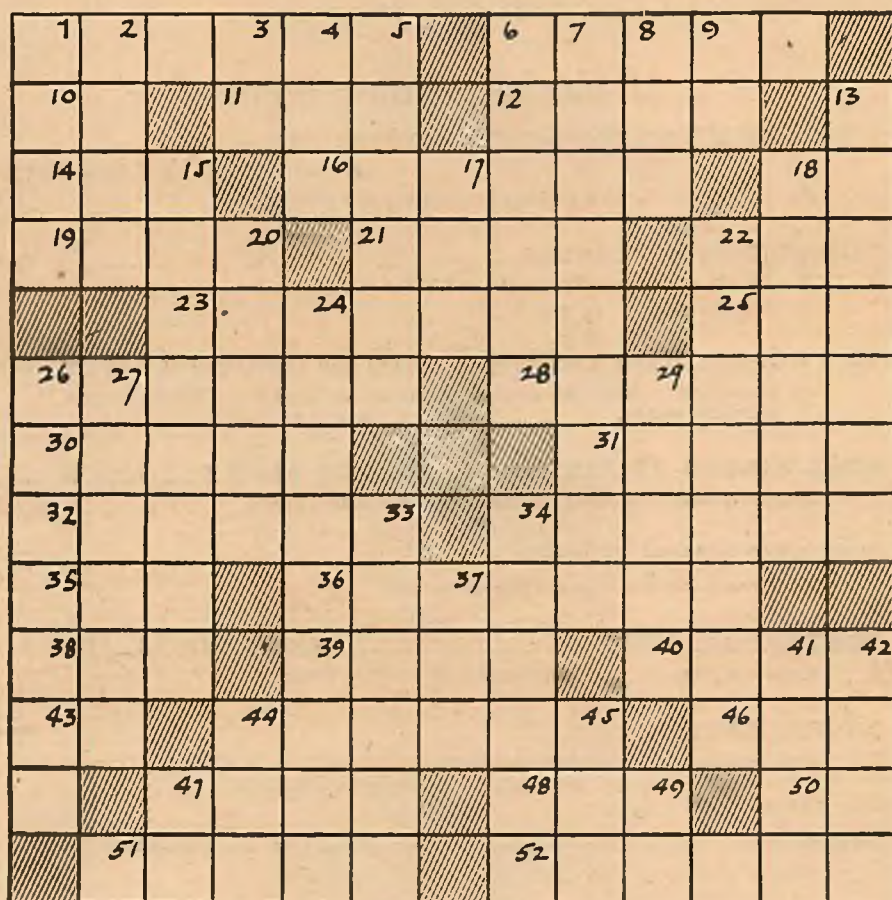


Curtiss XF13C-3, 700 h.p. Wright Whirlwind, has observation ports on fuselage sides and divided wings for glassed cockpit. Wings are fitted with both slots and flaps.



# CROSS WINDS

*Can you answer the aeronautical definitions in this puzzle?*



## ACROSS

- 1—First name of U. S. flier who holds world land-plane speed record
- 6—Projection on outside of plane for directing air to supercharger
- 10—Academic degree, initials
- 11—Sailor
- 12—Split
- 14—Decay
- 16—Italian airship expert who flew a dirigible to north pole.
- 18—Make of Argentine plane
- 19—Group of persons on one side in a contest
- 21—Able
- 22—Verb-forming suffix
- 23—Small dynamo operated by aero engine to provide ignition current
- 25—Diagram of land surface
- 26—Prejudices
- 28—Elementary
- 30—Hard surface in front of hangar
- 31—More dreadful

- 32—Inclined
- 34—Frenzies
- 35—U. S. government organization for young men, abbreviated
- 36—Consequences
- 38—Hardwood tree
- 39—The three imaginary pivotal lines about which an aircraft may turn
- 40—To fly alone
- 43—Airplane license letters denoting a U. S. commercial plane
- 44—Type of low-flying war plane used against ground forces
- 46—Prefix meaning not
- 47—Above
- 48—Edge of mouth opening
- 50—Type of electric current, abbreviated
- 51—Make of German plane
- 52—Power plant in airplane

## DOWN

- 1—Kind of Hawker (Br.) military plane

- 2—Musical wind instrument
- 3—Preposition
- 4—Moved swiftly
- 5—Dies by immersion
- 6—Poles with a support to raise feet above the ground in walking
- 7—Jellylike
- 8—Native compound of metal
- 9—Upon
- 13—Young frogs
- 15—Larch tree
- 17—Honey-storing insect
- 18—American shrub
- 20—One who builds with stone or brick
- 22—Confine
- 24—Created electricity
- 26—Projecting platform or gallery
- 27—Medicinal plant
- 29—Makes coins
- 33—Prefix meaning right-hand
- 34—Organ for exerting physical force
- 37—Ocean
- 41—Something borrowed
- 42—At some time
- 44—Make of French aero engine
- 45—Relatives
- 47—Coordinating conjunction
- 49—Post graduate, abbreviated

## CROSS WINDS

Answers for August

J	A	C	O	B	S	A	B	R	I
A	V	O	W	E	D	B	O	A	H
C	A	I	R	N	S	C	E	S	S
I	R	A	N	T	A	I	L	S	P
D	E	T	E	R	L	E	E	E	G
E	R	A	S	E	R	I	D	E	A
G	E	E	P	I	Y	A	N	R	R
R	E	E	D	S	T	A	T	I	C
E	R	A	A	T	E	C	M	A	S
A	I	R	S	P	E	E	D	I	C
V	E	N	E	E	R	R	O	C	K
E	E	E	R	M	U	R	A	L	S
E	D	D	Y	O	M	E	L	E	T



# MODEL MAKING—

*Air Trails Department of Practical Construction*

## The Air Trails Pictorial 1938

The Flier's Dictionary  
Pictorial History of Man in the Air  
Development of Planes  
This Winged World  
Split-second Action  
The Gallery

Plus

## This Outstanding Feature

Ten Pages of the Latest Planes in Four Colors. These will be printed on heavy paper stock with no lettering on front or back. Ideal for Framing.

Fellow Air Adventurers:

If you could obtain at the end of every year a single issue which would be complete pictorially of all those thrilling photographs and action drawings in Air Trails, would you be interested? We have received thousands of letters requesting such an issue and telling us how they carefully cut these pictures from current issues for scrap books. If you have had to miss issues during the year, here would be your opportunity to obtain all of pictorial interest in one volume. We want very much to satisfy this demand. The material has been carefully saved and is on hand. However, you must realize the tremendous expense involved in turning out such an annual year book, and unless we obtain at least ten thousand signed orders we do not feel we can go to press. If you will sign the coupon below, signifying your intention to purchase a copy of this annual for twenty-five cents, if we decide to publish it, you will receive one of the first copies.

Let me have an expression of your opinion.

Sincerely yours,  
ALBERT J. CARLSON,  
Flight Commander.

Com. Albert J. Carlson,  
79 Seventh Avenue,  
New York City.

I approve of the plan for a yearly Pictorial. I agree to purchase a copy of the Air Trails Pictorial for 1938, if you decide to publish it. On receipt of a bill for same I will remit the amount of 25c to cover cost of printing and mailing.

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State Model Co. (Christie Batlas)  
Tluth Super Ace Motor Co.



# Does Gas Modeling Deserve Restriction?

*A discussion of a question important to all model builders*

By Gordon S. Light

**G**AS MODELS have been criticized as being dangerous. They have been accused as a menace to airplanes when flown near airports and to surrounding objects when flown in congested areas. And some people seem to think the gas model is too dangerous for the young modeler to handle without taking dangerous risks. This criticism usually emanates from persons not familiar with gas-model flying. If gas modelers don't rally against this criticism, serious restrictions may be put on gas-model activities. The most likely restriction is that of licensing each gas model that is built. Another possible restriction—probably the worst that could befall the model hobby—is the banning of gas models at all airports.

We don't think licensing of gas models is necessary.

It wouldn't accomplish anything and would prove a hindrance to the hobby. The license issued for models would probably carry with it a definite set of flying regulations that the owner of the model would have to follow. But the only workable sort of regulations that could be set up would be based on common sense. And modelers don't need a license and a set of flying rules to teach them common-sense methods of flying.

A gas model represents a substantial investment in time and money. And in practically every instance the builder has made some real sacrifice to finance his model. Naturally, he'll abide by common-sense flying rules. His first consideration will be to keep his model away from danger. And this alone will prevent his model from becoming a menace, at airports or elsewhere.

Critics point out that after a gas model leaves

the ground it is out of control and is likely to fly anywhere. But modelers guard against this possibility. Methods of limiting the gas supply and automatic timers are practically standard equipment on all models. There are very few times when the model really gets out of control. The possibility of random currents carrying the model away is an ever-present danger that no sort of regulation could remove.

The criticism that gas models are too dangerous for young modelers cannot be taken seriously. We've seen too many youngsters in action to believe this criticism. A youngster with enough ambition to build a gas model can be trusted with gasoline, especially in such minute quantities. And as far as actual risks are concerned, we

believe a person is exposed to less danger when building and flying a gas model than when he is skating or riding a bicycle.

At a recent non-gas-model meet held in New York, two boys were injured by breaking rubber and required attention at the field. Surely, if gas modeling is to be restricted on the slim basis of possible injury, all categories of model building and flying should likewise be restricted.

The model fraternity should rally to keep the hobby free from licensing and to prevent our being banned from the airports. In the past our common sense and good judgment has kept our record clean from any serious accidents. And there is every reason to believe that we can continue to do the job better than any sort of licensing. Let's work together, keeping our hobby free from restrictions.

## The 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.

**SUMMER CONTEST** of the Jacksonville Model Club, held under the N. A. A. rules, scheduled August 15th. Information from club headquarters, 2048 Roselle Street, Jacksonville, Florida.

**OUTDOOR FLYING CONTEST**, Reading, Pennsylvania. Sponsored by Croll and Keck Model Club. August 21st. Program calls for detailed scale, stick, fuselage, glider, and gas-model events. N. A. A. rules will govern the meet. Two divisions: junior, up to sixteen; senior, over sixteen years. Entry blanks from the sponsor at 622 Penn Street, Reading, Pennsylvania.

**UNION COUNTY Gasoline Model Meet**, Saturday, August 21st, at Hadley Airport, South Plainfield, New Jersey. Sponsored by Linden Model Airplane Club and the Linden Recreation Commission. Models will be flown with a limited gas supply. Only residents of Union County are eligible. Entry blanks from the Recreation Commission Office, Old City Hall, Linden, New Jersey.

**FOURTH ANNUAL Outdoor Meet**, Lebanon, Pennsylvania, August 28th. Full list of outdoor events—gliders, rubber-powered, and gas-powered models. N. A. A. rules used. All modelers invited. For information and entry blanks address: Mathias Margut, Contest Director, Lebanon Exchange Club, Lebanon, Pennsylvania.

**1937 JUNIOR National Air Races**: August 30th, 31st, September 1st and 2nd, Akron, Ohio. Winners of the seventeen elimination contests from all parts of the United States will compete for one thousand five hundred dollars in cash and trophies. Information from Junior Aviator Editor, c/o The Press, Cleveland, Ohio.

**ANNUAL MISSISSIPPI VALLEY MEET**: September 3rd and 4th. Sponsored by Stix, Baer, and Fuller Model Airplane Club. Full list of outdoor and indoor events. N. A. A. sanctioned. Prizes include trips, cups, and medals. Events open to every one. For information and entry blanks address: H. T. Sommers, Director, Stix, Baer, and Fuller Model Airplane Club, St. Louis, Missouri.

**FOURTH ANNUAL Model Builders' Convention**: September 11th, New York City. Leading Eastern model builders and leaders will meet to discuss rules and regulations, plans for future activities, and exchange of ideas on design.





Chester Lanzo holding the Duplex, here equipped with experimental biplane wings.

# The DUPLIX

*Complete plans for building a championship model that holds two world's records—fuselage and stick*

By Chester Lanzo

*in collaboration with*

Gordon S. Light

CHESTER LANZO'S models always turn in a good contest performance. But the Duplex is probably the most outstanding of all his contest designs. The Duplex holds 2 records. At a contest last year it was officially timed at 48 minutes and 45 seconds, one of the longest official flights ever turned in by a rubber-powered model. For the past year this model has held the National Aeronautic Association record for cabin fuselage models. Since Lanzo is over 21, his record is catalogued as an Open Class Record to distinguish it from the Junior and Senior records turned in by modelers younger than 21 years.

Lanzo proved his modeling superiority by converting this same model into a hand-launched stick model and flying it for another official record. It was a flight of 18 minutes and 10 seconds. The only change Lanzo made in his model was to substitute a slightly different fuselage. In the hand-launched stick-model event, no landing gear is required, as the models are hand-launched. And, too, there is no restriction

on cross-section area. So the "stick" fuselage is slightly shorter and considerably "thinner" than the cabin fuselage. In all respects the 2 fuselages seem very much alike. The stick fuselage is built up and carries the motor internally, just the same as the cabin fuselage. This is a more convenient way of distributing the strain of the powerful motor than suspending it from a single stick, as was done in the old-type models.

Both fuselages are built to fit the same nose and tail plugs. The wing is easily transferred from one to the other. The change from cabin-fuselage model to stick

model is accomplished in a few seconds. Two-in-one is the best way to describe this model. By building one model, plus an additional fuselage, you'll have the benefit of two outstanding championship models. It's an inexpensive and convenient short cut in building up your quota of contest ships. Or, if you're a beginner, the Duplex should be an ideal way to acquaint yourself with the different types of contest models.

The Duplex was designed to conform to last year's weight requirements of 1 ounce per 50 square inches. Therefore, it will be necessary to increase the weight

about 2 ounces to bring it up to this year's weight rules. Lanzo suggests the following changes to meet the weight rule of 3 ounces per 100 square inches: a slight decrease in elevator area of approximately 5 per cent; a decrease in propeller area and a decrease in diameter to 17 inches; larger nose and rear plug to facilitate winding with increased amount of rubber motor; a more substantial landing gear to take care of the increased weight of the model; closer

## ABOUT CHESTER LANZO

Chester D. Lanzo has been building models for the past twelve years. He lives in Cleveland, Ohio, and his work and enthusiasm has done much to stimulate model interest in that city. He's the leader of the group of Cleveland experts who prove a worthwhile threat at any contest.

During the past year he's held two world records: outdoor fuselage and outdoor stick. The ship he used in making these records is the one described in this issue. His trophy case contains seven trophies, along with numerous medals and other prizes. Outstanding is the Major Al Williams Trophy, valued at five hundred dollars and won at the National Meet of the Junior Aviators of America.

Lanzo has done considerable acrobatic and stunt model flying. Smoke screens, parachute drops, and stunt flying are a few of the tricks his carefully adjusted models will perform.

rib spacing in the wing and tail, and closer spacing between fuselage uprights; and an increase in power to about 30-35 strands of  $\frac{1}{8}$ " flat rubber.

The details of these changes are left to your own judgment. The plans as shown here are for the original model as it was flown by Lanzo.

## CABIN FUSELAGE

First we'll describe the construction of the cabin fuselage. It's more difficult to build than the stick fuselage.  $\frac{5}{16}$ " sq. hard balsa longerons are used. If you're plan-



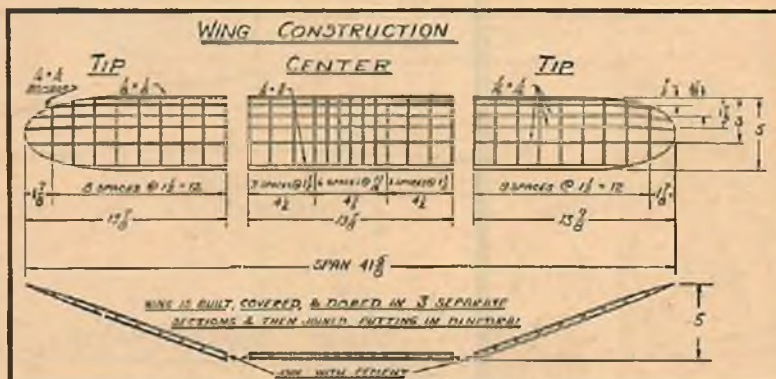
Lanzo, shown adjusting a stick-gas model, is adept in all phases of model construction.



ning to increase the weight of the model, substitute  $3/32''$  sq. hard balsa longerons. The sketch of the fuselage is fully dimensioned and you should have little trouble in making a full-size layout on a piece of drawing paper. First draw the thrust line of the model and dimension all parts of the fuselage with reference to this line, as has been done on the sketch.

Both the rear tip of the fuselage and the nose block are demountable for access to the rubber motor. The nose block is cut from a balsa block  $\frac{3}{8} \times 1\frac{5}{8} \times 1\frac{1}{16}$ ". Metal plates are cemented to both front and rear of the nosing. The front plate serves as a bearing for the propeller and the rear plate is raised about  $\frac{1}{16}$ " above the front plate to give the propeller 2 degrees of negative or downthrust. No right or left thrust is used. The nosing is secured to the front of the fuselage by a rubber band, which fits into a notch in the top of the nosing and extends down underneath the bottom of the fuselage. Wire hooks are cemented to the fuselage at the bottom of the second upright, to receive the rubber bands.

The rear tip of the fuselage ( $2\frac{1}{2}$ " from the rear) is removable. Build the fuselage in one piece and cut away the rear tip after construction is completed. The rear hook is bent from  $\frac{1}{16}$ " diameter wire and secured to the rear boom. When flying, the boom is attached to the fuselage with a few drops of cement applied immediately after winding has been completed. The tension of the rubber motor will hold the boom in place. By the time the motor has unwound the cement will have dried and will be capable of holding the boom in position. After the flight the boom can be removed by inserting a knife or razor blade.

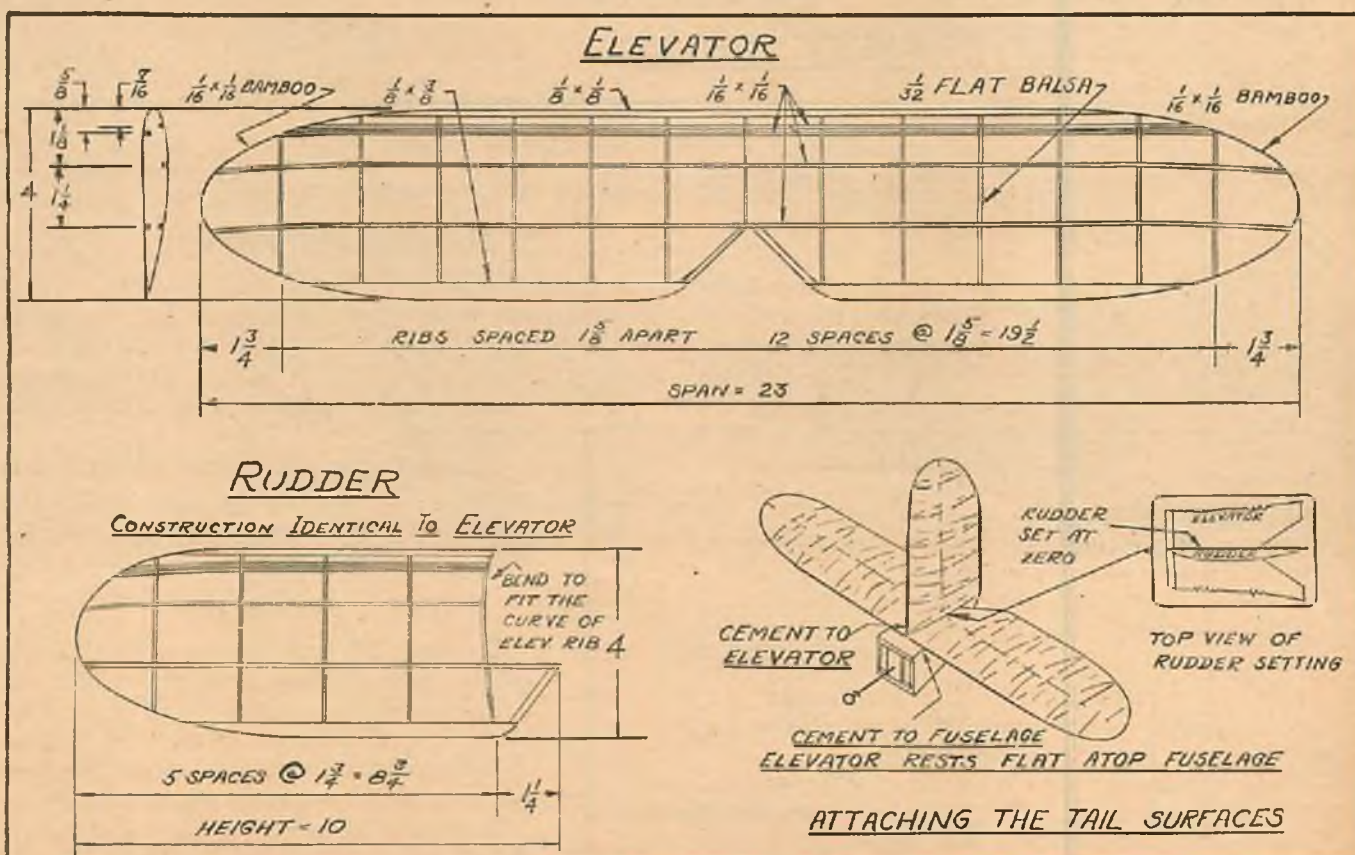


## LANDING GEAR

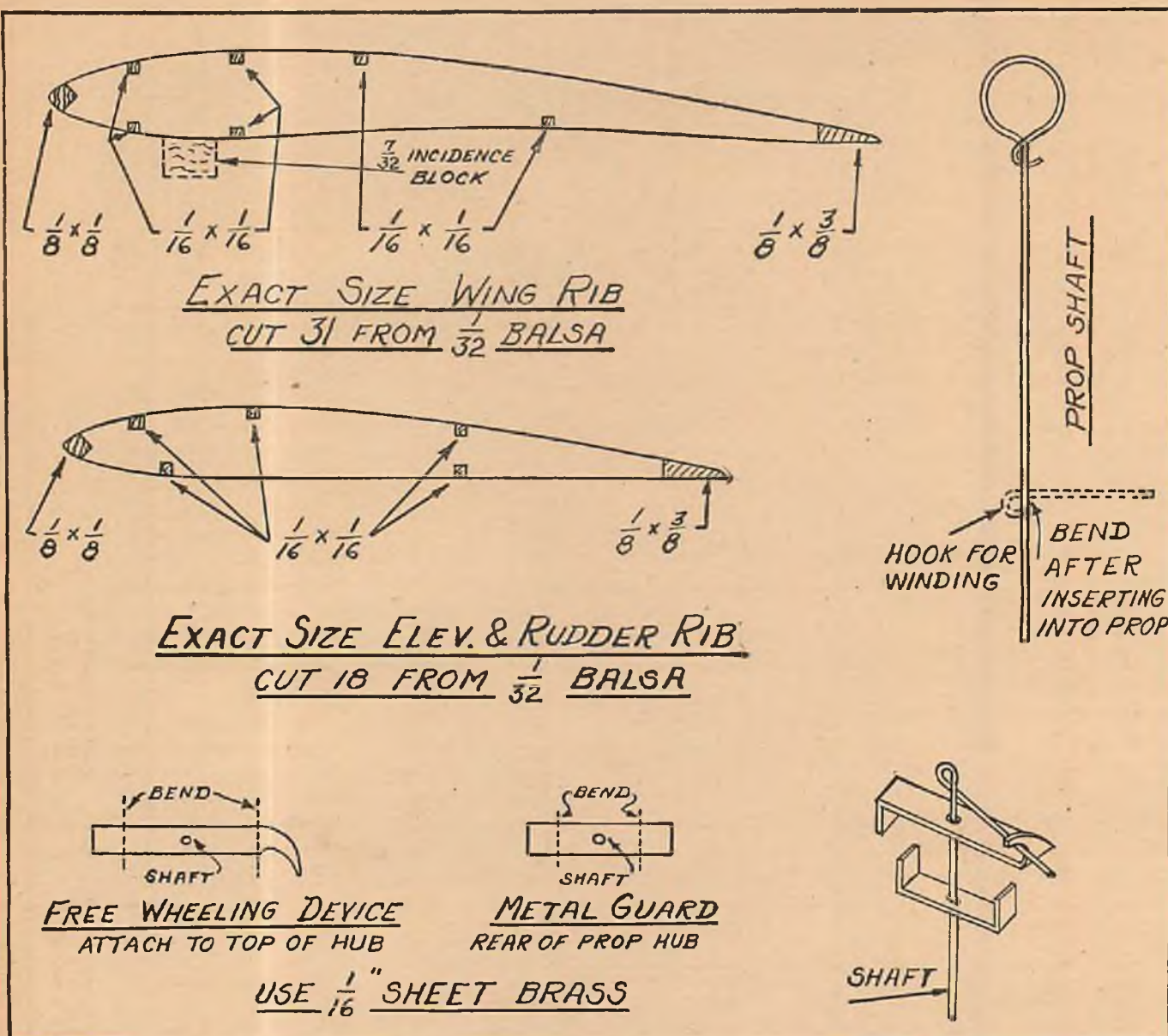
A single-strut landing gear is made from bamboo. The corners of the bamboo struts are rounded with sandpaper and the strut is tapered from  $1\frac{1}{8} \times \frac{3}{16}$ " to  $1\frac{1}{8} \times \frac{1}{16}$ " at the wheel end. The struts extend the full depth of the fuselage, the ends being joined to the cross brace at the front of the cabin window. This cross brace is strengthened by an auxiliary block of hard balsa  $1\frac{1}{8} \times \frac{1}{4} \times 2\frac{1}{2}$ " cemented flush to the top surface of the fuselage. The struts are also threaded and cemented to the bottom longerons. The wheels are 2 inches in diameter and are built up of 2 thicknesses of  $\frac{1}{8}$ " balsa cemented cross grain.

## WING

The wing is built in 3 sections. Each of these sections is completed—built, covered and doped—and then they are joined together to make the complete wing. The two tip sections are cemented to the ends of the center section, which is flat. Take care to make a snug joint between the tip and center sections. During the early stages of construction make certain the first rib of the tip section is staggered, so it will fit flush against the end







rib of the center section to make a nice snug cement joint. It will be necessary to raise the tip section 5" (the necessary dihedral) when determining the correct angle for these ribs.

Notice how the forward spars of the wing curve backward at the tips of the wing. This makes the wing tip easier to cover and prevents the tissue from sagging. There is no set procedure for bending the spars to this

shape. Merely force them into position following the shape drawn in the sketch of the wing.

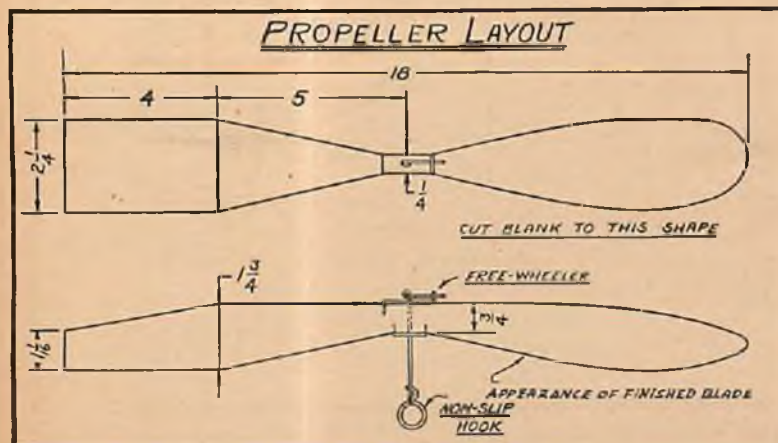
### ELEVATOR AND RUDDER

In the construction of the tail surfaces, Lanzo should certainly prove to be a favorite designer for many modelers. He used a lift section in the elevator and this same rib shape for the rudder. This makes it possible to use the same airfoil template for both rudder and elevator ribs.

Construction of the elevator and rudder is similar. The size of material is identical in both cases. The dimensions of the tail surfaces are available from the sketches.

### PROPELLER

The large 18" propeller turned by an ample rubber motor is the secret of the model's long duration and steep, fast climb. The propeller block is medium-grade balsa. The method of laying off the block is illustrated. The free-wheeling device is made from  $\frac{1}{16}$ " sheet brass. The shape of the metal plates is shown full-size in the drawing. They (Turn to page 92)









# Gull-Winged RELIANT



The finished model is complete in detail and accurately scaled.

THE 1937 Reliant is almost the same as the 1936 Reliant, with the exception of the changed cowl and rounded windshield. It is available in 5 models, depending upon motor and equipment required.

In designing the model, the simplest design has been adhered to and yet scale proportions have been maintained.

## FUSELAGE

Select 4 fairly hard  $\frac{1}{8}$ " sq. strips for the main longerons. Include the  $\frac{1}{8}$ " sheet wing mount in each primary frame, but leave off the  $\frac{1}{8}$ " sq. stringers until the formers have been cemented into place. The primary frames start at #1 and end with the short tail posts. The round bulkhead is added, along with the  $\frac{3}{16}$ " beams,  $\frac{1}{8} \times \frac{1}{8}$ " and  $\frac{1}{8}$ " sq. longitudinal braces. Sand the forward portion carefully to round off any protuberances and cover back to #2 with  $\frac{1}{32}$ " sheet, and frame in the windows as shown.

The "bill" or extension over the cabin that the top of the windshield attaches to is carved and hollowed from a balsa block, since sheet balsa could not be bent perfectly enough. Cement  $\frac{1}{32}$ " sq. bamboo strips in the slots on top of the fuselage and the 2  $\frac{1}{8}$ " sq. stringers in the slots along the bottom. Then cover the bottom edges with  $\frac{1}{64}$ " sheet, between the lower longerons and the bottom stringers. Cement in the rear hook and the stabilizer rest.

## LANDING GEAR

Carve the fillets carefully and streamline the struts.

Make the struts from  $\frac{1}{2}$ " to 1" longer if a longer propeller and flight is desired. Carve the pants from blocks and split them open to hollow. Cement the parts to the fuselage with the aid of short lengths of wire or bamboo. Attach tail wheel.

## WINGS

In making one of these wings it is best to mount the ribs along the main  $\frac{1}{8}$ " sheet spar and then block up the leading and trailing edges with blocks of varying thicknesses. Arrange all the parts and use plenty of pins to hold them in place. Some prefer to leave the ailerons and cut in for the spars and extra ribs after cementing all the parts, in which case, go ahead. The  $\frac{1}{64}$ " sheet leading edge is cemented on after the frame is removed from the board. Pin the finished wing frames to the fuselage in the position shown and cut struts to provide the proper dihedral and cement them to the wing, only, while in this position. In doing this, the wings can be attached easier after covering.



Although substantial, the framework is simple enough for all builders.



The tapered, gulled wings are brought into prominence when viewed from the rear.

## TAIL SURFACES

Assemble the tail surface frames, using unshaped  $\frac{1}{2} \times \frac{1}{8}$ " stock for ribs and sand them to shape after the assemblies are dry. Copper wire or aluminium sheet makes ideal hinges for all movable surfaces.

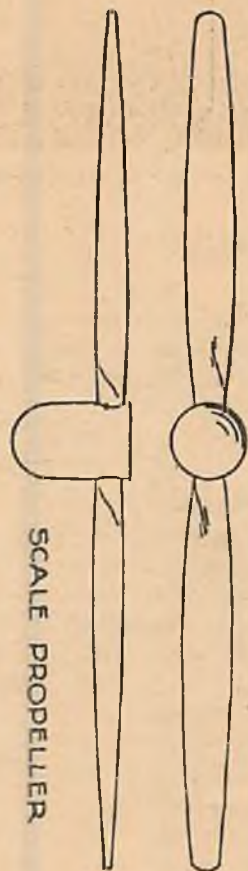
## COWL AND PROPELLERS

For this model, a carved solid block proved to be the most suitable for the desired balance, shape, and ease of making. Carve and hollow the block to (Turn to page 96)

*Detailed plans for building a rugged flying model of the Stinson for 1937—a realistic display model and an excellent flier*

By Alan D. Booton





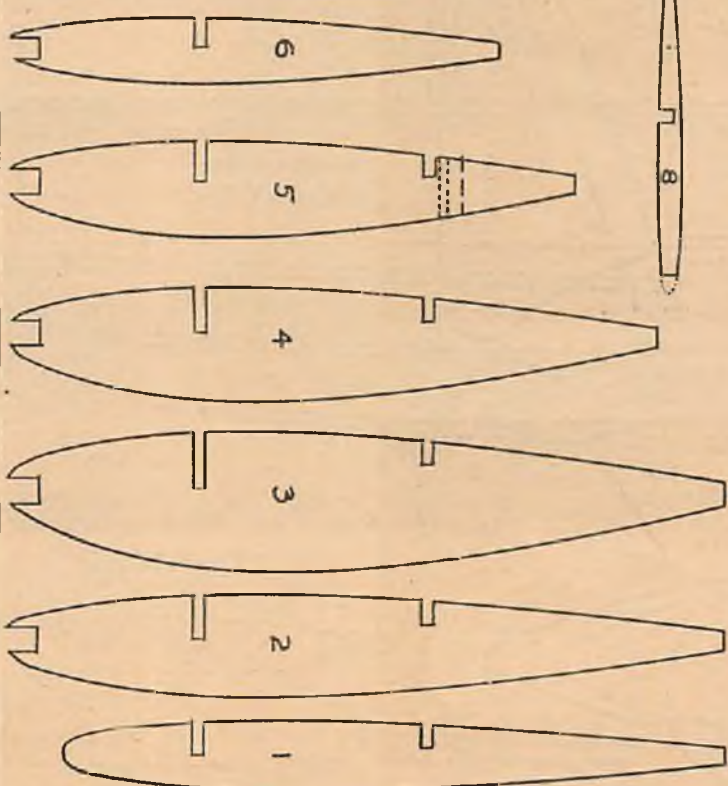
SCALE PROPELLER

11" DIHEDRAL ANGLE

1/6 SHEET SPAR CUT TO SHAPE.



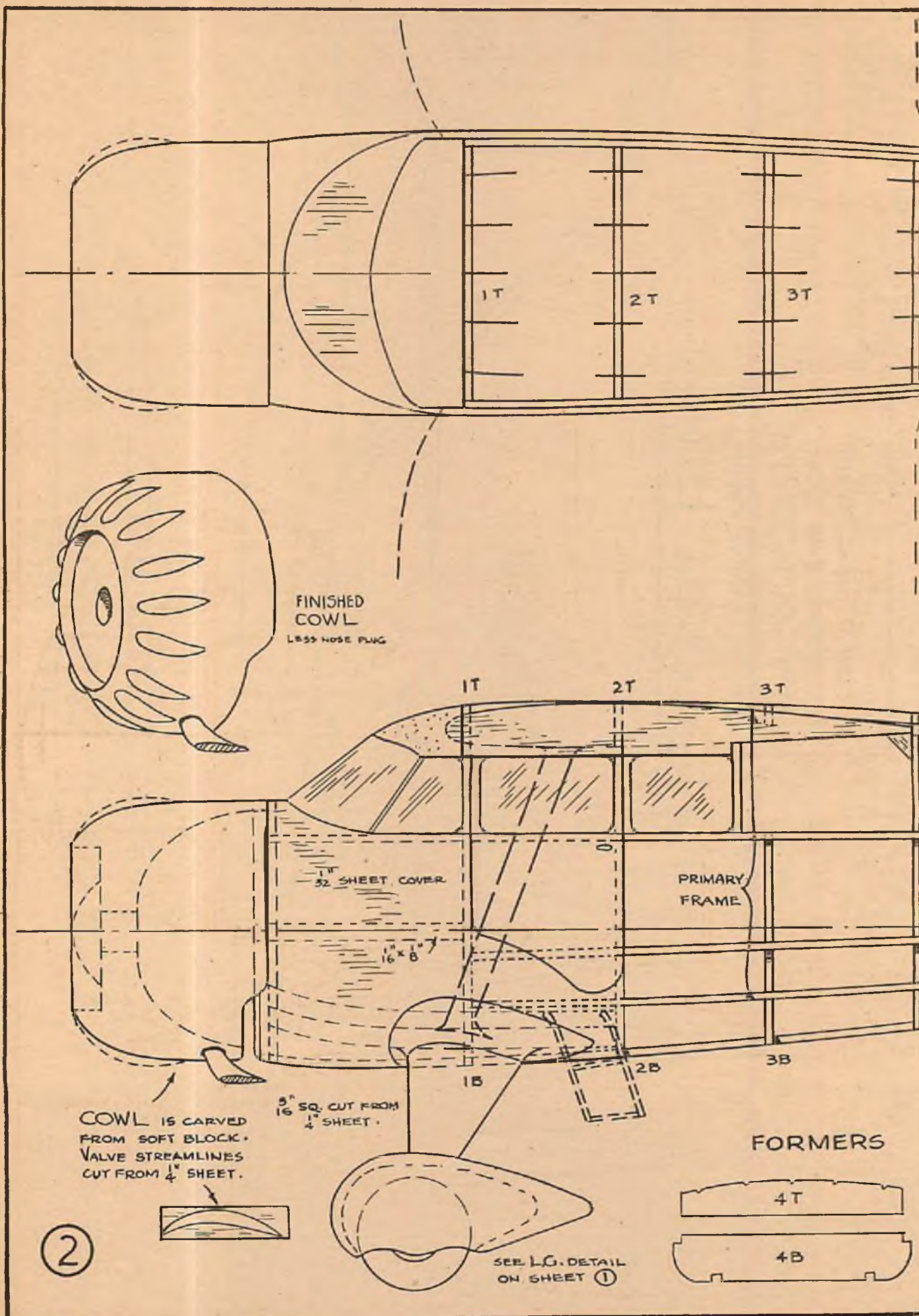
WING RIBS  
#1 IS 1/6" #2 - #8 ARE 3/2"



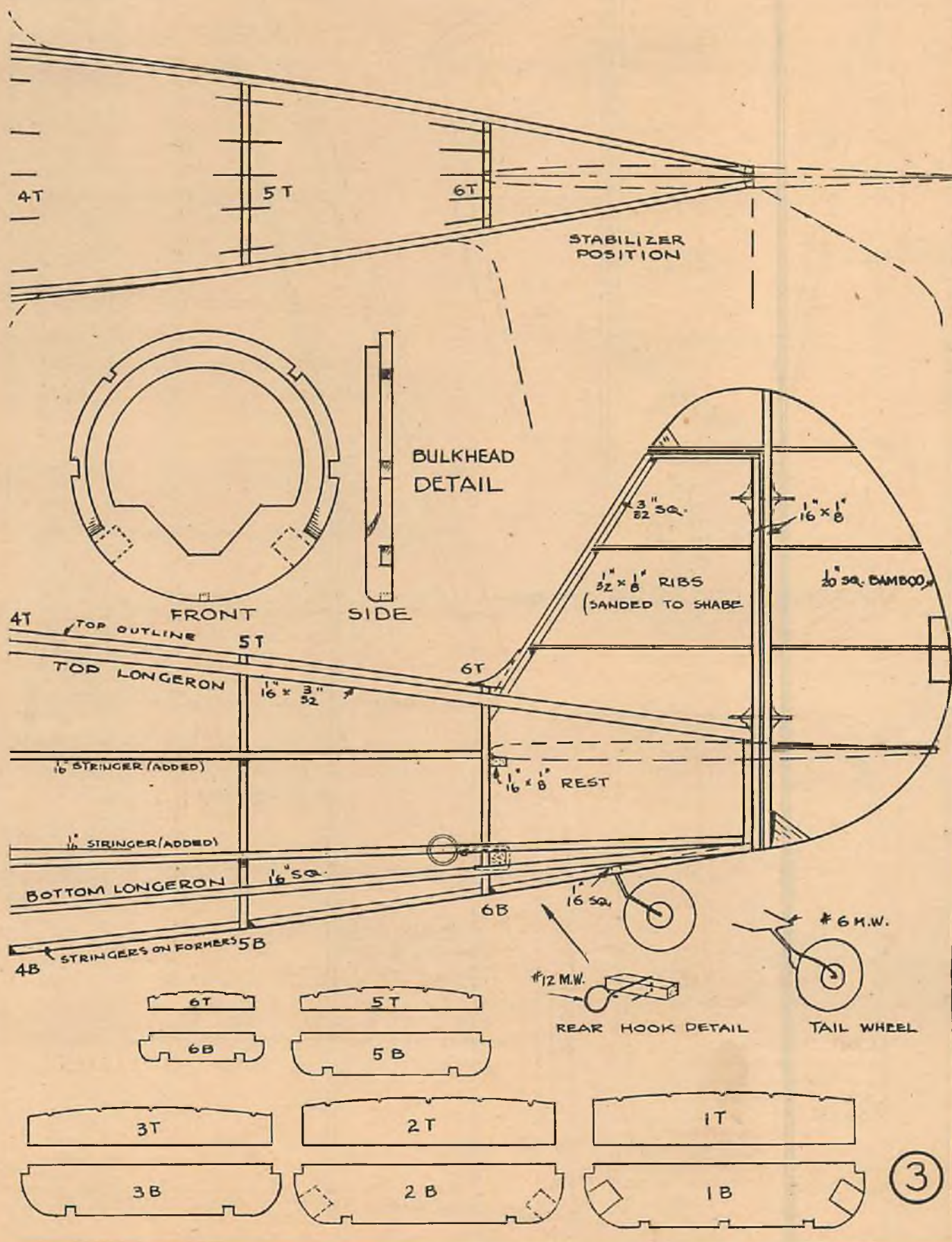
1

AIR TRAILS  
FLYING SCALE MODEL  
*of the*  
STINSON RELIANT  
1937 4-5 PLACE  
DRAWN TO 1/2"=1'-0" SCALE

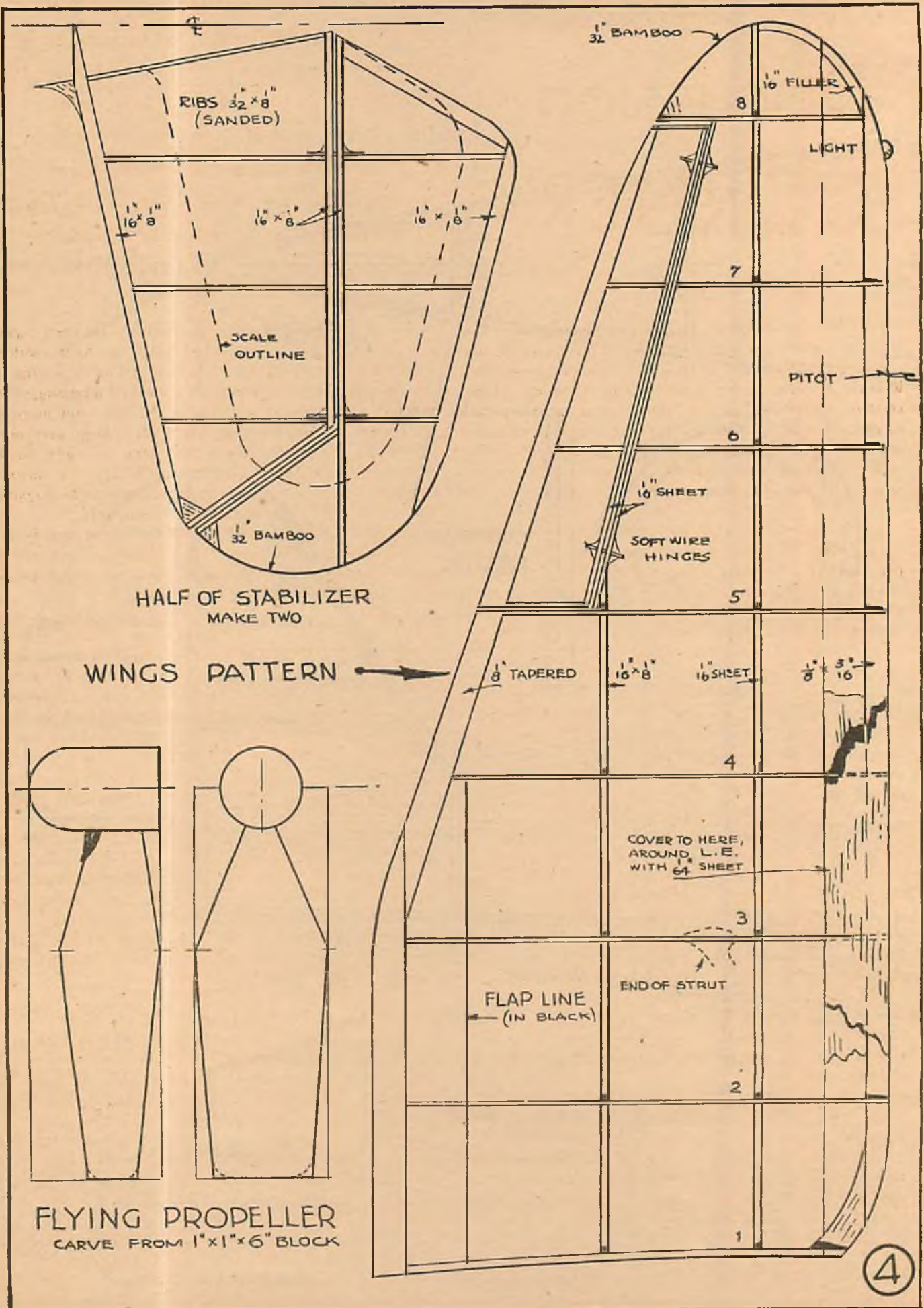














# The Discussion CORNER

*The model art progresses through exchange of ideas. The Discussion Corner is a monthly sounding board for your opinions. For October the subject is aspect ratio. 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.*

**T**APERED WINGS are essential for duration. Stability results from the reduction of weight at the tips.

I prefer to taper both edges in proportion to their location from the center of pressure of the wing. Under certain conditions, such as short spans, a sweep-back taper is desirable. On fuselage ships a straight center section is often necessary but should be as short as possible. The wing tips should be thin and free from warpage.—J. BLOOM, Roxbury, Mass.

It is a generally known fact that the elliptical outline is considered the most efficient wing shape. Of the various types of ellipses the most efficient is the "double ellipse," in which the straight line joining the extremities of the tips is one third the chord from the leading edge. ELWOOD BORDEN, New Bedford, Mass.

The tapered wing has proved its value by the results obtained in its use by most contest builders. The reasons for its superiority may be summed up as follows:

As a straight wing moves through the air, the air flow tends to travel at an outward angle, the angle increasing as the distance from the fuselage increases. A swept-forward wing would correct this loss of efficiency, but stability would be sacrificed. A tapered wing greatly increases the efficiency because its chord decreases as the angle of outward air flow increases. The most efficient wing shape is the double ellipse with the straight chord line.—LEONARD ELGENSEN, Librarian Chicago Aeromuts.

I believe the tapered wing is superior to the parallel type for the following reasons: First, lift concentration is nearer the fuselage, decreasing the strain as a result of the smaller leverage arm; second, the tapered wing adds beauty to the model, justifying the extra work required.

The chief objection to the tapered wing is in the fact that the tips stall first. This may be overcome by using a highly tapered wing with a thick tip section or moderately tapered wing with a thick section throughout. An excellent practice is to decrease the incidence at the tip so that both the tip and the root sections approach the stalling point at the same time.—ED FRANCIS, New Castle, Pa.

There is little difference in efficiency between taper-and-parallel-edged wings when used on light models. For heavier, streamlined models required by the increased weight rule a tapered wing has a marked advantage. A tapered wing having less area at the tips, and more at the center, has less leverage where lift is large and more where lift is small. Thus, the wing is more easily stressed. Resistance is also less at the tips of a tapered wing, and the structural weight being concentrated nearer the center of gravity makes for static stability.

For best results the edges should be tapered equally at a two-to-one ratio. The aspect ratio should be about nine to one.—GERALD SAYERS, Saskatoon, Saskatchewan, Canada.

A tapered wing has been proven by wind-tunnel tests to be more efficient than a straight wing. However, most model builders merely lay out the tip and root sections and guess at the shape of the rest. The efficiency would be lost in this case.

Tapered wings have the advantage of being better structurally than a straight wing.

If the builder chooses to lay out all of the ribs he will have a slightly better wing. If he does, then two thirds of the taper should be taken from the trailing edge, and one third from the leading edge. The chord at the roots should be one and one half to two times the tip chord.

The double ellipse would be the most efficient shape, but it is best adapted to indoor models.—BOB MEUSER, Oakland, Cal.

## *This Month's Topic*

For duration, has a tapered wing a marked superiority to justify its use? Which type of taper is most desirable, leading edge only, trailing edge only, or both?

COMING UP are these topics:

For November—*For maximum duration in the outdoor model do you favor a short, high climb, with a limited prop run, or a moderate climb with an extended prop run?* Answers must reach us by August 15th.

For December—*Does designing the outline shapes of wing tips, rudders, and stabilizers materially affect a model's performance? Other things being equal, does the model with a pleasing appearance show a noticeable superiority in performance?* Answers must reach us by September 15th.

For January—*Would the use of retractable landing gear on the new-weight-rule models improve performance enough to justify the difficulties in design and construction?* Answers must reach us by October 15th.



# Contest Gas Model

*A proven design that has been a consistent winner at many meets*

By Frank Ehling  
and Gordon S. Light

Dear Sir -  
Please call for your  
plane at Mrs. L. Christiansen  
115 Forest Hill Rd  
Port Richmond S.I.  
or phone any night and  
let me know when you will  
call for it. Phone PR 7-8272.

Frank Ehling  
51 Hancock Ave  
Jersey City

Receiving cards such  
as this is becoming  
commonplace to Mr.  
Ehling.



The model and its builder, Frank Ehling, waiting their flying turn at a recent contest.

## ABOUT FRANK EHLING

Frank is one of the most modest and unassuming modelers we've ever met. He seldom talks about himself. And when he does he dismisses his important accomplishments as though they were the most trivial matters. Only after considerable maneuvering were we able to dig out a few facts about his model work. It was useless to try and persuade Frank to talk. So we went to a fellow club member for the information.

Frank is only nineteen years old, lives in Jersey City, New Jersey, has been building models for seven years, and is president of the Hudson County Chapter of the N.A.A. He's turned in enviable contest records. He's had the satisfaction of watching other modelers win contests with ships of his design. His special delight is to originate some new wrinkle in a model and pass this idea on to the club members for development. He doesn't specialize in any one branch of modeling. All types get their share of his attention. But we suspect he's developing a decided taste for gas modeling.

tion system should be carried in the bottom of the fuselage for a low center of gravity position and it should slide backward or forward on a track inside the bottom of the fuselage for easy balancing. The model should be finished with clear dope to give a transparent wing, with color dope used for the outline or scallops on the wing. This color combination will keep the model in sight the longest possible time.

Modelers in general agree that these are necessary features for a successful gas model. This ship has all these features. And as you proceed with the construction you'll realize how thoroughly the design has been worked out.

## FUSELAGE

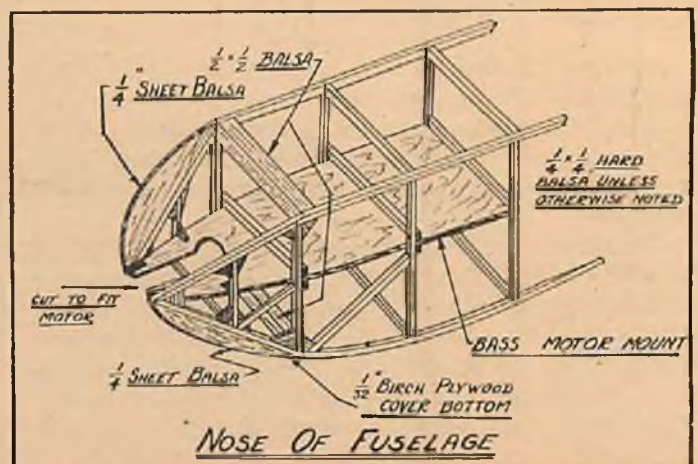
The cross section of the fuselage is rectangular except at the nose, where the motor is faired into the fuselage.  $\frac{1}{4} \times \frac{1}{4}$ " hard balsa longerons and braces are used throughout the fuselage, unless otherwise noted on the drawings.

The motor mount is cut from a piece of bass  $3/8 \times 3/4 \times 14$ ". This motor mount is cemented to the inside of the upright members of the fuselage. It is reinforced with auxiliary cross braces and hardwood corner angles.

The front of the fuselage is faired by cutting 4 curved pieces from  $\frac{1}{4}$ " flat balsa and cementing them to the top and bottom of the longerons.  $\frac{1}{8}$ " birch plywood covering is used to cover the bottom of the curved part of the nosing. The motor is cowled in with 2 pieces of aluminium cut to fit over the  $\frac{1}{4}$ " formers. These aluminium pieces are cut to fit the motor

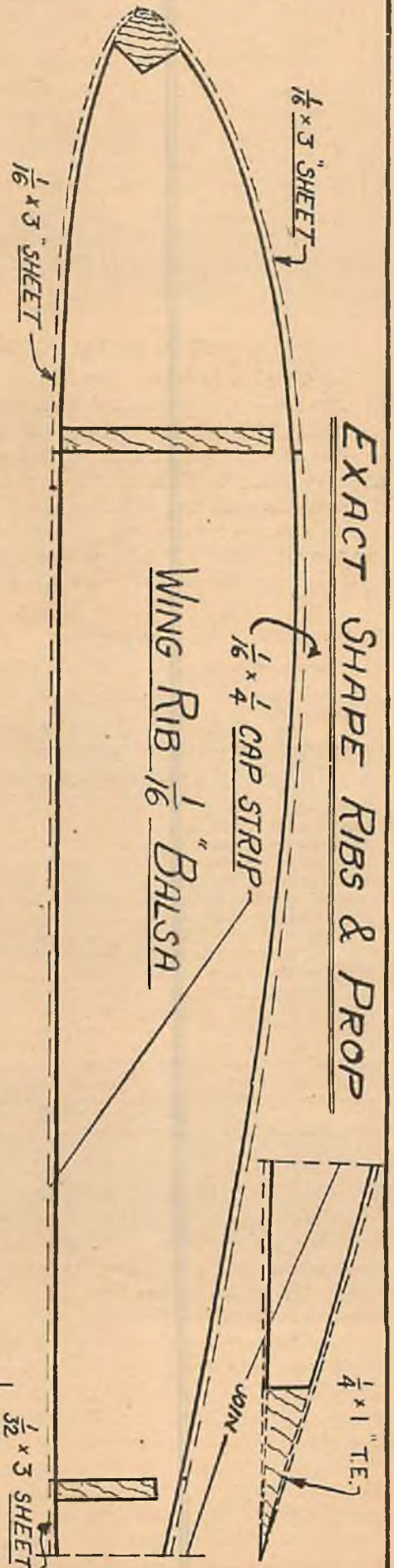
**A** GAS MODEL must be fundamentally sound in design and construction to withstand the wear and tear of flying. The fact that this model is recommended by Frank Ehling, its designer and builder, is proof that it fulfills this foremost requirement. His many years of experience with gas models has taught him what features to incorporate in a successful design.

Other than simplicity and durability of construction, Ehling makes the following recommendations for gas models: The wheels of the model should be placed forward of the propeller, to prevent damage to the model in the event of bad landings resulting from poor adjustment or from hitting an obstacle and diving to the ground. A moderate-thick wing section should be used. It produces a slower flight under power and a better glide than excessively thin or thick airfoils. The igni-



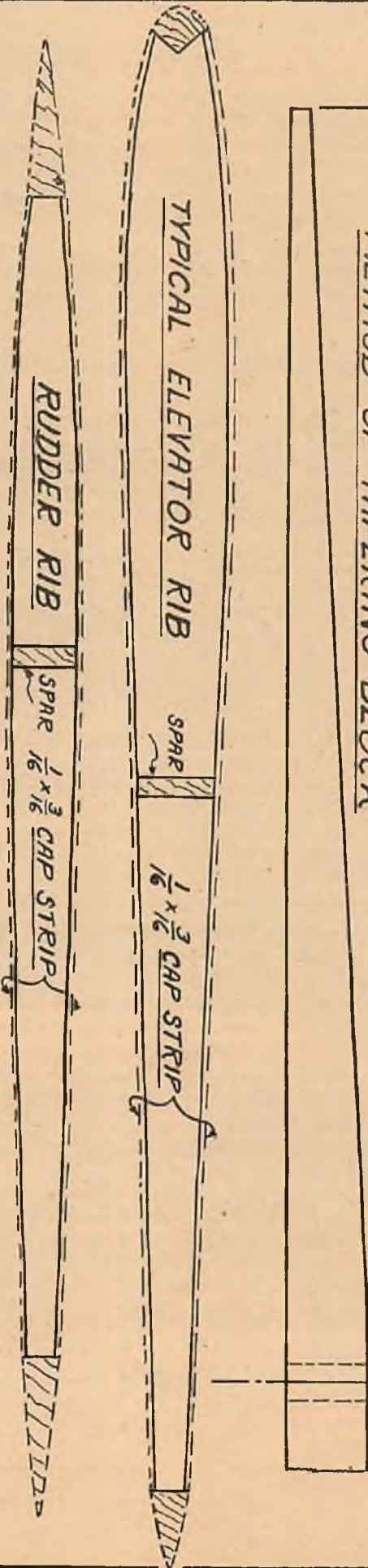


# EXACT SHAPE RIBS & PROP



## PROPELLER BLADE

### METHOD OF TAPERING BLOCK





and should allow for minor adjustments to the motor. For "servicing" the motor the cowl can be removed.

An inspection door is made from 2-ply  $\frac{1}{8}$ " sheet balsa. The location and size of this door is shown in the drawing. The door hinges are patches of adhesive tape and a small wire "catch" keeps it in position.

At the rear of the fuselage, 2 additional longerons are built into each side of the fuselage. These longerons extend back to the rear tip of the fuselage, where they are joined to the bottom longerons with a small block cut from  $\frac{3}{8}$ " sheet balsa. The 2 top fuselage longerons are cut off at the front of the elevator. The tail surface itself is carried flat atop the fuselage on the half longerons which have just been added.

### MOTOR INSTALLATION

The complete ignition system is carried in a balance tray, which is placed in the bottom of the front of the fuselage. This balance tray is built up from  $\frac{1}{8}$ " flat balsa as shown. Hooks are cemented to the sides of the tray and rubber bands fit over the top of the tray to hold the batteries, coil, etc., in position.

The motor is mounted to the bass motor mount with small wood screws. The front of this bass motor mount is cut away to receive the motor and gas tank.

### PROPELLER

A 16" medium-pitch propeller is shown in the drawing. It is cut from a block  $\frac{1}{2} \times 1 \frac{1}{2} \times 16$ ". Bass wood is the easiest wood to carve. But any other variety—mahogany, cherry, etc.—may be substituted. The block is first cut to shape, using the full-size template of the blade shape. Next it is tapered to  $\frac{1}{8}$ " at the tips from  $\frac{1}{2}$ " thickness at the hub. The propeller blades should be cut to an airfoil-shape cross section. Special attention should be given to careful balancing of the propeller and also to drilling the center hole. Mount the propeller on the motor, making sure that it tracks properly. That is, runs smoothly and does not wobble or vibrate.

### LANDING GEAR

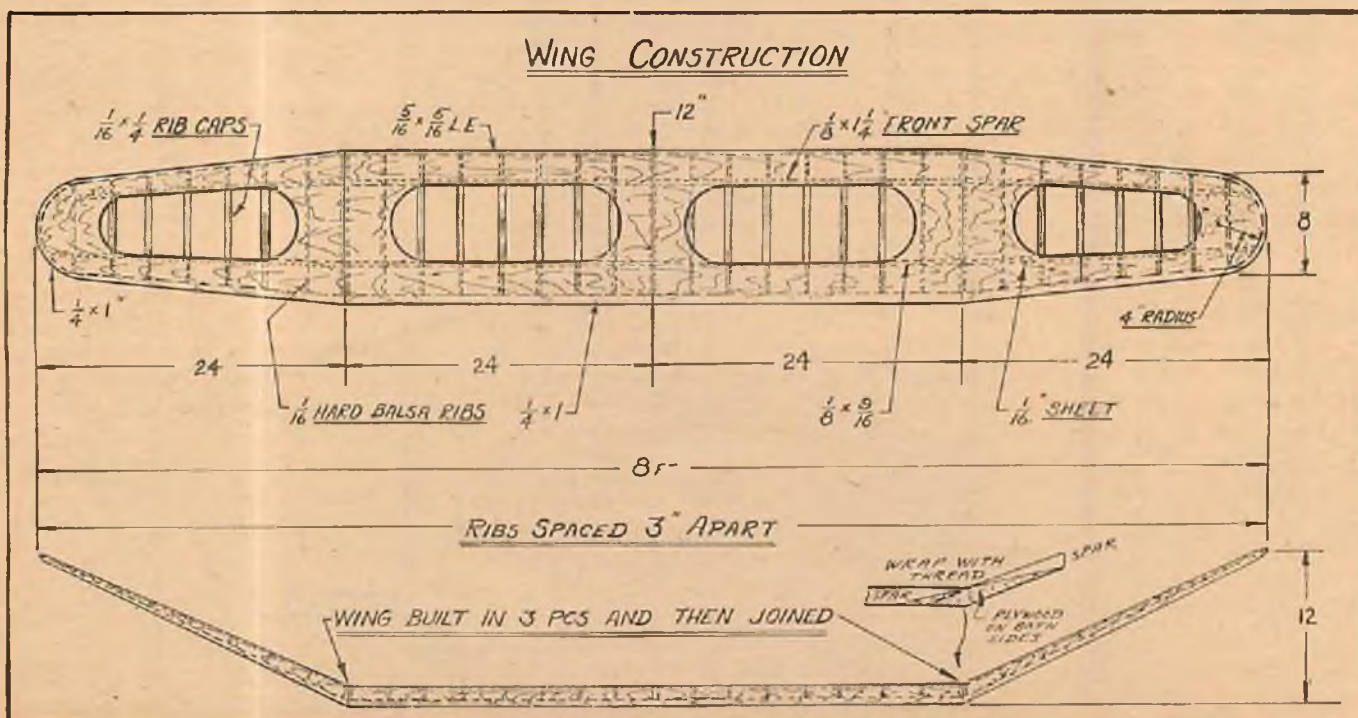
$\frac{1}{8}$ " diameter wire is used to form the 2 U-shaped pieces that make up the landing gear. The bottom of the U shape should be the same as the width of the fuselage. It is cemented and bound to the bottom of the fuselage at the indicated positions. The ends of the two U pieces are joined. Wrap the ends with soft copper wire and solder. A piece of .045 wire connects the 2 axles. It is also wrapped and soldered. Its purpose is to keep the 2 sides of the landing gear from spreading apart—the natural tendency after a rough landing.  $3\frac{1}{2}$ " diameter air wheels are slipped on the axles and kept in position with a drop of solder.

### WING

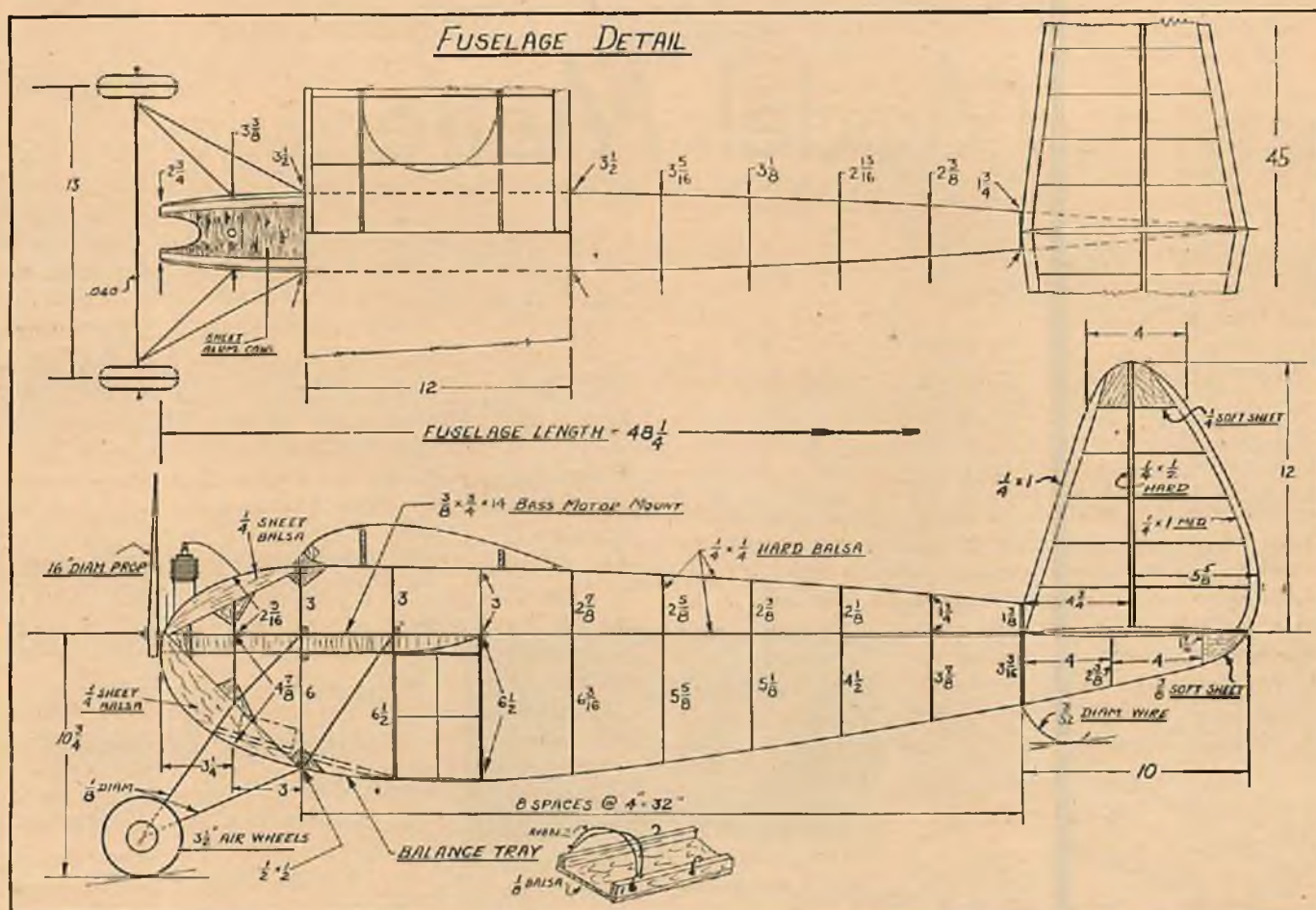
The wing is built in three pieces. The center section is of uniform chord. The 2 tip-sections taper from 12 to 8 inches. A full-size wing rib is shown. It is cut from  $\frac{1}{8}$ " hard balsa. Note that the rib shape allows for the addition of the sheet balsa covering of  $\frac{1}{16}$ ". This is added in 3-inch sections to the front and rear of the wing. At various points along the wing additional  $\frac{1}{8}$ " covering is filled in between these 2 strips. Where the wing is not covered with sheet balsa, cap strips of  $\frac{1}{8} \times \frac{1}{4}$ " hard balsa are cemented to the top and bottom of the rib.

When making the tips of the wing it will be necessary to taper the ribs. This is most conveniently done by sketching a full-size drawing of the wing tip. The ribs taper from 12 to 8 inches at the tip. They also taper in thickness from  $1\frac{7}{16}$ " to  $\frac{5}{8}$ " at the tip. The maximum depth of the ribs is located at about  $\frac{1}{3}$  the chord back from the leading edge. From the full-size drawing you've prepared, you'll be able to determine the required length and depth of each rib and cut them to shape.

The sheet-balsa covering is added to each section of the wing before joining. When joining, follow the method illustrated. It will insure a solid joint between the center and tip sections of the wing.  $\frac{1}{16}$ " birch plywood strips are cemented to each side of the spars and the joint is well bound with linen thread. After joining







the sections of the wing, additional sections are covered with  $\frac{1}{16}$ " sheet balsa as shown in the drawing.

### TAIL SURFACES

A symmetrical rib shape is used in both elevator and rudder. A sample full-size rib is shown in the drawing. Cut all the other ribs to a similar shape. The main spar of the elevator is  $\frac{1}{8} \times \frac{1}{2}$ " and is the full depth of the rib. The ribs are cut in 2 pieces and these are cemented to the front and rear of the spar. A  $\frac{1}{4} \times \frac{1}{4}$ " leading edge is cemented to the front of the ribs and a  $\frac{1}{4} \times \frac{1}{2}$ " triangular-shaped trailing edge is cemented to the rear.  $\frac{1}{16} \times \frac{3}{16}$ " cap strips are cemented to the top and bottom of each rib. These cap strips extend over the spar and fit flush with the leading and trailing edges.

The construction of the rudder is identical to that of the elevator. However, the leading and trailing edge is built up from  $\frac{1}{4} \times 1$ " balsa. The pieces are cemented together and then cut to the curved shape.

### COVERING AND ASSEMBLY

Bamboo paper is used as covering. It is good procedure to apply the paper to those parts of the wing and fuselage which have already been covered with sheet balsa. The paper will help strengthen the sheet-balsa covering. The top of the fuselage covered by the wing is not covered with paper. It will be convenient to make use of this opening when installing the ignition system.

The wing is mounted flat on top the fuselage and secured with  $\frac{3}{8}$ " flat rubber looped over the top of the wing and underneath the fuselage. The rudder is cemented to the top of the elevator, which, in turn, is cemented to the rear top of the fuselage.

### FLYING

The complete model weighs  $3\frac{1}{2}$  lbs. The wing area is about 7 sq. ft., making the ship rather lightly loaded. Test flying should be easier under these conditions. The model will suffer less from bad landings than a heavier model. Balance the model at the mid-point of the wing chord. The stabilizer has zero-incidence setting. The wing has one degree positive incidence. The original model was adjusted to fly against the torque (to the right with a right-hand propeller) and was adjusted to glide in the opposite direction.

This was accomplished by offsetting the motor a slight amount to the right. The rudder was set at neutral and the left wing was "washed in" a slight amount. This allowed the model to turn in a smooth flight without any hair-raising banks and turns that accompany so many gas-model flights.

Balance the model by means of the battery box in the bottom of the fuselage—sliding it backward or forward until the model trims at the mid-point of the chord. The balance tray is wedged in the bottom of the fuselage for the first few flights and later is secured with cement when the adjustment proves satisfactory.

Gliding the model proves little about the balance unless you're experienced enough to launch the model properly and to interpret correctly the maneuvers it performs in the short time required to glide to the ground. For all practical purposes it seems that trial flights under power are no more dangerous than trial glides. And they certainly prove much more. Observe a few precautions and your first flights will not be painful.

Select a day when the weather is calm. The model itself will require all your attention. (Turn to page 96)



*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.)

## Jersey Mosquitoes N. A. A. Chapter

The club has been holding a series of outdoor meets. At one of these sanctioned meets, club member Paul Chorbation broke the national record for Class B hand-launched gliders by 3 minutes. The flight was made from Lincoln Park, Jersey City, New Jersey. There are 12 gas models in the club. They take an active part in all the contests. Two club members have done exceptionally well in recent gas events. Frank Ehling lost his job after 18 minutes, disappearing from Hadley Field. It was later found in Staten Island. At this same contest Albert Mall, flying a job designed by Ehling, lost it after 16 minutes. But, like all good gas models, it turned up later, safe and sound, in Plainfield, New Jersey.

## Mississippi Valley Model Airplane Tournament

The Mississippi Valley Meet is one of the major contests of the year. Efficiently managed by the Stix, Baer, and Fuller Model Airplane Club of St. Louis, Missouri, its many and varied events require 2 days' flying. Many prizes are awarded, thus encouraging newcomers to contest circles; each event—both indoor and outdoor—is assured of ample



Built by Leonard Elgensen of Chicago, this model was lost after a 15-minute flight.

rewards in the form of trips, cups and medals.

Contestants were entered last year from cities as far distant from St. Louis as Sheboygan, Wisconsin; Little Rock, Arkansas; Chicago, Illinois; Burlington, Iowa; and Louisville, Kentucky.

Following is the summer program of the club:

June 19th—Classes and movies of former contests (9th Floor Assembly Hall).

June 26th-27th—National eliminations. Two boys will be selected to represent Stix, Baer & Fuller and St. Louis at Detroit, with escort. Eliminations to be held Saturday at the Municipal Auditorium, Sunday at Parks' Air College.

Contest: SENIOR		JUNIOR	
Outdoor	Indoor	Outdoor	Indoor
Stick	Stick	Stick	Stick
Fuselage			

10 cups and 5 medals will be awarded in these 5 contests. Bus transportation will be arranged for.

July 3rd—First instructor's meeting of summer school, (Sommers) Assembly Hall.

July 8th-9th-10th-11th—At Detroit with club representatives for Nationals. Second meeting of summer school (Instructor, Albert W. Courtial).

July 17th—Class in morning; contest for beginners at Forest Park in afternoon, start at 1:30—prizes, Fuselage Contest for older boys.

July 21st—Boat excursion, Streckfus Line.

July 24th—Class in morning. Contest for flying-scale models at Forest Park in afternoon.



This planked job, by Paul Plecan of Jackson Heights, N. Y., features an inverted Elf motor.

July 31st—Morning class (Courtial, instructor).

August 7th—Morning classes (Courtial, instructor). World Record trials at arena in afternoon.

August 14th—Classes (Courtial).

August 21st—Classes (Courtial). Announcement of Mississippi Valley Meet.

August 28th—Classes—last preparation for Mississippi Valley Meet. Test contest in Forest Park in afternoon.

September 3rd-4th—Mississippi Valley Meet. Indoors, arena, Sept. 3rd; Outdoors, Parks' Air College, Sept. 4th.

Events: SENIOR		JUNIOR	
Outdoor	Indoor	Outdoor	Indoor
Fuselage	Stick	Fuselage	Stick
Stick		Stick	
Gas Model			

## Coast Gas-Model Results

The Gas Model Airplane Association of Southern California held, on June 13th, one of the largest and most successful gas-model meets on record. Entries totaled 209. An impression of the size of the contest is to be gained from the report that the contestants' pits—each 8x10 feet—measured, in full, 1,600 feet. The program was not only a success from the contestant's standpoint but also from the spectators, as was demonstrated by the 5,000 present. Cars, totaling 1,500, jammed the field. Flights were made in accordance with 35-second, maximum-motor run. The prizes—80 in number—included cash, trophies, medals, motors, kits, supplies, and subscriptions.

First place was won by Mr. J. Marsden of Pacific Beach, California with a flight of 15 minutes on a 35-second en-

gine run, the plane being flown out of sight. He received \$50 in cash and a trophy. Second place went to Mr. T. Dykzuel of Bellflower, California, with a flight of 5:19.5 on a motor run of :32.5. Second-place award was \$20 in cash and a medal. Third place was captured by Mr. William Atwood of Glendale, California with a flight of 5:6.5 on an engine run of :34.33. He received \$10 in cash and a medal.

Mrs. Evelyn Hobart, whose model represented an eagle, received the award for the most unusual ship.

## 8th Annual New England Championship Model Airplane Contest

Indoor: Boston Garden, 9 a. m. to 4 p. m., May 22, 1937. Outdoor: Harvard Practice Field, 2 to 6 p. m., May 23, 1937.

The biggest model-plane meet ever staged in New England was held recently when the 8th Annual New England Championship Model Airplane Contest, sponsored by the Jordan Marsh-Boston Traveler Junior Aviation League drew hundreds of contestants and thousands of spectators.

Added interest was given the two-day battle by the five gas motors which were given as prizes, in addition to trophies, cups, plaques, medals, and kits.



Donald Lodge, 17, of Indianapolis, flew his gas job to a 42:47 Junior record.

The indoor events were run off in spacious Boston Garden on May 22nd from 9 a. m. to 4 p. m. The annual New England banquet for indoor winners was held in Jordan Marsh Co.'s banquet hall on Saturday evening, the 22nd.

The outdoor battle was fought at Harvard Practice Field on Sunday afternoon, May 23rd from 2 to 6 p. m., in the shadow of historic Harvard Stadium. In fact, the stadium proved to be a trap



for many a model during the afternoon's flying.

Since the outdoor meet was held under the N. A. A.'s new weight rule, many new national records were claimed. Almost every Boston record was broken during the two-day fray.

Automobiles equipped with radios operated on 5-meter bands followed fast-flying models from the Practice Field on the afternoon of the 23rd. As it was, several models disappeared over the outskirts of Boston.

Spectators came to Boston from as far as Toronto, New York and Chicago. Not only was the meet the biggest ever held in the Northeast section of the United States, but Junior Aviation



A flying Taylor "Cub" by Charles Holz, of Cloverdale, California.

League officials termed it the most successful from the standpoint of records broken and high flight times.

On both Saturday and Sunday the Spectacular event with its smoke screen, stunt, plane-towing glider, parachute dropping, and plane-launching-plane-in-mid-air flights proved most exciting. Special cups were awarded winners of these events.

#### WINNERS OF THE 8TH ANNUAL NEW ENGLAND CHAMPIONSHIP MODEL AIRPLANE CONTEST

##### Gliders (Indoor)

Marchi (open), class B	42.2
1st Durup (senior), class B	41
1st Cain (senior), class B	41
2nd Capo (senior), class B	37.2
3rd Sampson (senior), class B	35.4
4th Wallerstein (senior), class B	34
5th Lalenti (junior), class A	33
6th Tyler (senior), class B	30.8

##### Stick H. L. (Indoor)

1st Haynes (senior), class B	14:22
2nd Tyler (senior), class C	13:50
3rd Golden (junior), class C	11:05
4th Cline (senior), class B	10:52.8
5th Carlson (senior), class C	10:46
6th R. Stuart (senior), class B	10:38.2
W. Brown (open), class B	9:50

##### Fuselage R. O. G. (Indoor)

1st Capo (senior), class B	9:38.8
2nd Tyler (senior), class C	9:01.8
3rd Golden (junior), class B	8:00
Fleming (open), class C	7:28
4th Haynes (senior), class B	7:10
5th Shea (senior), class B	7:00
6th R. Brown (junior), class B	6:27

##### R. O. G. Stick (Indoor)

1st Tyler (senior), class B	11:07.2
2nd Cline (senior), class B	11:02
3rd Wallerstein (senior), class B	10:40
4th Cain (senior), class B	10:01
5th H. Phillips (senior), class B	9:50
6th Minkus (senior), class B	9:25.2
R. Brown (junior), class A	7:33.8

##### Miscellaneous

Marchi (open), R. O. W., class A	5:21
Marchi (open), R. O. W., class B	2:35.3
R. Brown (junior), R. O. W., class B	:08

Tasker (open), Ornithopter	:30.2
Elberfeld (senior), Ornithopter	:38.8
Elberfeld (senior), Ornithopter	:38.8
Elberfeld (senior), Autogiro	:56

##### Gliders (Outdoor)

1st Sampson (senior), class B, H. L.	1:27
2nd Capo (senior), class B, H. L.	1:17
3rd Sardella (senior), class B, H. L.	1:05
4th Durup (senior), class C, T. L.	:52.2
5th Golden (junior), class B, H. L.	:47.8
6th Wallerstein (senior), class B, H. L.	:46.2
Marchi (open), class B, H. L.	:46

##### Stick H. L. (Outdoor)

1st Wallerstein (senior), class C	4:40
2nd H. Phillips (senior), class C	4:03
3rd B. Maselkin (senior), class C	3:30
4th Ryder (senior), class C	3:05
5th L. Woodman (senior), class C	3:00
6th Barrett (senior), class C	2:54.6
Heyman (junior), class D	1:01
Wallerstein (senior), class D	1:10
Marchi (open), class C	:46
Townsend (open), class C	:46

##### Fuselage R. O. G. (Outdoor)

1st Barrett (senior), class C	10:00
2nd L. Woodman (senior), class C	5:00
3rd Peterson (senior), class C	3:49.5
4th Suddel (junior), class C	2:25
5th Capo (senior), class C	1:46.2
6th Golden (junior), class C	1:43.8
Crane (senior), class D	:50

Winner of Outdoor Spectacular Event—Bruno Marchi—parachute drop—"Wing Overs" Trophy.

Winner of Outdoor "Most Records" Plaque—Syd Wallerstein.

Winner of Indoor Spectacular Meet—Warren Avola—smoke screen.

Winner of Indoor "Most Records" Plaque—Bruno Marchi.

## T. Eaton Co., Fort York Armories, Toronto, Model Aircraft Contest

INDOORS, MAY 29th

##### R. O. G.

1st Don McIntyre, Guelph	7:07
2nd Ernest Barrie, Galt	6:48
3rd John T. Dilly, Galt	5:36



Torrey Capo, Boston J. A. L. member, was one of 3 high-point winners sent to the Nationals.

##### Commercial

1st Jim Haffie, Toronto	7:57
2nd Ernest Barrie, Galt	7:00
3rd John Meyers, Aurora	6:30

##### Tractor

1st Ernest Barrie, Galt	12:15
2nd G. Harris, Toronto	11:07
3rd John T. Dilly, Galt	10:20

##### Semi-scale

1st J. Templeton, Toronto	
2nd G. Harris, Toronto	
3rd J. Barton, Toronto	

##### OUTDOORS, JUNE 5th

##### Gas-powered

1st Vern Anthony, Toronto	11:08
2nd Albert Pow, Toronto	11:02
3rd Jack Buck, Toronto	6:10

ALL FLIGHTS BELOW ARE THE AVERAGE OF THREE FLIGHTS

##### Wakefield (4 oz.)

1st Ray Smith, Toronto	1:27
2nd J. Milligan, Toronto	1:17
3rd E. Barrie, Galt	1:04

##### Moffet (8 oz.)

1st A. Cornfield, Port Dalhousie	1:33
2nd John T. Dilly, Galt	1:10
3rd J. Milligan, Toronto	:57



An efficient model of latest design by Frank Zaic of New York.

##### Stick

1st John T. Dilly, Galt	1:48
2nd B. Lockhart, Toronto	1:45
3rd E. Barrie, Galt	1:26

Vern Anthony, J. Milligan, and Ernest Barrie won all-expense-paid trips to the Nationals in Detroit this July.

The indoor meet was held in a 45-foot ceiling, but, fortunately, there were very few other obstructions. The outdoor conditions proved less attractive. A 20-mile wind swept the airport all afternoon and there were no good currents. About 250 entries turned up for both outdoor and indoor events.

## Indiana Gas Model Association

The Indiana gas modelers are always ably represented at the Nationals and various mid-Western contests. Current plans of the association include the formation of chapters throughout the State. Those residing in Indiana who are interested in the propagation of gas-model activity should address the club secretary, Mrs. Thelma Stofer, 529 Wegharst Street, Indianapolis.

Representing the Indianapolis chapter at a recent contest at Dayton, Ohio, Harold Stofer and Kenneth Ernst placed first and fifth respectively.

Vernon Boehle, prominent member of the association, made a 22-minute flight with "The Giant," unofficially breaking the Open Class record.

## Rockford, Ill. Meet

A 40-mile wind sweeping across the Machesney Airport in Rockford, Illinois, caused postponement of the model meet





A planked DeHavilland "Comet," by James Kelly of Chicago, features 2 inverted Browns and dummy crew.

previously scheduled for June 6th. The contest was moved ahead to Sunday, August 8th. Attractive prizes have been offered at this meet, through the co-operation of the Rockford Chamber of Commerce, Kiwanis Club, and the Plam-Mor Wings chapter of the N. A. A. The prizes included 4 trophies, 16 medals, and 2 gas engines.

## Junior Aviation League

Boston, Mass.

Torrey Capo, Hewitt Phillips, and Wilbur Tyler were awarded all-expense-paid trips to the Nationals in Detroit. These three placed highest in the J. A. L. point system based on year-round contest performance. Other Boston boys representing J. A. L. at the National meet last month were Gunnar Munnick, acting director of the club, and Al Lewis, editor of the club's paper—"Wing Overs." Lewis reported the meet for the Boston *Traveler* newspaper, sponsor of the J. A. L.

Last year we had a chance to watch "News-hawk" Lewis in action. It was at a meeting in Detroit, immediately following the National meet. Important details were being discussed and a course of action for the following year was being decided by the model leaders. Lewis was there to report on the meeting. But while model history was being made, the old journalist himself fell asleep. The three-day strain of the contest was too much. So while we discussed model building, Lewis slept peacefully, disturbing us occasionally with a snore.

## Gas Model Retriever

We've heard an interesting story about Robert Long of Reading, Pennsylvania. A short time ago he sent up his gas model for what he thought would be a short flight. But the model had different ideas and the flight lasted for 25 minutes. Finally, when the model did land, it was in the middle of a large lake. There was only one thing to do, and Bob did it. He went swimming and retrieved the model. Incidentally, plans for this model, which is Long's original design, were in last month's Air Trails.

## Illinois Model Aero Club

I. M. A. C. members have been priming for the Nationals at Detroit. They have 8 gas models of original design under construction at present. These ships are an outgrowth of the outdoor fuselage models which I. M. A. C. members flew so successfully at the meet last year.

The indoor event is also coming in for its share of attention from I. M. A. C. members. They have made tests on their ships during the last several months which point toward greatly improved performance. But as the club members themselves say: "The Nationals will prove if we're right."



Hewitt Phillips, of Boston J. A. L., another high-point winner sent to the Nationals.

## Model Aeronautics Academy

At a recent meeting in New York City it was decided that the American Academy of Model Aeronautics should be the official choice of the N. A. A. to handle such matters as rules and regulations of model contest and other matters affecting the model hobby.

To assist the academy in carrying out this program, Willis C. Brown, president of the A. A. M. A. has appointed the following committees. The work of these committees is to study their particular phase of the hobby and suggest in what way the hobby could be better regulated. The formation of the rules and policies for the coming year will be based on the reports of these groups.

Following are the appointments made by President Willis Brown:

### Academy of Model Aeronautics Committees

#### Contest Rules

Frank Zalc Carl Goldberg H. T. Sommers

#### Executive Committee

President 3rd Vice President  
Secretary and Treasurer

#### Gas-plane Committee

Charles H. Grant Pat Sweeney  
Frank Tlusch Percy Pierce  
Bruno Marchl Edward Roberts  
William Atwood

#### Advisory Committee

Carmichael Stofor  
Copeland Wriston  
Hughes Zalc  
Penny

#### Research Committee

Hewitt Phillips Lawrence Smithline  
Frank Zalc Roy Marquet  
Gordon Light

#### Committee on By-laws

Torrey Capo Bruno Marchl  
Wilbur Tyler Hewitt Phillips

#### Membership Committee

Al Lewis Richard Lanzo  
Frank Zalc Carl Goldberg  
Harry Copeland Jesse Bieherman

## Connecticut Contest

The Ninth Annual Connecticut Model Aircraft Meet, sponsored by the United Aircraft Corp. and sanctioned by the National Aeronautic Association, was held June 5th. More than 120 model airplane builders from all parts of the State of Connecticut competed for prizes.

The organization called the Model Aero Engineers of Hartford, which was organized in September, 1936, had several of its members entered in this contest. They were represented in every event except the two Gasoline Model Events, and out of a possible 18 places obtained 14. All first-prize winners received trophies, while the second-and-third-place winners received medals. The names of members who won prizes and the events with the places they won are as follows:

### Solid Scale Event

Senior Class	Junior Class
1st Edward Brant	2nd Helmuth Baumann
2nd Edwin Goral	
3rd Thomas Hogan	

### R. O. G. Commercial Event

Senior Class	Junior Class
3rd Edward Rosen	1st Charles Downey
	2nd Theodore Sanko
	3rd Helmuth Baumann

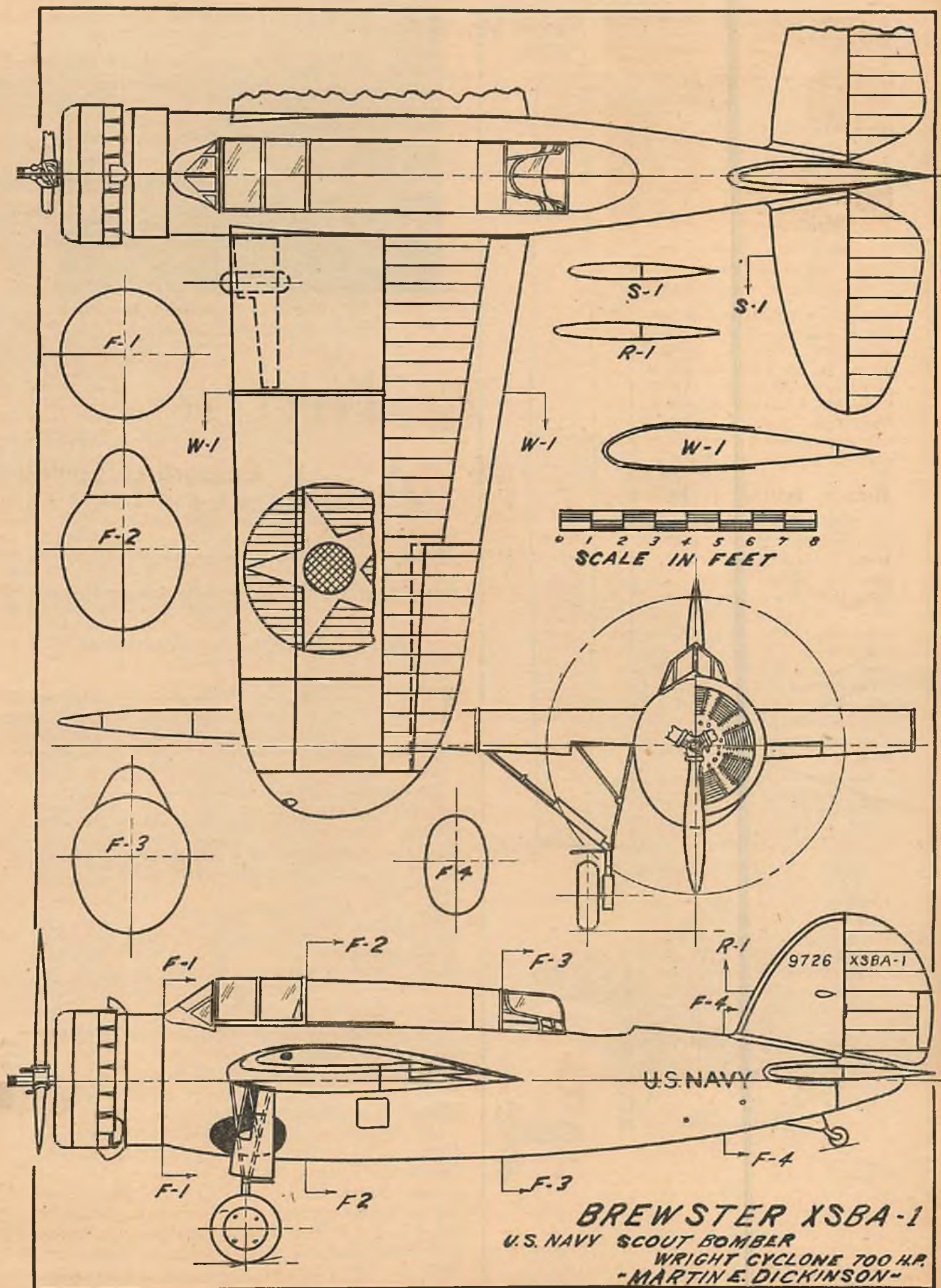
### Stick Model Event

Senior Class	Junior Class
1st Joseph Boreynski	1st Henry Boreynski
2nd Edward Rosen	2nd Oscar Boyajian
3rd Tadas Spells	3rd Frank Lattanzio

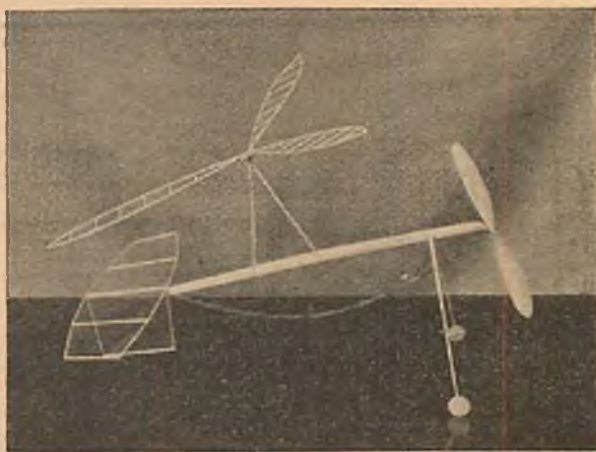
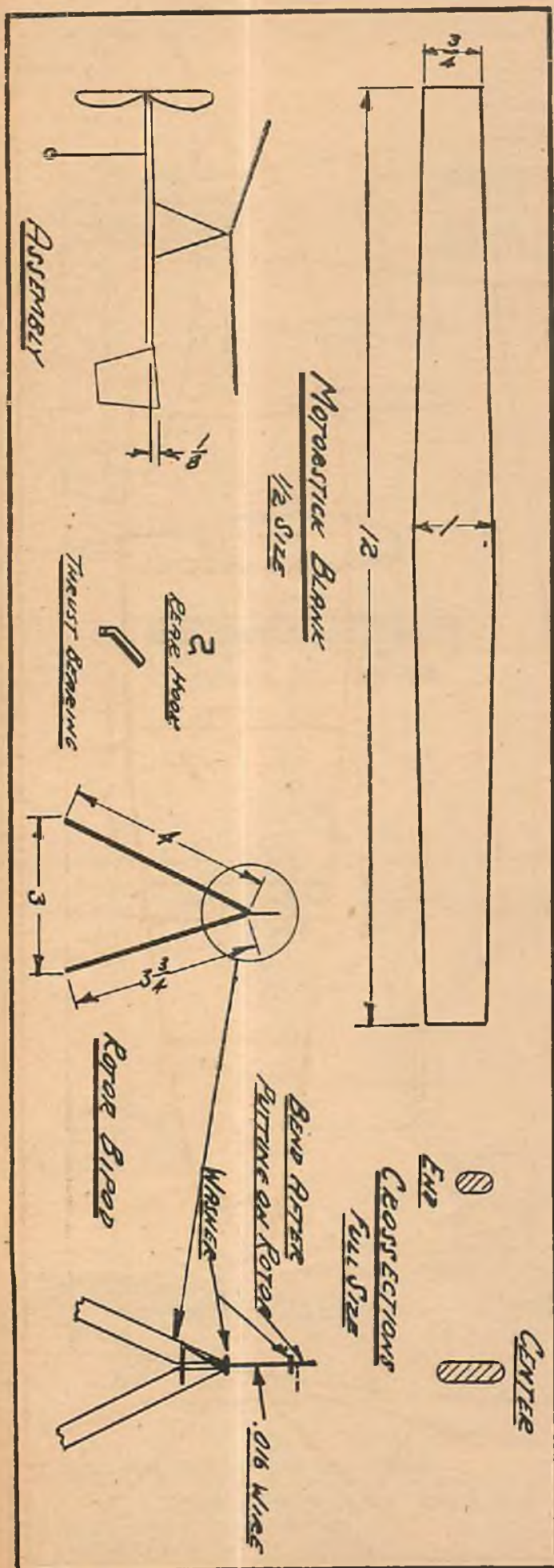


The first compressed-air model in Hawaii, constructed by James Kagawa.









The model is distinguished by its simplicity and practical design.

# Indoor Autogiro

*An experimental model of value to both indoor and outdoor modelers*

By Lawrence N. Smithline

THE AUTOGIRO is the model builder's orphan child. It has been neglected because it is such an inefficient means of flight and because it does not glide, thus making its chances of high duration very remote.

The wingless autogiro, although very successful in full-sized craft has, except in a few cases, defied model builders. The secret of wingless autogiros is patience. Only after many hours of experimentation were the kinks of this model ironed out so that it could be termed successful.

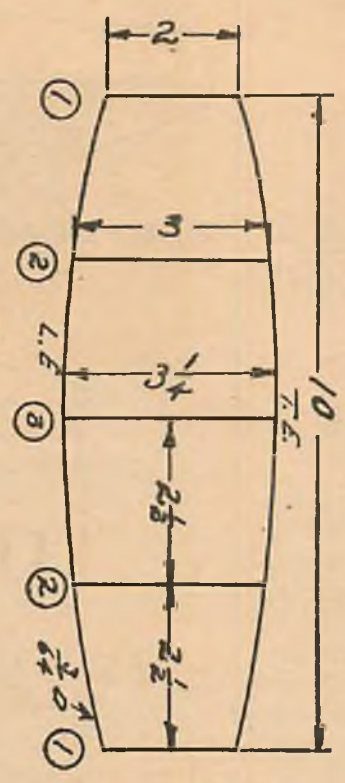
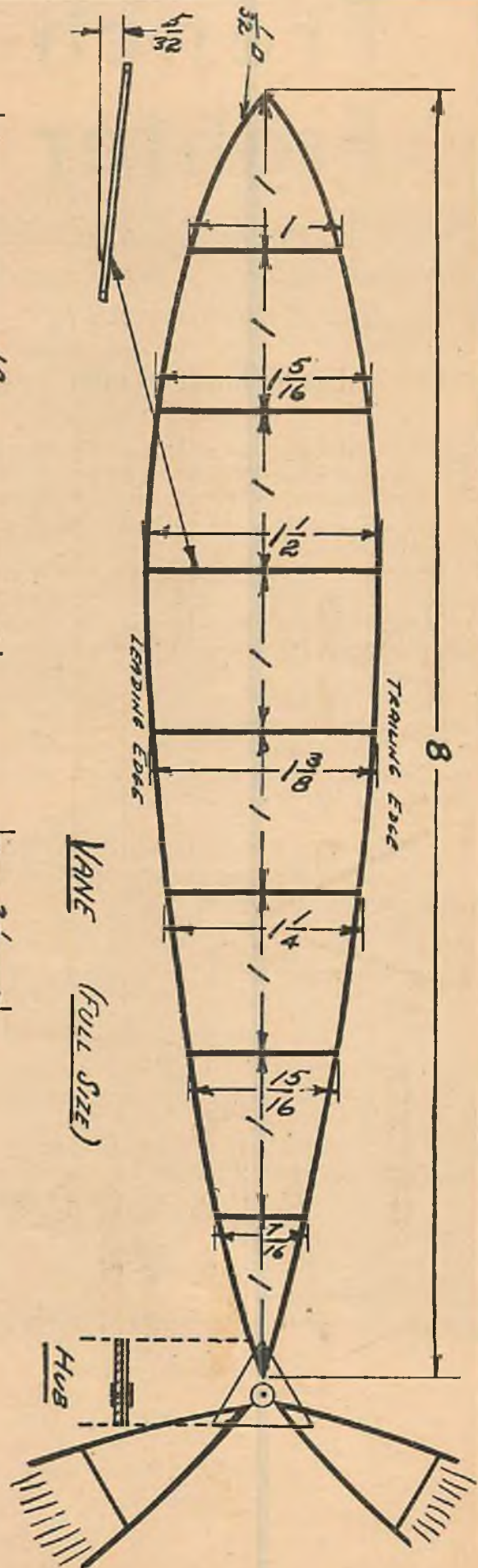
The model was designed primarily so that it would stand abuse, as it was realized that it would have many an unfortunate experience before it would be adjusted. Weight, therefore, was a minor consideration.

## VANES

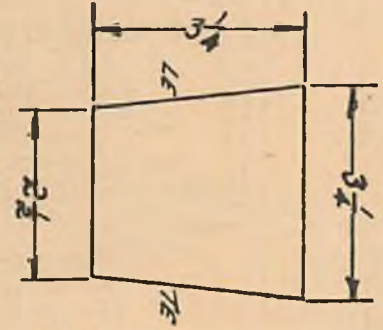
The rotor of this model was made three-bladed for simplicity. A fourth blade may be added. In fact, it would probably be easier to adjust a model with four blades instead of three. So if you are of an experimental turn of mind make a fourth blade.

Make a drawing of the outline of the blade and pin 2 strips of  $\frac{1}{32}$ " square medium balsa to the drawing. Cement in the ribs, which are likewise  $\frac{1}{32}$ " sq. and without camber. Make the other blades in the same way and then cover them all with microfilm. Make the hub of  $\frac{1}{32}$ " sheet balsa laminated as shown, and cement the bearing, which is a washer on either side of the hub, in place. Cement the blades in place. Raise the outside tip of each vane  $\frac{1}{2}$ " and the trailing (Turn to page 93)



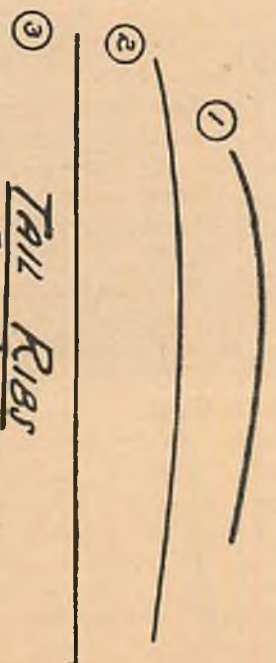


TAIL  
1/3 SIZE



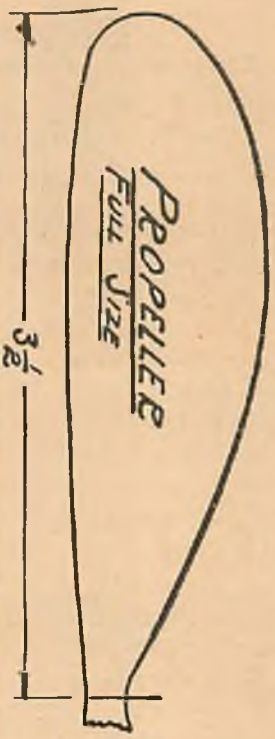
RUDDER  
1/3 SIZE

VANE  
(FULL SIZE)



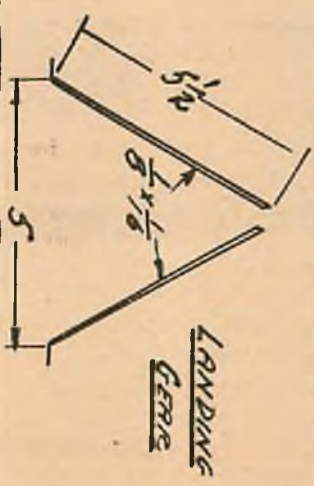
TAIL RIBS  
FULL SIZE

ON RIGHT (LOOKING FORWARD)  
PUT RIBS UP AND DOWN



WHEEL

AXLE  
DRAWING





# French Fighter

*A replica of the Nieuport 161—  
Europe's latest bid for the world's  
fastest military plane.*

by William Winter

**L**OW WINGS seem to be the generally adapted formula for high-speed fighters. In keeping with the latest practice, the French have evolved the slim-winged Nieuport 161, a liquid-cooled job of striking appearance.

Most noteworthy of its slight departures from international practice are the angular-shaped wing tips and rudder, the peculiar tail-wheel retracting mechanism, the fin-mounted stabilizer and the gulled-wing aspect of the front view.

That the craft is a capable one is attested by the maximum speed of 305 m.p.h. at 13,000 ft.

The model, if carefully finished, presents the same racy lines of its prototype and makes a noteworthy addition to the  $\frac{1}{4}$ " scale series of replicas.

## DIRECTIONS FOR BUILDING THE MODEL

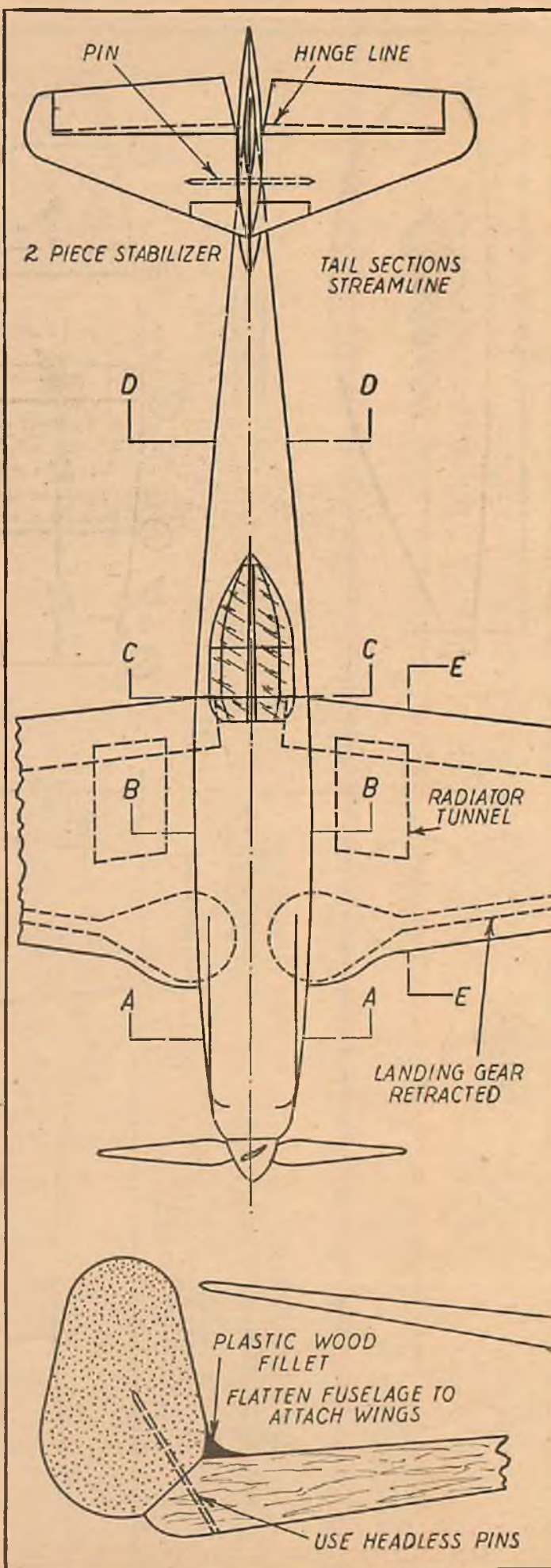
Material dimensions are given in the bill of material at the close of the directions.

Select a soft balsa block for the fuselage and square it down to the required outside dimensions. Draw the profile of the fuselage on the widest side and trim away the excess balsa. Draw the top outlines of the body and again cut away the surplus wood. Shape the partly finished block to the cross sections given on the plan and sand to a satin finish. The cylinder banks and the cockpit canopy are carved from scraps and cemented in place.

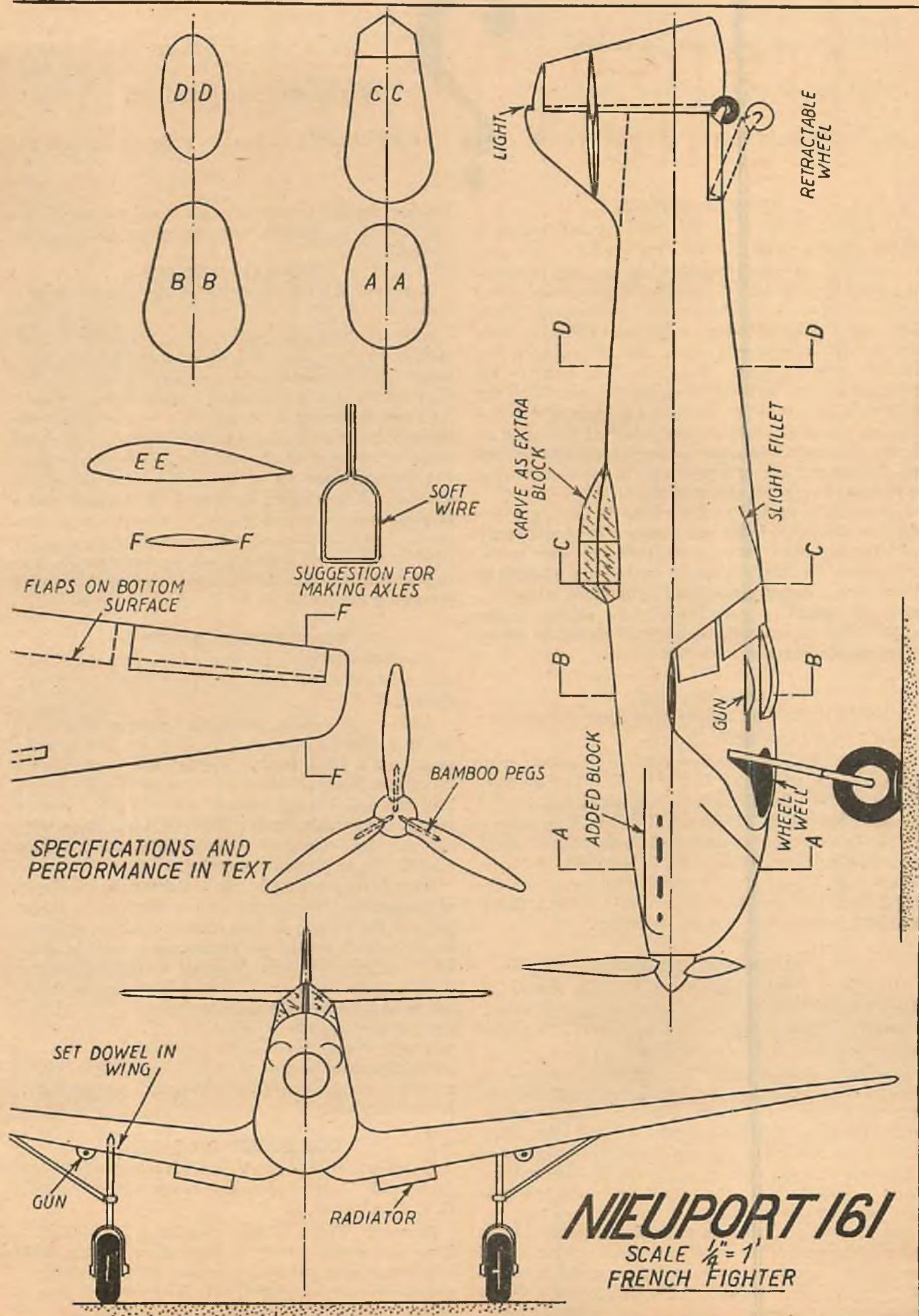
Trace the outlines of the tail surfaces on  $\frac{1}{16}$ " sheet balsa and trim slightly outside the line. Sand the edges round, endeavoring to attain a streamline cross section at the same time. Cement the rudder in place on the fuselage and, when dry, attach the stabilizer halves, using an internal pin and thickened cement. Fillet the cracks by rubbing in extra cement.

Trace the outlines of the wing panels—one left and one right hand—on soft balsa approximately  $\frac{5}{16}$ " thick. Saw each panel to shape, leaving at least  $\frac{3}{32}$ " margin for trimming. Straighten the edges and shape each panel to the rib sections indicated on the plan. Sand the completed panel with progressive grades of fine paper. To attach, flatten the fuselage slightly at the points of attachment and, using thickened cement and two headless pins to each panel, adjust each panel to the required alignment and dihedral. When dry, mold a slight plastic wood fillet as shown on the side view and explanatory diagram.

(Turn to page 95)









*Have you a question on model building or flying that bothers you? Bring us your problem and*



*we'll answer it in the interest of readers everywhere. Replies by mail require return postage.*

#### RUBBER LUBRICANT

*Question: What is rubber lubricant and how is it used on rubber motors? T. P., Fulton, Ky.*

*Answer:* An excellent rubber lubricant and preservative can be made with a few ounces of green soap mixed with a little water and heated until it dissolves. Then add a small pinch of sodium salicylate. These materials are available at any drug store. But, if necessary, use tincture of green soap. Sometimes it is easier to get than green soap itself. The alcohol is harmful to the rubber, so drive it off by heating the mixture of soap and alcohol. The sodium salicylate is added the same as before. Glycerin or a soapy shaving cream may be used as substitutes. Be sure you use the type of shaving cream that is applied with a brush.

Lubricant is applied to the rubber by putting a few drops of the liquid in the palm of your hand and gently rubbing the motor between the palms of your hands. In this way the lubricant can be worked into all parts of the rubber. Any excess should be carefully wiped off, as it will spatter over the inside of the fuselage as the motor unwinds. Additional lubricant should be added when the motor begins to dry off.

#### BALLOON TIRES

*Question: How are balloon tires for model airplanes made? D. B., Burlington, Ia.*

*Answer:* Balloon tires for models are available from the companies advertising in Air Trails. The commercial methods of manufacturing these tires is too detailed for description here. However, if you want to make a pair of balloon tires for your model, refer to the August and October issues of Air Trails for 1936. In these issues Alan Booton gives detailed instructions for making balloon tires for all sizes of models, using ordinary materials available to every model builder.

#### AUTOMATIC CONTROLS

*Question: I am building my first gas model. A former aviator advised me to equip it with automatic controls. Would you please tell me how such a control system works? J. E., Saranac Lake, N. Y.*

*Answer:* This question refers to the "automatic" control that is supposed to operate by a weight or pendulum suspended beneath the plane. The idea is that the weight will shift the control surfaces and keep the plane flying level. Practically every model builder has thought of this idea at some time or other during his modeling career. But the idea is not based on sound principles and proves to be worthless.

Don't waste your time on an automatic control. Make your first gas model as simple as possible. Select a good design and follow it closely, and your model is certain to have sufficient stability. The fewer extra details which you have to worry about on your model the better.

Building and flying your first gas model will require all your attention, without worrying about an automatic control.

#### PROPELLER WINDING

*Question: Does it matter which direction you wind a propeller? H. N.*

*Answer:* This is a question that the beginner in modeling is certain to ask. But once the beginner has completed his first model and experimented with winding the propeller he'll be thoroughly convinced that a propeller must be wound a certain definite direction. The beginner is usually confused between right- and left-hand propellers, each of which rotates in a different direction. But beginners are not to be criticized for asking this question. Even experts can't seem to remember that a propeller must be wound in only one direction to produce results. At every contest we've ever attended, modelers wind up the motor, hopefully put the model on the runway for the take-off, only to discover the motor is wound the wrong direction.

#### SCALE MODEL COVERING

*Question: What is the best covering for a 28" scale model intended for exhibition purposes? R. B. W., Cohoes, N. Y.*

*Answer:* A smooth, wrinkle-free covering is essential for an exhibition scale model. And, too, the covering must take a paint finish. Tissue makes a convenient covering to handle. However, it does not make a rugged covering, as it is easily ripped. Bamboo paper is more rugged and durable, but is a trifle difficult to apply without wrinkles. However, with a little care it can be worked into an attractive covering.

Sheet-balsa covering is the best from the standpoint of appearance. It preserves the true shape of the curved parts of the model. It is a trifle difficult to apply but seems to be a worthwhile investment because of durability and attractiveness. There is no sagging between the ribs and for this reason sheet balsa resembles closely the metal skin covering of large airplanes. However, if the full-size airplane is fabric-covered, tissue covering will more closely resemble the large ship. In this case sheet balsa could be used around the motor, cover plates, and other metal coverings which appear on every fabric-covered airplane.

#### COMPRESSED AIR TANKS

*Question: Where can I buy a compressed-air tank (about 25" length) for my compressed-air model? G. E. S., Concord, N. H.*

*Answer:* Write to the advertisers in Air Trails. They are almost certain to have some of these tanks available. Since gas models became popular, interest in compressed air has fallen off. The result is that at present there is little demand for such equipment.



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# PHILIPPINE GOLD

(Continued from page 36)

to Hassfurth," the commissioner said as they shook hands.

"I'll know about that, too," Bill said grimly.

"We're checking with Manila," the commissioner said. "We're getting a list of every one who has left the islands in the last six weeks. The man who killed your messenger may have a record. If he has, we'll have him soon. Maybe we can make him talk. It might be better for you to wait a couple of days until we find out."

"Shorty needs me badly or he wouldn't send for me," Bill said. "I'll get better results on the other end."

"Good luck, Bill."

"Thanks. I'll need it."

He whipped the Lancer into the air again and climbed to eight thousand feet before he leveled off. The gleaming waters of the Atlantic Ocean stretched off interminably to the east as he sped down the coast line of Long Island.

"Hey, Bill," Sandy said into his telephone. "There's a ship on our tail about three thousand feet above us. I just caught a flash of its wings as it went between those high cumulus clouds. It looked like a Snorter to me."

"All our Snorters are on Barnes Field," Bill said shortly.

"Maybe Scotty is giving one of 'em a test," Sandy said.

Bill flipped his radio key and chanted Tony Lamport's call letters into his microphone.

"B.B.X. answering. . . . B.B.X. answering," Tony said a moment later. "Go ahead, Bill. . . . Go ahead."

"Has any one taken a Snorter off the field, Tony?" Bill asked.

"Wait a minute, Bill. I'll check it," Tony said. In a moment his voice sounded in Bill's receiver again. "No, Bill. All our ships except the Lancer are here."

"Thanks, Tony," Bill said. "Signing off. I'll be there in a few minutes."

"Bill!" Sandy said excitedly, as Bill threw his radio switch and connected his intercockpit telephone again. "I just got a good look at that ship through some glasses and it's a Snorter or I'm crazy!"

"You're probably crazy," Bill said. "Where is it?" He craned his neck around and probed the sky.

His blue eyes hardened into pieces of ice as he spotted the speeding plane above them and he shook his head.

"It couldn't be," he said half to himself. Then a curse ripped from his lips and his eyes grew wide.

"Look!" he said to Sandy.

They saw the pilot of the big amphibian stick its nose down until it was in a vertical power dive. Then they

saw it shudder as the engine screamed and the nose began to lift. Up and up it came, until it was pointed straight at the sky. They held their breath while the pilot jammed his rudder and pulled the stick over. They saw the rudder bite hard and then they saw the ship whirl three times around, like a flying corkscrew, before the tail slid off toward the earth.

"It's Shorty, Bill!" Sandy screamed. "He's the only man in the world who can do that trick besides yourself. It must be Shorty!"

"Take it easy, kid," Bill said, and his face was white and drawn. He threw his radio key again and chanted Shorty's old call letters into the microphone. Over and over he repeated them, but there was no answer.

"It must be Shorty, Bill," Sandy repeated.

"If it was Shorty he'd come in close or answer his radiophone," Bill said.

"How would any one else but Shorty know that trick and know that you have used that trick in the air to identify yourselves when you had no radiophone?" Sandy asked.

"I don't know, kid," Bill said. "I wish I did. But there is something screwy about this. Perhaps that message didn't come from Shorty after all. Maybe some one learned that secret code word the same way he learned that corkscrew trick."

"You're too suspicious, Bill," Sandy said. "Look, he's banking around and he just flipped one hand above his head the way Shorty used to. It's Shorty all right and he's going to follow us in for a landing. His radio has probably gone haywire."

"He's not following us anywhere," Bill said grimly. "He's leading us. He knows the trick of seeming to go in one direction while actually he goes in another. He's heading us out over the Atlantic Ocean. I'm going to play along with him for a few minutes to see what he's going to do. If it was Shorty he'd fly in close with his goggles lifted so we could see his face. Swing out your swivel gun, kid. He's on our tail now. Keep an eye on him. He's—"

"Skid her out, Bill!" Sandy screamed, as the staccato chatter of two machine guns rose above the roar of the motors in the two ships.

Bill Barnes' face became as hard as a piece of granite as he felt bullets drumming into the tail assembly of the Lancer. He threw his stick, kicked his rudder, and began a tight turn to the left as Shorty's Snorter roared down under his tail and stuck its nose upward with both guns belching fire and death. The earth swung out from under the Lancer as Bill tightened his turn and

came around on a wing tip. Then he straightened out, neutralized his controls, and yanked the stick back into his stomach.

The nose of the Lancer came up as the Snorter hurtled above it to get the advantage of altitude. For one brief instant the Snorter came under Bill's sights. It was too far away for accurate shooting, but Bill clamped down on his gun trips and his powerful .50-caliber guns belched lead and flame. Feathery wisps that were the smoke from his tracers floated off the starboard wing of the speeding Snorter as it began to turn.

Bill spoke into his microphone to Sandy, "So you think that's our old pal, do you?"

"Gosh, no, Bill," Sandy said. "I'll keep him off our tail. Give me a crack at him if you can."

"You'll probably get a chance," Bill said sharply. "That man can fly and he can shoot."

As the big amphibian continued its climbing turn, Bill could see the pilot looking back and down to see what he was going to do. He waited until the Snorter was nearly around, then hung the Lancer on its two three-bladed props and took it up beneath him. But the pilot of the Snorter crabbed it out of range of Bill's bullets as though he knew exactly what Bill was going to do.

Again the circling Snorter stuck its nose down, but this time Bill could tell by the angle of the ship's dive that he was not going to go under him and pepper the Lancer's belly. Instead he was concentrating his fire on the after cockpit.

The yammer of Sandy's .30-caliber gun joined the rising wail of the Snorter's guns as the ship dived at terrific speed. As Bill felt machine-gun bullets drumming into his starboard wing he slipped the ship away and screamed to Sandy to correct his aim.

Then he was swinging the Lancer in another sharp turn to the left as the Snorter roared above him and began a similar turn.

Bill yanked the Lancer upward again to get in a burst of fire while the Snorter was vulnerable, but the pilot again anticipated him and slipped it out of range.

As the two ships finally leveled off they were at almost the same altitude and traveling in different directions. They both executed flashing chandelles at the same instant and came roaring at one another with their guns spewing lead. They roared by one another so close that it seemed for one terrible instant that they would lock wings. Then they were going away with Sandy's swivel gun chattering.



They began to circle around and around like two fencers, each trying to impale the other on his blade, reversing their directions, escaping head-on crashes by some miracle of fate.

"Hey, Bill," Sandy screamed in Bill's ear. "Our fuel is getting low and we've worked way out over the Atlantic."

Then Bill threw discretion to the winds and he closed in determined to bring the pilot of the Snorter down alive if he could, but to bring him down.

He got the Snorter under his hair sights for a fraction of a second, but it was not enough. The pilot took it out of danger with a series of Immelmann turns that were like the gyrations of a wounded duck.

The sky became a flaming inferno of noise and speed as the motors of the two ships wailed their screaming protests and their machine guns throbbed their deadly chant. Around and around they circled, firing burst after burst without telling effect, passing and repassing so close each could feel the gale of the passing.

A fight that had started out mildly and without fanfare had become a duel to the death such as young Sandy Sanders had never seen before. His face was white and drawn from the terrific speed of the Lancer's acrobatics. He could not understand why Bill did not finish off this man as he had done with a hundred before him.

"Why don't you take him, Bill?" he begged. "We're going to run out of fuel pretty quick."

"Take him?" Bill said, and his breath was coming in short, agonized gasps. "Why don't you take him if you want him? I told you he knows how to fly and how to shoot."

He brought the Lancer up and over in a lightninglike chandelle and dived on the turning Snorter again. But when he clamped down on his trips the Snorter slipped away as though some unseen hand had lifted it out of danger.

Bill cursed softly to himself as he realized that he was bearing down too hard. For a period of a few seconds he dropped his hands to his sides and let his body relax. He knew the Snorter was going away from him at the moment and he wanted to get himself more fully under control.

The next time the Snorter flashed across his sights he held his fire until the pilot had automatically made his correction, anticipating Bill's direction of fire. Then he kicked his rudder and his bullets wove a pattern from the engine housing to the tail assembly of the Snorter. It skidded off dangerously on one wing and yawed wildly. Bill whipped around and came back to the attack with all the speed the Lancer

could give him. His body was saturated with perspiration and he was so tired that he could hardly trip his guns. But he poured round after round at the Snorter as the pilot rolled it out of range.

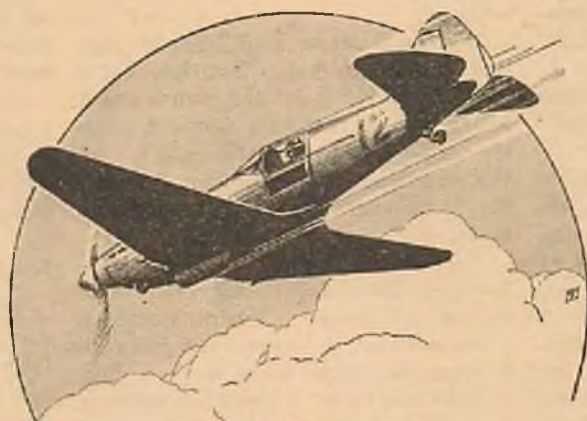
Then as Bill whipped back to the attack again the pilot of the Snorter stuck the nose down in a vertical power dive to escape the fury of his attack.

"You've got him, Bill!" Sandy screamed.

"Yes," Bill gasped. "I've got him. But I don't dare go after him. I don't dare lose any altitude. Our tanks are almost empty and we've got to glide back to the field. He gets away this time. But he'll come back. He doesn't want us to go to the Philippines."

Bill threw the switch on his radio-phone and picked up Tony Lamport again a moment later.

"Send out a quiet warning to all



Down and down it plunged through a gale of its own creation—

police and to Washington," he said into the microphone, "that a madman is loose with Shorty's Snorter. Tell them she still mounts her twin machine guns and the man who is at the controls knows how to use them. Keep it quiet, Tony. You know how to handle it. I—"

"How the hell do I know how he got it?" Bill shouted angrily, as Tony interrupted him with a question. "I just know it's a fact that it was Shorty's old Snorter and Shorty wasn't in the saddle. He nearly blew me out of the air. I'll be in in a few minutes."

He flicked the switch and said to Sandy over the intercockpit telephone: "Did you get a look at that bird's face, kid? I mean, could you tell what nationality he was or anything of the sort."

"Gosh, no, Bill," Sandy said, and his breath was still coming in short gasps. "Any time he was in close he was going so fast I couldn't see anything but a blur. I couldn't even get my sights on him. I could tell by his maneuvers, though, that it wasn't Shorty."

"Of course it wasn't Shorty," Bill snapped.

"Who was it, Bill?"

"It's some one who is helping to prevent us getting to the Philippines," Bill said. "It means he is a member of an organization that is more than a little tough. If they got that code word out of Shorty and managed to take his Snorter away from him they are the toughest outfit we've ever run into. No one ever did a thing like that before to Shorty."

"Maybe Shorty made a record of that code word, Bill, and they found it among his effects, then stole his Snorter," Sandy said.

"We'll find out about those things," Bill snapped. "I want you on your toes until we shove for the Philippines at dawn."

"Yes, sir!" Sandy said.

### III—THE ONE-MAN BAND

THROUGHOUT the rest of that day, Barnes Field was a madhouse on the surface. But underneath that surface there was a calm efficiency that could not have been matched on any civil or military airport in the world. Everything dovetailed and slipped into its own particular groove with a speed and precision that was remarkable.

At ten o'clock that night Bill Barnes was satisfied. He made a final check on the Silver Lancer, the giant transport-carrier-bomber, and the three gleaming Snorters.

"O. K.," he told his men. "Put a double guard on the ships and on the gateways into the field. Scotty. Tell 'em to be on the alert. I want all of you to turn in. You'll have about seven hours' sleep. Good night."

He went to his own quarters and spread out the maps and charts of the routes they were going to fly. He had flown them all a dozen times before but he wanted to recheck them in his mind.

"San Francisco," he said to himself, as his eyes followed his finger on the charts. "From there we'll plot a Pan-American route to Honolulu. We won't bother with Midway or Wake. We'll hop from Honolulu to Guam. It's a long water stretch, but we can manage it. Then it's only a short hop to Manila."

He sat back and closed his eyes for a moment.

"I wonder what we'll find there?" he asked himself softly. "We may be too late to help Shorty. If we are I'll take them apart just the same. Shorty would do as much for me. He—"

Suddenly, his whole body stiffened and he sat upright in his chair. A scowl creased his bronzed forehead as he



cocked his head on one side and then on the other.

"What——" he said as he shoved his feet into an old pair of house slippers. He got up and opened the door of his living room.

Across the tiled swimming pool behind his living quarters floated strains of what some people might have called music. To Bill it sounded like a cross between a firemen's clambake and a Chinese band. He stepped out the back of his bungalow and padded along the edge of the swimming pool in his slippered feet.

Beyond the swimming pool was the long, low building in which his pilots lived. All of the rooms and baths were dark except one. From the window of that room came the noise. It was muted, but it was terrible. It was so bad that it grated on Bill's nerves like the scratch of finger nails on slate. He opened the main door of the building and his face was like a thundercloud. He heard "Red" Gleason's voice booming down the corridor as he entered.

"If you don't stop that and go to bed, you little red-headed gnat, I'll come down there and break both your legs!" Red said in no uncertain terms.

For one instant the grim expression disappeared from Bill's face to be replaced by a grin. Then it was gone and he moved down the hallway as fast as he could without disturbing every one in the place.

The scowl was back on his face when he threw the door at the end of the hall open and barged into the room. What he saw drove away the scowl but it did not bring another grin. It brought utter amazement. He gazed at young Sandy Sanders and the contrivances he had around him with incredulous wonder.

"What in——" he began, and then he stopped for lack of words. The thing was too much for him. He pointed for a moment and then he managed to say, "What do you think you're trying to do?"

Sandy's first reaction as the door flew open had been to dive for the window. But he realized that he was too late. His first startled expression turned to one of affability. A grin spread across his freckled face. He tried to be nonchalant.

"Hi, Bill!" he said and he laid the guitar he was holding in his lap and flipped one hand above his head. "Glad to see you. Just practicing a little. Sit down. Here, wait a minute until I move that music off that chair."

Sandy tried to slip the two xylophone sticks which he had fastened to his feet with adhesive tape away and at the same time slip off the band that was fastened around his head. From the band extended a short metal extension; from it dangled a piece of elastic on the

end of which was fastened a mouth organ. But the attempt was too much for him. The sticks crossed themselves and nearly tripped him while the band around his head slipped down over one ear.

"I guess you'll just have to move that music over a little yourself, Bill," he said cheerfully. "It's a little hard moving around when I get all this equipment on. I have to sit in one place."

Bill's eyes were moving from Sandy's head to his feet and back again. His expression was one that would be hard to describe. It was somewhat like the expression of a country boy who is looking at his first giraffe.

"Will you tell me——" he began, and stopped. The thing to him was incredible. "Will you tell me," he said again, "what you think you're trying to do?" "I'm just practicing," Sandy said. "You know you've told me lots of times that practice makes perfect."

"You're practicing for what?" Bill snapped.

"For an amateur hour," Sandy said, and he tried to grin. "You see, I'm a one-man band. I get the mouth organ fastened in my mouth and can keep my hands free to play the guitar. At the same time I play the same tune on the xylophone with my feet. Quite a stunt, eh?"

"Listen!" Bill glared. "You're supposed to have a little bit more than normal intelligence. You're seventeen years old and if you're ever going to have any sense you ought to show signs of it by this time. I spend years trying to make you into a flier. I begin to think I'm making some headway and what do I suddenly find?"

He got to his feet, paced across the room and whirled. "What do I find?" he shouted, and answered himself, "A halfwit who sits up until all hours of the night—when he knows he is expected to start a long hop for the Philippines at dawn in the morning—trying to make himself into a one-man band."

"Aw, Bill, now, listen," Sandy said. "I was only——"

"You were only!" Bill shouted. "I have a damned good notion to throw you and your half-cocked orchestra out the window. You're not only keeping yourself awake but you're also keeping the other men awake." Bill was talking between his teeth now and rocking his head from side to side. "Isn't there any way to impress on your mind, if you have one, that working with me is serious business—that an hour's lost sleep may cost me a ship or you your life?"

"Why, gosh, Bill," Sandy said. He had managed to get the xylophone sticks off his feet and stood up. "You know I've never lost a ship through carelessness or anything like that. You know

I'll be all set to go in the morning. If I want to have a little fun on the side I don't see what harm it does. I——"

"No," Bill said. "You wouldn't. I'll admit you'll look like a newly scrubbed baby in the morning, but what about the rest of the men? Remember, they aren't seventeen years old. They've got to have some sleep."

"I never thought about that," Sandy said. "I didn't think I'd disturb them. I thought they were all asleep."

Bill groaned.

"Thought you wouldn't disturb them?" he said. "That noise you were making would disturb a wooden horse. Red Gleason was shouting at you when I came in the door."

"Oh, that red-headed fool," Sandy said indignantly. "He——"

"Shut up!" Bill shouted. "And get into that bed. If I hear another peep out of you to-night I'll come over and take you apart with my bare hands."

He stepped to the door and reached for the light switch as Sandy climbed into bed, still wearing the harmonica band clasped around one ear.

"Good night, Bill," Sandy said as Bill snapped off the light.

"Good night, you——" Bill stopped and spluttered. "Good night, kid," he said.

#### IV—NARROW ESCAPE

THE sixteen-foot props of the big carrier-transport gleamed dully in the false dawn as a mechanic blasted the two fifteen-hundred-horse-power, super-charged Diesel engines.

Above and behind the pilot's compartment was a circular platform in which was mounted a rapid-firing one-pounder that could throw one hundred one-inch shells in the space of a minute.

Back in the midships section of the bomber young Sandy was making a last-minute check on his fast little fighter, the Eaglet. Suspended by its landing hook from an overhead girder, the Eaglet was locked rigidly in place on the girders and hung with its cockpit just above the level of the deck.

Behind the Eaglet's hangar was a retractable machine-gun turret that could be lowered below the bottom of the fuselage in the twinkling of an eye. Farther down on the port side were lavatories, showers, and washbasins. On the starboard side was a dining saloon and a general all-use compartment that was hung with sleeping bunks. In the tail was the galley, with an electric stove, ice box and a machine-gun turret, where "Old Charlie," the cook, held forth.

On the bridge of the monster ship were dual controls and instruments, a Sperry automatic pilot under the pilot's seat, wireless equipment, a new Kreusi radio compass "homing device."

Steps led downward from the bridge



and pilot's compartment to a machine gunner's cockpit in the nose, mounted with a .50-caliber gun. Beneath the gunner's feet were bomb sights and releases. In each of the wings, abaft the engine, were inclosed machine gunners' pits similar to the one in the nose. A runway connected them with the main fuselage.

The three low-wing, all-metal, two-place Snorters, whose twin props were idling in the dim morning light, were as alike as three peas. Above the rims of the fast amphibians jutted the goggled, white-helmeted heads of Cy Hawkins, Bev Bates, and Mort Henderson. They were waiting impatiently for Bill to signal the dispatch tower.

As a white light flashed and Bill's hand shot above his head the three thousand horses in the Silver Lancer snorted and Red Gleason took it into the air with his usual abandon. The flaps came down and the wheels in the wing-tip pontoons left the concrete. The retractable gear rose smoothly to disappear beneath the fuselage and into the wings.

An instant later the three Snorters took off, one after another, and joined the Lancer high overhead, as Bill Barnes climbed into the starboard pilot's seat of the transport-carrier.

He slipped his boots into the rudder stirrups and gunned the twin, super-charged engines. He flipped a switch on the intercockpit telephone and checked his crew: Old Charlie, in the tail; Miles, who operated the landing and loading trapeze of the little Eaglet and the retractable machine-gun turret; Martin up in the nose, who could knock a gnat off a needle with his bombs at two hundred and twenty m.p.h.; McCoy and Neely in the two machine-gun cockpits abaft the engines. Above and behind Bill's head young Sandy rode the circular, glass-inclosed one-pounder turret. He had surreptitiously slipped aboard the carrier-transport before Bill was out on the apron that morning. In the emergency equipment locker in the tail of the Eaglet he had stuffed his harmonica, guitar, and xylophone.

"I may not have a chance to practice," he told himself. "But if I do I'll have them with me." He knew only too well what would happen if Bill caught sight of the stuff.

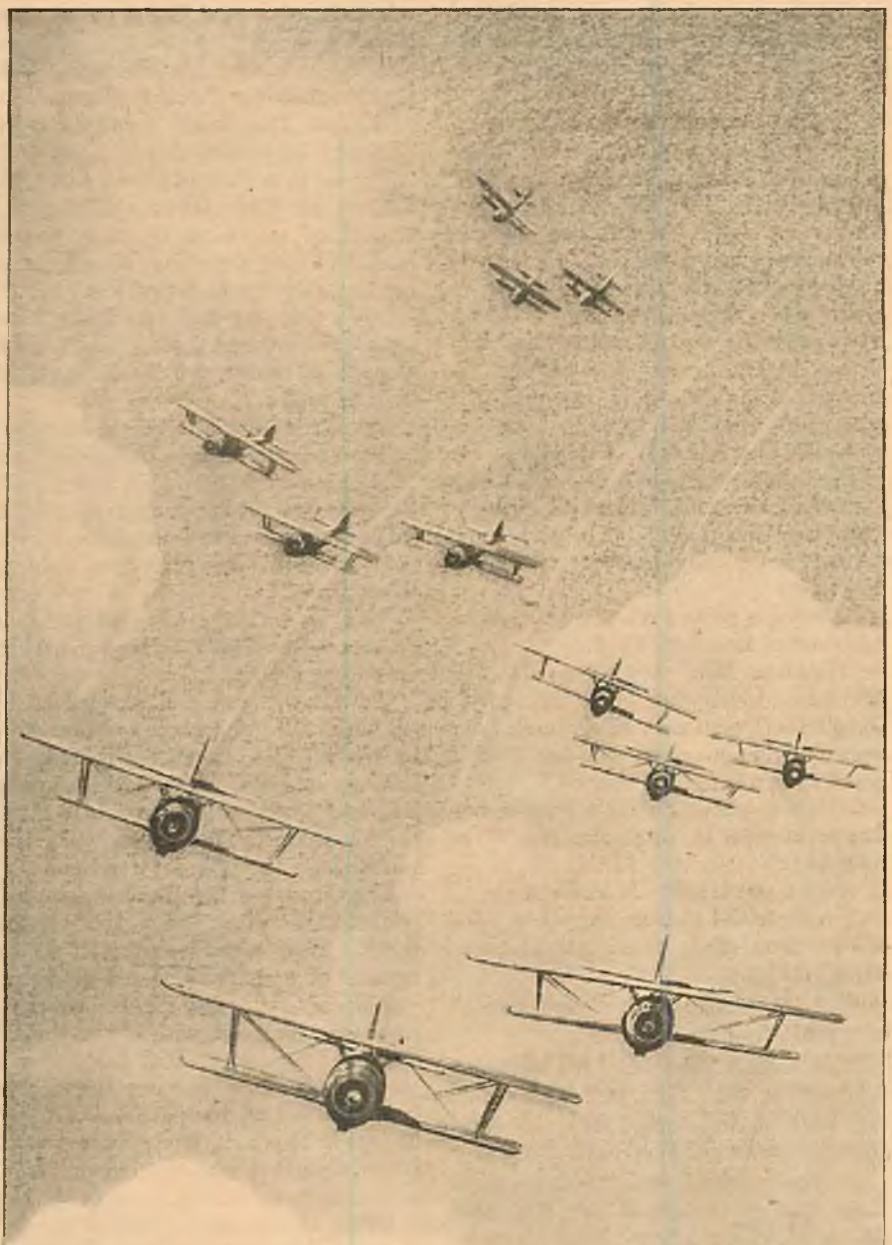
"I'll keep in touch with you by radiophone," Bill said to Scotty MacCloskey as he idled the engines for a moment. "Have Tony arrange for refueling at Oakland, Honolulu, and Guam."

"O. K., boy," Scotty said. "Take it easy and keep your eyes open. You may run into some very serious trouble."

"I've had it before," Bill said grimly.

"Let us know as soon as you know about Shorty," Scotty went on. "And bring him back with you."

"Right," Bill said. He waited until



They were boring through the air when Bill saw the twelve crimson biplanes——

the port gangway had been withdrawn and the port door sealed. Then he took the big ship down the runway with lugubrious grace and bounced it into the air.

The five ships fell into a tight formation at eight thousand feet, the three Snorters on each side and behind the transport. Two thousand feet above and a little in front rode the Silver Lancer, with Red Gleason's hand wrapped around the control column. Bill made contact with the four ships on the radiophone, gave them their cruising speed and course and called Sandy down to take over the controls.

"How do you feel this morning?" Bill asked him as he flopped into the port pilot's seat.

"Me?" Sandy said, and his eyes were sparkling as though he had had ten

hours' sleep. "I feel like a million bucks, Bill. How about you?"

"R-r-r-m-mmp!" Bill answered and went down the steps to the forward machine-gun turret.

A solid mass of cumulus clouds came racing to meet them as the State of New York spread out beneath the speeding formation. Skirting the southern tip of Lake Erie they flashed above Cleveland, Toledo and were leaving the city of Chicago behind their wing tips before seven o'clock Central Standard Time.

Bill came back on the bridge as Sandy laid the nose of the big ship on Omaha and chanted the course, wind and direction, and air speed into the microphone to the Lancer and the three Snorters.



"Gosh, Bill," Sandy said, as Bill relieved him at the controls and told him to get some breakfast from Old Charlie, "I almost fell asleep. I'm afraid this is going to be a dull trip."

"Why didn't you bring your three-man band along to keep you awake?" Bill growled. "You keep your eyes open. Unless my hunch is wrong you'll find we'll have plenty of things to keep us from yawning before we get back."

He was beginning to worry. Things were going too smoothly after that murderous attack of the day before. He knew that attack had been a part of a well-planned scheme to keep him from going to Shorty's aid. Everything was clicking too nicely to last. He threw his radio key and warned his men to stay constantly alert. Then he made contact with Tony Lamport on Barnes Field.

"Anything more from the police commissioner?" he asked Tony.

"Nothing, Bill," Tony replied. "He telephoned to say they had a report from Manila and were making a search for a man who has a record who left there a short time ago. That was all."

"Nothing about Shorty's Snorter trying to make a landing some place?" he asked.

"Not a word, Bill. It seems strange."

"Stranger things have happened," Bill said. "You made arrangements about refueling?"

"All set," Tony said. "You haven't run into any trouble?"

"Not a bit," Bill said. "It's too quiet. I'm signing off. I'll check back before we land at Oakland. We'll be there about noon Pacific time. All clear."

It was nearly four hours later when they were southwest of the Bad Man Lands of Wyoming and three thousand feet above the Bridger Butte that it happened. Bill was munching a sandwich while he anxiously probed the clear air ahead.

The light on his radio panel gleamed red. It was Red Gleason, riding the Lancer above and in front of him.

"A single ship," Red said, "holding a parallel course. He must have eighteen thousand feet on his altimeter. She's a single-place fighter with retractable gear and looks as though she carried guns. I've had her under my glasses and she has a curious sort of a cone mounted in the fuselage in front of the pilot. Shall I go up and look her over?"

"No!" Bill said, sharply. "Leave it alone. But keep your eyes on it. Don't let it get between you and the sun. Are you listening in, Snorters?"

Bev Bates, Cy Hawkins and Henderson checked in.

"All of you keep your eyes open," Bill ordered. "It may be an old trick. He may try to lure us into a fight and when he gets us in the right position a whole

squadron may come diving out of those cumulus clouds."

"He's reversing his direction, Bill!" Red shouted into his microphone.

"Follow him back!" Bill snapped. "He may be coming down on my tail."

The earth rocked out from under the Lancer as Red Gleason brought it around on one wing tip in a vertical bank and took a position directly below the tiny ship five thousand feet above.

"He's dropping down gradually," Red reported a moment later. "He has lost a couple of thousand feet and has throttled his motor."

Bill threw the intercockpit telephone switch and barked into the microphone, "Battle stations! Stand by, Miles, ready to lower yourself in your turret. If that single-seater dives and opens fire, let him have it. But keep your eyes open for other planes."

"Get up with the one-pounder, kid," he shouted at Sandy as he came racing up on the bridge.

Old Charlie, the cook, leaped to his station in the tail cockpit as Miles stood by ready to let himself down below the fuselage in his cylindrical turret. McCoy and Neely were thumbing the sun, their guns ready for action while they watched the tiny ship far overhead.

The three Snorters closed in, ready to pounce if the single-seater stuck its nose down. They were watching it in the manner of a cat watching a mouse.

Suddenly, the tiny fighter overhead roared as the pilot pushed the throttle open and zoomed upward to come over on its back in a flashing Immelmann turn. The instant the pilot rolled it level he stuck the nose down in a vertical power dive that sent the screams of its protesting prop wailing through the sky.

Down and down it plunged through the gale of its own creation. It did not seem possible that the stubby, fragile wings of the little fighter could remain attached to the fuselage. The eyes of Bill Barnes' men popped with horror.

"He's coming down on your tail, Bill!" Red Gleason screamed, as the single-seater reversed its direction with that Immelmann turn and stuck its nose downward. "Shall I let him have it?" Red finished.

"Hold your fire," Bill said calmly. "Don't use your guns until he uses his. Sandy and McCoy and Neely can hold him off when he opens fire. Keep your eyes open for other ships."

But there weren't any other ships. There was just that single screaming gannet plunging out of the sky at a speed that was over five hundred miles an hour.

"Get underneath in your turret, Miles!" Bill snapped as the roar of that plunging motor came closer and closer.

Sandy and McCoy and Neely were trying to hold the diving Juggernaut of the skies under their hair sights until

they saw the first wisp of tracer smoke come out of his chattering machine guns.

But no trace of smoke appeared as it came within range and continued to dive. They all waited, like men awaiting their doom, to see what the little ship was going to do. A lifetime seemed to tick away in those few seconds while they watched and waited.

Then Red Gleason's voice screamed in Bill's ear again: "He's pulling out, Bill! He's coming up underneath your belly. He is protected from machine-gun fire by a steel cone that almost surrounds his cockpit. He's going to ram, Bill! *He's going to ram!*"

Bill Barnes' blood froze in his veins and cold perspiration popped out all over his body as he heard Red's words. And in that split fraction of a second he made his decision.

As the little single-place fighter eased out of its terrific dive and came looping up under the tail of the carrier-transport Bill shouted into his intercockpit telephone, "Let him have it!"

At the same instant he opened the throttles of the two 1500 h.p. Diesels wide and jammed the wheel forward with all of his strength as he kicked the rudder bar against the stop.

The tail of the big ship slipped upward like the heels of a kicking mare, as the nose dropped off to the left. The tiny little fighting "rammer," whose pilot was willing to sacrifice his life to destroy Bill Barnes, zoomed upward beneath the rising tail so close that its propeller seemed to be kissing the tail assembly of the transport before it went over on its back.

As Bill fought with all his strength and skill to regain balance with the big bomber young Sandy's one-pounder and three machine guns opened fire on the little fighter. They raked it from stem to stern as Red Gleason pounced on it from above and drove round after round into its vitals from his powerful .50-caliber guns.

The little fighter staggered and lurched as it took that terrific concentration of fire. It rolled right side up and then the nose fell away and it started a sickening plunge toward the interminable wilderness below.

"Stick in close to me, Snorters," Bill ordered. "Red follow it down and see if the pilot is still alive."

At almost the same instant the little ship seemed to fall in half and out of the subdivision rolled a brown ball that plunged toward the earth.

Suddenly, a tiny puff of white shot out behind the ball, followed by a larger puff that was a parachute. The thing that had been a brown ball lengthened out and became a man dangling on the shroud lines.

"Do you think there is any chance of following him down and making a landing, Red?" Bill asked.



"Not a chance in a million," Red answered. "He'll never get out of there alive. It's desolate mountain country."

"If you'll let me take the Eaglet out maybe I can hook onto his parachute with my landing hook," Sandy said, excitedly.

"And get him tangled up in your prop," Bill growled. "Shut up!"

"Let him go," Bill ordered his men. "Could any of you get a good look at that ship?"

"I could and did, Bill," Cy Hawkins drawled. "It was a rammer all right. It was designed so that the pilot was protected from machine-gun fire with a steel conical shield. After he drove his prop into the tail controls of the carrier-transport he could separate the ship in the middle and roll out to yank his 'chute ring, if he wasn't killed in the collision."

"Hold your course. We'll go on through to Oakland," Bill said as calmly as he could. "Keep your eyes peeled."

He spoke calmly but he was still trembling. "Who," he asked himself, "ever sent such a hellish device out to get us?"

#### V—A BET

SHORTY HASSFURTHER became conscious of the things that were going on about him for the first time in three weeks. He could dimly see the three short, powerfully built men who stood beside the bed on which he was lying and he could dimly hear their voices. But he couldn't understand what they were saying. They were speaking in a foreign yet vaguely familiar tongue. He stirred uneasily and tried to wet his dried, parched lips with his tongue. One of the men beside him spoke.

"He is coming around," he said.

"We'll have to give him a small shot before long," another one said, "or we'll have a crazy man on our hands."

"Not too much."

"No. Just enough to keep him quiet."

Shorty struggled with the tangle of

thoughts that raced through his mind. One moment he was lying in his old room in the pilot's quarters on Barnes Field, Long Island, and the next he was entombed inside the shaft of a mine far beneath the ground. Faint little moans escaped his lips as he struggled with the mental agony that engulfed him. He was not yet sufficiently conscious to be aware of the thousand and one bruises that covered his face and head and body.

As he began to toss from side to side one of the men beside him prepared a hypodermic needle. While another one held Shorty the first one neatly lifted a bit of skin on Shorty's arm and plunged the needle into it. A faint whimper came from Shorty's lips.

"That will bring him around," the man who had applied the needle said. His expression was almost seraphic. His lips were drawn back over his teeth in what might have been a smile, but his eyes were small, hard and metallic.

"You have done a good job, Hako," the second Oriental, Sin Wing hissed through his large, yellow teeth. "He has told us what we wish to know and we have not hurt him a great deal."

The third of the trio made a gurgling noise in his throat, but he did not speak. He stood watching Shorty Hassfurther with eyes in which there was no expression. His face was the face of a graven image. He seemed like a malignant growth on the surface of something clean. His name, Kano Yeito, was associated throughout the East with evil.

Shorty Hassfurther strained with all his will to bring himself out of the coma that engulfed him. But his brain would not coordinate. He only knew that he was suffering as he had never suffered before. Dim memories flashed into his mind and out again. Then the injection of dope began to quiet him and he was aware of the three men beside him.

When he opened his eyes to gaze into the deadly mask that was Kano Yeito's face he closed them, thinking he had seen something that was not there. When he opened them again his brain had cleared. He looked at the three

men and then let his eyes wander around the room in which he was lying. The smiling Hako spoke to him.

"I am very, very sorry you have been so ill," Hako hissed through his large, even teeth. "We have done everything we can for you."

Shorty studied him for a moment and saw that the smirk on Hako's face which looked like a smile was not a smile and he knew that his soft, sibilant voice was only a covering of velvet over steel.

"Where am I and who are you?" Shorty asked through twisted lips. "Will you please give me a drink of water?"

"I will be very, very glad to give you a drink of water after we talk to you for a few minutes," Hako said. "It will be very, very much better for you if you give us the answers we want you to give."

Then Shorty remembered. He remembered these three when they first landed their plane on his landing field at the Little Nugget Mine. They had made generous offers to him and Tompkins, his partner, to buy the mine. He and Tompkins had laughed at them. They had accepted the refusal to sell calmly enough and had departed.

But they had come back and there were two more planes with them loaded with evil-looking thugs. He remembered how polite this little man Hako had been when he first renewed their offer. He had thrown Shorty entirely off his guard. He remembered how Tompkins had looked when they shot him through the head and how the thugs had overpowered his guards. He remembered all of it.

"You should not think too much," Hako hissed at him softly. "It is better not to fight the inevitable. You will become a very, very rich and powerful man if you let your thoughts wander in the right direction."

"Meaning what?" Shorty asked. He wondered if Bill Barnes had ever received the message he had paid a guard a fabulous sum to carry to him. Writing that short, terse note and explaining to the guard where he could find the

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cache of gold dust, he, Shorty, was ready to fly out of the interior was the last thing he could remember before a half dozen of Hako's thugs had come into the room where he was imprisoned to overpower him.

The chances were that the guard had not succeeded. Shorty clamped his teeth together with a determination that was characteristic of him as he looked eyes with Hako. They could tear him to pieces bit by bit, he thought, but he would never do what they wanted him to do.

"We have your mine," Hako said. "It has very, very fine possibilities. We expect that over the next few years it will finance our very fine plan. We have persuaded"—Hako smiled at the word and Shorty wished he could get his yellow neck between his two hands—"the officials in one way and another to transfer it to us. They were very, very nice about it."

"You lousy lug," Shorty said.

"'Lug' is not a nice word," Hako said, and he smiled. "I was educated in your United States and I know that to be called a lousy lug is not a compliment."

"I'm glad you understand it," Shorty said. Then he got hold of himself. He knew it would do no good to deliberately antagonize this seraphic little Oriental. He had learned to know the Eastern mind and he knew that they were a people with a single-track mind. No matter what obstacle confronted them they would plod constantly on in their calm, imperturbable way until they had overcome it. They were like a string of ants carrying out their tasks. He steadied himself and tried to smile. The effort cost him a wince of pain.

"We have a very, very fine plan which we are going to carry into execution," Hako went on calmly. "We wish you to join us because of your great skill as a pilot and your knowledge of combat work and organization. It will be very much to your advantage to do as we wish."

"Or else," Shorty said quietly.

"Or else is a very amusing American expression," Hako said, and his smile became a laugh. "It is just the expression I would have used if I had thought of it."

Shorty didn't say anything. He waited for Hako to go on.

"In a very few years," he said, "the Philippines will have their independence from your great country. That is the time we are preparing for. Some one must be in power here. We have determined that we three shall be that power. It is very, very possible that with a little help we will extend our power all over the Pacific. But first we will seize control of the Philippines. Your task will be to organize and train a suitable air force. We have developed

a type of plane that will mean destruction to any one who attacks us. We have only been able to secure a few so far, but after a time we will have them in large quantities.

"We must have them in large quantities because each time one of them attacks it is destroyed—also the pilot. He may survive if he is very, very clever, but the chances are against it."

"Rammers," Shorty said.

"Precisely," Hako hissed. "In attacking armies or battleships the pilot must die with his enemies. But here in the Orient our young men have the type of mind that considers it an honor to die for the cause in which they are enlisted. We will have men who are trained to believe that death in combat is the only honorable death."

"You expect me," Shorty said, not able to conceal the horror in his voice, "to train an air corps that will not mind committing hara-kiri."

"That is it," Hako smiled. "You will be in command."

"I—" Shorty began heatedly. He had forgotten his resolve of a moment before.

"Wait," Hako said, putting up one finger. "You must take time to consider. You must not hurry. If you will pardon me, that is a great failing in your great country—haste."

"We know you managed to send a note to your great countryman, Bill Barnes. Unfortunately for Mr. Barnes, the messenger got through with the message. But Mr. Barnes will not get through to you."

Shorty did not hear the last sentence. He heard only that Bill had received his message. He tried to keep the elation out of his expression as he gazed at Hako. Something that was so strong tears nearly leaped into his eyes welled through him. A vision of Bill's face and the faces of all his men floated before his eyes. He could see Bill receiving that message and he could see Barnes Field leap into activity as Bill lashed his men into action. Hako must have read his thoughts because he shook his head.

"You are very, very foolish to put any hope in Mr. Barnes," he said. "He is a great man, but he cannot do the impossible. He must overcome too many things to reach you. You have told us a great many things while you have been under the influence of drugs. They will help us very much to keep Mr. Barnes from reaching you."

"Such as what?" Shorty asked, and his heart had turned to ice.

"To show you that I speak the truth I will tell you one or two things," Hako said. "You told us the word 'nozzle' was the code word you would use if you needed Barnes."

Shorty stared at him as though he

had suddenly picked a rhinoceros out of his mouth.

"You see," Hako smiled. "Another thing you told us was about the corkscrew whirl you and Barnes have used in the air. You even told us how to execute it. When we learned your messenger was on the way to Barnes we gave one of our best men your Shorter to trap Barnes in the air by using that trick. But Barnes was too clever. He is a very, very clever man."

"Ha!" Shorty said, and he managed to grin this time.

"But you told us other things, too," Hako said. "I am very, very sorry that we had to use physical persuasion on you at times. You will find your body is very painful after a while. We did not wish to do it, but sometimes it was the only way we could get you to talk from the subconscious."

"Listen," Shorty said. "If I don't accept your proposition are you going to kill me?"

"I am very, very much afraid that will be necessary," Hako said, and his face was sober. "It is not anything personally against you, but is a matter of caution and necessity."

"And suppose I told you I would accept to keep myself alive until Barnes gets here," Shorty said.

"You would not do that," Hako said. "I know that you are an honorable gentleman who would not give his word if he did not mean to keep it. Is that not true?"

"Yes," Shorty said, and he said it reluctantly. "That is true." He could hardly believe that he was hearing correctly, his own possible murder was being discussed so calmly.

"I'll tell you what I'll do," Shorty said suddenly, and he was laughing now.

"Do not speak in haste," Hako said.

"You Orientals are honorable in gambling matters," Shorty said, "and I'll trust you. I'll gamble my life with you that Barnes gets through. You seem to feel you have him stopped."

"I am afraid I am very stupid," Hako said. "I do not understand."

"I'll gamble my life that he gets through," Shorty repeated. "If he gets through I will win. If he doesn't get through I will make my decision then whether I will join you or you murder me."

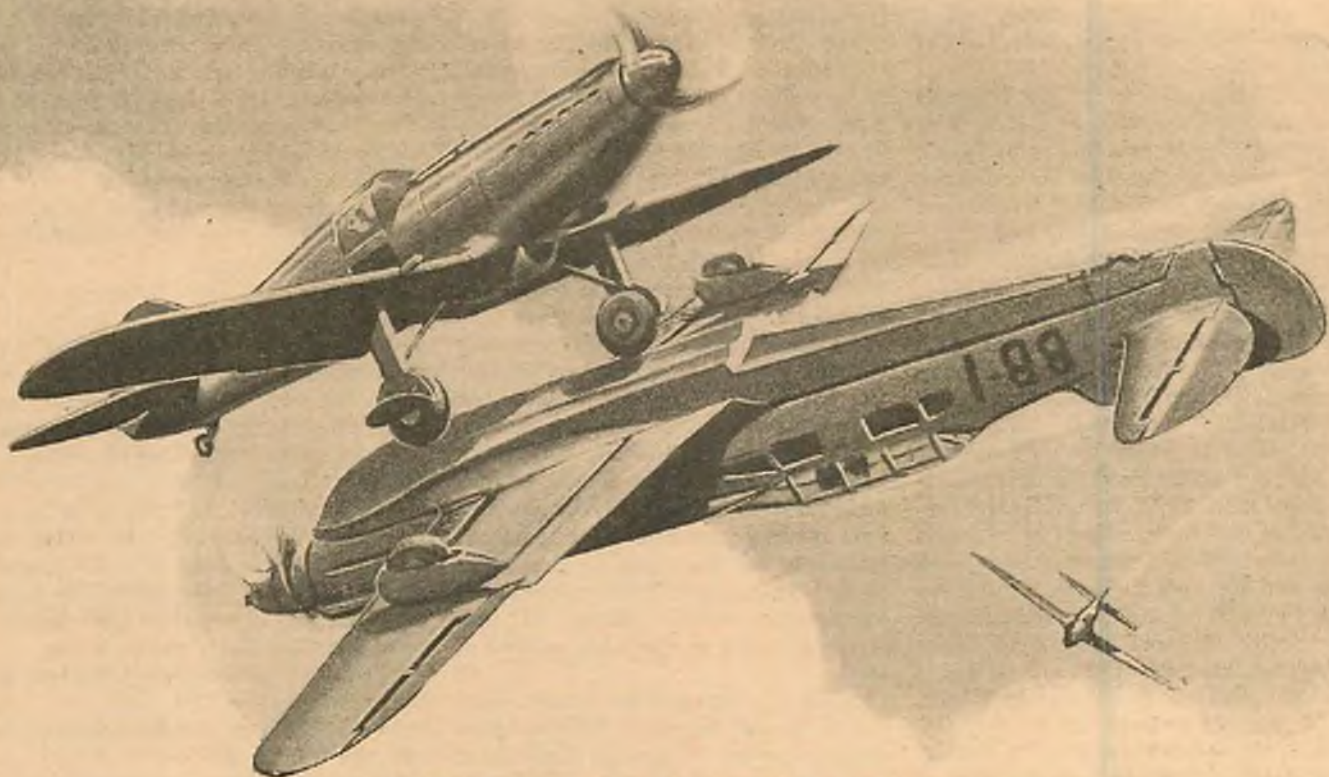
"What you are doing is stalling for time, to use one of your Americanisms," Hako said.

"That's the idea," Shorty said. "Is it a bet?"

"It's a bet," Hako said. He got to his feet and pushed a button on the wall. He interpreted the conversation he had had with Shorty to the other two men in swift, staccato words. They nodded their heads in agreement.

A Filipino boy came back in a few minutes, in answer to Hako's request,





He could feel the thump of the landing wheels on the pontoon—

with a large clay jug of cool water and a glass. Hako poured the glass full of water and handed it to Shorty.

"Thank you," Shorty said.

"It is an honor to serve you," Hako hissed.

Shorty took the glass of water away from his lips for an instant and gazed at the amazing man before him.

"You'd probably be a pretty good guy if you weren't a lousy lug," he said.

"I thank you," Hako said. "I know what you mean, but our ways are different. We do not see things with the same eyes. I will do what I can to see that you are made comfortable."

"After keeping me in a coma for three weeks," Shorty said.

"It was necessary and I am very, very sorry," Hako said.

Again Shorty's heart became a piece of ice as he realized the merciless ruthlessness of the man before him. Underneath the man's veneer of surface concern and politeness he was a piece of steel—an ant taking a dead fly home to its hill over seemingly unsurmountable odds.

## VI—ROARING MOTORS

BILL BARNES and his men held a short conference in the big transport-carrier a few minutes after they set their ships down at Alameda Airport, at Oakland.

They decided unanimously that they wanted to push on over the long water

hop to Honolulu after they had had six hours' sleep.

"We can't help the guy waiting here," Red Gleason said, and they all nodded agreement.

Before they turned in for their rest, Bill made contact with Tony Lamport and got a report that had come from Manila by cable.

"The officials at Manila say Shorty and Tompkins, his partner," Tony said, "sold their mine a couple of weeks ago and disappeared. Nothing is known about their whereabouts at the present time."

"O. K.," Bill said. "There is nothing more we can do about cutting the red tape now. We'll have to wait until we get there. We're shoving for Honolulu at about seven this evening, Pacific time. They're checking our ships and refueling us now."

At seven fifteen that evening the power plants in the little squadron of Barnes ships roared to life again. A crash launch sped down the course ahead of them as they warmed up their engines.

White spume sprayed high as Bill took the carrier-transport over the rough waters of the bay and kicked it into the air. A moment later he was followed by the Silver Lancer and then the three Snorters.

A low ground haze half hid the city of San Francisco as they climbed upward in ever-widening circles until they had ten thousand feet under them. The

hum of their engines changed as they adjusted them to cruising speed and Bill gave them their course. Point Bonita flashed under their wings and they were over the sea. The rays of the setting sun broke through the dull, wispy clouds and played on the silver surfaces of the Lancer, making it into a great red-gold bird. As the sun plunged into the sea the gold turned to purple. Then night was upon them.

Hour after hour the five ships droned on and on through the cold night air. From time to time Bill played the beam of a large spotlight on the port and starboard motor nacelles, the props and the wing surfaces. As the spotlight snapped off the exhaust pipes glowed a deep red and the port and starboard running lights far out on the wing tips blinked to life. Directly astern, riding their tail, was a full moon. Its dull light played on the great cloud banks below them, turning them to silver. Now and then a "moon bow" encircled the shadow of the carrier-transport and the Lancer on the clouds below.

They had all set their automatic pilots to work and were only half awake when the warm, pink rays of the invisible sun first peeped above the horizon to the east and Mauna Kea loomed up out of the sea ahead.

The crouching lion that is the extinct crater of Diamond Head flashed under their wings—then the naval air station, as they circled down for a landing.



An hour later they were all asleep in their rooms in the best hotel in Honolulu.

"Don't you think we ought to be on our way to-night, Bill?" Sandy asked, his eyes red and puffed from lack of sleep.

"No," Bill snapped. "We lay over here until dawn to-morrow. It is three thousand four hundred miles to Guam. We'll lay a course over Wake Island, but we won't stop there. We'll need plenty of rest for that long hop."

"Things are clicking too nicely, Bill," Red Gleason said.

"I'm worried," Bill said. "But I don't think we will run into any trouble until after we leave Guam. It's a fifteen-hundred-mile hop from Guam to Manila. That is when we must be ready. We can't afford to be caught half asleep."

The five ships took the thirty-four-hundred-mile flight from Honolulu to Guam as though it was part of an everyday job. But two mornings later when Bill and his men took the air for the last leg of their journey their faces were lined with fatigue. They were beginning to feel the strain of the long flights and the constant possibility of attack.

At the last moment before they left Guam, Bill ordered Red Gleason to take his place in the carrier-transport and transferred himself to the Silver Lancer.

"You'll have Sandy to relieve you," he said to Red.

"I'm all right, Bill," Red answered.

"You're tired," Bill snapped. "We're all tired. But I've had it easier than the rest of you, with Sandy relieving me. If we run into trouble to-day, I'll be ready."

Three hundred and fifty miles from Manila it happened.

The little formation was boring through the air at a cruising speed of two hundred and fifty miles per hour when Bill first sighted that flight of a dozen crimson planes. They were flying high overhead and trying to keep the sun behind them until they were ready to pounce. Bill flipped his radio key and calmly spoke into his microphone.

"Formation of twelve crimson biplanes," he said, "flying at about fifteen thousand feet on our tail. They are in the sun. Keep on your course. Red, hold the carrier steady on her course if they attack. I do not believe they are rammers. There are no steel shields in front of the pilot's cockpit. I am going to drop back behind the carrier. The rest of you hold your positions. Get your men into their gun pits, Red. When they come, they'll come fast."

"They're coming now, Bill!" Sandy screamed.

"Take 'em!" Bill roared.

Aboard the carrier-transport Old Charlie leaped to his station in the tail cockpit as Miles let himself down below the fuselage in the cylindrical turret, his

machine gun swinging. McCoy and Neely were thumbing the sun, their guns ready for action. Sandy went up the steps to the one-pounder turret like a frightened kangaroo.

The three Snorters closed in, to cut the formation of twelve biplanes in half as they dived on the carrier with their guns streaming tracers and lead. Bullets thudded through her wings and her tail surfaces as they dived. Martin tore the belly out of one of the crimson ships as it went by. It kept straight on down toward the waters of the Pacific as the eleven ships came up and around in a sweeping bank.

As the eleven crimson ships swung back to the attack a silver bullet that was the Lancer came out of nowhere. It tore their carefully aligned formation apart like a good full back shatters an opponent's line. They dived, zoomed and rolled to get out of the path of the mad Juggernaut that swerved neither to left nor right, its guns yammering death. Bill's hand was wrapped around the control column of that speeding carrier of death like a band of steel.

As the first three of the crimson ships roared up and around in flashing chandelles to pounce on him, he flipped over and sped across their tails. His fingers clamped down on his triggers as he caught one of them under his sights and then another. His bursts of fire lasted for only a split fraction of a second. But it was enough. Both of the crimson ships bowed their heads and went whirling to oblivion.

"Nice going, Bill!" Red Gleason shouted into his microphone while he held the transport steady on her course.

"Break 'em up, Cy!" Bill roared into his mike as six of the remaining crimson biplanes swung around to converge on the carrier again.

The three Snorters broke away from their position around the carrier with Cy leading them. He followed a crimson ship as it pulled steeply up into the sky, went over in a half loop, rolled right side up and came tearing back with its guns bellowing. Bullets ripped across the Snorter's wing, chopping through the metal skin.

Cy Hawkins laughed as he pushed the stick forward and went into a dive. He felt his ship shudder and tremble as the bullets of the crimson plane drilled through his tail assembly.

The next second the stick was back into his stomach and he zoomed up vertically and went over on his back. Centering his controls, he opened his throttle and was on the biplane's tail. Hanging head downward, he lined up the crimson ship in his hair sights and tripped his triggers. Fire and smoke belched from the biplane's engine housing as his bullets drove into the engine block. He threw the stick to the left

and rolled the Pacific out from under him as he came right side up.

A thousand feet below Cy the crimson biplanes were fighting for their lives in a madhouse of fire and smoke and roaring motors. They were not able to start another attack on the transport because each time they tried to come around in formation a madman was among them in the Lancer. Four biplanes were darting around Bill, trying to get him in the vortex of their fire. But each time they tried to close in he broke their ranks.

Farther down, Bev Bates coaxed a crimson plane to make an error. He darted in and out, waiting for that moment when he would have the pilot in a position to attack. Suddenly, he flashed over in a dazzling inverted loop, to come up under the tail of the crimson ship. Lead and flame vomited from his machine guns and the biplane staggered like a wounded deer. Then it came up with its nose pointed straight at the sky until it stalled. The nose fell away and it began its last spin toward the blue-black waters below.

Then Red Gleason saw that two of the crimson ships had peeled off and were closing the gap between themselves and the transport.

"Two of 'em are on our tail, kid," he said to Sandy. "Give 'em hell!"

Sandy nodded his head as he swung the rapid-firer around to meet the attack of the two diving ships. Before they were within range of the wing machine-gun pits, Sandy had them under his sights. His face was flushed and dripping with perspiration, but his eyes and his hands were steady. He lined them up with the coolness of a Foreign Legion sergeant and waited. Then the breach of the rapid-firer burned hot against his cheek as he clamped down on his trigger. A half dozen savage barks sounded above the roar of the throbbing motors—then again.

His targets became two great clouds of black smoke that were streaked with dabs of orange and crimson. Bright ribbons that were streaks of flame darted out of the smoke like the tongues of angry snakes.

Fabric, steel, wood and bits of what had been human beings flew in a dozen directions. As the smoke cleared away there was nothing left of the two things that had been crimson biplanes. They had become pieces of debris.

Then Bill saw Mort Henderson trying desperately to escape the deadly fire of two of the remaining five planes. He was using every maneuver known to combat pilots to elude their vicious attacks as they tried to line him up in a cross fire. He flipped his radio switch and shouted Henderson's name into his microphone.

"My guns, Bill!" Henderson gasped.



"Both of them have jammed. I'm trying to clear them."

"Hold it. I'm coming," Bill said, and he opened the throttles of the Lancer and raced away from the two ships above him.

The crimson ship on Henderson's port side took the full impact of Bill's .50-caliber guns before the pilot realized that any one was on him. His propeller became a thousand pieces as bullets tore through it and drove into the windshield and tore his head from his shoulders. The other plane dropped its nose and started an almost vertical dive toward the waters of the Pacific.

Bill saw that the other three ships had dropped their noses also and were diving out of danger. Then he was aware of something else, as Red Gleason screamed something unintelligible in his ear.

He barrel-rolled the Lancer as he became aware of the ship that had come out of nowhere and heard a crash that brought his heart up into his mouth. He rolled the Lancer back to level as he saw that Henderson's tail controls were entirely gone! They were entangled in the prop and nose of a tiny single-seater with a conical steel shield in front of the pilot's cockpit.

He saw five more of the ships as Henderson's Snorter stuck its nose down and plunged like a diving gannet toward the Pacific. He saw Cy Hawkins and Bev Bates hanging their ships on their props to get them out of the way of the madmen who were piloting those suicide rammers. He saw young Sandy blazing away at another one to keep it out of range of the big transport. He threw his radio switch again and bellowed into the microphone.

"Remember the tactics we planned!" he screamed into the mike. "Keep 'em away from you. Don't let 'em get on your tail. Stay away from 'em. Stick close in by the transport. Use your extra speed. You've got to fight like hell!"

That was all he had time to say, because another of the vicious little rammers was diving under his tail, ready to zoom up and take away his controls. He half rolled the Lancer and hung it on its two screaming props as he took it upstairs.

The next instant he saw his chance as one of the little rammers flashed beneath him. He came over on his back and pushed the control column forward ever so little. For that brief instant that is enough the head of the rammer's pilot was exposed to his guns. Diving in an inverted position he clamped down on his gun trips. The stream of lead that poured out of his powerful guns chopped into the pilot's back as he tried to skid his ship out of range. The little ship zoomed upward like a

wounded duck and then fell away and plunged to its death.

Again Bill shouted instructions into his microphone.

"Watch it, Red!" he screamed. "Vary your speed and keep maneuvering as well as you can. Sandy must keep them away from you with his rapid-firer. Miles' machine-gun bullets will do no good if he gets under your tail. Keep 'em away, Sandy!"



"A madman is loose with Shorty's Snorter."

Far below he saw the whirling Snorter plunging down and down. He could see no motion in the cockpit and wondered if Henderson was being held in by centrifugal force.

Henderson's head had been banged against the cowling with such force when the little rammer made contact with his tail controls that he had been knocked unconscious. He had plunged three thousand feet down before he opened his eyes. Then the ship was whirling so fast that he could not push himself up out of the cockpit. He was held there like a fly in a spider's web. He gripped the top of the cockpit and struggled to haul himself up, kicking desperately with his legs. Closer and closer the fuselage of his Snorter plunged toward the water.

Then fate took a hand as one of his kicks struck the control column. For one instant it gave way, then snapped back so hard that it lifted him bodily out of the cockpit and catapulted him into space. For one awful moment he fought the faintness that closed around him. Then he found his release ring and his pilot chute floated out behind him as his Snorter plunged by. His main chute opened and he began to swing gently back and forth while he tried to watch the flaming battle overhead.

While Cy Hawkins and Bev Bates each kept one of the armored rammers occupied and Sandy held a third one off from the transport with his rapid-

firer, Bill Barnes coaxed the fourth and last one away from the battle and studied its maneuvers. In a matter of sixty seconds he had found the position from which it was vulnerable.

Because of the conical steel shield which protected the pilot from the front, Bill found that he had a blind spot which was directly underneath and in front of the little ship.

Five times he feinted to get the rammer coming at him head-on. The sixth time he was successful. When the little ship was four hundred yards away from him, Bill stuck the nose of the Lancer down for an instant, then eased back on the stick. As the rammer began a fast turn to the right Bill's finger clamped down the trip of his 37-mm. cannon. Orange flame and black smoke belched out of the hollow shaft in the V of the Diesel's cylinders.

The dozen shells he poured into the fast little ship tore its belly out from stem to stern. For one perilous moment it held its course straight toward the transport. Then the nose dropped and it began its downward plunge.

"They are blind from the front!" Bill shouted into his microphone. "Come up underneath 'em."

Ten seconds later he saw Cy Hawkins use the same tactics he had used and another of the tiny rammers dived toward the Pacific. That was when the last two peeled off and started westward with all the speed their pilots could coax out of their engines.

"Let 'em go!" Bill roared at Bev Bates as he started in pursuit. "Drop down to the surface in the transport, Red. Henderson bailed out. We've got to pick him up. I'll make a landing."

He stuck the nose of the Lancer down in a vertical power dive toward the spot where Henderson's parachute still floated on the surface. A few minutes later he helped Henderson climb aboard the Lancer.

"I didn't see him coming, Bill," Henderson said. "He was up underneath my belly before I could get away from him."

"They are horrible things," Bill said. "You were lucky."

"My starboard-wing fuel tank has been punctured and is leaking," Red Gleason cut in over the radiophone.

"Back on your original course when we get ten thousand feet under us," Bill snapped. "Speed three hundred. Henderson will ride with me to Manila."

## VII—AN INTERVIEW

AN HOUR LATER the first of the seven thousand islands that make up the Philippines came to view, south of west of their course. They settled down on the waters of Manila Bay and taxied toward the shore through a swarm of paddled dugouts, tugs, and motor launches.



A half hour later Bill was telling his story to a representative of the governor general, Sturgis Benton. Benton sat on the edge of his chair with an incredulous expression on his face as Bill told him of the several attacks on him.

"It seems incredible, Barnes," he said finally. "But strange things happen out here in the East. I don't think there is anything I can do for you in an official capacity. Naturally, we'll start a hunt for Hassfurth and his partner and we'll investigate the men to whom they sold their mine. The whole thing will have to be reported to the Philippine officials with the customary formality."

Bill got to his feet and paced the length of the room and back again. Suddenly, he stopped and threw out his hands.

"Listen, Mr. Benton," he said. "I've seen what happens when a report is made to the proper officials. Nothing! I came out here to find Shorty Hassfurth if he's still alive. And I'm going to find him. I'm not going to wait for the Philippine authorities to gum things up and spoil what little chance I have."

"I understand what you mean, Barnes," Benton said. "I understand perfectly. Official red tape is a pretty terrible thing sometimes. But we have to observe it. You can't tell what may be behind this whole thing. I'll have to make a report. But if I were in your place I would go ahead and make my own investigation. From what I've heard you are pretty good at untangling such things as this."

"I have your permission to do that?" Bill asked.

"I don't know anything about it," Benton said. "If you get into trouble I'll try to help you out personally. But officially I know nothing about what you are doing."

"Thanks," Bill said. "I'll keep you informed. First, I'm going up to Benguet and look over Shorty's mine and the men who bought it. After that, I don't know."

"Good luck, Barnes," Benton said. "I'll be anxious to hear from you."

Bill went back and joined his men at the airport, where they were directing the repairs to the two Snorters, the Lancer and the carrier-transport.

"I'm going to hop up to Benguet," he told them after he had related his conversation with Benton. "I understand there is a good landing field there at Baguio. I'll see what I can find out. You'd better all go to the Manila Hotel and get some rest. But keep some one here all the time on guard. Bev, you'd better go over and talk to one of the Jesuit priests who conduct the Philippine weather bureau. Find out if there are any typhoons predicted. Whoever is on guard here stick close to the radio panel. I may want to make contact with you."

A few minutes later he circled above the rocky fortress, Corregidor, and stuck the nose of the Lancer on the mountainous province of Benguet.

Below him the Central Luzon Plain, the great rice granary of the Philippines, spread out interminably. The Pampanga and Agno Rivers wound their way like lazy pythons toward the Lingayen Gulf. As he neared the gulf, here and there stone watch towers reared their heads from the days when the Spanish conquistadores kept watch for Moro raiders from the south.

At Baguio, Bill learned that there was a suitable landing field adjacent to the Little Nugget, the mine Shorty and Tompkins had owned. He could find no one who could give him much information about them there. They told Bill the only time they ever saw Shorty

was when he brought out gold from the mine in his Snorter.

"It's all damned peculiar," he said grimly, as he kicked the Silver Lancer into the air again. "After I have a talk with the present owners of the mine I'll check up on the transfer of ownership."

The land under him had changed now from the fertile rice fields of the valley to dense jungle with huge trees supported by flying-buttress roots and tangled with bamboo, rattan, and creepers.

He checked his bearings as carefully as he could, according to the directions they had given him at Baguio. From a height of five thousand feet he picked out the shaft of the mine, the tiny landing field, and the dozen corrugated iron buildings. He took the big sesquiplane in at eight miles an hour and just managed to swing the nose in time to prevent it from being cracked off in the jungle.

Two armed Filipino guards with express rifles across their arms greeted him as he stepped out of the Silver Lancer. They were small men with straight, black hair and beady black eyes.

"They don't seem to be very glad to see me," Bill said to himself, and asked them if they spoke English.

"You come with us," one of them answered. That was all. One of them led the way while the second brought up the rear. They both looked as though they would have taken pleasure in using the rifles carried under their arms.

They led him to the largest of the corrugated iron buildings near the shaft of the mine. Inside he was taken into a room that was partitioned off from the rest of the building, and told to wait. He surveyed the hot, stuffy little office with the single desk and wondered if this had been Shorty's workroom. He didn't hear the door open behind him and he didn't know that any one was in the room until a soft, sibilant voice spoke behind him.

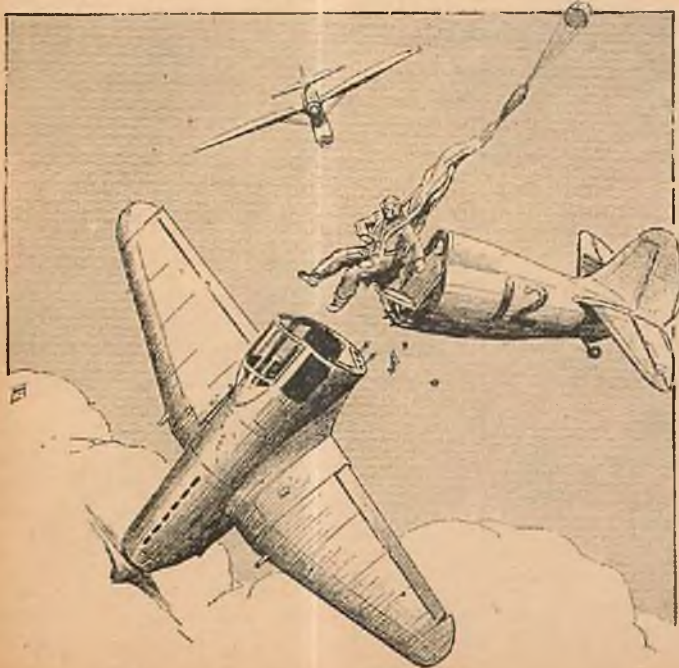
"It is a very, very great honor to have you call upon us, Mr. Barnes," the voice said. "I am Kwa Hako, one of the purchasers of Mr. Hassfurth's mine. It is a very, very great pleasure to know you."

Hako flashed his broad smile and clicked his heels together as he bowed. Bill studied his hard, metallic eyes for a moment and shook the hand he extended.

"It is very, very regrettable you did not arrive in time to see your friend," Hako said.

"Perhaps I did," Bill said, and his eyes narrowed. "Where is Hassfurth?" he added.

Hako spread his hands and an expression of genuine concern played on his face for a moment.



The little ship seemed to fall in half—a tiny puff of white shot out—







whipped the undercarriage. He hung suspended for a breath-taking moment. Then he hung the big ship on the two enormous three-bladed props and took it upstairs.

He took the Lancer up in ever-widening circles until he had ten, then fifteen, then twenty thousand feet on his altimeter. He switched on his oxygen and took a pair of binoculars from a pocket beside him. He knew that one or both of the planes he had seen inside the corrugated iron hangar below would follow him into the air.

## VIII—ACTION

BILL idled the twin Diesels in the nose of the Lancer down to their lowest safe speed to hold his altitude, while he cruised back and forth above the Little Nugget Mine and studied it with his glasses.

He saw the two teardrop biplanes being pushed out on the flying field and saw that they were the same kind that had attacked them over the Pacific between Guam and Manila. They were the same except that they were finished in a verdant green, which made them almost invisible when they were flying above the jungle.

When they leveled off at five thousand feet and took a course that would take them toward Baguio, Bill dropped down to twelve thousand feet, just behind them. But in a moment he realized that they were not going toward Baguio. Instead they were pulling around in a great circle that would take them back toward the mine. He maintained his position above them, watching their rudders through his binoculars.

As Bill watched the two fast little fighters he became more and more convinced that they would lead him to Shorty. He decided to make contact with his men at Manila and order them to proceed to Baguio if their ships had been properly checked and repaired. He flipped the key on his radio panel and chanted the call letters of the carrier-transport in his mike.

"BBT answering. . . . BBT answering. Go ahead. . . . Go ahead," came back a moment later.

"Bill speaking, Red," he said. "How are the ships—checked and refueled?"

"O. K., Bill," Red said. "They just finished up the work on the starboard fuel tank."

"Right," Bill said. "I think Shorty is some place up in this country. I landed at Baguio and got directions about getting to his mine. I made a landing there and talked to one of the purchasers. He told me he didn't know anything about Shorty. But I think he was lying. I think he knows things he didn't tell me. He told me Shorty had moved out bag and baggage."

"And he didn't know where he had gone?" Red asked.

"That's right," Bill said. "But you remember the little leather box Shorty used to keep his decorations and medals in?"

"Yeah."

"It was on this man Hako's desk," Bill said. "Shorty would never have left that behind."

"Never!" Red said. "He was pretty proud of that box and the things in it. He might leave an arm some place, but never that box."

"Check," Bill said. "Are you all ready to get into the air?"

"We will be in fifteen minutes," Red said.

"O. K.," Bill said. "Come to Baguio. It is less than two hundred miles from Manila. Sit down there and wait until you hear from me. I'm tailing a couple of those teardrop biplanes that attacked us this morning. These two are painted green. Keep your eyes open for more of them. I'll pick you up a little later on. Signing off."

He threw the radio key and was reaching for his binoculars when the sound of those screaming props struck terror through his whole being. For an infinitesimal part of a second he was motionless. Then his eyes swept the sky above him.

Three of those fast single-place fighters, with the conical steel shields before the pilot, were converging on him from three sides! They were only three hundred yards above him and traveling at terrific speed when he yanked the control column of the Lancer back into his stomach and hung it on its props. The three diving ships were easing out of their dive to come up underneath him and ram as he poured juice into the engines of the Lancer and took it upstairs.

"O. K., Hako," Bill said between his teeth. "That pins it on you."

He leveled off a thousand feet above the three rammers and waited as they came out of their dives and came around to form a V. His finger nursed the electric trip of his 37mm. cannon as they stuck their noses up in formation.

"I've got to keep 'em at a distance and get 'em with my cannon if I'm going to get 'em," he said aloud. He opened the throttles of the Lancer for a moment and came up and back in a flashing Immelmann turn.

The three little single-seaters were coming at him head-on now. And when they were five hundred yards away they opened fire with nine machine guns, three to a plane. Bill saw that one gun was synchronized through the propeller and the other two were fixed on the little fighter's wings. The concentrated fire of nine guns was terrific. Bill skidded the Lancer out of range and eased back on the stick as the three ships passed underneath him. He knew

he was going too fast for them to nose upward and tear off his tail controls.

But this time he didn't wait for them to come back to the attack. Instead, he yanked the stick back and came up and over on his back just after they passed below him. At the top of his loop he neutralized his controls for a moment, then he eased the nose down and dived in an inverted position.

He got the leader of the three ships under his hair sights for an instant before he could skid or slip out of range. Bill's finger came down on the trip of his 37mm. cannon. The rapid-firer threw five high-explosive shells within the space of a second, but Bill's speed was too great for accurate shooting. Between the time he had the ship under his sights and when he tripped his trigger the little fighter had passed out of his range of fire.

Bill cursed and jammed the stick of the Lancer farther forward and completed his loop. The single-seaters were coming around on one wing tip as he leveled off and took the Lancer upstairs again to gain the advantage of altitude.

He knew that he could run away from the rammers with a minimum of effort, but he couldn't see any advantage in running away. He knew that he could wait for his men and have an advantage in numbers, but he also knew that it was a miracle that those self-same rammers hadn't got the carrier-transport that morning. With its superior speed and maneuverability, the Silver Lancer had more than an even chance against one of them. Against three, Bill knew the odds were with the rammers. But, he reasoned, if he didn't get them now they'd be after him again. Some one was determined that he shouldn't get to Shorty and he was convinced now that it was Hako and the men associated with him.

They had probably killed Shorty and his partner and had managed to have the records falsified. Sheer rage almost consumed Bill's reason as he became convinced that such was the case. The only thread on which he could hang any hope in those few seconds while he thought the thing out was the message he had received from Shorty. If Hako hadn't killed Shorty immediately—and he had had an opportunity to send that note—he might still be alive.

That thought gave Bill new life. If he was alive he was probably some place around the Little Nugget Mine. He spiraled the Lancer upward in tight circles while he threw his radio key and made contact with Red Gleason again.

"We just got away, Bill," Red told him. "What is it?"

"I have three of those rammers after me again," Bill panted into the microphone. "I'm right in the region of Shorty's mine. They appeared from some place right after I left the field



there. They're determined to get me. And I'm going to get them."

"Can you hold out until we get there?" Red asked anxiously.

"I'll hold out," Bill said. "But I want to shoot them down. I want to get back to Shorty's mine again. I'm convinced he's still being held right there. We've got to go in and get him and we're going to have a fight on our hands."

"You want us to come right through?" Red asked.

"Yes, and fast!" Bill snapped. "It's getting late in the afternoon. We've got to get in there before dark. If we don't, Shorty may not be alive tomorrow. Here's my position." Bill read from the chart beside him. "Pour in the juice! I'm signing off now. They're coming back at me fast. Hurry!"

He threw his key and rolled the Lancer completely over to avoid the screaming prop that had sneaked up under his tail. He whipped around and poured a burst of ten shells at the little ship as its nose pointed straight up until it nearly stalled, then fell away. But again his aim was bad and the little ship kicked its tail in the air and dived out of danger.

"Take it easy, Barnes!" Bill gritted to himself through set teeth. He gunned his engine and dived on the tail of the single-seater as it went away from him. His line of tracer smoke curled above the head of the pilot. He eased his stick forward a little and his bullets crashed into the tail assembly and climbed forward along the fuselage to the engine block. And on the way a half dozen of them crashed into the back of the pilot of the little rammer.

Bill saw him crash forward over the stick as the ship kept straight on toward the tangle of jungle below.

Suddenly the air seemed to be choked with slashing, roaring green planes. The two verdant-green teardrop biplanes Bill had been tailing before had come into the battle. Bill could see that the pilots of those two ships knew their job as combat pilots. They were like darting hawks as they converged their fire to get Bill in a position where one of the rammers could get in close to him to finish him off.

The four ships came speeding in like swifts after a hawk who has tried to rob their nests. They were everywhere, charging in from all angles, their guns screaming lead.

Bill's mind and muscles had to co-ordinate with the speed of light if he was to survive that terrific onslaught. He knew he must be able to distinguish between the teardrop fighters and the rammers in a split fraction of a second so that he could vary his tactics as they came at him at three hundred miles an hour.

A solid mass of cumulus clouds came racing to meet them—



He eased the throttles of the Lancer open another notch and took it through the air with the speed and fury of a flaming meteor. He saw his bullets tracing designs on the sides of the green ships, but his own terrific speed was too great for accurate shooting.

He felt the Lancer buck and shudder as it was riddled from wing tip to wing tip by a never-ceasing hail of lead. But he fought on while he gasped for breath, his face tense and terrible in its absolute concentration on the horrible job before him. He whipped the Lancer up and down, skidded and side-slipped, zoomed and dived to avoid the fire of the two green ships and the ramming tactics of the two single-seaters. He knew that one slight error in judgment would be his last. He tried desperately to keep the two little rammers always in front of him so that he could see their every movement. But the two green fighters were wearing him down as they tried to jockey him into a trap where a rammer could do its work.

Then the four ships got him inside the vortex of their fire as they began to circle him. Each time he tried to break out of the tightening circle there would be one of the rammers in his path ready to force him back. Bullets drummed all around him, but he seemed to bear a charmed life. His breath was coming in quick, agonized gasps now. His right hand was wrapped around the control column with a death grip. He was using all of his inherent genius as a flier, together with the great speed and maneuverability of the Lancer, to keep himself alive.

It did not seem possible that any one man could withstand the terrific concentration of gunfire that was turned upon him. But he was inspired by the

thing for which he was fighting. He knew that if their positions were reversed, Shorty Hussfurther would give his last gasp to help him. He had seen Shorty risk death a thousand times to aid him. He had no thought of peeling off and trying to run for it. It was his fight and he would fight it!

Then the four ships began to tighten their circle again, their guns spewing fire and lead and death. Bill waited until they almost had him between a cross fire. He held his own fire until one of the green ships became overconfident. Then his finger clamped down on his 37mm. gun. He fired a burst of five shots as he threw the throttle of the Lancer wide open and dived.

The green biplane became one great mass of black smoke and orange flame as he went away from it. The explosive shells he had poured into it took it apart as though it had been struck by lightning. The other three ships zoomed wildly up to avoid the shooting debris as it exploded.

The pilots of those other three ships must have thought a new man was at the controls of the Lancer as Bill eased it out of its dive and took it back upstairs. He knew that now was the time to strike if he was to finish the fight alive. He knew that the morale of the three remaining pilots would be at low ebb after his annihilation of the green fighter. For the moment they would become too careful, and a careful fighter in the air is a dead fighter.

His blue eyes were gleaming as he went back to the attack with a mad recklessness. He was growling low down in his stomach as he literally tore the second green fighter into ribbons with his powerful .50-caliber guns vomiting lead and death.



Then he flipped over and came up under one of the rammers as it tried to flee for its life. He raked its belly with a withering fire that brought the pilot up in his seat with his arms flailing the air. The next instant it yawed wildly and the pilot shot out of the cockpit into space, his body turning over and over as he fell.

Bill wiped the perspiration out of his eyes and shook his head like a punch-drunk fighter as he hung the Lancer on its props again. Then his blood froze as the last of the rammers loomed just above him. He could see the face of the pilot as he peered around the side of the conical shield in front of him and the face was white and desperate.

Bill Barnes never knew how he brought the nose of the Lancer over on its back and got it into that inverted dive that saved his life. He realized as he saw that white, desperate face behind its shield that the pilot was making one last effort to ram him and his muscles acted instinctively.

He could feel the landing wheels of the little single-seater thump on the single float in the Lancer's belly as it skimmed above him at terrific speed. He knew that he had been flicked by the finger of Eternity as he brought the Lancer around and rolled it right side up.

There was no mercy in Bill's heart as he stuck the nose of the Lancer down and pounced on the last rammer as it was going away. He knew that the pilot was as merciless a murderer as he had ever encountered. He counted life so cheaply that he would give his own to sacrifice an enemy. Bill knew that he was not fit to live.

He waited until he was only two hundred yards away from the single-seater when he tripped his triggers. His bullets took the little ship apart with a finality that was appalling, as he added a half dozen shells from his cannon to the carnage.

The last of the rammers plunged into the high, flying-buttressed trees of the jungle and lay quiet after one terrific crash. Brilliantly colored birds winged out of the forest crying their protests at the disturbance. Only they were there to mourn its death.

Bill Barnes was groggy as he quickly scanned the air all about him and put his automatic pilot to work. A glance at his altimeter told him he had five thousand feet under him and that was enough. He locked the controls and sat back in his bucket seat without looking at his compass. He didn't know where he was heading and for the moment he didn't care. He felt as though he had been beaten with clubs for hours on end.

He was exhausted to the point of collapse.

## IX—ARRIVAL

TWO MINUTES LATER the light on his radio panel gleamed red and he sat up and threw the switch. He noticed that his hand was trembling as he did it.

"Calling B. B. . . . Calling B. B.," came Sandy's voice.

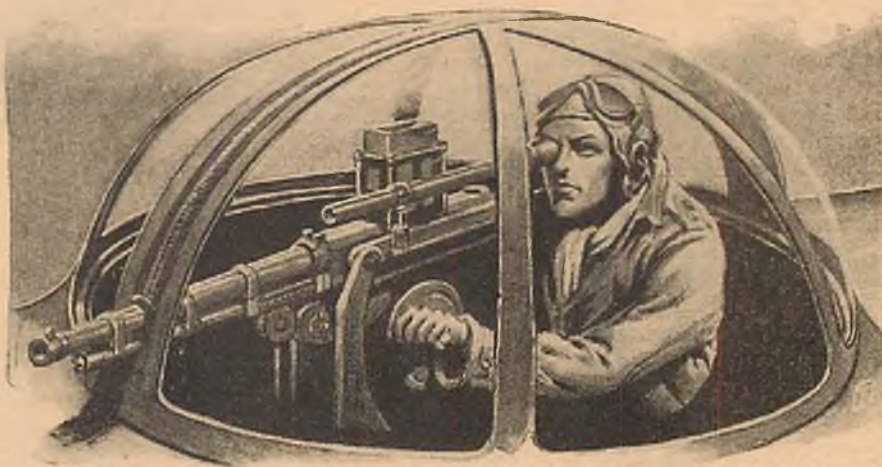
"B. B. answering. . . . B. B. answering, kid," he said, and his voice was tired.

"Where are you, Bill?" Sandy asked. "We've reached the position you gave us and can't locate you."

"I don't know where I am, kid," Bill

minute you get down get back into your emergency lockers and get your sub-machine guns. I don't know what we are going to run into. They may let us come in without any trouble. On the other hand they'll have us trapped there if they want to trap us. It is my guess that Hako, the man I talked to down there, sent those ships out to pot me. He probably knows by now that they didn't succeed and he may be waiting for us with a flock of machine guns."

"What we have to do is take the place apart and see if Shorty is there?" Red asked.



Then the breech of the rapid-firer burned hot against his cheek—

said wearily. "I've been fighting all over the province of Benguet. I'll be back to that position I gave you in a few minutes."

"O. K., Bill. Red says we'll circle here until you come."

A few minutes later he picked up the three circling ships and spoke to Red over the radiophone again. He could see the landing field and the corrugated iron buildings at the Little Nugget Mine now.

"We've got to make a landing on that field down there," he said to his men.

"Are you all right, Bill?" Cy Hawkins asked anxiously.

"I'm tired," Bill said. "Three of those single-seater rammers and two teardrop fighters jumped me. We had quite a time."

"Where are they, Bill?" Red asked.

"I imagine they're all in hell," Bill said. "I shot 'em down. But listen! We've got to get in there and see if we can find Shorty. I'll go in first with the Lancer and give you an idea of how much of a run you'll have. The field is short. You'll have to go easy with the carrier, Red."

"You think they're holding Shorty down there?" Bev Bates asked.

"They are holding him or they know where he is being held," Bill said. "We may run into trouble the minute we land. Have your guns ready and the

"That's the idea," Bill said. "I'm going down."

"Say, Bill," Cy Hawkins cut in. "You say they may greet us on the ground with machine guns. Don't you think it a good idea if one of us stays in the air to strafe them from above? I used to be pretty good at that. If they have several machine-gun nests I think I can strafe 'em out of 'em."

"Right!" Bill said. "You stay in the air, Cy, and clean 'em out."

Bill dropped the landing gear of the Lancer and kissed the uneven surface of the little flying field at eighty miles an hour. Again he was afraid for an instant that he was not going to make it. But by skillful maneuvering he brought the big ship to a halt only a few feet from the line of jungle.

Red Gleason brought the carrier in as though he had been landing it on postage stamps all his life. Bev Bates sped in beside them and Bill ordered them to follow him across the field to a point that was nearest the mine buildings before they left their ships.

"Sandy," Bill said, "I want you to stay in the one-pounder turret of the carrier. That is the best lookout station we have. You stick there beside that gun and be ready to use it every second. Martin, you stay aboard the carrier with Sandy and be ready to use your machine guns. Keep a lookout on every side. You'll have to protect



all three ships. The rest of you get your submachine guns out of your lockers and we'll take this mine apart."

Overhead, Cy Hawkins was skimming the treetops in his Snorter. He was banking low around the corrugated iron buildings, using the tactics of an attack plane.

Suddenly, as Bill and his men made ready to leave their ships, the afternoon was made hideous by the chatter of machine guns. It seemed for that first terrible moment that the world was alive with them. Their bullets thudded into the metal surfaces of the three planes and into the cabins and cockpits.

Bill, still sitting in the forward cockpit of the Lancer, screamed Cy's name into his microphone. "Let 'em have it, Cy!" he shouted. "There are two guns in the hangar and one each in those buildings along the edge of the field. Let 'em have a couple of bombs, then dive on 'em with your machine guns!"

The next moment Bill clamped down on the gun trips attached to the control column of the Lancer. The two .50-caliber Brownings and the 37mm. cannon roared as one. Machine-gun bullets and high-explosive shells drove into the corrugated iron building directly in front of the Lancer. But Bill knew his guns were shooting too high to be effective. He hoped that his fire might help to silence the machine-gun nests until Cy could lay one of his twenty-five-pound bombs on the roof.

Then the quiet mountains that surrounded the Little Nugget Mine threw back the echo of chattering machine guns, exploding bombs, and the fierce cries of men in battle.

Cy Hawkins took his Snorter over the hangar along the edge of the field. Machine-gun bullets whipped all about him as he nosed down only twenty feet above the building. His speed was terrific as he pulled his bomb release lever and sent a twenty-five-pound bomb into the bowels of the building. Then he came up and over in a dazzling loop and dived on the building with his machine guns yammering. If there were any men alive inside the building after the explosion of the bomb they were silent now.

"All right!" Bill shouted. "I'll lay a barrage of shells in those buildings ahead while the rest of you go in and silence those machine guns."

McCoy, Neely, Miles, Red Gleason and Mort Henderson swarmed out of the carrier with submachine guns under their arms. Bev Bates was out of the forward cockpit of his Snorter and in front of them as they began their advance.

Again Cy Hawkins swooped down like an avenging attack ship and laid two of his deadly eggs. The walls of the building he hit with his bombs seemed to puff outward for a moment

like a blow fish. Then a muffled detonation sounded inside, followed by a louder one that scattered fire and debris for fifty yards.

Cy came back with his machine guns yammering as the enemy camp, caught in a cross fire, became bedlam. Machine guns raked them from above and from an arc directly in front of them. Men scampered out of the buildings along the edge of the field and dropped on their bellies to squirm away.

Bev Bates and Red Gleason had spread the gunners from the carrier out in a semicircle to advance. They crawled along on their hands and knees through the grass as machine-gun bullets whipped over their heads. Their faces were grimy with dirt and sweat, their clothes covered with dust and mud as they went grimly forward.

The roar of Sandy's one-pounder from the turret of the carrier added speed to the retreat of the Filipinos. They were totally disorganized as they fled back toward the last of the corrugated iron buildings and the shaft of the mine.

Bill Barnes dropped out of the Lancer with a heavy automatic in his right hand as he saw the Filipinos fleeing toward the jungle. He saw that they were taking a path that would take them toward the little group of bungalows he had spotted from the air. He knew that some place in one of those half dozen buildings he would find Shorty. He caught up to Red and Bev Bates and told them to be sure there were no machine guns left in any of the buildings.

"Clean 'em all out," he said. "If you don't they may catch us on our way back to our ships. Then work over to the little group of bungalows you'll find about a hundred yards down that path. That's where I'm going. Follow me after you've mopped up."

## X—A MUSICAL SUCCESS

SHORTY HASSFURTHER looked up into the small, dangerous eyes of Kwa Hako and knew that he was staring death in the face. His arms were tied to the bed in which he was lying. He was entirely defenseless. He looked at the automatic in Hako's hand and he laughed.

"I win my bet, eh, Hako?" he said. For a moment the muscles in Hako's face worked convulsively. Then he got control of himself. He even managed to draw his lips back over his large teeth in a semblance of a smile.

"It is very, very good for you that I do not have more time," Hako said. "If I had more time I would make you very, very sorry you ever came to the Philippines."

"A little torture, eh?" Shorty said and he laughed again. He knew that at the moment his life hung by a thread. He was trying to stall for time until

Bill or some of his men got to him. He had heard the Lancer and the carrier and Bev Bates' Snorter roar down on the little flying field and he had heard the battle that followed. He knew the sound when Cy Hawkins' bombs detonated on the hangar and he knew the sound of the rapid-firer in the carrier. He knew that Bill would get through to him. But he knew now that he might be too late.

"So you didn't think Barnes could make it, eh, Hako?" he said. "I wouldn't have bet my life if I hadn't thought so."

"It was a foolish bet for me to make," Hako said. "It did not make sense. I should have forced you to take the air against Bill Barnes. You are the only man who could have stopped him. Instead I act like one of you Occidentals. I am soft. I do not deserve to win."

"I couldn't have stopped him," Shorty said. "Nothing can stop him. When he makes up his mind to go some place he goes there. You Orientals may be stoics, but stoicism won't stop determination."

"Perhaps Barnes' determination will be his ruin," Hako said. "I am not through yet. Barnes has done exactly as I wished him to do. He may be supreme in the air, but he has walked into a trap on the ground. I have a hundred men out in the jungle with machine guns. When Barnes and his men are entirely away from their planes I will cut them off so they cannot return. They can take their choice of being mowed down by machine-gun fire or perishing in the jungle."

"How do you expect to get away with it, Hako?" Shorty asked him. "The government will come down on you. You can't fight them."

Shorty knew that the things he was saying were silly, ridiculous under the circumstances. But he knew that Hako's weakness was in his desire to boast. If he could only keep him talking.

"I will take care of that when I come to it," Hako said. "I have come to you now to hear your decision. I am not through yet. Barnes and his men will be dead before morning. You can still save your own life by coming in with me. We will have Barnes' Silver Lancer, two of his Snorters and his carrier-transport when we start building our air force. You will have something familiar to work with."

"What about my mine, Hako?" Shorty asked. He could tell that the gunfire was coming closer each moment. And he knew that each second was taking him closer to eternity. "You know I put a lot of money and a lot of hard work into the development of this mine. What are you going to do about paying me if I come in with you?"



"We do not have time to talk about that now," Hako said, and for the first time Shorty caught a note of nervousness in his voice. "We can settle those things again." He lifted the gun he held in his hand and said, "I wait your answer." He laid the cold nose of the gun against Shorty's temple. "It would seem a shame to spill your brains out on a pillow. Quick!"

Suddenly, the awful strained stillness of the room was broken by a noise that was as faint as the flutter of a bird's wing. Hako's beady eyes darted toward the door and back again. His finger clamped down on the trigger of his gun as Shorty bobbed his head forward and the gun roared.

Almost simultaneously the automatic in Bill Barnes' hand barked, followed by two more explosions. Bill stood half crouched in the doorway with the smoking automatic in his hand, as the gun slipped out of Hako's hand and he sprawled grotesquely on the floor.

"Baby! Was that close?" Shorty Hassfurther said, wiping the powder from one of his eyes after Bill untied him. "Hello, fella. I knew you'd make it!"

"You're O. K., Shorty?" Bill asked. "Can you walk?"

"I can try if you'll cut these damned ropes," Shorty said. "I'll probably stagger a little, but I think I can make it."

"Where are Hako's partners?" Bill asked, as he cut the ropes and helped Shorty from the bed.

"One of them, Kano Yeito, his war lord, is directing the battle against you," Shorty said. "They have a hundred men with machine guns to cut you off when you try to get back to your planes, Bill."

"We'll come to that when we come to it," Bill said grimly. He watched Shorty sidle off to the right as he tried to walk.

"I'll get my legs under me in a minute," he said. "Do you have another gun?"

"Take Hako's," Bill said. "He won't need it any more. If they are going to try to cut us off we'd better get started. We'll get you out of here and then the government can take care of the clean-up work. That's their job. They took your mine away from you instead of buying it?"

"And murdered my partner," Shorty said. "Let's go!"

IT WAS young Sandy Sanders who first saw those heads hobbling up and dropping out of view again off to the left of the landing field in the jungle. He called Martin, the carrier's bomber, and pointed them out to him.

"They're setting up an ambush there to get Bill and the rest of the men when

they come back," Martin said. "If we open up on them they'll tear our ships apart. We'd better lay low and see what they are going to do. We can stop a few of them if they rush us, but not all of them."

"I could drop a few one-inch shells in there," Sandy said.

"Leave 'em alone," Martin advised. "We'll wait and see what they are going to do. If we don't stir them up they may leave us alone. We don't want our ships burned. If that happens we'll never get out of here."

"Maybe we could spring some kind of a surprise on them and scare them out of there just as Bill comes back," Sandy said. "If we don't they'll cut him down. I've seen them moving a half dozen machine guns around in there. They have 'em placed right along the edge of the jungle."

"Leave 'em alone," Martin said sharply.

Sandy sat in the one-pounder turret peering into the gathering dusk as the rifle and machine-gun fire from up near the mine subsided and died away entirely. He knew why those guns were placed where they were and he knew something had to be done about it before Bill and the rest of the men came back. They would be mowed down like grain when they tried to cross that space from the edge of the field to the planes. He went down to the forward machine-gun pit in the nose of the carrier and spoke to Martin again.

"Listen, Martin," he said, and his eyes were gleaming. "I got an idea. It may work and it may not. But it's worth trying. At least, it will throw those murderers over there off their stride. They won't know what to think."

"What's the idea?" Martin asked. He regarded Sandy suspiciously. He was familiar with Sandy's ideas and knew that half the time they were more than a little goofy.

Martin listened while Sandy unfolded his plan, and Sandy could tell by his expression that he didn't think much of the idea.

"We'll give it a try, anyway," Sandy said. "It might work."

"It might," Martin said. "Get your stuff ready."

Sandy went down to the main deck of the carrier and opened the emergency locker of the Eagle. After rummaging around in the half dark for a moment he pulled out the things he was seeking. He took them up to the one-pounder turret and slid the hatch back.

"O. K., Martin," he shouted. "I'm ready. Everything is set. I'll start when we hear Bill coming."

Both he and Martin could see the tall grass moving at the end of the field,

and they estimated that there were a hundred men lying there. They knew what a half dozen machine guns could do to men marching across an open field. They were both trembling as they saw Bill and Shorty and the rest of Bill's squadron coming toward the flying field and certain death.

"Let her ride, Martin!" Sandy shouted, as Bill stepped onto the field. He began to work his mouth, his hands and his feet at one and the same time.

Bill and his men stopped short in utter amazement as they heard what sounded like a small orchestra playing "Anchors Aweigh." The strains of the famous marching song of the navy floated across the field in the clear air and sounded like the work of a half dozen men.

They stood with their mouths open gazing at the bomber until one full chorus of the song had been played. As Bill started to speak, the *rat-tat-tat* of a machine gun sounded in the nose of the bomber, followed by the deeper roar of the one-pounder in the turret.

For an instant Bill didn't know what had happened as he ordered his men flat on their stomachs. He had warned them to be ready for an attack. But they weren't expecting it to arrive with music.

As they saw the shells of the rapid-firer and the machine-gun bullets cutting up the dust at the edge of the field and saw a mass of shrieking, screaming Filipinos rise up in the grass and run for their lives they knew what was happening.

"Get across to the carrier, fast!" Bill roared. He threw Shorty across his shoulders and started to run as the music of "Anchors Aweigh" came to his ears again.

"We've got to get out of here," Bill said to Bev Bates and Red Gleason as they put Shorty on a settee in the main cabin of the carrier. "Get your engines tuned. Order Cy to stay in the air, Red."

Then he went up to the one-pounder turret abaft the bridge. Sandy's face was red and his eyes looked as though they were going to pop out of his head as he continued to blow on his harmonica, strum his guitar, and slam the xylophone with the sticks fastened to his feet.

"You're O. K., Bill?" Sandy gasped as Bill came up the steps.

"Yes, kid," Bill said. "We're all O. K.—even Shorty. Your one-man band saved us at the last minute. That was the sweetest music I ever heard, kid. It was—"

"Wait a minute, Bill," Sandy gasped. "Wait a minute! Wait till you hear me play 'Flyin' Down to Rio!'"



# MERRILL, COMMERCIAL PILOT

(Continued from page 14)

Floyd Bennett Field. One thousand feet short of the thirty-five-hundred-foot runway she lifted. She rose heavily under her weight of gas. Then she was clear, climbing into the pale dawn.

Turning east along the Great Circle from Newfoundland, the *Lady Peace* ran into dirty weather. They held to altitudes between five thousand and ten thousand feet where prevailing winds are best for the eastern flight. Head winds and cross winds buffeted the ship. Their course was a series of upstairs, downstairs. Once the ship pitched, nosed and dived in the rough weather over the Atlantic. It was a close call. But Merrill put her through to Ireland.

Eighteen hours after their take-off they ran out of gas, making a forced landing in the Welsh cow pasture of one Farmer Evans. In spite of the forced landing, they broke the New York-Great Britain record. The average speed of the trip was one hundred and eighty-eight miles per hour, with top speeds of two hundred and fifty at times.

They were not immediately well received. Some cows let out a bawl and streaked for the woods. Two snorting, red-eyed bulls charged out to annihilate the interlopers. Farmer Evans thought them a couple of highfaluting idiots, from a near-by resort, trying to land atop his cows. When Richmond phoned a near-by airport, the attendant thought it a hoax and hung up.

Merrill was in a dour mood. A forced landing rankled his commercial pilot's instincts. Not making their goal was worse. Amid circus ballyhoo, Merrill took the ship off from ground smaller ships would not even attempt to land on and flew on to London.

A special runway, flanked by flares, was constructed on the beach at Southport, near Liverpool for their return flight. In the traditional stunt manner, the take-off awaited weather. People asked when the hop would be made.

Others grinned and said, "Six hours—aviation time!" That might be minutes or weeks.

Merrill has an affinity for thirteens. Early in the morning of September 13th the Southport beach went ablaze with flares. The *Lady Peace* got an eleven-minute warm-up. She carried one thousand six gallons of gas, forty gallons of oil, six chicken sandwiches, a few tomatoes and a bottle of coffee.

"Going to make it?" called a hard-boiled news sleuth.

"We are going to do our best!" Merrill replied.

Flashing between lines of flares, the *Lady Peace* ran down the hard sands, circled once in farewell, and hummed toward Ireland and Cape Race, Newfoundland. From the west coast of

Ireland the *Lady Peace* was pitched and tossed and bucked through dark and murk and gales. It was blind flying all the way. Terse radio reports told little of that wild flight with storms beating and tearing at the small craft, driving it violently off course. There were eleven grueling hours with the ship bucking and trembling, sometimes snapping the men out of their seats.

Sleet storms pounded the ship, rattled on the metal fuselage like grape shot, loaded the wings heavily with ice. Five hundred miles off Newfoundland the motor coughed, sputtered and died. The ship was heavy with ice. The storm twirled it like a leaf.

There was little time for discussion. Beneath them ugly gray seas piled up mountainous waves. Only one small wing tank of gasoline remained. Merrill switched onto this last bit of gas. One hundred feet above the frothing, gnashing seas the engine coughed and throbbed steadily. After a fifteen-hundred-foot dive, with the ship heavy with ice and the storm shaking it like a kite, Merrill pulled out of the dive and pulled toward land.

They barely made land when they ran out of gas. In a desolate, frozen bog near Musgrave Harbor, Newfoundland, Merrill landed in the middle of a gale. There was so little damage to the ship that with fresh batteries and gas brought north by the War ace, Eddie Rickenbacker, the *Lady Peace* was moved to the beach and took off under her own power.

Out from Harbor Grace a violent northeast gale drove the ship down for weather. They waited, then hopped for New York—one thousand one hundred and fifty miles in six hours and thirty-two minutes.

Their arrival at Floyd Bennett was epic. As a final gesture, the *Lady Peace* rolled off the wet concrete runway into the soft rain-soaked red mud. Tired and with frayed nerves, the two maneuvered the ship back on the runway and came up the apron, after nineteen days of grueling tension and some of the dirtiest weather ever flown.

But chorus girls in full costume had arrived to greet Broadway's Harry Richman. The two men counted the girls, looked at each other and grinned. There were thirteen girls!

The Richman hop got further sensational publicity through its fact dramatization on Dick Humber's radio program. They had a hard time getting Merrill primed to give his voice a dramatic inflection that night. When he finished the broadcast he was streaming perspiration.

"Boy, you don't have to do that dra-

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The "Daily Express" lands at Croydon Airport, London.

matic stuff in a plane!" he breathed thankfully.

Merrill got the Eastern Airlines medal for distinguished service outside line of duty for the Richman hop. His technical report on the flight was considered the most specific and useful of any report on the north-Atlantic crossing to that date.

Immediately returning to commercial service, Merrill took his place as chief pilot on Eastern Airlines Miami-New York run. On December 20, 1936, he took his fourteen-passenger Douglas monoplane off from Miami at noon. The ship stopped at Charleston and took off for Newark, due at eight fifty-five.

Suddenly, the ship was driving through black weather. Merrill thought he would put in at Washington, but heavy fog and rain prevented. The Newark port was blanketed, but Boston was clear. He headed for Boston.

Over Newark the storms suddenly crushed down; ceiling zero, visibility zero. Merrill was in a fix. Ice had formed on the ship's radio antenna, destroying the radio beam. The ship was weighted down with ice; snow static had interrupted radio service; the radio compass was useless.

Merrill had ten passengers and a copilot to think of. He knew he was off course, but he didn't know how far. Outside, the storm was thick and violent. He couldn't find a hole in it and he couldn't come down. A one-hundred-mile wind picked that moment to crash the ship violently into the driving, gobbling blackness of a sleet storm.

Merrill held the ship to a course the best he could. He thought they were over coastal lowlands. He cut through impenetrable fog and storms at two hundred and fifty miles per hour, trying to find a hole for direction or landing. He noted his altimeter showed fifteen hundred feet and cut the gun to one hundred and eighty-five.

There was a rip and the ship shuddered like a washboard. Merrill knew what it was—trees. He wondered how trees got up to fifteen hundred feet.

But in that instant those trees gave him a fair idea of where they were—the Poconos, the graveyard of aircraft!

Crashing into a mountain near Matamoras, Pennsylvania, with both seven-hundred-and-fifty-horse-power motors roaring against the storm, the heavy, all-metal plane sheered tree tops for one thousand feet. The first impact tore the two rear seats from their moorings.

Merrill acted, with calm, in split seconds. He snapped off the master switch and pancaked the ship. It was luck that it landed in a tree. But it was precision flying that crashed it easy, a perfect pancake, and kept passengers safe afterward. Only Merrill was hurt. He lost ten teeth, got a fractured jaw, arm and foot, when a tree broke through the pilots' compartment.

His co-pilot, John Battle, was shaken, but unhurt. Passengers were in the same condition. Before they realized fully what had happened, the half-conscious Merrill, hobbling on one foot, spitting teeth and blood, was helping them out of the rear emergency door. Immediately he commandeered all matches and moved the group a distance from the ship. There was still danger of explosion.

The big ship looked like Merrill felt. The wings were ripped, the nose bent and twisted, the props bent and broken. But the passengers were safe. Choking with blood and pain and the forty-below zero of that Heater Hill freezing night, Merrill took command. He ordered camp made and sent Battle and a passenger for help. They were seven miles by foot from the nearest telephone.

Five hours later a pistol shot announced the rescue party. The passengers huddled around the fire cheered—then cheered Merrill. During the hours of exposure to that raging black hell they felt something of what he had gone through. Only an expert landing had saved them.

At the hospital, Merrill's first query was for his passengers, his second for his ship. After more than twelve thousand hours' flying and over two million miles of spotless record he had crashed.

"The passengers and company clear you of blame," a friend told him. "You'll forget it on your vacation."

Merrill croaked through bandages.

"No vacation for me! I'm going back on the job!"

Still conscious of his new store teeth, and with his foot in a cast, he went back on the Miami run three weeks later. He was cleared of all but a mild criticism from the air commerce bureau's investigation, which reported Merrill in error in letting his plane down without establishing location. With radio out of control, it suggested no means of locating, however.

A crash has ruined many commercial pilots. The extremely fine handling of his ship might be said to have made Merrill. Several of the crash passengers requested to fly with him. Requests for passage on his flights flooded in.

He had already established one Miami-Newark record. On April 13th—the number again!—he smashed the intermittent record for a commercial plane by making the one-thousand-one-hundred-and-ninety-two-mile hop (via Washington) at two hundred and twenty-two miles per hour in five hours and twenty-six minutes. His ship was a Douglas DC-3, twenty-one-passenger.

The same month he found financial backing from Ben Smith for the coronation flight. He could have had the flight sponsored with no danger of financial loss. He could have gone after records and prize money. He refused. He wanted to make a straight commercial flight on a business basis.

The ship selected was one of the private fleet of Harold Vanderbilt, a Lockheed Electra, powered by two Pratt & Whitney 550 Wasps. The ten-passenger seats were ripped out and tanks holding one thousand fifty gallons of fuel installed. The reconditioning cost twenty thousand dollars above the purchase price of forty-six thousand dollars.

The ship was christened the *Daily Express*, in honor of Lord Beaverbrook, a close friend of Dick Merrill's, owning the famous London daily by that name. There was no money or advertising involved. Beaverbrook was as surprised to hear about it as any one else.

The ship weighed sixteen thousand, three hundred and fifty pounds fully loaded. It attained a cruising speed of one hundred and sixty miles per hour at fifty-five per cent power and a top speed of two hundred and ten at full throttle. The ship's maximum ceiling was twenty-eight thousand feet with both engines. With a two thirds pay load it could reach seven thousand feet and sustain flight on one engine. The efficiency of its constant speed propellers and low landing speed, due to special wing flaps, gave it utmost safety.

Dick Merrill told Air Trails, "Our chief interest was to get to England and back with the photos of the coronation we contracted to fly. We were on a business errand with no thought of anything but flying safely and on schedule.

"There has been some misunderstanding—



ing that Hearst sponsored the flight. There was no more sponsorship than there would be in hiring a messenger. International News Photos counted on our return on time. In case we ran into violent weather pulling our gas down and causing a forced landing along the last lap, they had planes stationed at Sydney, Nova Scotia, Bangor, Maine and East Boston. If we were forced down, these ships would make a relay dash with the photos.

"Our plans were no more elaborate than the routine work of everyday, long-distance, over-water flights. Al Lodwick, of Curtiss Wright, supervised all technical arrangements and preparations. There isn't a more practical-minded man in aviation. Al Lodwick was not asked to take charge of these vital arrangements because of friendship alone. He is our foremost and least publicized long-distance flight expert, having helped with the arrangements for Lindbergh, Byrd, Frank Hawks, Howard Hughes, Jimmy Doolittle, Al Williams and others who have made aviation history.

"To give you some idea of part of Al's job he made arrangements with eleven steamship lines to listen in for us every hour. In event of trouble their ships at sea were to establish triangulations to locate us. Before our departure our ship was thoroughly overhauled. The Sperry gyropilot was reassembled and tested. All instruments were completely checked. The old tires were taken off and new tires put on after thorough checking that there were no bruises nor flaws.

"On our arrival in England the tires were carefully checked again by experts. So were our props and motors. Our gas was filtered at both ends and our radio and radio compass carefully checked.

"Arrangements had to be made for all these things and the right men contacted to do the jobs. When our batteries were checked in England they were found to be fully charged. We had not drawn on them at all.

"Mid-ocean radio communication has been found so eccentric that every precaution must be taken to assure constant contact. During our flight, Mackay, RCA communications, radio marine, and coast guard were all attempting to make hourly contact with us. Sometimes one would pick us up and not the others. All Eastern Airlines airports were tuned in on our station hourly. We spoke with Atlanta, Miami, New Orleans and Newark. Sometimes weather blotted out two or three stations. In New York there was a central headquarters at the Waldorf Hotel. This clearing house had the job of keeping in constant touch with various radio stations, ships at sea, weather bureaus, England, etc., and clearing all important information through to us.

"Major Alexander P. de Seversky, veteran of the Russian imperial air force,

conditioned the plane. His crack mechanic, Jim Springfield, did such a good job of tuning our motors that we made the return trip without any repairing or adjusting. To me, that was one of the most important points of the flight.

"Our original plans were to take off from England, regardless of weather, the night of the coronation. We stayed an extra day, allowed within prearranged schedule, to arrange to fly movie prints also. It was highly desirable to fly the Newfoundland-New York stretch in daylight, so instead of taking off the morning after the coronation, we waited until night.

"We had little special equipment. Today's commercial planes are capable of thirty-five-hundred-mile flights. In the commercial service we are constantly flying areas of weather not very different from those over the north Atlantic. We carried two-way radio, radio-beam system, radio compass, gyro compass, and a Sperry gyropilot. The latter is of particular help in long-distance flights, as it relieves the pilots from manual handling of the controls at cruising altitudes and gives needed time for navigation, weather observation, flight logs, radio work, etc.

"What we missed mostly was detailed radio and weather information. The lack would be overcome by a few intermediate stations.



Beechcraft used by International Photos.

"I believe the Great Circle Route ready for commercial flying. Immediately after a national tour and making a moving picture for Monogram titled 'Atlantic Flight,' I anticipate making a New York-Rome flight. If possible, I will fly over for the Lindbergh commemoration races running over the course from Istres, near Marseilles, to Damascus and then to Paris. The races are scheduled for August 20th.

"Jack Lambie will accompany me as co-pilot again. I would like to take this opportunity to express my regard for him as a friend and pilot. A good half of the credit for the success of the coronation flight should go to Jack.

"Whatever those who have not made the hop may think, I believe, after two round trips to England, that the planes and equipment of to-day are able to meet problems effectively. With good pilots and proper cooperation there is no logical reason why transatlantic flying should not be safe, efficient and scheduled."

That is the quiet summary of the pilot of the *Daily Express*.

At two thirty-five on the morning of May 9th, the *Daily Express* was wheeled onto the special runway of Floyd Bennett Field. Built to assure a perfect take-off, the runway was the most elaborate of the plans. The engines were tested and cut.

With Dick Merrill was his commercial co-pilot, Jack Lambie. Lambie, a youngster of twenty-seven, was born in the Philippines, has a natural aptitude for over-water flying. He knows storms and hurricanes by instinct. He has the same quiet regard for aviation as Dick Merrill. For three years before going with Eastern Airways he was with the army air corps.

A few minutes before take-off, the ship was warmed up. The two men climbed aboard and checked instruments. They carried one thousand two hundred and seventy gallons of fuel, sixty gallons of oil. They had no cigarettes and only a few sandwiches, biscuits and coffee.

They caught a twenty-mile tail wind to Newfoundland, helping during the period of heaviest load. At Newfoundland they came into thick weather and made the eastern flight blind at altitudes from four thousand to eight thousand feet. "The winds are stronger upstairs and blow almost constantly east," Merrill said. "The weather was just plain thick and not particularly squally. We held a speed close to one hundred and seventy, averaging one hundred and sixty-five miles per hour on the east crossing."

Over England they stopped at North Weald to check their gas gauge, about the accuracy of which Merrill was uncertain. They took off immediately for Croydon Airdrome, arriving at London twenty-one hours and two minutes from Floyd Bennett Field. It was the first time a New York-London flight had been completed.

The following day they moved their ship down to Liverpool, a better take-off point with a longer runway permitting them to carry fifty gallons more gas on the return trip. They got some sleep and checked their ship. They did not attend the coronation, although they saw the rehearsal. They had to stay on the job, ready at a moment's notice to get the news photos back to New York.

Merrill says calmly that the weather was a bit thick. It was so thick that ten planes took off from Croydon to rush the pictures to Liverpool. Three of them crashed and the rest turned back. The photos finally arrived by train. Without any fanfare, now loaded with one thousand three hundred and twenty-five gallons of fuel, the *Daily Express* took off and headed west—on May 13th!

The weather was filthy. For the first six hours they bucked bumpy twenty-five-mile head winds. They flew blind



at around two-thousand-foot altitude all the way back. At three thousand they took on ice in their carburetor. They were in a steady strata of clouds. Several times their radio faded and they were badly jolted for considerable periods.

On May 14th they returned to Floyd Bennett Field. They had stopped at Squantum, Massachusetts for twenty-two minutes, to check fuel. The return flight time was twenty-four hours, twenty-two minutes, twenty-five seconds. They had plenty of gas left, they had used only fifty per cent of available engine power, and their average speed for the west crossing was one hundred and forty-four miles per hour.

In five days they had traveled seven thousand miles, most of it through absolutely blind murk over watery deeps. Although within the specified schedule by many hours, they were over Merrill's private hopes. He had wanted to average both crossings at around twenty hours. He had compromised with good judgment and precision flying. The ship was not burned out nor strained. They had flown safely.

Merrill is the only man to have two

round trips to his credit. He is the only man with a five-day round trip. He brought the only plane back from Europe without accident. He made the first round trip to his take-off point. He made the first heavier-than-air commercial flight over the Atlantic and the first nonstop New York to London flight.

Marking a new era in transatlantic flying (heavier-than-air craft), he made his trip within prearranged scheduled time!

Greeted by the news that his flight was considered a good stunt, Merrill replied, "Actually it was just a scheduled flight."

"Yes, I think transatlantic flying is now practicable," he says. "I would be in favor of big ships with four engines, any two of which could maintain a full load. There should be a good safety margin of power—some of the weather can be nasty. Such ships should have a cruising speed of around one hundred and seventy-five miles per hour with a top of two hundred until we learn more about speed flying.

"A crew might consist of four or five men all capable of handling any other man's work. A first pilot, co-pilot, navi-

gator, engineer and radio man should handle a commercial transport safely.

"We need stronger land radio stations and much more complete weather information. Ships at sea might make upper air observations twice a day, sending up meteorological balloons and watching their actions. The reporting could be done to a central weather bureau. A patrol of coast-guard ships would aid safety, but, more necessary, supply detailed weather information.

"The north Atlantic is commercially conquered. But I want to impress two points: this coronation flight was not sponsored and it was not a stunt flight. Neither will any future transatlantic flight I make be. The day when flying the Atlantic was a stunt is past. The youngsters who are going to make tomorrow's aviation will not be stunters. They will be first-rate commercial pilots with a full realization of the responsibilities and cares of commercial aviation."

NOTE: This is the first complete, accurate, approved story of Merrill's achievements in his much debated transatlantic flights.—THE EDITOR.

## THE CASE FOR AIRSHIPS

(Continued from page 22)

Let the writer make it plain that he has no quarrel with heavier-than-air development. He has been employed by the aircraft industry in various capacities in recent years and he is no less enthusiastic over airplane progress than airship progress. We are examining facts, however, and it is on the record that for seven years now transatlantic plane operations have been predicted with the arrival of the robins every spring. Some experimental operations got under way last year. They will be continued on a larger scale this year. That passengers will be able to buy Atlantic air transportation before 1938, at the earliest, he must doubt. Even then there is no evidence that heavier-than-air craft will achieve a better transoceanic performance than the airship for many years to come. A case in point is found in the Pacific, where already flying boats are now carrying paying passengers from America to Asia.

In that pioneering operation weather still remains a serious handicap. Postponements of schedules, turnabouts midway on various legs of the route, have been rather frequent in operations of the clipper ships. The penalty of safety often entails delay of days. Delays have also been caused in airship operations by weather, but with the distinction principally of landings, and then such delay has been chiefly a matter of hours. Airship departures have, in general, been promptly on schedule. On three occasions last summer, when

airplanes scheduled to carry passengers for the *Hindenburg* from Newark to Lakehurst could not get clearance because of low ceilings, necessitating transportation of airship passengers by auto, the *Hindenburg* took off with the same dependability as though clear skies were overhead. Airships can and do operate through weather which prevents airplane operations.

Because the weight of its fuel is a minor consideration in an airship, her navigators can fly almost any course they elect, avoiding bad weather, seeking helpful tail winds, even at the cost of a thousand-mile detour. Because fuel is a paramount problem in heavier-than-air operations, in general the skipper of such craft must fly a direct course through whatever weather lies in their paths. The range of heavier-than-air craft is limited by fuel and time.

Let us concede that the famous clipper ships now flying between San Francisco and China are becoming obsolete equipment already, although only a year in commercial operation. It is admitted that faster, more efficient transoceanic craft are nearing perfection; yet I am content to make a specific comparison between to-day's flying boats and yesterday's airship, the nine-year-old *Graf Zeppelin*.

The clippers weigh something more than twenty-five tons, and given flyable weather they will complete their voyages across the Pacific in six days. Except between California and Hawaii those

boats do not fly at night. At Honolulu, Midway, Wake, Guam, and the Philippines passengers sleep at night in hotels along the slightly zigzag course. The clippers were designed to accommodate fourteen passengers. Because of the necessity of carrying a safe fuel reserve on the longest hop—that between Frisco and Honolulu, two thousand four hundred and ten statute miles—the clippers can carry only six passengers, their limited baggage and a few pounds of mail—in total, less than one ton. Fuel requirements for that longest hop limits cargo for the entire journey.

There is but one comparative airship operation across the Pacific—that made in 1929 by the then one-year-old *Graf Zeppelin*. She flew from Tokio to San Francisco with full crew and twenty passengers, plus a thousand pounds of other cargo, in less than three days. A typhoon, the same weather phenomenon which often has prevented the clippers from flying, actually aided the airship's speed, as Captain Eckener chased the storm's tail to take advantage of its suctional pull. Typhoons do not operate on schedule, however, and a fairer comparison of a Pacific operation by airship may be made on the basis of what the *Hindenburg's* sister ship, *LZ-130*, is known to be capable of. Following normally the Great Circle course between the same terminals bridged by the clippers, the new airship could operate with dependability on a four-day schedule, or one third more speedily



than the clippers, by reason of continuous flight, and carrying fifty passengers and several tons of cargo, against the one-ton capacity of a clipper.

The point I would emphasize, above the incomparable superior pay load of the airship over that of flying boat or airplane, is that to a passenger paying a high premium for speed in travel, *total elapsed time* is the thing that counts. Because of overnight stops enroute, the comparative doubled speed of the clipper ships over the airship in flight must be figured against zero speeds, while the clipper awaits its passengers at intermediate points. The average works out as a 60-mile-an-hour average speed for the clippers against the 80 to 90 mile-an-hour average of the airship flying continuously night and day. I do not think there can be any argument about the superior physical comforts and luxuries available in a big airship, as compared to the most luxurious airplane cabin.

One may say that flying boats or airplanes will soon be flying nonstop, too, or at least with brief stops for refueling. The answer is that the oldest air-transport company in business, Pan-American, has yet to fly at night on its South American routes, after a decade of operating experience. That they will do so some day is conceded, but that day has not yet arrived. On projected transatlantic heavier-than-air routes, overnight halts at Bermuda and the Azores are indicated for the Southern route, a stop at Newfoundland on the Great Circle Route to the North. Such halts cannot fail to slow total elapsed time for passengers, mail and express, between Europe and the American continent, apart from the aforementioned weather handicaps which interfere with heavier-than-air operations, much more frequently than in airship operations. The airships' advantages of continuous flight, resulting in highest average speed, plus far greater capacity for useful load, are arguments for continued airship development unanswerable by heavier-than-air critics.

Because a few great ocean greyhounds cross the Atlantic at an average of thirty knots fair-weather speed, the slower boats, even the tramp freighter and tanker have not been relegated to the junk yard. Conceding that twenty hours to Europe by air will some day become a reality for the airplane, that distant goal is translatable into a single advantage—speed. Airships should then be flying at faster speeds, too; but even should the airship remain static in the field of speed, it will still possess the other superiorities of vastly greater pay load and incomparable creature comforts, as compensation for its leisurely pace.

So much for the airship in its commercial aspects.

By virtue of Allied propaganda, Ameri-

cans were led to think of War Zeppelins as another instrument of "frightfulness." How the "women and children" phrase dominated press reports of airship bombing raids! Actually, fewer than one thousand Allied noncombatants were killed in all German air raids—which figures include lives lost in airplane as well as airship raids. The truth is that damage inflicted by airship bombs over England and France throughout the War was negligible. Yet airship raids gave the Germans a tremendous advantage during the first three years of the War, for a reason not directly apparent. In the necessity of the English and French to provide constant protection against airship raids, both nations were obliged to maintain vast home-defense forces: thousands of men, anti-aircraft guns, searchlights, airplanes. That diversion of men and material in total might well have given the Allies a preponderance of power on the Western Front sufficient to have brought victory, before the Russian collapse.

Measured in terms of military effectiveness, however indirect, that result alone would justify the German airship program; but actually bombardment work was approximately but ten per cent of the services rendered by the Zeppelins to the German cause. From airships observers kept constant supervision over enemy mine-laying activities. The procedure was to watch the mines being laid, mark their location, and then summon mine sweepers to remove the deadly explosive machines or detonate them with rifle fire. From subcloud cars, with the airship motors silenced or idling, Zeppelin officers kept continuous vigil over the British grand fleet. They captured enemy and neutral vessels laden with contraband. They sunk, or aided in sinking, enemy vessels. And last but not least, they were given credit by the British for having saved the German high-seas fleet after the first battle of Jutland. The weather on that historic occasion was so bad that airplanes could not operate; yet eleven airships took the air for scouting. Two of them discovered reinforcements speeding to aid the British grand fleet in such numbers that when their reports reached Admiral Scheer he decided to retire his fleet from battle.

A British opinion on the value of airships is contained in a secret report adopted by the admiralty on September 20, 1917. It well summarizes the services rendered by the Zeppelins, apart from their value in forcing England and France to maintain vast home-defense forces.

"It will be seen how justified is the confidence felt by the German navy in its airships when used in their proper sphere as the eyes of the fleet," states the secret report. "It is no small accomplishment for their Zeppelins to have saved the high-seas fleet at the Battle of

Jutland, to have saved their cruiser squadron on the Yarmouth raid, and to have been instrumental in sinking the *Nottingham* and the *Falmouth*. Had the position been reversed in the Jutland battle, and had we rigids to enable us to locate and annihilate the German high-seas fleet, can any one deny the far-reaching effect it would have had in ending the War? There are many other striking, though perhaps less important successes to the credit of Zeppelins at sea—even to the capture of the Norwegian bark, *Royal*."

It must be conceded that because of the great strides made in all types of heavier-than-air craft since the Armistice, not only in performance but in pilot skill as well, many of the duties performed by Zeppelins in the World War may to-day be better done by seaplanes and flying boats. Modern heavier-than-air craft have range equal to that of the War airships. With superior speed and advancing cargo capacity heavier-than-air craft are indicated as the logical bombardment machines. Yet it is possible that airships may still serve effectively as bombers. Not only may they still carry the greatest bomb load, but where the bombardment squadron serves notice of its impending arrival by the noise of its motors and propellers at whatever altitude they fly, it is possible for an airship to maneuver far to the windward of its objective and then free-balloon silently to the point where the bombs are to be loosed, thus forestalling advance warning.

But bombardment work is not a prime tactical use in modern airship strategy. It is, as the British admiralty stated, most effective as the eyes of the fleet. With its vast range and great fuel reserve it might well maneuver for a week or more in midocean to intercept an enemy fleet. However low the cloud ceiling, through the use of subcloud cars, the surface of the sea may be watched constantly. The *Macon* carried five airplanes in its hull. By means of a hook-on device the small, scouting craft were launched from the airship and returned to her in mid-air. They extended the scouting range of the airship by hundreds of miles in all directions, reporting observations by radio. These observations were reported to the fleet by the airship's more powerful radio.

With the use of helium the airship is no longer vulnerable, as it was when only hydrogen was available. Despite its great size and comparative slowness in speed it can maneuver efficiently in both the horizontal and vertical. Maintaining superior altitude, it is defensible, not only by means of machine guns, which leave no blind angles, but also by the airplanes it carries, which are fighters as well as scouts.

On the bridge of the *Akron*, as we sailed down the Atlantic coast one day, the late Admiral William Moffett sum-



marized to me his conception of the value of the airship to a fleet.

"Think of the airship as a light cruiser only, a scout," he said. "Early information of the strength and disposition of an enemy fleet is a first requirement for effective defense. Not until such information is available may an admiral perfect his battle plans. The airship has practically unlimited range, beyond which it has *twice the speed of the fastest naval surface craft*. A navy with scouts twice as fast as those of an opposing force has a tremendous advantage. But because an airship travels in the air instead of on the water, many old sea dogs will have none of it. Speed and communications, to give information first, are my idea of the value of the airship."

It may be added to Admiral Moffett's opinion that the loss of one or more light cruisers in battle would be a cheap price to pay for advance information of details of an attacking enemy force. In maneuvers the airship has performed

that service. Assuming that the airship would have been destroyed in performing that service, it is a comparatively cheap price to pay, in men and in money. Fewer men are required to man an airship than a light cruiser, by scores. The cost of a light cruiser is from three to five times that of an airship.

Loss of life in post-War airship disasters throughout the world is slightly more than three hundred. Except for the *Akron*, hydrogen has been the prime factor in that large loss of life. Had helium been available for the *Roma*, the *R-101*, the *Hindenburg*, human casualties would have been negligible.

Hydrogen may still be used in military airships, if demand for high ceiling and maximum load is required, but that is a War risk. For commercial operation it would appear that the hydrogen airship is doomed.

Is the helium airship worth further development? I have tried to give all the facts for and against that little-understood aircraft. The final decision is up

to *you*, as a voter and taxpayer, because only through public interest will Congress appropriate sufficient money to enable the United States navy to resume airship building. Private capital is skittish. We have already spent forty million dollars in American airships. Ten or twenty millions more should enable Americans to find a conclusive answer to the question. I think the promise is worth that risk.

Mind—I say only for transoceanic flight. The lighter-than-air yacht is a futile dream. The family blimp such as proposed by two companies a few years ago, is totally impractical because of gas costs, personnel requirements and hangar space.

For the private owner, the new light planes are ideal. They are safe, economical and practical. I want to see them become as common as automobiles.

But I also want to see giant airships cross the oceans of the world regularly, as they have for several years in commercial operation.

## GLIDING AND SOARING

(Continued from page 25)

The weather during the meet was far from kind to the soaring pilots. Although the sun shone each day, lack of wind and the absence of cumulus clouds robbed the contestants of lifting air currents and prevented them from making long flights. The outstanding flight was credited to Lew Barringer, who stayed up for fifty minutes and gained an altitude of five hundred feet above the take-off point, or two thousand feet above the valley. Pete Bonataux's performance of twenty minutes aloft was next best, but the remainder of the boys had to be content with five-minute slides to the valley.

While this meet was going on at Ellenville, the Airhoppers Gliding Club was busy at Wurtsboro Airport, not far away, flying their Prueffling and Franklin. Pilot Emil Lehecka also tried out the recently finished all-metal glider designed and built by Paul and Ernest Schweizer, of Peekskill, N. Y. This ship, the only one of its kind in the country, proved to have excellent flying characteristics. Since it is still in the experimental stage, no data as to cost and delivery date are yet available, though the price is believed to be in the range of the Utility field.

Dave Miller and Harold Kruger of the Glen Ellyn Glider Club, Glen Ellyn, Ill., are hard at work constructing a sailplane from German plans. Dave became a glider pilot when he was only fourteen, and with his partner Harold once attained an altitude of nine hundred feet in their Northrop primary.

A new world duration record has been established in Germany by Ernst Jachtman. Flying a Grunau Baby type glider

over the North Sea from the Island of Sylt, he remained aloft for forty hours and forty-five minutes.

From California, Jay Buxton, constructor of the two-place Transporter, writes that his ship has undergone considerable alterations and its performance is noticeably increased. The Transporter holds the world's altitude record for its type, as well as a duration record of over seven hours for a glider flown with a passenger.

The Metropolitan Soaring Association held a meeting on June 16th at the Hall of Aeronautical Science in Rockefeller Center, New York City. The guest of honor was Mr. Richard Depew, president of Fairchild Sales at Roosevelt Field. Mr. Depew, one of the organizers of the Cornell Flying Club back in 1909, was among the first glider pilots in this country. An interesting talk on learning to fly in those early days was given by Mr. Harold Brown, the oldest licensed pilot in America. Mr. Brown, now seventy years of age, regularly flies his Taylor Cub to all glider meets.

Glider acrobat Emil Lehecka recently test flew his German Rhönsperber sailplane at Flushing Airport, Flushing, N. Y. Towed to an altitude of twenty-three hundred feet by Ray Brown, in his Kinner-powered Bird biplane, Emil

turned in an excellent performance lasting twenty-five minutes, and this in spite of rain and poor visibility.

Ted Bellak, president of the Delaware Soaring Association, has returned from Germany, where he studied gliding methods and conditions, and is busy at present instructing members of the Association at Bellanca Field, New Castle, Del.

Back from Germany also is Kurt Siemon, now the proud owner of his airplane-tow and parachute-jumping licenses.

According to an article by Floyd Sweet, published in the magazine "Soaring," members of the University of Michigan Glider Club have chalked up eleven hundred eighty-four flights in their Franklin from September, 1936, to February, 1937—a record to be proud of.

Attention, unaffiliated fans! Al Berwick, founder of the Rockaway Gliding and Soaring Club at Inwood, Long Island, N. Y., is looking for prospective members. The club owns a Cessna primary, and has a Bowlus Albatross sailplane under construction.

Helmuth Kalwite of the Bronx, New York City, is organizing a club and extends membership invitations. Helmuth, whose gliding experience dates back to 1928, is purchasing a nacelled Zoegling from the Airhoppers.

A. L. Hurd, founder and manager of the Capitol Aviation Society, Albany, N. Y., reports that his club is open to new members. The boys have a Waco primary, and are contemplating the purchase of a Cub or Aeronca for power flying.

### IMPORTANT

The October Issue will contain the complete story of the International Gliding and Soaring Contests at Elmira, N. Y.



# THE DEVIL'S PLAYTHING

(Continued from page 18)

constant speed—terminal velocity. He could go no faster. His resistance had equaled his thrust and gravitation. Still he dived. Another thousand feet, another, another. I lowered the glasses. No use for them now. You could read "U. S. Navy" on the wings with the naked eye.

"Pull out, you fool, pull out!" I heard Banty grit. My eyes began to sting. Craig's finger nails were biting into his palm. This was the supreme test!

Suddenly the ship quivered and began to rise from its vertical path. Nine times normal gravity was acting on ship and pilot. It made a one-hundred-eighty-pound man weigh sixteen hundred pounds, it crushed you in your seat, made you black and dizzy, put huge, unbelievable strains on the ship. The acid test for ship and man!

But she was pulling out. Farther and farther the nose was coming up. Then, suddenly, the left wing crumpled. The sound of a pistol shot reached the earth. The wing slammed back against the fuselage with terrific force and was glued there over the cockpit by the rush of air. The ship slued off drunkenly and then began to spin. She whipped tighter and tighter. There could be only one end. I'd seen ships spin that way before. It wasn't pleasant.

Suddenly the meat wagon's siren cut into the wail of the falling ship. I laughed crazily. Didn't they realize no ambulance would be needed?

The ship hit just outside the field. She plowed a whole six feet into the ground with that sickening air of finality only metal can make. She hissed there spitefully, a flat mass of broken steel and duralumin.

Somehow I reached the crash. Men had torn the wing from over the cockpit. I turned away. Poor cuss, he hadn't had a chance. The wing had trapped him in his pit. I thought of what he said just before the dive: "If I'm going to pile up, why, I guess I'm just going to."

I spotted Craig carefully examining the wreckage, his tired eyes missing nothing. I wanted to get away, anywhere, and started. But before I left I got a glimpse of the naval engineers. That I-told-you-so expression was fixed on their faces in the approved style. I ran for the hangars before I could make a fool of myself.

A WEEK had passed since that fatal day. Again we were in Craig's cubby. The electric light burned into my eyes. Outside that faint-gray streak was there as it always had been and always would be. Dawn is a funny time if you work

all night—a sort of inspiration, a feeling that you're near the end of the trail.

Things had been pretty quiet since the crash. We'd only played at engineering to-night. There wasn't much to do. She'd been as perfectly engineered as possible in the first place. We were just haunting the drafting room, trying to get reorganized. We'd been talking mostly.

Craig was saying in his tired voice, "Yes, that's why I don't think it was an engineering fault. No break like that could be caused by a crash. It was nothing but a structural failure. That wing broke because of a defective piece of steel. We got a lemon, so to speak, first thing."

That was about the hundredth time he'd repeated it.

"What about some more wind-tunnel tests?" I ventured, not knowing what else to say.

"Kid," he spoke patiently, "you know as well as I do that the tunnel isn't all it's cracked up to be. You don't get true flight conditions. Your action is dampened out when it is measured, hence, no reaction. And reactions are important," he finished.

I shut up.

The last week had been taxing. Another XF5F-1 had been completed and was ready for tests. But no pilot could be found to fly her. Her reputation as a killer had spread rapidly. Craig's reputation as an aeronautical engineer was at stake—although mostly in his own imagination. And the Old Man had too much money in the little fighter to stop now. Besides, we never stopped halfway. Yet the funny thing about it all was that the navy was willing to give us another test! And no test pilot could be found. A pretty kettle of fish and all because the first ship had been a lemon.

Suddenly the field siren blared and lights flashed out on the runway. That would be No. 3 from New York. I glanced out as the big transport settled gracefully. Idly, I remembered when that ship had been on our drafting boards. Craig had lived by it. Night and day he had slaved. Then tests and more work. Finally completion and success. That's when I'd been promoted to assistant chief engineer.

I watched the passengers disembark. Then the pilot dropped off his charge. I knew him, had worked with him on the design. Tommy Davidson was his name—likable young chap. I watched his wife come out and greet him with a kiss. She always came to the field to meet him. They walked to their car arm in arm.

I turned back to Craig. His face

held the most wistful expression I've ever seen on a man's face—a kind of longing look intensified by his very soul.

Stories I'd heard about him popped back into my head. Somebody had told me he'd been engaged once—right after he'd graduated. But she had balked when he'd been assigned to China on a long export job. She'd told him it was one or the other. He'd sailed.

That probably accounted for his intenseness in his work. He knew nothing but airplanes, lived nothing but airplanes. And now his world was collapsing around his head. Because of one failure he was losing his hard-earned pinnacle.

He startled me out of my meditations. "What the hell's the matter with you?" he snapped.

I was surprised and didn't know what to say. I hadn't realized how my thoughts must have been mirrored in my face. Yet it wasn't like Craig to snap like that. I'd always known a quiet, self-controlled Craig. But I suppose he couldn't be blamed, under the circumstances.

He apologized quickly. "Sorry, kid." His tired eyes looked more so. "Better get some sleep."

I took the cue and left.

ABOUT NOON the next day the phone jingled harshly. I took the receiver and yawned. Craig was on the other end and the quality of his voice made me sit up suddenly.

"Kid, will you come down here in a hurry?"

"Sure," I said, and started throwing on clothes. I hit the field just ten minutes later. As I dashed into the drafting room I noticed the second XF5F-1 out on the apron with her prop ticking over. So Craig had finally got a pilot. I rejoiced. Throwing open the door to Craig's office I—stopped short!

Craig was dressed in flying kit!

He was seated at his drafting table and I could see he hadn't been to bed. Suddenly, the full significance struck me.

"You idiot!" I spluttered. "You absolute imbecile! You're no test pilot. Sure, I know you've done some sport flying, but test flying is as different from that as night is from day. Why, you haven't got the constitution. It takes a superman to stand those strains. Why—" I fizzled into silence.

"Here's the layout," he said in a flat voice. "The Old Man's got the gold braid in his office now. Get them out after I'm in the air. Watch this lad show them how their killer can take it. Yeah, and I want you to see our ship



come through, too, kid." He smiled thinly.

"Why, it's suicide——" I began to splutter again.

But he broke in, "You mean well, fella, but you're mighty crude on the way. Come on."

I walked out to the ship with him, my mind in a turmoil. No use trying to stop him. If he didn't do it now, he'd do it some other time. We each knew the risks he was taking.

Meticulously, Craig fastened his helmet. I helped him into a 'chute and boosted him into the pit. He revved up the warm engine, then idled it again. I stuck my head behind the windshield and said something foolish.

Craig pulled down his goggles and gunned out onto the field. Then he smacked the throttle and roared down the runway like a tornado. A curt wave saluted me as he hurtled past. Then off he soared, up and farther up.

The Old Man came bellowing from his office at the first blast of the engine. I pointed up and everybody piled out onto the field. Somebody had binoculars and passed them around the group. I managed to get a pair myself and scanned the firmament.

There he was, still boring for altitude—up and up. Then again I watched an XF5F-1 hoick up to level off. Again she seemed to take a breath before diving. Then she came—down the chute like a ton of brick, faster, ever faster. Again we heard the rising whine of a falling ship—terminal velocity. I

gritted my teeth and felt suddenly alone. Craig and I had worked together for a long time.

For three or four thousand feet more Craig rode, her down—down until she was a hurtling comet—down until you could see the wings shiver.

Now was the time. Ease her out, Craig. For Heaven's sake don't hold that dive any longer. But he continued to dive. Continued until you could see his helmeted head bent over the stick. Then, suddenly, the nose started up. And it started up fast.

Craig wasn't easing her out; he was snapping her out! It was do or die. The crate fought to get out. Every part of her vibrated. You could see the wings bend against the strain. You could see them struggle to stay together. You could hear the agonizing scream of the overworked engine. You could see the whole ship valiantly fight to get out of the dive, fight—and win!

The wings glinted in the sun as she triumphantly mushed out. She smacked the bottom of the dive and ballooned up like a rocket—one thousand feet, two.

I darted a look at the navy men. So she couldn't take it? She wasn't strong enough? Cantilever wings made a fighter a killer? I felt the glow of victory.

I glanced back at the sky—and felt suddenly strained. Something was wrong. The plane fluttered uncontrolled off the top of the zoom. She slued drunkenly across the sky. There was

only one explanation: Craig hadn't stood the dive.

The strain had been too much for him. "Black out" was the technical name. Centrifugal force had sucked all the blood from his brain, left him unconscious.

I watched the crate helplessly. Suddenly, a wing dipped. She slid off sickeningly and whipped into a spin. Faster, she spun, faster and tighter. I rubbed my eyes. The distance between the plane and the ground melted rapidly. Finally it was no more. The noise of the crash was deadened by the ground it passed over to reach us, but it was none the less terrifying. I didn't feel like going to the spot. There could be only one result. I didn't feel like doing anything but sitting down——

THAT faint line still glows in the east every morning. No. 3 still comes in from New York at four ten. But the drafting room is intolerably lonely now. True, my name is on a door with "Chief Engineer." But somehow it has a hollow sound.

And when we work until that faint line in the east forecasts the inevitable return of day it is just as inevitable that Craig is out there, too, saying in his tired voice, "Yes, progress is expensive. But the price is never too high!"

His tired eyes will smile and he'll turn back to his inevitable drafting board and slide rule with that inspired glow on his face I so enjoyed when we worked together.

## THE DUPLEX

(Continued from page 46)

are cemented and threaded to both faces of the propeller hub.  $\frac{1}{16}$ " diameter wire is used for the propeller shaft. A loop is bent in the front of the shaft, after it has been inserted through the propeller. This loop fits onto the winder.

### ASSEMBLY

The rudder is cemented atop the stabilizer at zero degrees. That is, the flat under-surface of the rudder should be lined up with the center rib of the elevator. The elevator is cemented flat to the top of the rear boom of the fuselage. The bottom of the rudder is cemented to the extreme rear tip of the boom.

The wing is mounted flat atop the fuselage, using rubber bands for attachment. A  $\frac{7}{32}$ " incidence block is inserted, as shown, between the bottom of the wing and top of the fuselage. The original model weighed 4.1 ounces ready to fly.

### FLYING

The power was 24 strands of Banko's superlastic,  $\frac{1}{8}$ " flat, gray rubber. The motor was 40" long and was soaked in lubricant for one day prior to the contest. It is wound by hooking the pro-

peller shaft on the winder and stretching the motor out through the nosing of the model. The boom is removed from the fuselage and the other end of the motor is held at the rear hook fitting.

The model flies against the torque in large circles. It should be adjusted to dip slightly when changing from powered to gliding flight. The durations turned in by the model show its ability to glide and take advantage of favorable currents.

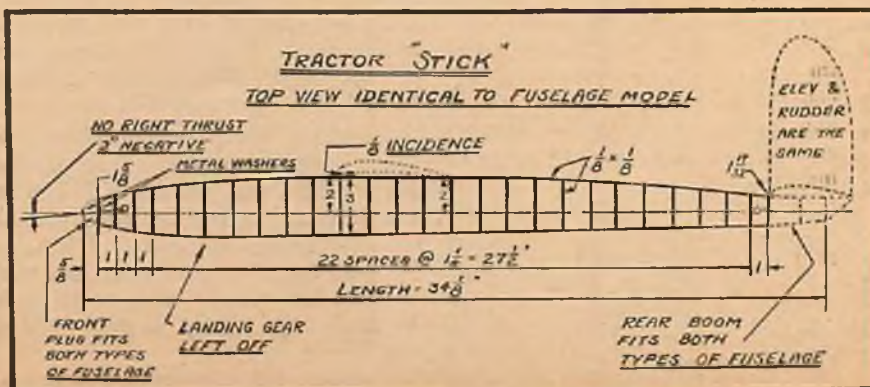
### BUILDING THE STICK-MODEL FUSELAGE

The stick-model fuselage is smaller than the cabin fuselage. The landing

gear and the cabin are omitted. Special care should be taken when building this fuselage to make sure the front and rear ends will fit the nosing and tail boom which you've already built for the cabin fuselage.

Construction follows that of the cabin fuselage. The few differences are pointed out on the drawing. The nosing and the tail boom are mounted in the same way.

Flying the model with the stick fuselage is practically the same as with the cabin fuselage. It will be necessary to move the wing back a trifle to compensate for the eliminated weight of the landing gear. The incidence of the wing is reduced to  $\frac{1}{8}$ ".





## Indoor Autogiro

(Continued from page 62)

edge at the third rib from the end  $5/32''$ . The result should be a negative incidence. This is very important.

### TAIL AND RUDDER

The tail is made of  $3/64''$  square soft balsa which has been pinned to a full-sized drawing. The center rib is flat and the other ribs are slightly cambered. Looking toward the propeller the ribs on the left are conventionally cambered, whereas those on the right are reverse cambered. This is done to give an even greater rolling moment, to overcome the torque, than is possible from a flat tail alone. The rudder is made very simply of  $3/64''$  square balsa and is cemented underneath to keep it out of the way of the vanes and also to bring the C. G. of the model as low as possible.

### MOTOR STICK, LANDING GEAR, AND VANE BIPOD

The motor stick is hollow and made in the conventional way for indoor models. It is  $12''$  long and made from a blank  $1''$  at the center tapered to  $3/4''$  at the ends. The blank is  $1/32''$  light sheet balsa. Soak the blank in hot water, bend and bind it around a former  $3/8''$  by  $1/8''$  at the center, tapered to  $1/4''$  by  $1/8''$  at the ends, by  $12''$  long. Allow it to dry.

After it is dry cement the seam, angle the front end, and cement the caps on front and rear. Cement the dural thrust bearing and rear hook in place. Make the landing gear from medium balsa to the size shown on the drawing. Cement the axles in place and put on the wheels. Keep the wheels on with a drop of cement at the end of each axle. The bipod is made of medium balsa  $1/8''$  by  $1/8''$ , corners rounded. Then angle one end of each stick and cement them together, so that they form a "V" of the dimensions shown. Make a shaft, cement it and put on a washer. We are now ready to make the propeller.

### PROPELLER

The  $7''$  diameter propeller is carved from a light block  $7''$  by  $1/2''$  by  $1/8''$ . Such a propeller is used as a low torque is desired. Draw diagonals on the wide faces of the blank. Cut down to the diagonals, then carve the propeller in the conventional way, starting with the concave side of each blade first. Finish and sand the concave side before even starting the convex side. After finishing the convex side cut out the template of the blade shape, pin it to the blades one at a time, and cut the blades to fit the template. Finish the propeller by sanding; insert the shaft and cement it. The propeller may be  $1/32''$  thick at the tips, as it will take a lot of punishment till the ship is finally adjusted.

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### ASSEMBLY

Cement the tail assembly on the rear end of the motor stick. The tail should be at a negative angle, as shown in the drawing. Cement the landing gear in place and allow it to dry. Insert the shaft of the propeller in the thrust bearing and put a loop of  $3/64''$  rubber  $13''$  long in place. Now balance the ship without the rotor and bipod. The center of the bipod should be located over the point of balance. Slice the seam of the motor stick about  $1/2''$  long just about where each leg of the bipod should be. Insert each into its corresponding slit till they touch the other side of the motor stick and cement up the slit. Make sure you have the correct incidence in the plane of the vanes (about  $5^\circ$ ). If, after the cement has dried, the bipod is flexible at the point of insertion of the legs, brace it with a strip of  $3/64''$  sq. balsa. Now find the approximate vertical position of the C. G. (Keep the rubber on the motor stick for this test,

in order to simulate flying conditions as much as possible.) Then bend the thrust bearing so that the thrust line passes through this point.

### ADJUSTING AND FLYING

First see that the vanes rotate freely. Then, holding the model above your head, *vaness parallel to the floor*, rotate them slowly with your other hand and let the model drop. The model should come straight down or move forward only a short distance. It should not have rotated with the vanes any more than  $1/8$  of a turn in a 6-foot fall. If it did the friction of the vane bearings is too great. Relieve it before going any further with the tests.

The launching procedure is as follows: Wind the rubber about one row of knots. Then, holding the model above your head, draw it down vertically and forward so that the vanes rotate and release it. At the moment of release the plane of the vanes should be parallel to the ground. The model will probably spiral into the floor because of the torque of the propeller. To overcome this treat the tail as a wing—put washin in the left side, washout in the right.

Another trick that might be used is bending the rudder to make the model turn against the torque. This should eventually get the model to fly correctly. If you still cannot get the model to fly well you might, as a last resort, make a simple auxiliary wing  $15''$  long and  $1 1/2''$  wide, which can be washed in to overcome the torque.



The completed model.



# HIGH SCHOOL PILOTS

(Continued from page 11)

## THE AIMS OF THE COURSE

The student of to-day, is, in most instances, an intense, serious worker who knows what he wants and is willing to work to get it. He will absorb the attitudes of fair play, self-reliance, self-control, and honest workmanship, if imparted through subjects he really desires. One has only to visit any airport from the large, modern plant to the small "pasture-lot" field to recognize that young America is eager to learn the science of flying. Therefore, an adequately planned aviation course, taught by a well-trained teacher, appears to be a desirable unit in any modern secondary school.

For the student of science this course acts as a preparation for advanced work in such subjects as properties of materials, mechanics, action of gasses, applied mathematics, and many allied subjects. The presentation of such subjects as physics, astronomy, chemistry, and trigonometry in a practical manner, covered with the sugar coating of interest, will develop habits of study which will be of great value in college or engineering schools.

For the student who cannot pursue his studies further than the high school this course will lay a definite foundation for a career in aviation; as it takes the student through the primary stage of flight training and through all the theory needed for a pilot's license. A good student should be able to leave school with a commercial pilot's license and be prepared to enter at once into productive aviation.

No one who has observed the aviation class in advanced stages can doubt the value, from a physical standpoint, of this type of training. The very nature of the work, with its constant activity in the clean, pure air of the higher altitudes, together with the knowledge that a pilot must keep fit for quick thinking and mental and muscular coordination—all combine to develop the students into clean-living, cool-headed, bright-eyed girls and boys who are *living*.

When one compares the value of this course with the total cost, there is no doubt of its desirability. When we think of it in terms of preparation for engineering colleges, as preliminary training for actual self-support, as an asset in general business and social life, and as a method of developing a sound body, and the habit of keeping it sound, its commercial value becomes evident.

## CONTENTS OF THE COURSE

In organizing the material for this course, Major Norwood has given special attention to the problem of selecting such material as will vitalize the work

and appeal to the student's interest. The selection of such material has also been so organized that the average student of secondary school age will find the subject matter not too advanced for his high-school level, but also profitable to the extent to which it is pursued.

## AERODYNAMICS

One of the major units of this course covers the field of aerodynamics. This unit is designed to give the student a complete knowledge of the properties of air, both static and dynamic. He is also taught the law of gasses, Newton's laws of motion and their application to the moving air stream about an airfoil, and the recognition that air as a definite *body* is capable of supporting weight and offering resistance to motion.

The student is further given an understanding of the various types of airfoils; and the general form of airfoils is studied so that students may learn their use. The action of stabilizing airfoils is experimentally determined; and a complete study made of the law of levers as applied to the solution of design problems in stabilizer size and section. An aerodynamic balance is used in the laboratory to demonstrate the lift-drag ratio of several types of airfoils, and to observe the changing effect of speed as well as the angle of attack. With this equipment, the students are also enabled to note the design and use of control surfaces.

## AIRCRAFT STRUCTURE

Another unit of the course covers aircraft structure which is so treated as to give the student an understanding of how and why each part is constructed in the conventional manner. This unit considers the various stresses and strains to be met in operation, the truss system of bracing, the factor of safety and general structure. The tubing system is studied in relation to its diagonal and longitudinal members. Various tests are made on strength of materials, bolted and welded fittings, and such specialized subjects as hydraulic shock absorbers, control operating systems, rigging wires, and struts.

## METEOROLOGY

Meteorology, being most important to the airman, is also incorporated in the course of study. The student is given a thorough knowledge of the fact that the distribution of heat over the surface of the earth is the primary cause of airflow and weather. Thermal and con-tour currents are studied as well as relative and actual humidity; the formation of rain, hail, sleet, and snow; cloud formations with their cause and indications; and the formation and movement

of areas of high and low pressure are observed over long periods.

The student is taught to analyze a weather map as issued by the government, considering such points as movement of "lows," wind direction and velocity, temperature, position of isobars, dew point, and cloud formations. At the conclusion of this study each student is required to report on the conditions expected along a definite line of flight over an eight-hour period.

## AVIGATION

Realizing that avigation is a subject often neglected in flight schools, this unit has been developed to a complete study of *three* systems: "piloting," "dead reckoning," and "celestial avigation." The student is taught the methods used in projecting various types of maps and charts, the interpretation of the airway map and the running sheet, and technique of map and chart work. The compass is studied in relation to its errors and limitations, and in relation to the use of the watch and air-speed indicator in "dead reckoning."

Considerable time is given to the study of the earth's division into degrees of longitude and latitude and the relation of longitude to time. The sextant and chronometer are used to solve problems in nautical astronomy; and adequate practice is afforded in their use to enable the student to become proficient in locating position.

## POWER PLANTS

While it is not felt that the engineer or pilot need have a detailed knowledge of the actual work of maintaining his power plant, he should understand the theory of its operation and know the name and function of each part. With this in mind a power-plant unit has been added to the course. With the use of a model engine, the student is taught the cycle of operation; and a complete aircraft power plant is disassembled and reassembled so that the student has a thorough knowledge of the structure, position, and use of each part. Regular inspection and simple adjustments are made by groups of students after various maladjustments have been made and recorded by the instructor; and the student is taught to make proper entries in the engine and ship log books.

## CONCLUSION

The work in Teaneck High School has passed the preliminary experimental stage and is now an accepted part of the industrial arts department. Other communities will eventually be forced by general demand to incorporate such a course.



# AIR PROGRESS

(Continued from page 7)

to collect air luggage labels. Collectors all over the world are making wild bids for the early vintage stickers, and many old air passengers are carefully steaming their labels off old luggage and selling them for pretty fancy prices.

## AIR FORCES

The largest single order for military machines was given recently by the secretary of war for 177 Douglas B-16 bombers. The total cost was \$11,651,948. The machines are 2-engined jobs using the new Wright "Cyclone" engines which may be stepped up to 1,000 or more by the time they are delivered. They will have a top speed of well over 225 miles an hour.

Many will wonder why the Boeing "Flying Fortress" was not purchased in such large numbers, and there has been no satisfactory explanation, except that the Douglas won the annual military trials at Wright Field some time ago. The Douglas company had previously received an order for 310 planes, many bombers, but mostly trainers, pursuits, observation ships and about a dozen said to be experimental and revolutionary in character.

Twenty-two students of the Observation section have just completed a full course in Observation of Artillery Fire at Kelly Field. The course consisted of 24 recitation hours and stimulated artillery fire, during which time the students had a minimum of 10 problems to familiarize themselves with the procedure of artillery adjustment. The work was carried out at 4,000 feet and 2-way radio communication was used.

Reports from Wright field through the Air Corps News Letter have it that the new Wright R-2600 has passed a very commendable type test at 1,500 brake horse power take-off rating. Also that the new V-1710 Allison chemical-cooled motor has passed a 100-hour type test in the air, fitted to an A-11A. Added to

this the new Lycoming (R-680-7) has passed its type test.

The first British Hawker Hector squadron is No. 13, which used Spads during the War. The Hector is fitted with the Napier Dagger III 24 cylinder H-type engine.

The new Belgian Renard R-31 was the sensation at the recent Brussels air show. This ship, a low-wing monoplane, is mainly a duralumin construction, has a top speed of 313 miles per hour, using the 910 horse power Hispano-Suiza engine. It carries 4 Browning guns, 2 in each wing and a motor cannon set in the engine, firing through the prop boss. It cruises at 248 miles per hour.

The French Morane 405 powered with a Hispano motor-cannon engine does 305 at 16,000 feet. There was a new type also, listed as an *Avion de Represailles*, made by the Caudron concern for low bombing. It looks much like the De Havilland Comet and carries an internal bomb load of 660 lbs. It also has 2 motor cannons of 20 m.m. caliber.

## MISCELLANEOUS

Nashville's new airport will be marked with a border of iris plants. The border is seven feet wide and measures nearly one mile in actual length.

Herr Stenig, the German glider pilot, established what is believed to have been a world's record for gliders in a competition at Grunau, Silesia. His barograph registered 19,600 feet.

Italy has captured the world's altitude record from Great Britain. On good authority we learn that Colonel Mario Pezzi's flight to 51,361 feet, or 1,417 feet higher than that attained by Squadron Leader Swain in a Bristol some time ago, will be accepted by the International Aero Club. Pezzi used a Caproni 161 with a 14-cylinder Piaggio PXI engine.

The new Stinson Reliant has caused quite a sensation in England. British test pilots have been loud in their praise

of its viceless action in the air and automobile comfort and luxury in the cabin.

Scientists of the Columbia Medical Center have disclosed that many pilots are affected by the lack of oxygen at high altitudes and that this lack may account for the cases of "pilot error" in air accidents. Flying in rarified air, according to these scientists, may cause damage to the functioning of the heart and the brain. This will bring on lax vigilance, acroneurosis and the desire to take chances. It often affects pilots to the extent that they cannot read instrument dials with any degree of judgment.

The Cephemyia is the fastest job in the world. It does 800 miles an hour. It has 2 wings and a blunt head. It is not an airplane, but a common insect about half an inch long and uses vibration for its power. Aero scientists are studying this insect in hope that they may find the secret of his speed and apply the general idea to modern planes. So far, however, it has been admitted that no material known to man would withstand the vibration beats the Cephemyia is capable of.

Great Britain has lost her greatest airplane designer. He was the comparatively unknown R. J. Mitchell whose machines won the Schneider Cup trophy 3 times. His most recent craft, a Supermarine, is said to be the fastest military plane in the world, but its performance has not been made public. For years he has refused to allow his name to be used in connection with any plane or to put it on any machine that flies. He died at the age of 41.

With planes of China, Japan, the United States and Great Britain using her airport as a junction, Hongkong has become the aerial crossroad of the world. With all this and many other such points in mind, a committee of American jurists is working on the arrangement for a new set of neutrality laws to be applied to aircraft in war, just as they are applied to the surface vessels of maritime shipping.

# FRENCH FIGHTER

(Continued from page 64)

The landing-gear wheels are mounted on soft wire axles; the axles are shaped as suggested in the detail and forced into slits cut in one end of the dowel struts. Point the end of the dowels and force each into the wing in the position designated. Use fine bamboo for the jury struts. The tail wheel is mounted on a fine music-wire axle; the choice of open or retracted position makes the method optional with the builder. The wheel wells are cut in the lower surface

of the wing with a sliver of a double-edged razor.

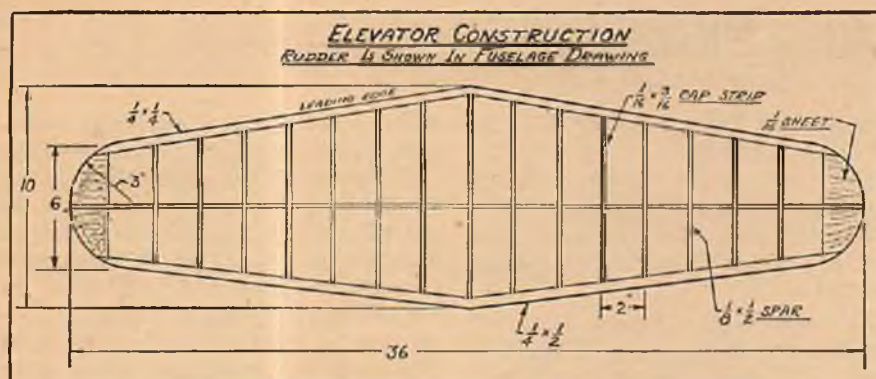
Score the control outlines with a dulled point. Give the entire model two coats of white shellac, clear varnish or dope, sanding after each. The top coat is silver; silver bronzing powder and liquid or aluminum paint may be used. Trim with black. The canopy may be painted white and finely outlined in black to simulate windows.

The propeller, metal finished, is mounted on a pin free to turn.

## BILL OF MATERIALS

- 1 12x5/16x3" soft balsa
- 1 3/4x1 1/4x6 1/2" soft balsa
- 1 1/8x2x6" sheet balsa
- 1 pair 1/2" wheels
- 1 vial cement
- Clear dope, clear varnish or white shellac
- 1 vial aluminum paint or silver bronzing powder and liquid, and black paint
- 1 1/8" dowel
- Scrap of bamboo, straight pins and sandpaper





## CONTEST GAS MODEL

(Continued from page 57)

without the additional worry of gusty air. The first flights should be made with a slight negative angle in the engine. This negative thrust will prevent the model from stalling. If the model is nose-heavy it will taxi harmlessly over the ground. But if it's tail-heavy the ending will probably not be as happy. Throughout the trial flights keep the motor running at reduced throttle setting. In the following flight, give the engine a trifle more throttle. And after that, the next step is to decrease the negative setting of the motor. Change the speed of the propeller and vary the angle of the motor until the most efficient flight is obtained with the flattest glide back to earth.

Frank Ehling has offered to answer any questions that may arise concerning the building or flying of his model. So if there are any troublesome points, write to us. We'll ask Frank for the answers and send the information back to you.

### MATERIAL REQUIRED

(Balsa, unless otherwise noted)

#### Fuselage

- 4 pcs.  $\frac{1}{4} \times \frac{1}{4} \times 18$ " for longerons
- 8 pcs.  $\frac{1}{4} \times \frac{1}{4} \times 36$ " for braces
- 1 pc.  $\frac{3}{8} \times 3 \frac{1}{4} \times 14$ " bass for motor mount
- 1 pc.  $\frac{1}{4} \times 2 \times 24$ " for motor fairing
- 2 pcs.  $\frac{1}{16} \times 2 \times 24$ " for inspection door, etc.
- 1 pc.  $\frac{1}{2} \times 3 \frac{1}{2} \times 12$ " plywood for fuselage nose

- 1 pc.  $\frac{1}{8} \times 2 \times 24$ " for balance tray and runners
- 2 pcs.  $\frac{1}{8}$ " diameter x 24" music wire
- 1 pr.  $3 \frac{1}{2}$ " diameter air wheels
- 1 pc.  $8 \times 12$ " sheet aluminium for motor cowl
- 1 pc.  $3 \frac{3}{32}$ " diameter x 8" music wire for tail skid
- 1 pc. .040x14" music wire for landing-gear cross piece

#### Wing

- 2 pcs.  $\frac{5}{16} \times \frac{5}{16} \times 18$ " for leading edge
- 2 pcs.  $\frac{1}{4} \times 1 \times 48$ " for trailing edge
- 2 pcs.  $\frac{1}{8} \times 1 \frac{1}{4} \times 48$ " for front spar
- 2 pcs.  $\frac{1}{8} \times \frac{9}{16} \times 48$ " for rear spar
- 2 pcs.  $\frac{1}{4} \times 1 \times 24$ " for wing tips
- 16 pcs.  $\frac{1}{16} \times 3 \times 24$ " for wing covering
- 12 pcs.  $\frac{1}{16} \times \frac{1}{4} \times 24$ " for cap strips
- 9 pcs.  $\frac{1}{16} \times 2 \times 36$ " for ribs

#### Tail Surfaces

- 2 pcs.  $\frac{1}{16} \times 2 \times 24$ " for ribs
- 2 pcs.  $\frac{1}{4} \times \frac{1}{4} \times 24$ " for elev. leading edge
- 2 pcs.  $\frac{1}{4} \times \frac{1}{2} \times 24$ " for trailing edge
- 1 pc.  $\frac{1}{8} \times \frac{1}{2} \times 18$ " for elev. spar
- 1 pc.  $\frac{1}{4} \times \frac{1}{2} \times 12$ " for rudder spar
- 2 pcs.  $\frac{1}{4} \times 1 \times 12$ " for leading and trailing edge of rudder

#### Extras

- 1 pc.  $\frac{1}{2} \times 1 \frac{1}{2} \times 16$ " hardwood for propeller,  $\frac{1}{8}$ " flat rubber for attaching wing, soft copper wire for binding landing gear, linen thread, cement, dope, bamboo paper, fine wire for fittings on inspection door and balance tray.

## LIGHT-PLANE FLYING CLUBS

(Continued from page 9)

The Aeronautical Corp., makers of the Aeronca, has outlined a carefully calculated club plan for our guidance. Vice president Carl Friedlander tells us that it is a practical plan based on experience.

The Stearman-Hammond Corp., just getting into production, express their desire to extend the fullest coöperation to the new department as a medium of extending the interest in light planes.

Mr. Hayden Campbell, of Campbell Aircraft Co., assures us of his willingness to coöperate to help make this department a real success.

Mr. Carl Wootten, of Taylor-Young Aircraft Co., promises to give us any

help which will contribute to the success of the light-plane venture.

And Waldo Waterman, of the Waterman Arrowplane Corp., writes in a similar vein.

This is sufficient to indicate to you that the best technical and engineering talent in the American light-plane field will be available to Air Trails for the purpose of answering all queries on the basis of manufacturing and flying experience.

I want to ask you the definite favor of writing me a line telling me if you are interested personally in the formation of a light-plane club, and what questions you feel to be most important. I don't

care whether it's 1 question or 10. I'll get the best qualified light-plane experts in the country to contribute their viewpoints to these pages in answer; and will steer your course safely and economically into the air through a light-plane club.

Am I repeating? Only for emphasis. The day you have been waiting for is here—the day I have been waiting for. It requires only the coöperation of three parties for practical accomplishment.

The coöperation of the manufacturers and technicians is assured. The coöperation of the editors is, of course, already demonstrated. The coöperation of *Air Trails* readers, by far the largest aviation magazine audience in the nation, will complete the triangle. Please, if you are interested, drop me a line.

—THE EDITOR.

## GULL-WINGED RELIANT

(Continued from page 48)

the size and shape shown and then add the valve cover bumps.

Attach the finished propeller to a conventional nose plug with washers for bearings.

### FINISHING THE MODEL

Cover all the frames with tissue. Spray the covering before doping, pinning the tail and wing to the bench until dry. Cement the wings, cowl and tail surfaces in position on the fuselage and dope.

The original model flew well on 4 strands (2 loops) of  $\frac{1}{8}$ " flat rubber. Make the first flights in tall grass by hand launching.

### MATERIAL LIST

- 1 1x1x6"
- 1 oz. cement

- 2  $\frac{5}{8} \times \frac{5}{8} \times 1 \frac{5}{8}$ "
- 1  $1 \frac{1}{2} \times 2 \times 2$ "
- 1  $\frac{3}{8} \times \frac{3}{4} \times 2 \frac{1}{8}$ "
- 2  $\frac{5}{8} \times \frac{3}{4} \times 2$ "
- Sheets**
- 1  $\frac{1}{8} \times 2 \times 18$ "
- 1  $\frac{1}{16} \times 2 \times 18$ "
- 3  $\frac{1}{16} \times 2 \times 18$ "
- 1  $\frac{1}{64} \times 2 \times 18$ "
- Strips**
- 1  $\frac{3}{32} \times \frac{3}{16} \times 18$ "
- 3  $\frac{1}{16} \times \frac{1}{8} \times 18$ "
- 10  $\frac{1}{16}$ " sq. x 18"
- 1 oz. clear dope
- 2 drams color dope
- 2  $\frac{1}{2}$  sheets colored tissue
- 2" #4 wire
- 8" #12 wire
- 1" wide strip bamboo
- 1 pr.  $\frac{7}{8}$ " wheels
- 1  $\frac{1}{2}$ " tail wheel
- 2x6" model celluloid
- 40"  $\frac{1}{8}$ " flat rubber



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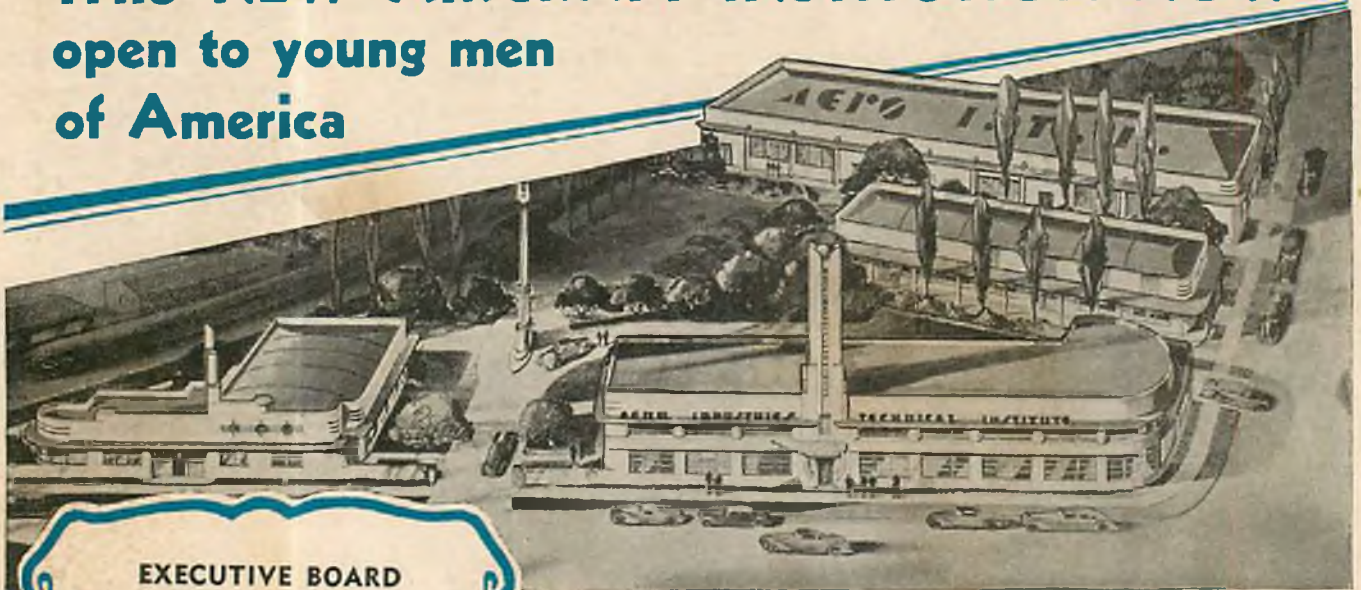
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