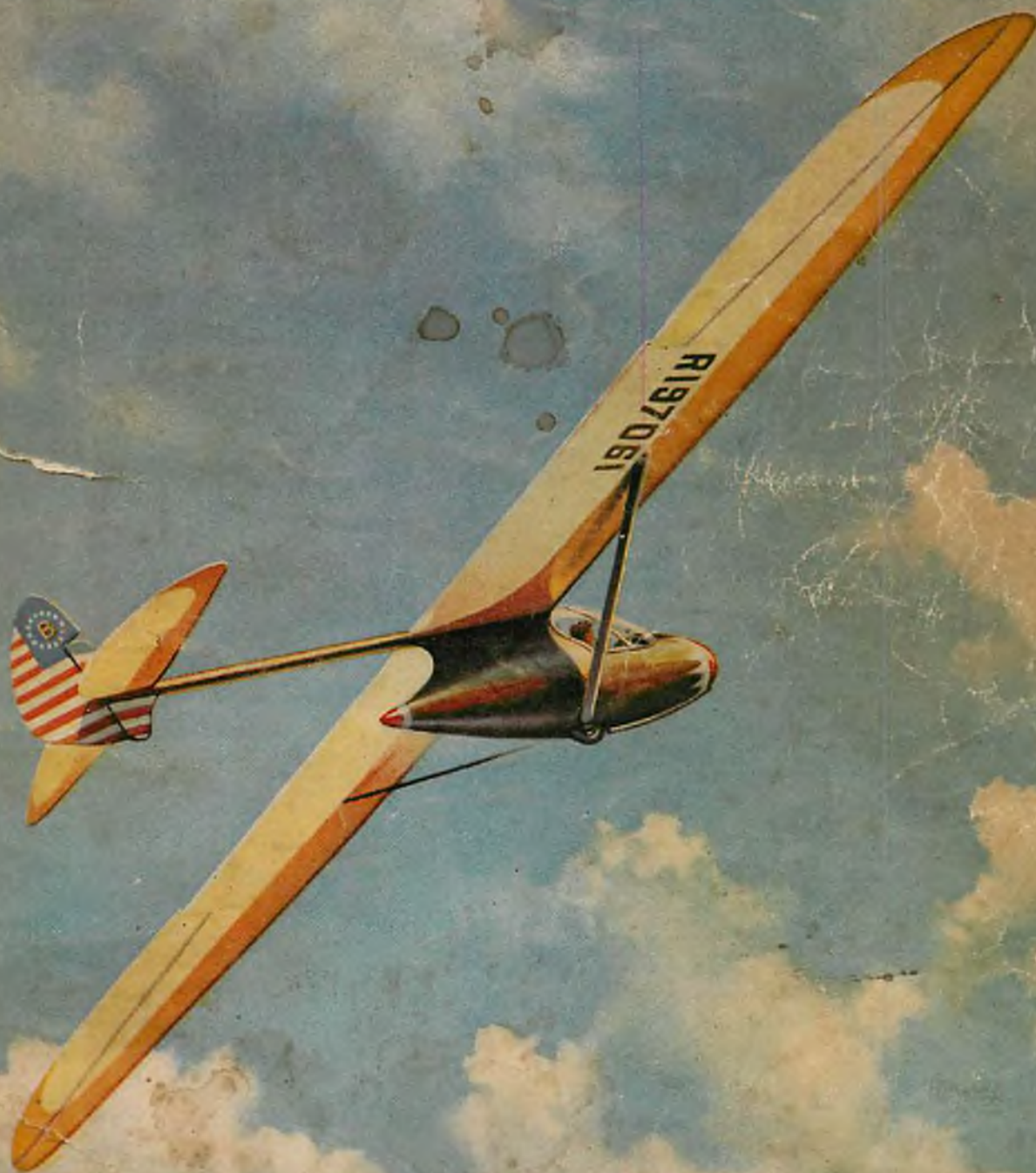


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JULY
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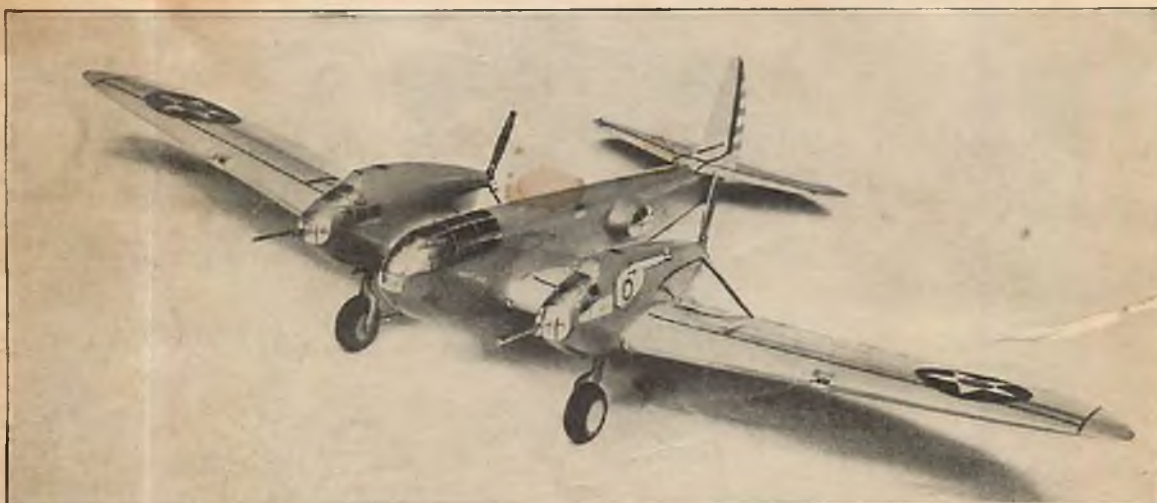
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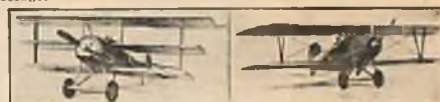
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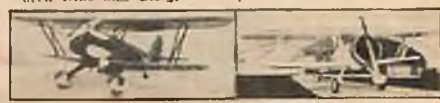
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CONTENTS

3 Articles:

The Baby Albatross by Frank Tinsley 18
The newest Bouclus sailplane spreads its wings—the ship on the cover.

Crash! by Lee Gehlbach 20
Six-mile-a-minute racers jamming around pylons in vertical banks, the roar of overheated motors, the threat of weakening wings—how it feels to fly in the big-time racing circuit.

Elementary Avigation by James Smithson 26
Concluding a remarkable series of easy-to-read educational articles.

2 Stories:

The Great Impersonation (Bill Barnes Novel)
by George L. Eaton 36
An amazing intrigue of international proportions centers on a far-off land—Madagascar.

High Flyer by John DuBarry 78
A truly modern story of concern to anyone who has ever endeavored to get into aviation.

10 Features:

Air Progress 6
Reviewing the developments of the month—the current happenings in every land.

Transports of Tomorrow by Jack Frye 8
A guest editorial by the president of T.W.A.

Our Guest Editor Compiled by Tracy Richardson 9
The life story of T.W.A.'s youthful but successful president.

This Winged World 10
The news of the aeronautical world presented in pictures.

What's Your Question? Conducted by Clyde Pangborn 30
An expert pilot answers your aeronautical questions.

Ceiling Zero 32
Pictorial story of a blind flight—a proof of aerial transportation's safety.

Pictorial History of Man in the Air 55
The march of aviation—ships, men, and events now all but forgotten.

Ships in Black and White 56
Planes of the moment pictured in impressive style by an aviation artist.

Cross Winds 88
A crossword puzzle to test your aeronautical knowledge.

Silver "C's" 97
Biographical notes of American sailplane pilots—about Lewin Barringer.

4 Departments:

Gliding and Soaring Conducted by Alexis Dawydoff 16
About the Elmira contest—prizes, events, ships entered.

Official N. A. A. News Conducted by William R. Enyart 24
An opportunity to keep abreast of the trend of private flying, manufacturing, and other phases of American aviation.

Light Plane Flying Clubs Conducted by Arch Whitehouse 28
"Something to sink your teeth into" is the universal acclaim of this popular department.

The Air Adventurers Club Conducted by Albert J. Carlson 34
22,000 members united in common bond to spread the gospel of modern flying.

9 Model Building Items:

Model Contents are listed on a separate page 57

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A cleverly arranged photo showing how the Boeing 307 Stratoliner will look in service this year for T. W. A. Top speed, 241 m.p.h.; gross weight, 36,000 pounds.

TRANSPORT

PROBABLY the most arresting news in the air transport field recently was the announcement of the projected Seversky Super-Clipper intended to fill a Pan-American specification for transoceanic aircraft. The new Seversky, if it is built, will have a payload of nearly twenty tons, a range of 5,000 miles at a minimum cruising speed of 250 m.p.h., and a top speed of more than 300 m.p.h.

Eight engines of unannounced manufacture rated at 2,000 h.p. each will be geared to five propellers. Three pusher props will be mounted along the trailing edge of the monoplane wing and the center prop will be driven by two engines. It is believed that the outboard props will be driven by liquid-cooled Allison engines. The two tractor props set in the noses of the twin hulls will also be driven through two engines apiece.

According to reliable information the new plane will cost about \$7,000,000 and will take about two years to complete. It will accommodate 120 passengers and should make the hop from New York to London in 14 hours.

The new Wright two-row, fourteen-cylinder Cyclone engine has been awarded a new rating of 1,500 h.p. for take-off and 1,200 h.p. at normal sea-level output. As compared to the original G-model, the new Cyclone-14, as it is known, has a capacity of 2,600 cubic inches, whereas the G-model had 1,823. This is now the highest rating of any American aero engine.

The new German Heinkel seaplane has just broken several world records and recently established a new speed mark for the distance of 2,000 kilometers carrying 2,000 kilograms. It is equipped with two B.M.W.-built Hornets rated at 850 h.p. apiece.

D. H. L. European routes are now seeing the new Junkers Ju.90 and the Focke-Wulf 200's in service. Both

planes cruise at better than 200 m.p.h. and the Ju.90 is said to have the largest passenger capacity (40) of any high-speed transport now in service. It is believed these ships will be put on the Berlin-Bagdad run, which is to be placed on a 24-hour schedule.

Regular operation of passenger airplanes carrying as many as 100 passengers over the North Pole between Soviet Russia and the United States has been predicted by Russian engineers. It is believed the service will be available within five years.

The Trans-atlantic Air Conference staged recently in Dublin disclosed that both Pan-American and Imperial Airways will continue their test flights across the Atlantic this summer. Both organizations have pooled their experiences and findings, which has resulted in the decision to set up further elaborately detailed organization covering radio communication, radio direction finding, meteorological service and other safety devices. From the United States end, further tests will be carried out with a land plane and also with one of the new super-Clippers now being built at Seattle.

The prospects of a business war between Pan-American Airways and the American Export Airlines, a subsidiary of the American Export Line, over future air operations across the North Atlantic, have been heard in Washington. Much of the trouble appears to hinge on the proposed amendments to the Merchant Marine Act which would give the Maritime Commission some amount of jurisdiction over American airliners flying overseas. These amendments conflict with another bill which provides for the establishment of an Aviation Authority with powers over domestic and international air lines similar to those now exercised over land transport by the Interstate Commerce Commission. (Turn to page 95)

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Transports of Tomorrow

An Editorial by Jack Frye

The President of T.W.A. is the Guest Editor of this issue of Air Trails

ASSUMING that most of us are familiar with the development of aviation since its beginning some few short years ago, let me for the moment cast myself into the rôle of a modern Jules Verne and prophesy, not fantastically but practically, what the next few years hold in store for commercial aviation in America.

Seventy per cent of the earth's surface is covered by water and thirty per cent is land, but over all there spreads an enveloping realm of air capable of sustaining flight. And only the air provides opportunity for unlimited exploitation, thus opening up a universal method of transportation limited only in scope by man's ingenuity in achieving ways and means of taking advantage of the potentialities of flight.

The Curtiss-Wright two-engined ship, the Douglas DC4 and the Boeing 307 are all ships of the immediate future. The Curtiss-Wright twin-motored plane is an improved type with a carrying capacity of thirty passengers. The Douglas DC4 is a larger substratosphere ship powered with four motors, weighs 65,000 pounds and has a top speed of 234 miles per hour with every modern convenience and mechanical device for the safety and comfort of passengers and crew.

The Boeing 307, which the T.W.A. plans to place in operation in 1938, is designed and being built for substratosphere operation. Powered with four engines, it will be capable of 270 miles per hour at 20,000 feet altitude. Its gross weight is 42,000 pounds and it will accommodate thirty-three passengers and a crew of five.

The Boeing 307 is the most modernly designed plane now actually being built for passenger service. It is as perfectly streamlined as modern construction permits. The cabins are conditioned for altitude pressure and passengers will constantly enjoy low-level air pressure and oxygen content regardless of altitude flown.

Due to the thick walls of the 307, necessitated by the cabin pressurizing and insulation, engine noises will be greatly reduced, and this combined with normal pressure at all times, constant temperature and humidity, combined with smooth "over the weather" flying, will make this the most ideal method of travel of modern times.

These are not dream planes, but craft that will be operating over our airways shortly. And they in turn are only the forerunners of the fully supercharged airliners capable of cruising anywhere from ten thousand feet to thirty-five thousand feet. It is logical to predict that these planes will be suitable

for non-stop flights from coast to coast, to Alaska, or for operations across the Atlantic. For the shorter flights they should be able to carry up to one hundred passengers.

This type of aircraft, which we may expect within the next five years, will be three- or four-motored with a gross weight of around 125,000 pounds and with a crew requirement of nine men or more.

But of even more importance to aviation itself are a second and third type of plane. The second will be smaller, two or three motors, with a high safety factor and a large load capacity, capable of being used on feeder lines and short hauls. These planes will be able to get in and out of small fields where the larger transports cannot operate.

The third type of plane, and one of the most important, should be the background of the air freight service, carrying principally first-class mail and low-rate cargo. A three-motored job with around 3,600 horse power and a cruising speed of 150 miles per hour and an estimated range of 750 miles. This type of plane would be of most importance as a testing laboratory for ships and personnel.

Safety remains the dominant factor regulating the growth of the air transport industry. Weather remains the chief barrier to the solution of safe and satisfactory flying. We cannot experiment with passenger planes but we can with these freight carriers.

Designed to give the greatest degree of safety for the crew, who would also be equipped with parachutes, we could send them into weather that cancels passenger flights and learn first-hand what these weather conditions are and how to cope with them. It will permit us to perfect our blind flying and landing systems. It will provide the perfect training school for pilots and crews and so furnish a well-trained personnel to man the larger and faster transport planes.

By such testing in otherwise unflyable weather, by the developing and perfecting of mechanical aids to flying and navigation and the training of personnel, we may be reasonably sure of speeding up the day when regular passenger service may become a reality regardless of weather conditions or other deterring factors to safe flying.

The opinion I express here is merely of the general classification of aircraft that may well be required for safe, economical and dependable service as the need for air transport grows. The details, the specifications, the power plants and other features of these ships must of course be subject to the technical advancement of the industry.



Our Guest Editor

About Jack Frye, president of Transcontinental and Western Air, Inc.

Compiled by

Tracy Richardson

JACK FRYE, President of Transcontinental and Western Air, Inc., is the youngest executive head of any major air line in America, being born on a ranch near Sweetwater, Oklahoma, some thirty-five years ago. His people migrated to Texas from Virginia, and later Jack's parents moved across the line to the new state of Oklahoma.

They say that Jack can still qualify as a top cowhand, although he left the ranch at the age of seventeen to join the U. S. Army Engineers. Army life didn't take, however, and two years later he moved on to California, got stung by the aviation bug and made up his mind to become one of them there flying men.

There was no royal road offered him into aviation. He found that if he wanted instructions in flying he had to pay for them. He got a job at twenty-five dollars per week and out of that salary saved enough to pay for flying lessons and still later buy an old war-time Jenny. That was his start. He organized himself into a one-man company and went barnstorming, giving exhibition flights and carrying passengers. Then he took in a friend, said friend having a little money, and they toured the country, visiting the fairs, carrying such passengers as had five dollars and the nerve to ride their planes. A hard, grinding way to make a living, but a good foundation for his future career in aviation.

Still later he formed a company with two of his former students, Paul E. Richter and Walter Hamilton. They organized a passenger and freight service between Los Angeles and Phoenix, Arizona. Despite the poor equipment of the day, lack of confidence on the part of the public and shortage of finances, the company managed not only to stay in existence but to merge another company. Money didn't mean a thing to them; they had so little of it that a few more obligations were just something for the other fellow to worry about. Their stock in trade was their confidence in the future of aviation. So they entered into a series of mergers and the result was the Transcontinental and Western Air, Inc. Jack Frye was made president of the company in 1934 when he was only thirty-one years old.

It's easy to understand why Jack Frye made good in aviation at such an early age. First it is a young man's business, and Jack has what it takes. He has a very pleasing personality and an aggressive jaw just made to fit onto a fighter. He learned the game the hard way, by doing things for himself. When barnstorming over the country, attending fairs, taking all kinds of chances to make gas money for the old Jenny, he had to do all his own mechanical work and his life depended on it being done right. He learned to do a good job of it.

As he progressed from ship to ship, getting more

speed and power all the time, he kept abreast of the improvements. His experience in cross-country flight taught him the difficulties of bad-weather flying with few and inadequate instruments and a lack of proper facilities for servicing planes. He knew just what had been accomplished in aviation and what could be expected from both ships and men. He applied this knowledge to operating the T.W.A., and it has paid dividends by making that company recognized as one of the finest air lines in the world today.

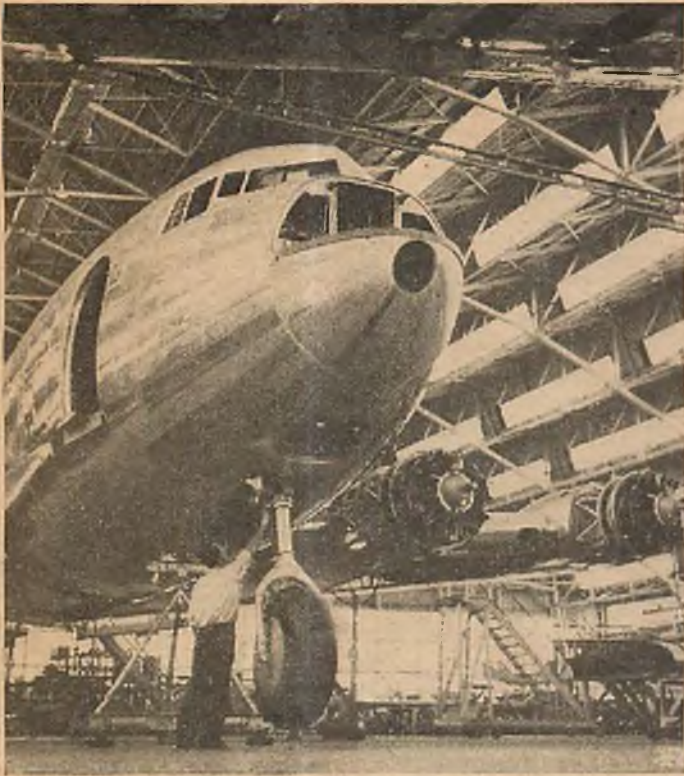
Jack Frye is not an office president. His headquarters are in Kansas City, that is, he has a desk and a secretary there, but Frye himself is a hard man to pin down to any one desk. He's apt to step off any one of the T.W.A.'s airliners, almost anywhere at any time, or perhaps out of his private Northrop Gamma which he loves to fly himself and in which he does most of his traveling. But at all times he is in constant communication with the home office by two-way radio, always with his hand on the pulse of the airways.

It is generally conceded that Jack Frye has more logged hours of flying—around 5000—than any other head of an air line. He holds three types of pilots licenses and is a lieutenant in the Naval Air Reserve. He knows the business from the ground up and is constantly striving to add features to the T.W.A. lines that will make them more comfortable and safe. In this direction Frye has himself added many outstanding items.

He is especially interested in stratosphere flying and has a Northrop Gamma plane equipped for this experimental work. He expects that within the next two years most of the transcontinental passenger flights will be made in this above-the-storm area. D. W. (Tommy) Tomlinson is in charge of this stratosphere experimental flying, acting as personal assistant to Vice-President Paul Richter. Data is being gathered and filed against the time when the new ships that are in the process of construction are ready to carry out stratosphere flights.

It is impossible to estimate the benefits Jack Frye has brought to aviation outside of his knowledge of the subject and his executive ability. There is no question that aviation has made him, though doubtless he would have gone far in any other vocation. On the other hand, the industry is very much in his debt.

President Frye is strong in his belief that aviation is a young man's game, and if the visions he sees when he has time to relax and talk about them, come true, it is going to be a business far, far beyond its present scope. And who in all aviation has a greater right to speak of a youthful business and its prospects than its youngest executive head, Jack Frye?



GOLIATH of the skyways, the Douglas DC-4 nears completion at Santa Monica. The novel nose wheel, yet untried on transports, is pointed to by man in foreground.

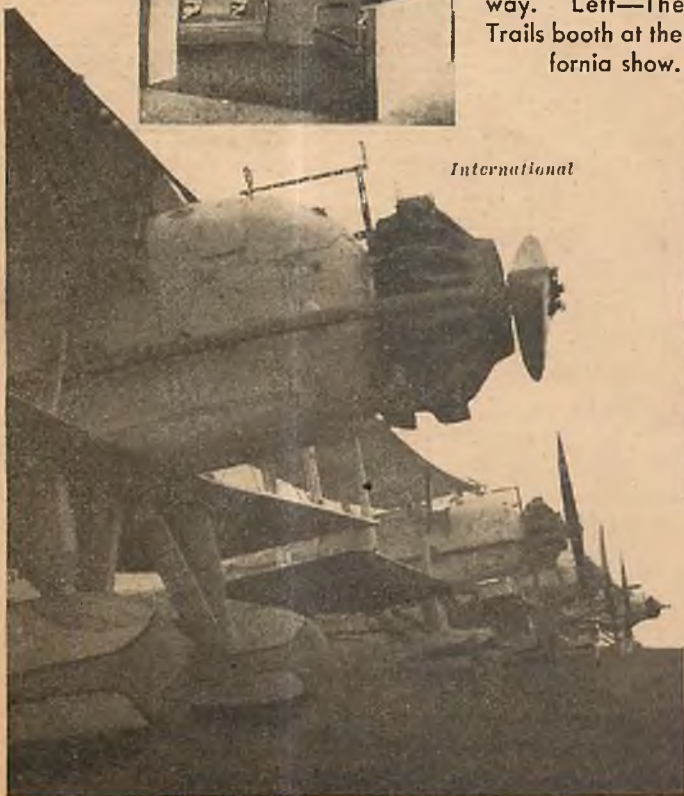


RIGHT—Aviation writers and editors were the guests of Douglas, at whose plant they inspected the DC-4. C. B. Colby, Air Trails editor, right, top of stairway. Left—The Air Trails booth at the California show.

THIS WINGED WORLD



Rudy Arnold

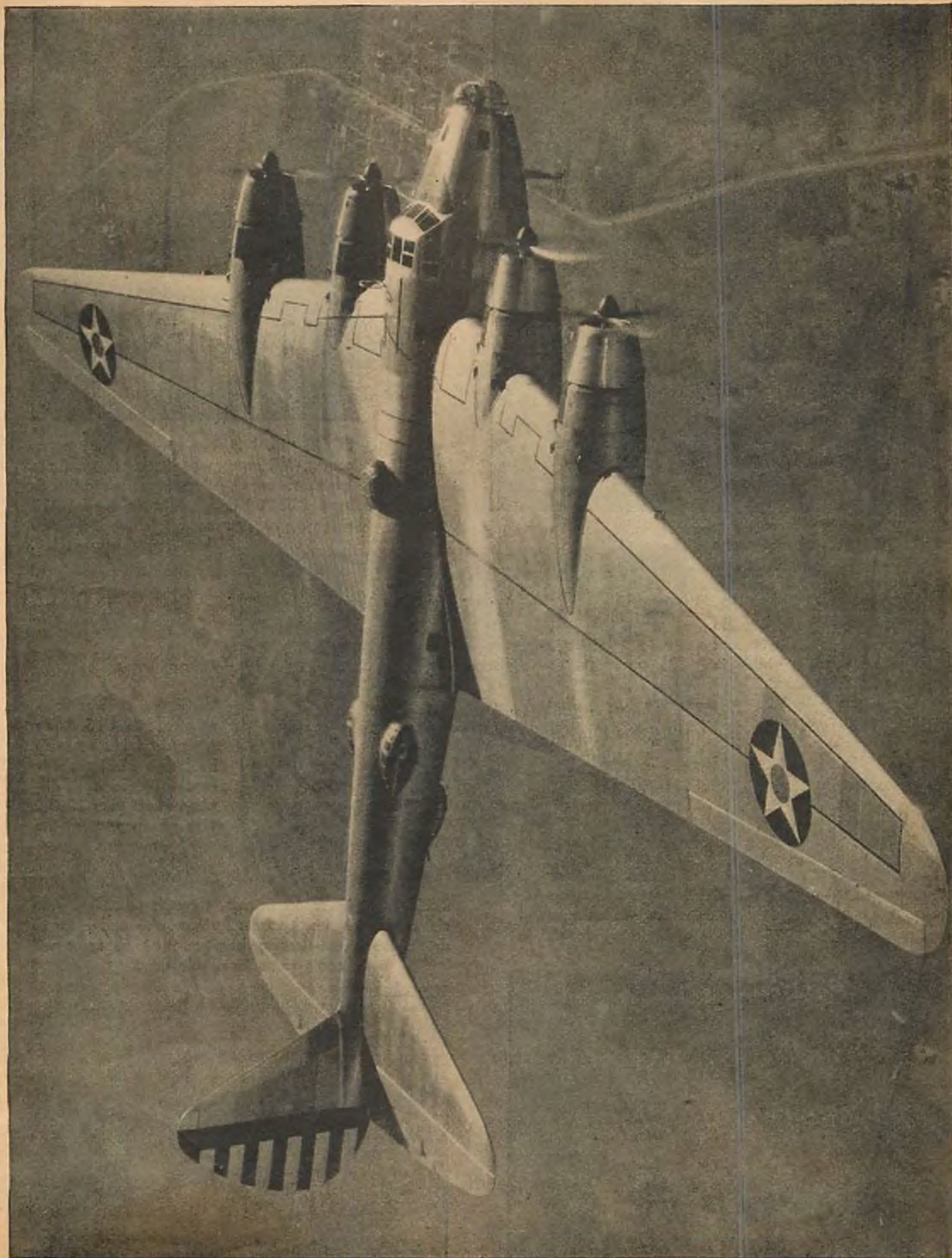


International



BULLDOG for the Navy is the Brewster XF2A-1, phenomenally fast, experimental fighter of all-metal construction.

LEFT—Singapore air base for the British was dedicated amid extensive aerial maneuvers. Despite their cumbersome appearance, the Vickers torpedo planes shown, just a few of the hundreds in Empirical service, are deadly weapons, a threat to enemy surface vessels.

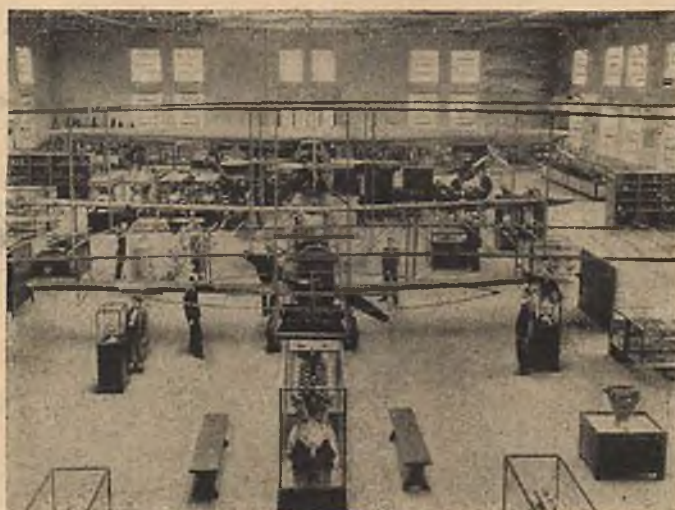


BOEING YB-15, 30-ton Army giant, traveled faster on a cross-country hop than the customary time of a fighting plane. The YB-15 is half again as large as the Flying Fortresses.

Pictorial

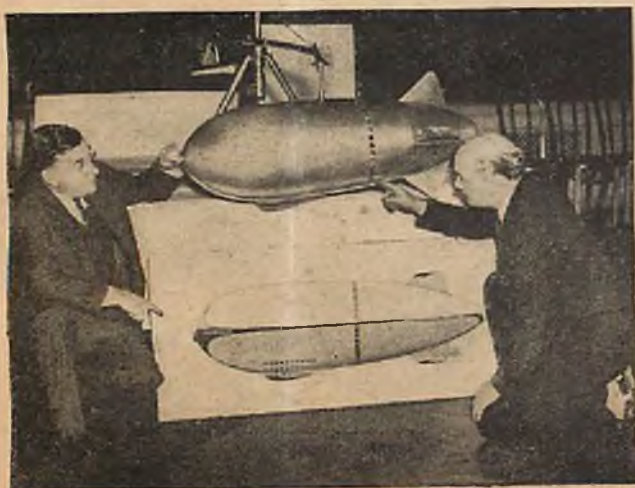


PUERTO RICAN maneuvers of the U. S. Marines carried these Boeing F4B-4s over the ancient outposts of the historic land defenses. Castillo Del Canuelo, Spanish arsenal in pirate days, is visible in left foreground.



W. P. A. workers have enhanced the U. S. Army Aeronautical Museum by building cabinets for model planes and display. Last year 27,000 visitors inspected the museum.

BELOW—New dirigible design features a Venturi tube running the full length of the ship. Engines are mounted within the tube, the ends of which move to aid in maneuvering the craft.



International



International
BOGEY MAN? No, just a French parachutist, Williams, who broke the altitude 'chute record by jumping from approximately 33,000 feet. After falling for 170 seconds, he opened his 'chute only 600 feet from the ground.

BELOW—Children in Europe, through schooling from charts such as this, become familiar with and learn to dread the death-dealing bombers that all know will come some inevitable day.



Arme

Hott from Globe



GRUMMAN amphibian taking off from a Florida airport. The sleek-looking G-21A amphibian is the surprise product of a firm internationally noted for thoroughbred Navy fighting planes. Powered by two Twin Wasp Juniors, the G-21A can hit 201 m.p.h.



GOEPPINGEN WOLF, famed German secondary sailplane flown by Lewin Barringer with success in this country, was designed by Wolf Hirth and Martin Schempp.



MINIMOAs, renowned German sailplane design, is revered wherever sailplanes are flown. Beautiful in flight, the Minimoas have established numerous outstanding records.



ROSS STEPHENS sailplane is the outstanding American sailplane design and, after its performance at Elmira in 1937, is expected to turn in many more laudable flights.



ITALIAN progress in gliding is producing many fine ships. Being towed aloft, the Alcione B.S. 28 makes a distinctive appearance.



TWO-PLACE sailplane is the Buxton Transporter, an American design emanating from California. On one occasion the Transporter remained aloft for more than seven hours.



ABOVE—The perennial Franklin, ever popular and reliable among American utilities. Without exception, glider pilots always have a good word for the Franklin.

LEFT—A Rhonsperber passes overhead, rapidly gaining altitude on a winch tow. Distinguished abroad, the Rhonsperber has won new laurels here under the capable handling of Emil Lehecka.



GRACE of a soaring bird cannot surpass that of a sailplane in the air. Climbing steeply by tow, wheeling high in the air free to ride the supporting thermals, the deceptively frail-looking sailplanes afford the world's premier aerial sport.



GLIDING AND SOARING

About the Ninth Annual Soaring Contest—ships entered, prizes and trophies, details.

Conducted by Alexis Dawydoff

ONCE again above Harris Hill and the city of Elmira, N. Y., turn and wheel great silent ships. With a sweeping rush others dart aloft to join them, until the air is filled with a strange flock of many-colored birds darting, swooping and spiraling in soundless flight.

The Ninth Annual Soaring Contest is under way! From June 25th to July 10th the cream of the nation's soaring ships and the pick of the soaring pilots will vie with each other in friendly competition for supremacy in motorless flight. Once again enthusiastic thousands will gather from far and wide to witness this astonishing exhibition of man's true conquest of the air.

During last year's Eighth Annual meet many records

were broken, and new ships were introduced whose performance kept the thousands of visitors interested in every minute of the contest. The Air Trails Trophy awarded for the outstanding flight in qualifying for the "C" license was presented to Harland Ross, piloting a Ross-Stephens sailplane. Who will win it this year?

Below are descriptions of the ships that will be present at Elmira this year, as well as the prizes and trophies to be competed for. Let's all get together to make this, the Ninth Annual Soaring Contest, the very biggest, best, and most successful ever held.

PRIZES AND AWARDS

Bendix Glider Trophy

1. Gold trophy for the greatest distance flown at the contest and a \$500 cash award. This award is raised to \$1000 if an American distance record is established.
2. Silver trophy for the second greatest distance.
3. Bronze trophy for the third greatest distance.

A. Felix duPont Altitude Trophy

1. Gold trophy for greatest altitude above point of release, accompanied by \$500 cash. The cash award will be \$1,500 if a new American altitude record is established.
2. Silver trophy for the second greatest altitude.
3. Bronze trophy for the third greatest altitude.

Air Trails Trophy

A handsome silver trophy donated to a "C" pilot making the most notable flight record.

Edward S. Evans American Soaring Championship Trophy
Trophy to the holder of highest number of points.

Edward S. Evans Barograph Awards

Glider barographs to the groups whose ships compile the highest number of points.

Lieutenant Henry Harris Memorial Trophy
Trophy for the New England Champion.

Mrs. Warren E. Eaton Trophy
Trophy for the greatest achievement in promotion of gliding and soaring.
(Turn to page 92)



The Air Trails trophy for the outstanding "C" flight was awarded last year to Harland Ross. The award will be made again this year.

SHIPS ENTERED IN THE NINTH ANNUAL SOARING CONTEST



STEVENS FRANKLIN—Secondary sailplane. Span 46 ft., length 18.5 ft., wing area 180 sq. ft., aspect ratio 11.5, weight empty 325 lbs., gross, 550 lbs., sinking speed 3 ft./sec., gliding angle 1:16.



MINIMO A—High-performance sailplane. Span 55.7 ft., length 23 ft., wing area 205 sq. ft., aspect ratio 16, weight empty 441 lbs., gross, 651 lbs., sinking speed 2 ft./sec., gliding angle 1:26.



CADET II—Utility glider. Span 37.5 ft., length 18.75 ft., wing area 162 sq. ft., aspect ratio 8.7, weight empty 230 lbs., gross, 410 lbs., sinking speed 3.5 ft./sec., gliding angle 1:15.



ALBATROSS—High-performance sailplane. Span 62 ft., length 23.3 ft., wing area 205 sq. ft., aspect ratio 15, weight empty 325 lbs., gross, 515 lbs., sinking speed 2 ft./sec., gliding angle 1:23.



KESTREL—Intermediate sailplane. Span 40 ft., length 20 ft., wing area 150 sq. ft., aspect ratio 11, weight empty 245 lbs., gross, 415 lbs., sinking speed 2.9 ft./sec., gliding angle 1:18.



ROSS-STEPHENS—High-performance sailplane. Span 46 ft., length 20.5 ft., wing area 125 sq. ft., aspect ratio 17, weight empty 280 lbs., gross, 470 lbs., sinking speed 2.5 ft./sec., gliding angle 1:23.



PROEFLING—Secondary sailplane. Span 42 ft., length 19.5 ft., wing area 230 sq. ft., aspect ratio 7.7, weight empty 320 lbs., gross, 500 lbs., sinking speed 3 ft./sec., gliding angle 1:15.



H-17—Secondary sailplane. Span 32 ft., length 15 ft., wing area 100 sq. ft., aspect ratio 11, weight empty 145 lbs., gross, 345 lbs., sinking speed 3 ft./sec., gliding angle 1:16.



FRANKLIN—Utility glider. Span 36 ft., length 22 ft., wing area 180 sq. ft., aspect ratio 7.2, weight empty 220 lbs., gross, 400 lbs., sinking speed 2.5 ft./sec., gliding angle 1:15.



RHONSPERBER—High-performance sailplane. Span 50 ft., length 20.4 ft., wing area 164 sq. ft., aspect ratio 15.6, weight empty 340 lbs., gross, 550 lbs., sinking speed 2.4 ft./sec., gliding angle 1:20.



WOLF—Secondary sailplane. Span 45 ft., length 20 ft., wing area 162 sq. ft., aspect ratio 14, weight empty 290 lbs., gross, 490 lbs., sinking speed 3 ft./sec., gliding angle 1:17.



TRANSPORTER—Two-place sailplane. Span 52.3 ft., length 26.6 ft., wing area 240 sq. ft., aspect ratio 11.4, weight empty 435 lbs., gross, 725 lbs., sinking speed 2.5 ft./sec., gliding angle 1:20.



A. B. C. SAILPLANE—Intermediate sailplane. Span 48.5 ft., length 19 ft., wing area 175 sq. ft., aspect ratio 13.2, weight empty 300 lbs., gross, 470 lbs., sinking speed 2.8 ft./sec., gliding angle 1:18.



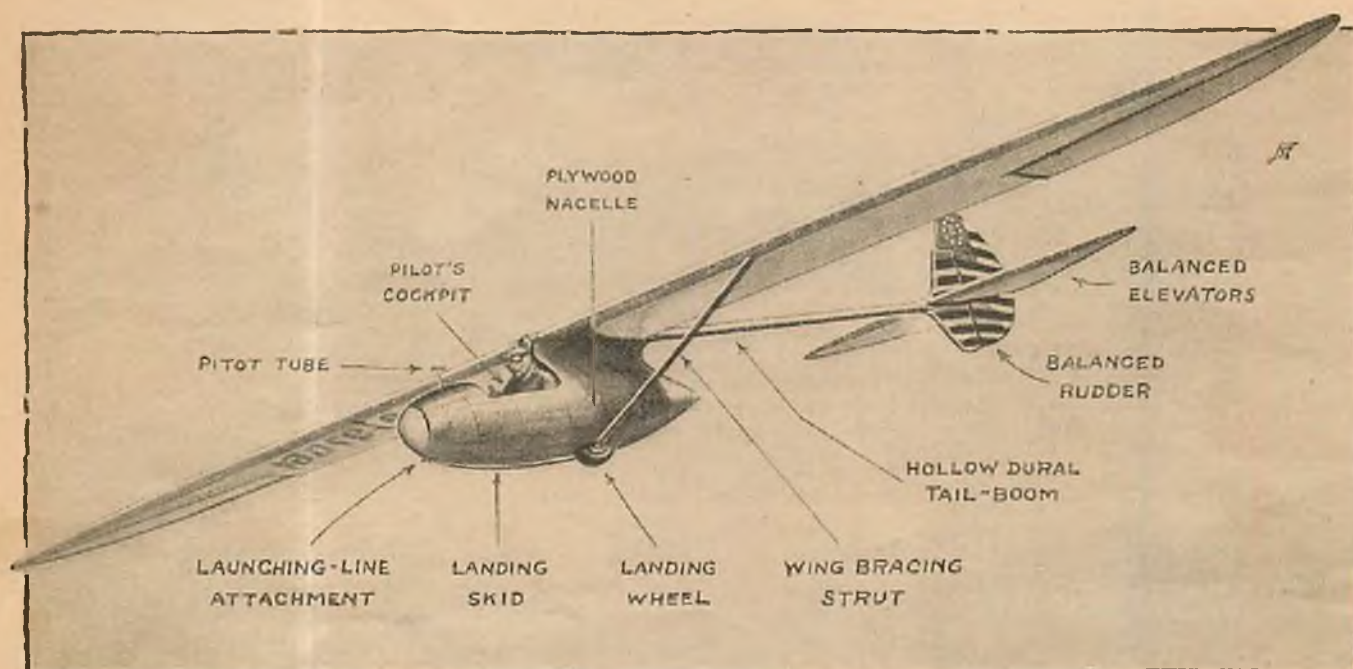
SCHWEITZER SGU-1—All-metal utility. Span 38 ft., length 20 ft., wing area 170 sq. ft., aspect ratio 8.5, weight empty 293 lbs., gross, 473 lbs., sinking speed 3 ft./sec., gliding angle 1:17.



RHONBUZZARD—High-performance sailplane. Span 47 ft., length 19.1, wing area 151 sq. ft., aspect ratio 14, weight empty 300 lbs., gross, 475 lbs., sinking speed 2.3 ft./sec., gliding angle 1:18.

THE BABY ALBATROSS

From the ranch workshop of William Hawley Bowlus comes this striking utility sailplane—the ship on the cover.



By Frank Tinsley

IN a secluded workshop on the Oncota Rancho near San Fernando, Cal., on ground homesteaded by his pioneer father in the 1880s, William Hawley Bowlus is busily superintending the production of the Baby Albatross, latest of his many highly successful glider designs. Twenty-five years of experience in the engineering and manufacture of "America's highest performance sailplanes" is reflected in the sound construction and flight efficiency of the new ship. It is a lineal descendant of Bowlus' world-famous Albatross II, in which Richard duPont took off from Elmira, N. Y., one gusty morning in 1935 and successfully rode the thermal currents to the Summerville Airport at Basking Ridge, N. J., almost 160 miles away. This flight gained duPont the American distance record, which remained unbroken until recently.

Hawley Bowlus began building and flying gliders back in the dark ages of aviation. Although he is credited with considerable time on powered planes, his real interest has always centered on the fascinating problems of motorless flight. Even when he was working with Benjamin F. Mahoney, designer of the *Spirit of St. Louis*, Bowlus' mind was more occupied with new glider ideas than with building the ship that was to carry an obscure air-mail pilot across the Atlantic to fame and fortune. It was at the Mahoney-Ryan factory that Bowlus became acquainted with Charles A. Lindbergh. Some years later, at the glider school he had since established at San Diego, Bowlus had the pleasure of introducing both Anne Lindbergh and her now famous husband into the mys-

teries and pleasures of soaring. It was at this school, too, that he designed and built the original Albatross I, first modern sailplane to be produced in America. In it, on December 10, 1929, he flew 2 hours, 47 minutes, 13.5 seconds to set a new American record.

Moving to the East, Bowlus joined forces with Wolf Hirth, designer of the famous Minimoa sailplane. The plans called for the teaching of gliding technique on a more elaborate scale than had been attempted heretofore in this country. The partners set up shop at the North Beach airport on Long Island, with Jack O'Meara as chief instructor. Some of our best-known "Silver C's" made their first primary hops at the Bowlus-Hirth school. One prominent graduate, Emil Lehecka, is now running a school of his own as chief instructor of the highly successful Airhoppers Club of Astoria, N. Y. Another is C. B. Colby, the editor of *Air Trails*.

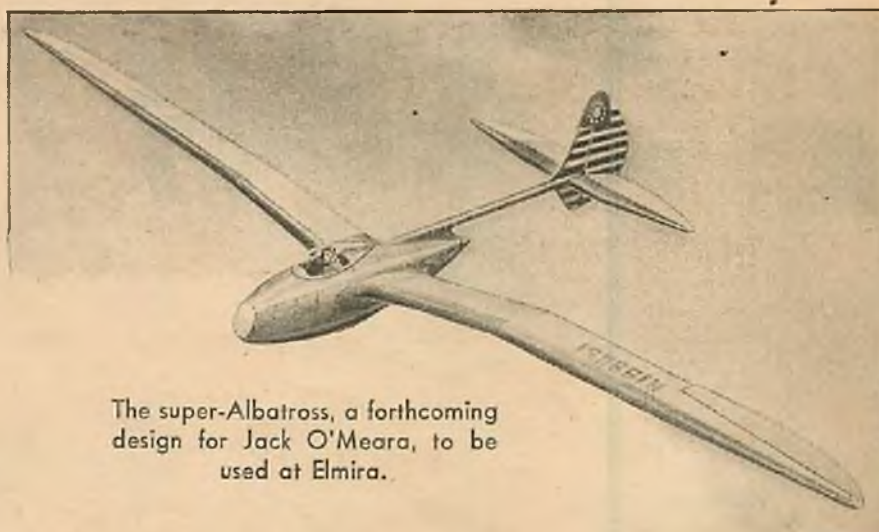
As soaring gained in popularity, glider clubs began appearing in various parts of the country. Each successive club gave increased impetus to the fast-growing market for first-class gliders and sailplanes. Recognizing the opportunity of popularizing his native American designs, Bowlus returned to California and turned the old homestead into the first "Aviation Ranch" in the U. S. A. He erected a suitable shop and went to work improving his Albatross II. Today he has eight helpers busily working under his direction to fill orders for both the "II" and its new little sister, the Baby Albatross. Each ship requires almost a month of highly skilled hand labor to complete and sells for around seven hundred and fifty

dollars. Both types are also produced in a knock-down form resembling huge model-airplane kits. These are becoming increasingly popular among home builders.

The Baby Albatross, pictured on the cover of this issue, is classified as a utility sailplane. Primarily intended for use in student training, the sturdy little craft is stressed to take the hard knocks and rough handling unavoidable in school work. The new "Baby" combines efficiency with strength, however retaining all the good features of a first-class thermal and ridge soaring ship. All parts and assemblies are stressed and static-proof-tested for airplane towing at speeds up to sixty-five miles an hour.

In order to produce a plane combining good flight characteristics with low initial cost, ease of repair and light weight, Bowlus has constructed the Baby Albatross entirely of wood. He has originated a new and unique patented process of manufacture which will be used in producing the new ship. Replacing the customary fish-like fuselage is a perfectly streamlined egg-shaped nacelle or pod which houses the pilot and controls. Constructed entirely by hand, the high quality of workmanship involved in building the pod has been compared to that of the skilled violin maker. The analogy is an apt one for the sleekly varnished, ocarina-shaped nacelle looks startlingly like the huge soundbox of some giant musical instrument.

The framework of the pod consists of ten super-light, oval, wooden frames connected by longerons. The three main frames are cross-braced to insure additional strength and rigidity. In the upper prolongation of these frames are inset bearing surfaces to which the cylindrical dural tail boom is bolted. In assembling the pod, the frames are first clamped upside down in self-aligning jigs. At this point, the framework of ribs resembles the



The super-Albatross, a forthcoming design for Jack O'Meara, to be used at Elmira.

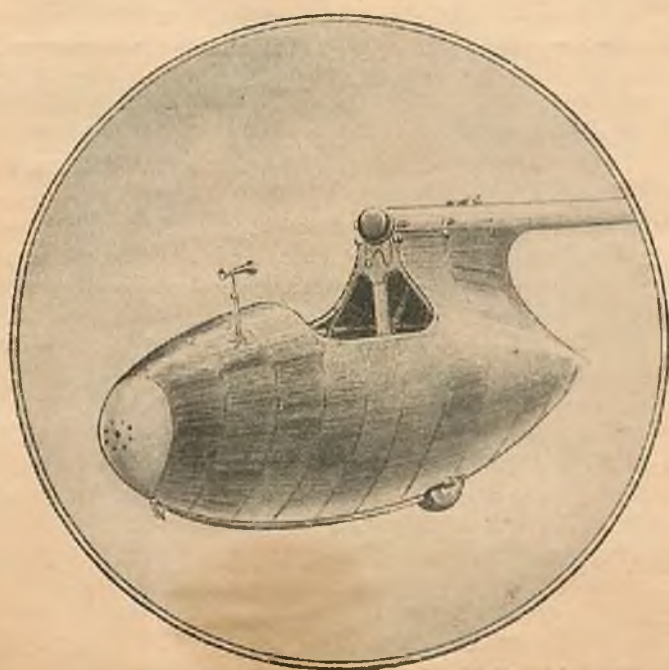
bleached skeleton of some Stone Age animal. The connecting longerons are soon fastened in place and the task of covering the bare bones with curved sheets of plywood begins. The upper sections of the two ribs immediately forward of the main frames are then cut out to form the cockpit opening. Coamings connect the severed butts and curve smoothly upward at either end to join the adjacent frames.

A compact instrument panel fitted with an altimeter, airspeed indicator and rate-of-climb dial, is set in the front frame of the cockpit. Below it is the control column, either wheel or stick form being optional. A pitot tube, mounted on a short upright column, projects from the rounded forward deck. The nose of the pod is finished off with an aluminum fairing and a long, hardwood skid, on which the cable attachment is mounted, curves back along the keel line as far as the landing wheel. This is a single 10x3 Goodyear wheel and tire, housed in a semi-retracted position inside the bottom of the nacelle, and provided with a brake. The total weight of the pod, fully equipped, is one hundred pounds. The plywood skin is varnished and hand-rubbed to a smooth satiny finish.

The wings are built in two panels which under normal practice are transported separately from the body of the ship and are bolted in place at the starting point of a flight. They are externally braced with single inclined struts which spring from either side of the pod, where they are attached to the cast duralumin wheel-fitting. The wing construction is of wood, with a torsion type leading edge and I-beam section spars. The ribs are of plywood, pierced for super-lightness. A fabric covering extends aft of the forward spar.

The cantilever tail surfaces are all constructed with torsion-proof leading edges and are mounted on a duralumin boom. This is bolted at its forward end to three bearing points on the pod's upper crest, between the wings. The control wires for the rudder and elevators run through the hollow center of the boom and are routed down over a pulley into the pod. This arrangement of a short, tear-drop-shaped nacelle and boom-mounted tail surfaces, results in a sailplane design of unusual cleanliness, strength and beauty.

The Baby Albatross has a 44-foot span, a chord of 48 inches and an area of 153 square feet. The little ship is 18 feet in length over all and has an empty weight of 216 pounds. In kit form, the "Baby" (Turn to page 97)



The completed monocoque pod weighs but 100 pounds.

CRASH!

By
LEE
GEHLBACH



Photos by Acme and Rudy Arnold

Above—The big moment of the aeronautical year—the start of the Thompson Trophy Race. Below—Count Otto Hagenburg flies inverted at the National Air Races. Too close to the ground, he landed a few seconds later—still inverted.



THE last race of the day had been flown and the assembled multitudes were busily departing from the scene of the highly publicized air meet. Wafted over an accidental breeze, I heard some dear old ladies agree that they had not enjoyed the day at all. "Why, there wasn't even any one hurt!" I had just been lucky enough to win the feature race after a bitter battle against tough competition.

Our dear ladies would have enjoyed the spectacle presented during the next two days. Obliging, in turn, one pilot each day went to the undertaker, several others to the hospital—not to mention a prize collection of airplanes being thrown on the junk heap.

Such appreciation of the hazardous business of racing airplanes should make any one wonder what might be the use or excuse for it anyway. What type of mentality does one need to follow a profession in which, by the law of averages, he should live about two years? However, there must be reasons for all these wrecks. By studying them it should be possible to avoid many of the fatalities and the terrific wear and tear on the airplanes.

Actually, human nature has not changed much since the ancient Romans used to turn thumbs down at the gladiator bouts or feed their captive lions the live meat of Christians on the hoof. It is the old story of "blood and sand." People still go to the air races to-day with the fond expectation of seeing the carcass of some hapless parachute jumper or pilot literally scattered over the green carpet of the airport. Often, they are not disappointed.

Granted, our American audiences are the greatest sport enthusiasts in the world. They are always anxious to cheer a winner. There is no greater spectacle to watch than some of our racing aircraft flashing past at some 300 m.p.h. and not always missing the pylon or each other by inches. Engines, propellers and airplanes set up a howl to awaken the dead while they are being punished up to or beyond their breaking point.

Your pilots truly enjoy an airplane race probably more than any of the spectators, just as a race horse enjoys his kind of



To the layman the racing pilot is one of a strange fraternity. But much lies concealed beneath the roar of straining motors and the howl of whirling propeller blades. Lee Gehlbach, in this saga of airplane racing, brings to Air Trails readers the inside story of racing; its ironic tragedy, its humor, its place in aeronautical progress.



Top—The finish! Frank Fuller's Seversky hurtles over the line to victory in the 1937 Bendix Race, a cross-continental dash accomplished in 9 hours, 44 minutes, 43 seconds. Below—Panoramic view of the Roman Holiday crowd at the Cleveland Races.





Major Seversky and Jacqueline Cochran with the Seversky racer used by Miss Cochran to set a new mark of 4 hours and 12 minutes between Miami and New York.



Harold Neumann, capable fellow pilot of Ben Howard, pictured with two of the Howard team of racers—"Mike," left, and "Ike," right.



When airplane racing is discussed one always thinks of Roscoe Turner. Flying a variety of specially built racers, Turner has turned in an enviable record. His racing career has witnessed the extremes of fickle fortune.

competition. These men would gladly exchange their souls or what little hope they have of heaven merely to be in another race. They love the cheers of the crowd after the race and the roar of their gasoline flight-steeds while in it. In these respects they can best be compared to moths that play around a candle flame, only, finally, to have their wings scorched.

In their love for speed at any price the pilots themselves have always tended to sacrifice every consideration of safety. Skill on the controls they certainly must have to play with their over-sensitive toys that arrive back on land at 80 to 120 m.p.h. But most of the pilots either do not know or else they prefer to gamble on how much punishment their equipment can withstand. To the pilots, the prospect of a ride in the "meat wagon," as they have nicknamed the ambulance, merely makes the game more sporting.

Racing has been the proving ground for aviation just as the Indianapolis track has been the proving ground of the automobile industry. Ever so many details of design now used in our own military and commercial airplanes were first tried and proven in the racers. The sleek, trim lines of the racing airplanes, as well as their flashing speed, have been a spur to the airplane industry to build something different than the old-fashioned collections of spare parts in formation flights that used to wallow along at about 100 m.p.h.

It is possible to go only just so far in engineering with formulas and laboratory data. For instance, our automobiles are only partly designed on paper. The final answer is to build some of the new ones—then run them ragged to find out what still ails them.

Below—Most beautiful of all racers was "Mr. Mulligan," Ben Howard's successful creation. Shown taking off for the 1936 Bendix, "Mr. Mulligan" crashed in the west during the race. This ship won 1935 Thompson event.

Below—Lee Gehlbach with the "44," noted Wedell Williams racer. Gehlbach's active career has included test work for leading manufacturers and participation in all the big-time racing events of the day.





Frank Hawks and his Texaco 13, Travelaire "Mystery" ship. Among the first high-speed, long-distance racing craft, the "13" startled the world to attention. Scores of records between cities, both at home and abroad, were amassed by the "13" before her performance could be matched by other designers.



The late Russell Boardman standing next to his ill-fated Gee Bee "7-11." Flown in the 1933 Bendix Race, this ship later crashed. The Gee Bee design, flown by many pilots to numerous victories, eventually became the jinx ship of all racing history. To-day the "Flying Silos" are but a memory.



Jimmy Doolittle and his "400," a Laird Super Solution. Appropriately nicknamed the "Skyways Buzzard," this ship once reigned supreme in the racing world. To its credit are listed many notable records. Jimmy himself has spent a lifetime in racing, holding at one time or another a number of international speed marks.

In aviation, this "cut and try" process has been expensive. It has cost a lot of crashed airplanes and pilots in order that others may fly in safety.

In radio, the so-called amateurs have had a large share in the technical development of the industry. Particularly, they have astounded said industry by the way they talk around the world with their low-powered short-wave sets.

Similarly, the boys who build and fly their own racers have done the same for aviation. We jokingly say that an expert is some one who can give a million reasons why it can't be done. But we, poor fools, don't know any better so we merely go ahead and do it.

Five years ago, Steve Wittman built his "Chief Oshkosh" racer with only fourteen feet of wing spread and forty square feet of wing area. On what was originally a 90-horse-power engine, the job will do about 225 m.p.h., and Steve has been flying it all around the country.

I'm always amazed every time I see this tiny gadget land, and watch Steve, who is somewhat over two yards of man, unwind himself out of no space at all. I still do not believe it. Either my eyes or Steve's head should be examined. Maybe such things cannot happen, but they do.

Our two most famous airplane races are the Thompson Trophy Race and the Bendix Trophy Race. Any size of airplane from any country is eligible to compete. These races are always glorious, free-for-all scraps. The Thompson Trophy Race is flown around the pylons, which mark a circuit of ten miles. Primarily, the winning airplanes of this race are copied in the designing of our Army and Navy pursuit ships. The Bendix Trophy Race is always across the country. It has had direct influence over commercial design. In fact, several of the winners have not been far from stock commercial jobs. Always, our racing speeds of yesterday become the military and air-line speeds of to-morrow.

Rudy Kling won the Thompson Trophy Race in 1937. His airplane was about the same size as Wittman's "Chief Oshkosh." The engine on the front was a six-cylinder in-line Menasco. For ordinary operations this engine is 150 h.p., but Rudy had his pet pepped up to about 300 h.p. Top speed on his Folkert Special was over 300 m.p.h. Everybody wonders why and how such a small airplane is so fast; but there are a lot of clever ideas there that will be used in other designs. Kling's unfortunate crash and demise at the past Miami Air Races closed the book on his career, but not on progress along these lines.

We racing pilots have lost many of our friends and absorbed a lot of grief as we made higher and higher speeds. From the tendency of wings or control (Turn to page 81)

Official Senior N.A.A. News

Inaugurating a new monthly feature covering the news and current developments in aeronautical activities, as reviewed by the National Aeronautical Association.

WANTED: MORE AIR CORPS PERSONNEL

THE ARMY AIR CORPS is looking for flying cadets.

Those who qualify will not only be given what is generally conceded to be the finest flying instruction in the world, but will be furnished uniforms, all living expenses and actual pay while undergoing instruction! Nearly one thousand are taken in each year.

Recently the N.A.A. co-operated with the Air Corps in launching an educational program designed to inform young men of this unusual opportunity. The size of the class that reported at the Primary School at Randolph Field in March was indeed gratifying. It numbered 321 students, the largest body ever to begin training at the Air Corps Training Center.

The course consists of eight months of primary and basic work at Randolph and four months' advanced work—in pursuit, observation, attack, or bombardment—at Kelly, a short distance away. Both schools are located at San Antonio, Texas, where it is claimed there are more sunny days a year than in Hollywood.

Classes normally start on March 1st, July 1st and October 15th. Each class is authorized to contain about 344 students, except the October class, which is somewhat smaller. A cadet receives \$75 per month, in addition to the uniforms and living expenses mentioned above. At the end of his training he is commissioned a Second Lieutenant in the Air Corps Reserve and assigned to a tactical unit in the regular Army with a pay of approximately \$205 a month. If civil life beckons at the end of this period, he may be relieved from active duty, at which time a bonus of \$500 will be paid him. On the other hand, if he so desires and is selected, he may continue for two years more with promotion to First Lieutenant and a

pay increase to approximately \$280. Should a man continue for six years, it is estimated that he will receive a total of \$15,545 in pay and \$2,880 in rent allowances and the like, if quarters are not furnished. Of course, these sums do not include the cost of instruction and other expenses borne by the government which, except in the case of only a few, would be prohibitive if similar instruction were obtainable elsewhere.

The N.A.A. has been informed by the army that domestic air lines have increasing need for pilots trained in the Air Corps. Only recently the vice-president of one of the largest air lines in this country stated in the office of the Chief of the Air Corps that he would employ fifty army-trained men, if he could get them, as co-pilots, at a good salary, with a promotion in a short while to the position of pilot. An authoritative survey shows that more than 50 per cent of the pilots on established air lines today are graduates of Kelly.

PLANS FOR AIR RACE CLASSIC

Plans for what is probably the world's most brilliant high-speed air spectacle—the annual National Air Races—are well advanced. The classic is scheduled for Sep-



Above—Captain Alex Papana of Roumania, one of the world's outstanding aerobatic flyers, who is expected to be a leading participant in the 1938 National Air Races to be held at Cleveland over the Labor Day week-end.



Below—Frank Sinclair, Seversky test pilot, tuning up his special racer for the 1937 Bendix. Seversky is expected to be well represented in the 1938 lineup.

tember 3rd, 4th, and 5th, at Cleveland, Ohio, and the indications are that a galaxy of the world's pylon-polishing stars will vie for honors. The event is held each year under N.A.A. sanction and association representatives are always on hand to check the race course, the qualifications of pilots, to see that the regulations of the F.A.I. are adhered to, and to take care of a multiplicity of other duties. Cash prizes totaling a minimum of \$102,750 have already been assured.

Prepared by WILLIAM R. ENYART

Secretary N. A. A.



Top, left and right—Members of the San Diego Flying Club. Membership includes over 60 men and women; the club's three planes in formation. Inset—Herbert D. Naseef, club organizer and flying instructor. Directly above, left and right—Tuning up one of the club's ships; A. L. Griffith, president, signing up the log book.

Glenn L. Martin, distinguished designer and developer of ocean-crossing clippers, is the N.A.A. governor for Maryland.

FLYING FOR \$1 AN HOUR

Do you want to fly for \$1 an hour?

If you do, and approach the average flying instructor, you may receive a rude awakening. However, there is a little group of air enthusiasts in San Diego, recently become N.A.A. members, who are doing their flying at one of the lowest rates in air history. The group is known as the San Diego Flying Club.

Aviation may be considered as an expensive pastime by many, but this little band of determined flyers—some from gasoline stations, some from grocery stores, some from offices—are getting in their air (Turn to page 85)

The colorful participants may well include Michel Detroyat, the French meteor who streaked to victory in 1936 in the Thompson Trophy Race, the most coveted of all speed events for land aircraft. It is rumored the dynamic Frenchman may bring with him not one but several "mystery" planes, which will constitute a real threat. Art Chester, another luminary who has participated in a number of National Air Races and won top honors in several events, also is being talked up as a likely threat.

The top-flight events will include the far-famed Thompson Trophy Race, the Louis W. Greve Trophy Race, the Vincent Bendix Trophy Race, parachute jumping contests, and numerous other events for engines of various cubic-inch displacement. The usual entertainment features will be presented, such as tactical demonstrations, stunting exhibitions, and a varied assortment of so-called novelty numbers.

It might be pointed out that the by-product of air racing is more efficient aircraft, more reliable motors—and consequently safer air transportation. If the records are consulted, it will be found that racing planes constructed for high-speed contests have had a profound effect upon the design of utility machines. Many of the principles incorporated into commercial craft in operation today were derived from the engineering of high-speed ships.

Grover Loening presenting the Intercollegiate Trophy for 1937—collegiate top honor—to Don Martin, president of the Harvard Flying Club and of the N.I.F.C.



Elementary Avigation

The direction finder and its use—weather, fog, ice, and atmospheric conditions—concluding the most instructive series of the year.

By James Smithson

THE RADIO DIRECTION FINDER

ONE important practice which as yet has not been discussed in these articles, is that of position "fixing" by directional bearings. This may be accomplished either by visual or aural bearings or by a combination of the two. As an illustration, suppose a plane were headed for a distant mountain, the location of which is shown on the chart, and at the same time a known lake could be seen in the distance off the plane's wing tip. The position of the plane would then be definitely "fixed," inasmuch as the bearings of the two objects relative to the plane could be set down on the chart, and the point at which these two bearing lines crossed each other would reveal the position of the airplane. See Figure 8. This can be accomplished by taking bearings of any two or more objects so long as they are known and their positions shown on a chart. It is to be noted, however, that these will all be "relative" bearings, that is, bearings relative to the heading of the plane. Care must be exercised to take into consideration the compass or true heading of the plane and add or subtract the relative bearings from it before laying them down on the chart. For instance if in Figure 8 the heading of the plane had been 80° true, the bearing of the mountain to lay down on the chart would have been 80° true, but the bearing of the lake would have been $80^\circ + 90^\circ = 170^\circ$ true. In other

words "relative" bearing means the bearing of an object with relation to the plane's head.

Visual cross-bearings are seldom employed in a plane except as a rough check, but aural, or more specifically speaking, radio cross-bearings are very often employed, particularly in bad weather, and it is well worth every potential navigator's time to become acquainted with them.

Most pilots are familiar with the radio beacon ranges and their functions, but not so many are familiar with the radio direction finder. Without going into detail on the theory of why the radio direction finder functions as it does, it will suffice to say that when the loop antenna is broadside to the incoming radio wave, a minimum signal is heard in the earphones and when the loop is perpendicular to the incoming wave, a maximum signal is heard. The "minimum signal" referred to above may become so low as to blank out altogether, in which case it is referred to as the "null."

The loop antenna is always situated somewhere outside the plane, but is so geared that its position is indicated by a pointer which rotates around a stationary azimuth circle inside the plane. The bearings indicated by the pointer are of course relative bearings—bearing relative to the ship's heading.

Bearings on a transmitting station may be obtained with a loop in a position to generate a maximum signal, but better results are obtained by employing the minimum signal because the human ear can more readily detect the null than the point of maximum sound.

Let us assume now that a direction-finder-equipped plane is in dense fog and wishes to ascertain its position. A and B in Figure 9 are two radio broadcast stations. The loop is rotated on point A until a minimum signal is heard in the earphones; the position of the pointer on the azimuth circle is then noted. Its reading indicates the relative bearing, or the number of degrees off the nose of the plane that point A bears. The same procedure is used to obtain the relative bearing of point B. Suppose the relative bearing of point A is 66° and that of point B is 100° .

A T.W.A. Skysleeper passing over the Grand Canyon, one of the scenic highlights of transcontinental flying.



Now if the plane is steering 10° true it means that point A actually bears 76° true from the position of the plane and point B bears 110° from it, and those two values must be laid down on the chart in order to locate the position of the airplane. Very often when three or more bearings are used to obtain a fix, they will not all cross at a single point. If the variation is small, however, this is of no consequence and a mean of the two or more points where the bearing lines cross each other can be taken as the plane's position.

The direction finder can be used to follow a continuous radio signal all the way to its source, that is, to the broadcasting station, by setting the loop perpendicular to the fore-and-aft line of the plane and keeping on the null. In using this measure, however, the plane will follow an arc of a circle instead of a straight path if there is a cross wind blowing.

The direction finder can also be used to follow a radio beacon range, but its performance here is beset by complications and it is not nearly so satisfactory for the purpose as is the ordinary radio beacon receiver.

WEATHER

If the navigator is to be efficient or even moderately successful at his profession he must become acquainted with the characteristics and peculiarities of the medium through which he flies.

The air or atmosphere, which everywhere surrounds us, bears down on the earth with a pressure of approximately 14.7 pounds per square inch at sea level. Atmosphere is present up to a height of approximately 200 miles above the earth, but it is by no means of the same weight and density at that height that it is near the earth's surface. As a matter of fact the density of the air decreases continuously (not uniformly, however) with increased altitude until it has reached a point where the air has vanished altogether.

The statement that the pressure of the atmosphere on the earth at sea level is 14.7 pounds per square inch, is a generalization. As a matter of fact the pressure is 14.7 pounds only when the temperature of the air is at 59° Fahrenheit. Any increase in this temperature will cause an expansion of the air which in turn will cause the air to rise; this rise or up-current of air results in a reduction of the pressure of the air against the earth's surface. Similarly a reduction in temperature of the air close to the earth causes the air to contract, and because of the reduction in volume, this cooled air allows the air which has been pushed off by the warm areas somewhere else to pile up on top of it, resulting in an increase of pressure in this locality. Whenever it happens that an area of high pressure and one of low pressure are adjacent to each other, there will be a natural movement of the air in the high pressure area toward the area where the pressure is low. This results in the phenomena we know as wind.

All aviators are of course vitally interested in winds. Every pilot knows that he must land and take off into the wind and that wherever wind is blowing across uneven ground or around buildings and other promontories, eddy currents and gusts will be present. Most of them know that on the windward side of a mountain an up-current usually exists and similarly a down-current is present on the lee side, so that it is fairly safe to approach a mountain at low altitude so long as the plane is traveling with the wind, but it is unsafe to approach at the

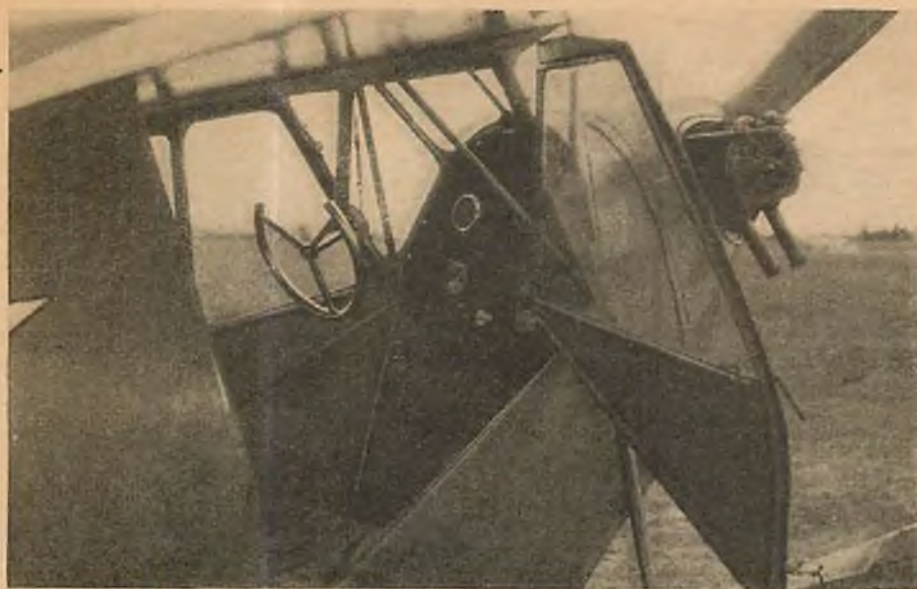


Many aids have been devised to make flying safer. Here a T.W.A. pilot points out the directional loop antenna.

same altitude against the wind. Not so many of them, however, are familiar with the various winds in their relations to general weather conditions. The student who aspires to become an expert navigator should, among other things, make himself a good aerologist. The subject is of course too involved to be more than touched upon in an article such as this one. There is, however, an almost inexhaustible list of good publications on the subject, to be found at any large library or publishing house, and the writer suggests that it would be well worth the student's while to undertake some research along this line.

The ordinary pilot of course need not go so deeply into the subject. This is because of the fact that not only can the existing weather conditions be obtained by teletype for almost any locality in the United States in which he is likely to be interested, but also that the United States Weather Bureau disseminates daily maps which forecast the weather over the entire country. Yet he should be familiar with certain generalizations which will assist him in determining when a long flight can be made with reasonable safety and when it cannot.

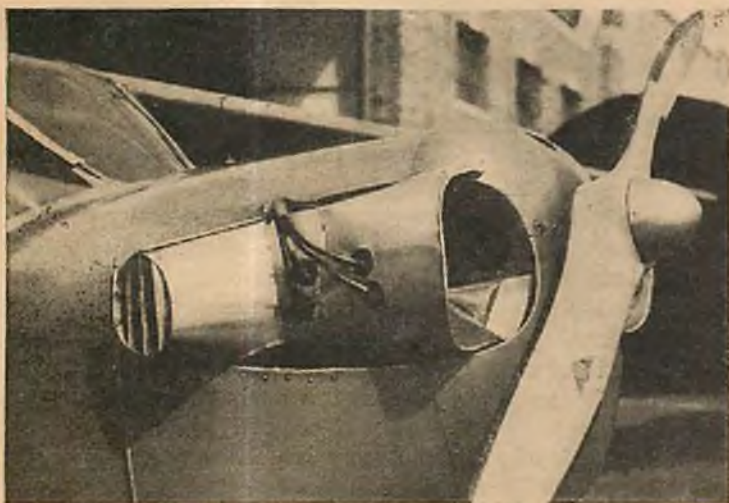
Areas of high barometric pressure are generally associated with clear skies and good flying weather while those of low barometric pressure are associated with the reverse. The first-mentioned areas are called anticyclones, and in them the wind has a general movement in a clockwise direction in the northern hemisphere, and a counter-clockwise movement in the southern hemisphere of the world. The low pressure areas are called cyclones and have a counter-clockwise movement of the winds in the northern hemisphere and (Turn to page 90)



The interior of the Welch, showing the overhead change-over wheel control which gives unobstructed leg room. Seating is spacious and side-by-side.

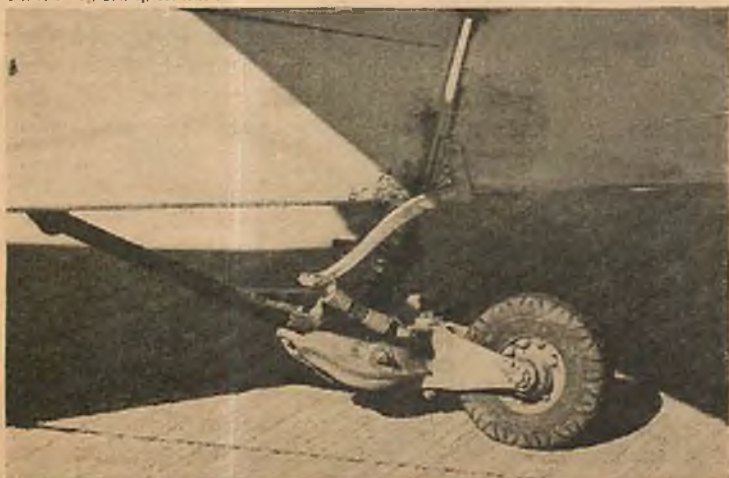
Concerning the place of the amateur pilot in aviation; light plane testing procedure; new ships and general news notes and activities.

LIGHT PLANE FLYING



A Taylorcraft fitted with a special metal cooling sheath. This scoop forces air back to the rear cylinders for efficient cooling.

Photos by Rudy Arnold



A new type detachable tail wheel for light planes is easily installed over the skid to cope with airport surfacing conditions.

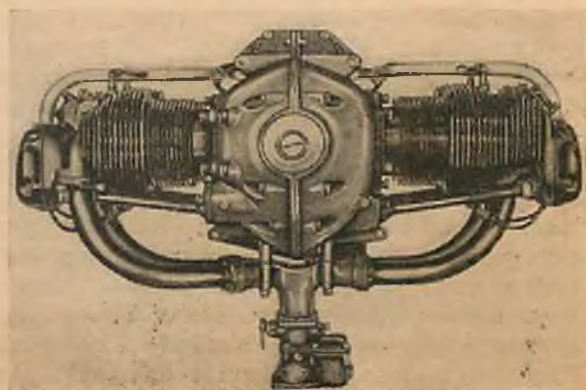
NO SUBSIDY FOR LIGHT PLANE MEN

HAVE you ever considered that the only unsubsidized flights made in the United States—and the British Empire—are those carried out by amateur pilots flying their own light planes? They are the only ones in the game who really dig down and foot all the bills out of their own pockets.

For that reason alone the light plane pilot should have a particularly jaunty stride. He should assume a little more frontal curvature about the chest line. He should merely sniff at air-line pilots and the gentry in government uniforms who have all their flying, as well as crack-ups, paid for.

Of course a lot of people will get up on their hind legs and deny all this, but the facts are there nevertheless.

No one will deny the fact that no air line today could fly a profitable mile without benefit of air-mail contracts. They could not get from New York to San Francisco on scheduled runs without the use of the navigational facilities and routes provided by a fairly generous government. Our



The new 50 h.p. Continental.

Send in your
notes, news, snaps

Conducted by Arch Whitehouse CLUBS



The Welch light plane, an ideal ship for instruction and sport flying, is reasonably priced. Span is 34 feet, 5 inches; weight empty, 515 pounds; payload, 368 pounds; top, cruising, and landing speeds are respectively 96, 85, and 29 m.p.h.

military flyers are completely subsidized and supported by government funds. The Navy, the Marines and the Coast Guard are all flying today because Uncle Sam digs down and lays it on the line for fuel and ships.

Did you ever stop to think that it is the private owner who has created and maintained the demand for about 40 per cent of all existing airports?

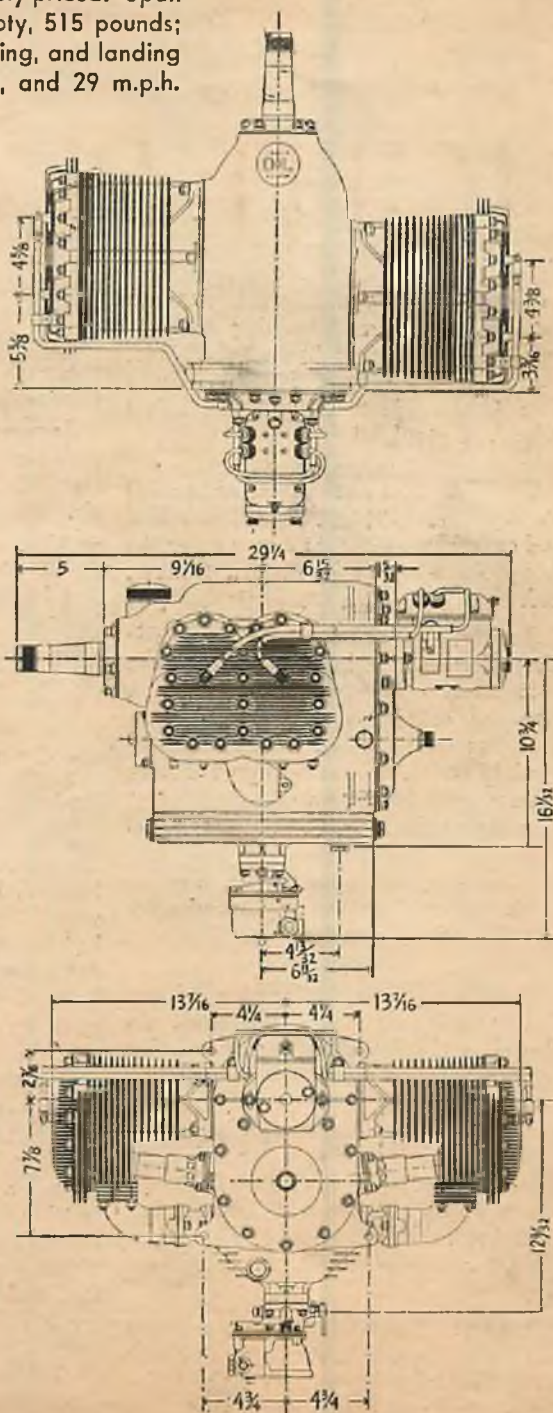
Did you ever stop to realize that the private pilot has helped develop many of our aeronautical concerns and bring them along to the point where they are capable of doing their part in the event of war?

The private pilot has purchased with his own money his plane and his tuition. Every hour in his log book represents a cash outlay.

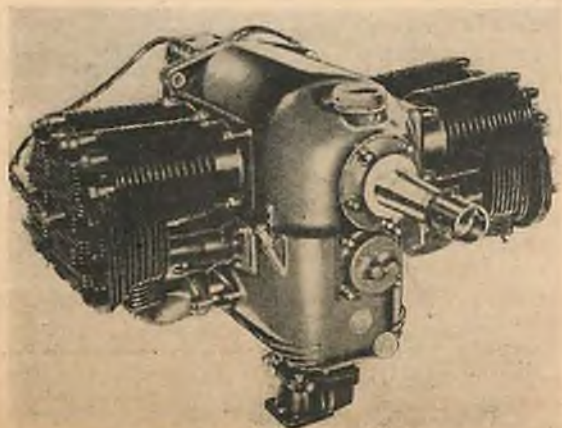
But what position does the light-plane man hold in aviation?

He should, as I said, hold his head high in the world of aviation. He should be granted some badge of distinction, a laurel of honor. Instead he is shoved about, ignored when new rules are drafted, and generally considered something of a lecherous menace on the runways.

The average light-plane owner slinks about the airport like a war-time observer who has to admit his name never got on an ace list. He skulks about in dark corners of dusty (Turn to page 86)



Right—Three-view drawings of the new Menasco engine taken from a reproduction of the Menasco Mfg. Co. Left—The 50 h.p. Menasco.



What's Your Question?

By CLYDE PANGBORN

Wing Commander



As soon as possible after being received, all questions will be answered. Those of general interest will appear on this page; others will be answered by mail. Enclose a stamped, self-addressed envelope to insure answering.

Question: I am interested in aviation and would like to know what part of the Army Air Corps I could get into with only a high-school education. What training school is nearest to me? D. P. G., Waitsburg, Wash.

Answer: With only a high-school education you can become an aircraft and engine mechanic in the Army Air Corps and eventually be transferred for flight training. The nearest training school to you is the Aircraft Technical School, Denver, Col. Write for particulars to The Commandant, Aircraft Technical School, Rantoul, Ill.

Question: Please advise me as to what studies I should take during high school and college in order that I may enter the Army Air Corps. F. P., Jr., Denver, Col.

Answer: To enlist in the Army Air Corps for flight training you must have successfully completed two years of a standard college course. This means that you do not have to take up any special courses. Those who do not have the required two years of college must pass examinations in U. S. history, general history, English grammar and composition, geography, arithmetic, algebra, plane and solid geometry, trigonometry and elementary physics.

Question: I am a member of the Teaneck High School aviation class. In this class the fundamentals of aviation are taught—aerodynamics, navigation and meteorology. I would like to know if you think this course will be of any value in enabling me to enter either the Army or Navy flying corps. I do not expect to be able to go to college, but intend to take the competitive examinations for entrance. R. F. W., West Englewood, N. J.

Answer: Those subjects on aviation will be taught you in the Army or Navy ground school prior to your flight training. The only value in them now is to

yourself, as it will make your studies easier later on.

Question: Could you send me some information on the English Mayo Composite plane? What is the seaplane it carries used for? Has it any special use? Does it stay on top of the flying boat? Does the seaplane help it in any way? Could a Douglas Transport be turned into a bomber without too much trouble? Is the Boeing Bomber the fastest one in the world? What is the top speed of a Curtiss P-37? J. K., Schenectady, N. Y.

Answer: The idea of the Mayo Composite aircraft is to launch a smaller and fast, heavily loaded cargo plane into the air. The lower component is the mother ship which carries the top component up. As the speed increases, the seaplane begins to support itself more and more until finally it is supporting its own weight. Then the plane on top separates from the flying boat and goes on its own way. The seaplane, of course, is of help to the flying boat on the take-off because of added wing surface and greater motive power as the engines of the upper ship are wide open on the take-off. I suppose that in case of necessity the Douglas Transport could be transformed into a bomber, but it would involve a lot of work. The Boeing Bomber is the fastest bomber in the world in its class. I do not know the top speed of the Curtiss P-37, as it is on the secret list, but it is in excess of 300 m.p.h.

Question: I am just starting to take flying lessons and am figuring on getting an airplane of my own. I was wondering if it would be wise of me if I purchased a Flea ship for the purpose of putting some flying hours in before I got something better. How much does this airplane cost? What is its landing, cruising, and top speed? Is this plane safe for a student flyer? S. R. B., Jewett City, Conn.

Answer: I would not recommend the purchase of a Flea. This ship has not

been approved by the Department of Commerce and therefore cannot be licensed. To my knowledge there were only two of them built in this country, so that its price is not known. Its performance is supposed to be top speed 95 m.p.h., cruising 75, and landing 30. A number of them have been flown in Europe and they are continually undergoing changes. I would rather suggest that you buy a good, second-hand, American light plane like the Aeronca or the Cub, which will not only pile up your flying time for you, but also give you a lot of pleasure and with which you can earn some money after you get your ticket.

Question: I have a few questions I am sure you can answer. The altimeter shows altitude above sea level, does it not? What instrument, if any, gives altitude above land level? Is there an instrument able to give the distance of the ground in front of the plane, as, for instance, when a pilot is lost in a storm and heading into a mountain? F. M. H., Honolulu, T. H.

Answer: Yes, the altimeter shows the altitude above sea level. A sonic altimeter is the device which shows altitude over the ground. It is based on the echo principle, using ultra-short radio waves instead of sound. It is still in the stages of development because of tricky characteristics of short waves. As to the other device, to my knowledge it does not exist as yet.

Question: Did the rotary motors used during the War turn with the propellers? If so, how fast did they turn per second and where could I obtain information on them? Could you also tell me what planes had these power plants? E. A. S., New Bedford, Mass.

Answer: Yes, all rotary motors turned with the propellers, the crankshaft being stationary. The revolutions per minutes varied from 1,100 to 1,300. Air Trails published an article on them in

the March, 1937, issue. You can obtain it by sending 15c to Mr. Clifford in the circulation department of Air Trails. The majority of planes during the War used those engines. I could not give you all the names of them, for there would not be enough space for it. But here are some of them: the Sopwith Pup, Snipe and Camel, DDH3 and 6, The Avro 9, The Farman, Nieuport, twin-motored Caudron, Morán Saulnier and Parasole, Fokker Monoplane, Fokker Triplane, Fokker DII, DIII, Thomas Morse Scout.

Question: Can you tell me who holds the world's land speed record, what kind of plane he used, the name of the company that made it, the make of the engine, number of cylinders and its horse power? Will you please do the same regarding the seaplane record. H. E. R.

Answer: The official world's land speed record of 381.8 m.p.h. is held by a German pilot named Wurster. The plane he used was a Messerschmidt BF-109 fighter, built by the Bayerische Flugzeugwerke. The engine was a Daimler-Benz 12-cylinder, 1,100 or more h.p. That is all we know about it. The seaplane record, which is 444 m.p.h., was broken by an Italian pilot, Francesco Agello, flying a Macchi Castoldi racer, powered with a 24-cylinder, 2-unit Fiat AS-6 engine which developed 5,100 h.p.

Question: If, as you say in the Air Trails Annual for 1938, the range of the Short Empire flying boat is only 800 miles, how is it that it has already flown the Atlantic? J. D., St. Petersburg, Fla.

Answer: To clear up this matter, which has puzzled many readers, I should explain that the standard Empire flying boat, carrying 24 daytime passengers and crew and 1½ tons of mail, has only a range of 800 miles. The *Caledonia* and the *Cambria* were stripped-down versions used for survey flights, carrying a crew of three and being fitted with special long-range fuel tanks. Thus, passenger weight was taken up with extra fuel, which gave the two ships a range of about 3,300 miles.

Question: Can you tell me where I can get any information on obtaining a position as a stewardess on an airliner? I am a registered nurse. M. C. P., Sacramento, Cal.

Answer: You should make a formal application by letter to the Personnel Managers of any of the air lines that employ women hostesses. I would suggest first that you try United Airlines, 221 N. La Salle St., Chicago, Ill., or T. W. A., at Municipal Airport, Kansas City, Mo.

Question: Can you give me any further information on the Mayo Composite planes, including the weights, horse power of the engines, and the number of

passengers they carry? E. P., Bronx, N. Y. C.

Answer: As far as we can see from very good colored photographs recently received from abroad, both the upper and the lower components are natural aluminum in color with no decorative markings of any kind. The upper (Mercury) carries the registration letters G-ADHJ along the fuselage and under the wings, while the lower (Maia) carries the registration letters G-ADHK. The wooden propellers on the Mercury are natural mahogany color, and the front section of the Maia's engine cowling appears to be painted a dull gray-blue.

The Mercury is a four-engined twin-float seaplane built to carry only one pilot and a radio operator. The rest of the fuselage is devoted to mail or freight compartments. It uses the 340 h.p. Napier-Halford Rapier engines and has a top speed of about 207 m.p.h.

The lower component is powered with four Bristol Pegasus 915 h.p. engines and has a top speed of 200 m.p.h. The hull carries three passenger compartments accommodating 18 passengers but, as the lifting component in the general arrangement, does not actually carry passengers, using all its power in the work for which it was designed.

Question: Where can I buy a copy of the book "Flying Vistas," by Dr. Isaac H. Jones? T. M., Detroit, Mich.

Answer: I am sure any good bookseller in the city of Detroit could get the book for you, if he does not have one in stock.

Question: What information can you give me on the Horace Keane "Ace" light plane, shown in Air Trails some months ago? F. O. H., Jerseyville, Ill.

Rudy Arnold



Pulling the chocks! A Navy SOC-1 ready to take off from Floyd Bennett.

Answer: The Keane "Ace" is an open cockpit land plane using the Ford V-8 engine. It has a top speed of 110 m.p.h. The wings are built up on a wooden spar with plywood ribs and covered with plywood. The fuselage is built up in much the same way.

Question: I wish to become a pilot in the Army Air Corps. Do you think if I enlisted and worked my way through the various grades to the point where I might receive a Flight Cadet appointment, I would stand a better chance than if I took two years of college and then applied for a regular appointment? A. D. F., Fall River, Mass.

Answer: This is one of those questions which only you yourself can answer. If you take your college credits and are sure you can pass the physical examination and get into Randolph Field, by all means do so. The path through the regular enlisted grades is long and only those with unusual background, ability and a keen desire to advance, accomplish it. I will say, however, that during the past few years more candidates have been selected from the enlisted ranks than ever before, and men who have gone through the grades usually turn out to be highly skilled and fine all-around pilots.

Question: How many planes are there in a regular squadron of the British Royal Air Force? L. D., Windsor, Ontario.

Answer: Under present conditions the number varies depending on several circumstances. Some fighter squadrons are composed of three flights of six planes each, others have only three planes in a flight. Bomber squadrons usually have twelve planes, as do the coastal reconnaissance squadrons.

Cruising ZERO

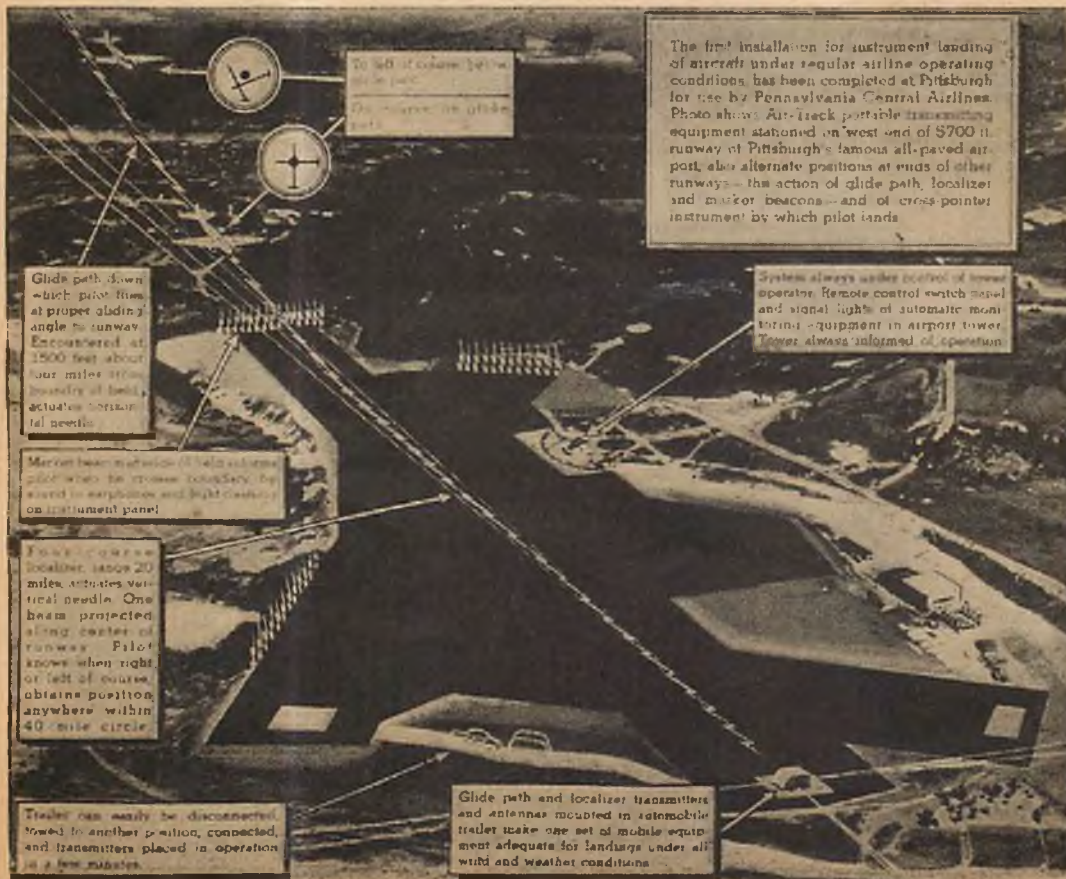
Photos by Rudy Arnold



Transport aviation has overcome the hazards of nature one by one, until air travel has become one of the safest methods of transportation. Even blind landings are now possible. The "Air Track" system illustrated is one of the better methods of bringing a blind-flying ship in to a safe landing.

Left—An American Airlines Douglas DC-3 prepares to take off at Floyd Bennett Field, taking on passengers, mail and express for what is expected to be just another run.

Right—The visual indication "Air Track" dial on the plane's instrument panel gives the pilot both direction and altitude. The photo illustrates the procedure of a plane approaching on the center-line of the localizer. The localizer has a twenty-mile range. When the plane comes under its influence at a 15,000-foot altitude, four miles from the airport, the horizontal needle begins to rise. Any movement of the plane from the proper path is indicated by the needles and, as long as they cross at right angles in the center, the course is correct. A—To left of course, below glide path. B—Right of course, below glide path. C—Left of course, above glide path. D—On course, below flight path. E—On course, on glide path. Below—This superimposed drawing and aerial photo shows "Air Track" directional and glide path utilized by a transport coming in for a blind landing.





Pilot and co-pilot confer. With weather conditions growing unexpectedly worse, they must fly solely by instrument and radio.



In addition to flying by instruments the co-pilot tunes in the direction-finder-homing unit, getting on the radio directional beam.



Co-pilot uses two-way voice microphone to contact airport at destination, inquiring weather at that locality. Below—The "Air Track" mobile car, containing glide path and localizing transmitters. The trailer is plugged in to power and control cables; is put in operation by man in airport control tower.



The airport answers co-pilot's call; gives résumé of local conditions, advising plane that weather bureau must be contacted for more accurate broadcast.



Weather man checks maps and latest reports. Fog coming in, visibility and ceiling decreasing. Information is relayed to the plane by radio.

When an airliner nears the field flying blind, the airport control tower directs the mobile directional indication finder trailer to its position on the field to guide incoming plane.



Below—A clear-weather demonstration of an "Air Track"-equipped airliner. A DC-3 comes in to a perfect landing, using the direction and glide path radio beams.





The Honor Roll For July

FLIGHT CAPTAINS

Doug Valteau, Toronto, Ont., Can.
Leonard Heidebrecht, Vermilion, Alta., Can.

FLIGHT LIEUTENANTS

William King, Windsor, Ont., Can.
Douglas Gunther, Chicago, Ill.
Roy Kaufman, Bridgeport, Conn.
Raymond Fowler, Jr., Waterbury, Conn.
Anthony Lenac, Ottawa, Ill.
J. W. Foster, Miami, Fla.
Bob Herzog, Burbank, Calif.
David Baker, Chicago, Ill.
Herman Stevens, Jr., Rocky Mount, N. C.
Hugh Fraser, Toronto, Ont., Can.
James Neil Cooper, Dayton, Ohio
George Burghardt, Queens Village, N. Y.
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Afraid Of Airplanes?

GREETINGS, Air Adventurers!

This month I am taking up a topic that has been suggested in a somewhat roundabout manner. Further on in this department you will read about a problem that stumped George E. Goodhead, Jr., of Tulsa, Oklahoma, when he tried to interest some business men in a mass-production idea. George built a swell model in which he developed his ideas on mass production and displayed it in hopes that he might interest a few wealthy men in his plan. The picture of the model published herewith will give an idea of what George was getting at. It is a simple low-wing monoplane in which most of the parts are to be stamped out in much the same manner as motor car parts are produced today.

Regardless of the worth of Goodhead's idea or how well he carried it out, we felt deeply for him when he explained that the wealthy business men were interested—in a way—but turned him down flat with the statement that the public was afraid of airplanes!

Nothing riles us of Air Trails more than a statement like that, unless it is the age-old chestnut: "Sure. I don't mind flying, if I can keep one foot on the ground."

If there is one thing Air Adventurers all over the world must do it is to convince people that the airplane is nothing to be afraid of. We must keep up this fight to keep our wings, in spite of the continued undercurrent of vile criticism that eats at the foundations of aviation.

Air Adventurers, are you afraid of airplanes?

Are you one of those people who enjoy basking in the reflected glory of aviation and aviators, or do you do something about it? Are you just another model builder who does a lot of hangar flying but has no intention of ever attempting to fly? Do you *believe* in aviation?

Let us not bury our heads in the sand and ignore the faults of the modern airplane. It is not a fool-proof instrument as yet. If it were there would be no need for Air Adventurers. I, for one, do not believe that one day only a few years from now we shall all be flying, just as we motor on the roads. I do not believe that *anyone* can be taught to fly, any more than *anyone* can be taught to drive a car. There are physical and mental limitations to everything, and flying demands a reasonable amount of native skill, judgment and common sense.

Ever since my earliest days in aviation, I have been asked whether I am afraid of airplanes. I have always answered, "No, but I have a lot of respect for them." There is a vast difference between the two feelings, and most of our living flyers who have been in the business since the War are still around because they



Closeup of the nose of a Douglas O-46A Army observation ship. Picture by Jerry Baer of Madison, Wis.

respected the plane without being afraid of it.

It is true you must point out to the skeptics that airplanes *do* crash and that flying men are sometimes killed. It would be only a waste of breath to add also that people are killed in bathtubs, on football fields, climbing mountains and in coal mines. People are drowned at the seashore, washed off motorboats and killed in skiing accidents. Window cleaners fall to their deaths daily from skyscraper windows and men are asphyxiated in sewers and garages where doors are closed. People are killed on golf courses when they are struck by lightning or sliced drives. However, our manufacturers still continue to turn out bathtubs, footballs, spiked shoes, pick-axes, bathing suits, motorboats, skis, safety-belts, motor cars and golf clubs with steel shafts—because no one is really afraid of these things. Why, then, should we be afraid of airplanes?

None of this perhaps is very satisfactory or convincing because they will still say that airplanes crash.

All right, then, let us look up the actual figures on this crash business and see just how much real danger there is in aviation. Remember,

Right—George E. Goodhead of Tulsa, Okla., designed this model to illustrate a mass-production idea.



Above—Blinker beacon at Pittsfield, Mass., snapped by Warren Vreeland. Left—Dornican Castle, Glendale, Cal., snapped this Marine Corsair at the National Guard Air Field.



would naturally expect; but you would have to fly 53,894 miles to encounter an ordinary accident such as a forced landing, a turn-over or a normal crash in which no one was killed. You would have to fly 512,712 miles to get mixed up in a fatal accident, and when you added it all up you would find that of all accidents in this classification, 55.90 per cent can be traced to pilot error or some form of personal error. The airplane itself is only responsible for 9.15 per cent of all such accidents!

So, Air Adventurers, what are we afraid of? Certainly not the airplane. It must be ourselves we can't trust.

But we have a Creed and we're going to put it over in aviation and take all the fear out of the industry. We have a Creed and we have a swell crowd to carry out the Creed, but we want more. Can you fit in and tell the world that there is nothing to be afraid of? If so, there's a coupon in the corner below. Fill it out, send in your dime for your badge, and let's run this boggy-man into the earth—where he belongs.

ALBERT J. CARLSON.

AIR ADVENTURERS NEWS

So now to the regular business of the month.

Our members are (Turn to page 80)

the figures I am about to present have been carefully collected by reliable officials and they are referring to reasonably modern aircraft of 1937—not 1938.

Let's take the figures of the regular scheduled air lines for the last six months of 1937, which cover a great deal of the so-called hazardous winter period.

If you flew 1,839,799 miles you might run into an accident—not a fatal accident. You would have to fly 10,618,964 miles to stand a chance of being killed. There are few men in the world who have flown 1,000,000 miles, so what are we worrying about?

But, you might argue, that's all right for the scheduled air lines; what about flying in general, which includes ordinary operators, private flying and club flying in licensed planes?

Here our figures are not quite so impressive, as one

(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 August 15, 1938.)

THE GREAT

By

GEORGE L. EATON

A Complete BILL BARNES Air Novel



He brought the Lancer around in a sweeping bank—the two biplanes were coming back at him in a stepped-up column—

TINY shivers, that to Bill Barnes were mute evidence of his own trepidation, seemed to creep up his spine as he threw himself into the bucket seat in the front cockpit of the Silver Lancer, and adjusted his seat pack. The sun glittered like molten silver on the newly lacquered wing and tail surfaces of the big ship, standing there on the apron at Barnes Field, Long Island.

Bill Barnes realized that in the next few minutes he would definitely know the fitness and the fate of the great ship which had carried him above the Seven Seas for the past few years. And he realized that if he was forced to scrap the famous fighter it would be like retiring a beloved thoroughbred racehorse that could never run again.

His eyes flitted across the instrument panel as almost affectionately he nursed open the throttles of her twin Barnes

Diesels and listened to the full-throated roar of her three thousand horses.

Not since that fateful day when he had been rammed by Mordecai Murphy above the Isle of Wight had he tried to fly the Lancer. Mordecai Murphy, who called himself the Saver of Souls and had been Bill's most dangerous enemy, had begun a twisting, tortuous descent toward the waters of Alum Bay that day and had disappeared from the sight of man.

And for three long days Bill Barnes had lain close to death before he had been removed to the ancestral home of his friend, the Duke of Malbury. There he had spent a month recuperating while young Sandy Sanders, the youngest of his little band of flyers, had arranged to have what was left of the famous Lancer transported back to Barnes Field.

At first, old Scotty MacCloskey, head

technician and major-domo of Barnes Field, had insisted that the Silver Lancer would never fly again. For Scotty MacCloskey to make such a statement was the same as sentencing one of his own kin to death. The Silver Lancer had been to him not a thing of metal and wood, but a thing that breathed and talked.

The dour old Scotsman wept his last rites over the Lancer while he was figuring out in his canny mind how to make her skyworthy again.

They went to work on her in the little airplane factory that Bill maintained on Barnes Field. Every one of them, from the lowliest grease monkey to the most skilled technician, put everything they had into bringing the Lancer to life again.

They tore down the powerful twin Barnes Diesel engines and checked them from the fuel injection pumps and noz-

IMPERSONATION

Above the wilds of Madagascar Bill Barnes encounters a fiendish weapon and in a strange aerial duel solves an international mystery.

zles to the cap screws on the valve tappet assemblies. While mechanics, under the supervision of Martin, their chief, overhauled engines, propellers and accessories, skilled craftsmen calibrated and adjusted and replaced the naviga-

waters of the English Channel. It was a feeling that he could not express. He could only feel it as he had felt the almost human responsiveness of the Lancer in time of need.

Now, his blue eyes were grim and not

and went whistling away in his wake as he hung the Lancer on her props again and took it upstairs. After a moment he yanked the nose of the big ship up and began a series of squirrel-cage loops that took him higher and higher with each one. At the top of the last one he rolled right side up and cut his throttles.

"All right, baby!" he said, grimly to himself, "we'll see if you can take it!"

He stuck the nose down until he was in a steep dive. When he was vertical, with his throttles wide, he eased the nose under until he was in a steep inverted dive with a gale lashing at his hatches and screaming through his struts.

For one horrible instant he thought the Lancer was not going to be able to take it. But he held her there under that frightful strain until she had reached terminal velocity. Then he leveled off upside down and half-rolled right side up. Perspiration was streaming off his face as he brought her up in a climbing turn and whipped back to reverse his direction of flight in a flashing chandelle.

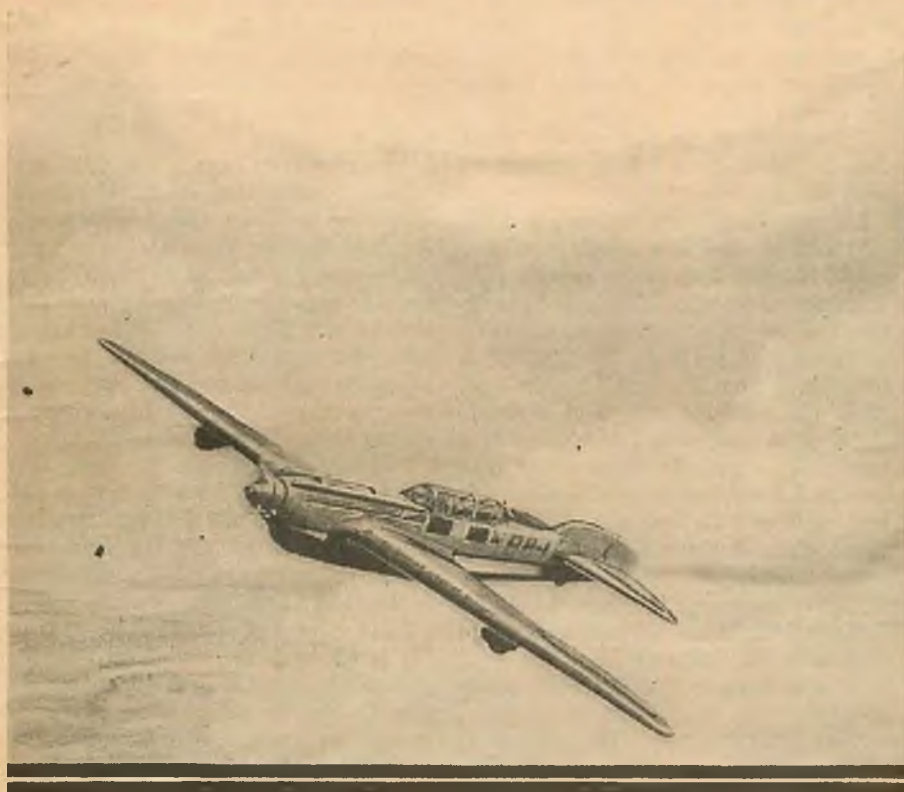
An instant later he stuck the nose on the traffic tower of Barnes Field far below him and opened the throttles again. Down and down he plunged, fighting to keep the nose from coming up before he had reached terminal velocity. At five thousand feet he began to pull out, easing back gently until the nose began to rise.

"You'll do," he said to the Lancer, a trifle sadly, because he knew that she was not the ship she once had been. She would never be the same again.

He dropped his retractable landing gear and kissed his wheels on the runway a few minutes later. He rolled up to the apron, killed his power plant as he set his brakes.

Old Scotty MacCloskey and three of his little squadron, Shorty Hassfurter, his chief of staff, Eric (The Red) Gleason and Beverly Bates, stood on the apron as he slid out of the cockpit. Shorty and Red and Bev Bates were the only remaining members of Bill's original organization, with the exception of the irrepressible Sandy Sanders. They all knew him as a man knows his own brother and they knew that now he was not satisfied with the Lancer.

They could tell it by his every gesture as he dropped to the ground. They



tion and flight instruments. "Tin knockers" ripped out whole sections and replaced them while two inspectors kept checking the work constantly.

They had been forced to remove the 37mm. cannon that was mounted in the Vee of the cylinders and shot through the hollow shaft. They found that they could not eliminate the torque caused by it and Bill told them to shelve it because, even then, the unformed spark of a new Barnes creation was stirring to life in his fertile brain.

When they had finished she was ready from the tip of her spinner to the trimming tabs of her rudder. She was, on the surface, the same gleaming creature of alloy steel and shining dural that she had been before.

But deep down in his heart Bill Barnes knew that she was not the same. He knew that she had left some inanimate part of her buried deep in the

a little sad as he released his wheel brakes and blasted the big ship around into the wind. The field seemed to melt away from him as he raced the silver bullet down the center runway into the wind. The tail lifted and he whipped the nose up with that touch of *élan* for which he was justly famous.

He slid back the hatch above his head and let the wind beat against his face as he took the Lancer upward. It was the first time he had been in the air above Barnes Field since his return from England. He watched the long strip of brown and green that was Long Island roll out from in under him as he brought the ship around in a great sweeping bank.

Something of the peace and serenity that is the natural heritage of the airman crept into his blood and made him glad to be home again, glad and proud. The wind snatched at his white helmet

didn't have to ask him. Old Scotty MacCloskey's face was as long as the Straits of Magellan and almost as narrow in spots.

"You don't like her, boy?" Scotty asked.

"I don't dislike her," Bill said, trying to ease the blow to Scotty. "She'll do for the time being. Until——"

"Hey, Bill! Bill!" young Sandy Sanders screamed from the steps of the Administration Building. "On the telephone!"

Young Sandy screwed up his freckled face while he held one fist to his ear and pretended to talk into the other one in what he thought was a pantomime of a telephone conversation.

"Who is it?" Bill roared at him.

"James Morton! Washington!" Sandy shouted back. "He says it's important."

"Okay," Bill said. He started toward the Administration Building with long, powerful strides. Young Sandy waited for him on the steps.

"Did he say what he wants?" Bill asked him.

"No," Sandy answered. "He just said it was important. Maybe it's something like those old jobs we did for him, Bill," he added, hopefully.

Bill picked up the telephone in his office with a feeling of mingled reluctance and anticipation. He knew that a call from James Morton, Chief of the Criminal Bureau of Investigation in Washington, might mean almost anything. It might mean a long, tedious, uninteresting investigation or it might mean fireworks from beginning to end.

Whichever it was Bill didn't want any part of it. He had the beginning of a new creation to take the place of the *Lancer* in his mind, and he didn't want to be interrupted by a government job, no matter how important it seemed to Morton. He resolved that he would tell Morton that immediately and save a lot of beating around the bush.

"Hello, Bill Barnes speaking," he said into the mouthpiece.

"Hello, Bill," the deep, pleasant voice of James Morton said in his ear. "How are you, old man? I'm fortunate to reach you. Can you get down here immediately?"

"Hey!" Bill said. "One question at a time. I'm feeling okay and I can't get down there inside of three months."

"Oh, oh!" Morton said. "That doesn't sound encouraging." Then his voice became serious. "Have you been keeping up with the newspapers recently, Bill?"

"Why, yes. . . . no," Bill said. "I was in England for a time."

"I've heard about that," Morton said dryly. "Listen, Bill. Evidently you don't know what I'm driving at and I can't talk about it over the telephone. You'd better hop down to see me this afternoon if you possibly can. It's about

something that concerns you, directly."

"It's not the Bureau of Air Commerce again?" Bill asked.

"No," Morton said. "Nothing so mild. It's a mighty serious thing, Bill. It doesn't come under my department officially. But I learned about it and I thought I'd better get in touch with you and try to get things straightened out before they became too involved for you to make a satisfactory explanation."

"Explain!" Bill snarled. "What have I got to explain?" Then, something in the warning sound that came from Morton made him hesitate. He glared into the telephone and said, "Okay, Morton. You'll be in your office."

"I'll wait for you, Bill," Morton said. "Good-by."

Bill laid the telephone back in its cradle and gazed with unseeing eyes at the gaping Sandy.

"Newspapers?" he said aloud. "What does he mean, have I been keeping up with the newspapers?"

"What's that, Bill?" Sandy asked.

"Have we had any clippings of any special interest from our newspaper clipping bureau recently?" Bill asked Sandy, who also served as his secretary.

"Nothing in particular since you first came back from England," Sandy said. "Just the regular stuff. And a couple about some man who is impersonating you. I informed the police about that because I knew you were here when this bird who said he was you was somewhere else. I haven't heard anything more about it."

"Those impersonations are old stuff," Bill growled. "Some half-wit who wants to make a hit with a girl."

"You're going to Washington?" Sandy asked.

"Yes," Bill snapped. "This afternoon. Morton says it's something serious."

"I better go along then," Sandy said.

"You'll do nothing of the kind," Bill said. "You'll stay here and hold down the office."

II—MORTON'S REVELATIONS

IT WAS two-thirty in the afternoon when Bill walked into the office of James Morton. He shook hands with that strong-faced, stocky individual and growled as the other's brown eyes twinkled merrily in reply to Bill's bad temper.

"I always cross my fingers every time I hear from you," Bill told him. "I always say I'll have nothing to do with what you have on the books and the next thing I know I'm in the South Seas working for you."

"I haven't anything on the books that I want you to help me with, Bill," Morton smiled. "I'm going to do you a favor this time."

"I'm still suspicious. Let's have it."

"The whole thing is really out of my

jurisdiction," Morton said. "I heard about it because of an investigation that overlapped into my territory. I had some further investigations made and I find you're running around in bad company, Bill."

"I still don't know what you're talking about," Bill said.

"Well," Morton said, "I don't know a great deal about what I'm talking about myself. That makes it mutual. But, did you happen to notice that some one masquerading under your name was a guest at a very important State dinner, here in Washington, a short time ago?"

"No!" Bill said, and he sat up a little straighter in his chair.

"Do you think it worth while," Morton went on, "to investigate another story about a conference you had with the heads of a couple of countries in Central Europe?"

"I never even heard of it," Bill said. "Sandy Sanders, my secretary, calls my attention to those things occasionally. But usually they don't amount to anything—some drunk who resembles me slightly and tries to impress some more drunks at a night club. It has become such old stuff that I don't pay any attention to it anymore unless someone tries to forge my name to a check or charge things to my account."

"This isn't anything like that, Bill," Morton said, and he was serious now. "As I said, I made a few investigations. The thing is in the hands of government operatives but I can't tell you just who is the most interested."

"But I can tell you this," he went on. "It is no small matter. You may find yourself in a great deal of trouble and also in deadly peril. I've found out enough to know that this person who is impersonating you looks amazingly like you and people who have met you have been deceived. I have no idea who he is. He is working very quietly, using your name because of your standing in aviation to gain him admittance where he would otherwise be barred."

"But what's the idea?" Bill asked. "What is he trying to prove?"

"According to the secret agent with whom I talked," Morton said slowly, "he is getting several interested nations to bid against one another to buy the secret to one of the most deadly war devices that has ever been conceived!"

Bill Barnes came straight up in his chair and some of the color had drained from his bronzed face as he stared at Morton in horrified amazement.

"And he's using my name to peddle it!" he said. "Do you know what it is?"

"No," Morton said. "No one seems to know. But from what the agent told me they are all trying desperately to get it to prevent it from falling into enemy hands. According to what we know it is such a hellish device that they all

want to secure it and destroy it before it destroys them."

"You have no idea what it is?" Bill persisted.

"None," Morton said. "That sort of thing is all done very quietly, Bill. Espionage and the buying and selling of destructive or constructive formulas to wage warfare must all be done under cover. I imagine that this weapon or device must be something that has to do with aerial warfare or your name would never have suggested itself to them. That's just plain every-day psychology."

He dropped the nose of the Lancer this time and the wheels of the little ship grazed his rudder—



"Yes," Bill said. "But what? And who is it?"

"I can't answer any of those questions, Bill," Morton said. "But you can easily understand that you might be in peril this very minute."

"What about this State dinner here in Washington?" Bill asked. "Did you investigate that?"

"I did," Morton said. "It was just a run-of-the-mill State dinner. A man impersonating you was there. Several people who have met you spoke to him and did not know that it was not you. The dinner was given by a representative of another nation. An invitation was secured for you in some manner. We don't know how. We don't even

know who your impersonator wished to talk to—why he wanted to be at that dinner."

"My heavens!" Bill said. "Can things like that happen? It sounds like one of those New York debutante parties where no one knows the hostess and she doesn't know any of the guests!"

"Strange things occur in Washington, Bill," Morton said.

"But good grief, man!" Bill said. "What had I better do about it?"

"You'd better keep your ears and your eyes open," Morton said. "I thought you'd be interested in coming down after I told you."

"I don't know how I can thank you," Bill said earnestly. "But I don't know where to begin to uncover this thing."

"Sit back for a bit and keep your powder dry," Morton said. "I'm going to find out what I can. It's all out of my jurisdiction but I'll keep nosing around. You've done me a few favors, Bill."

Bill was fervent when he shook hands with Morton. "I feel like a man in a

glass cage with someone sniping at me from outside," he said.

"You'd better keep in touch with me," Morton said. "If anything breaks I'll let you know."

Bill glanced at the extension-charging handles of the twin .50-caliber Brownings, and the circular dials of the automatic ammunition counters on either side of the forward cockpit of the Lancer as he took it into the air again for the homeward journey.

It was not only Morton's warning that gave him a feeling of nervous apprehension. There was also that curious inherent instinct that always let itself be known when trouble lay ahead. He never stopped to analyze such a feeling but he always heeded its warning by a considerable degree of caution.

That was why, when he saw those two olive-drab biplanes high above him, he could feel the muscles in his stomach tighten. He had flown north from Washington until he was above one of those long stretches of the Susquehanna River that are rather desolate for that section of the country. The two ships above him looked not unlike P12F biplane fighters and they were holding a parallel course to his own, each about four or five hundred yards out on either side of him.

He watched them for a moment and

began to nose the Lancer up, hoping to shoot through the space that separated them and get above them.

His thoughts drifted back to the strange things James Morton had told him, and the two ships were for the instant erased from his mind when, suddenly, the high-pitched scream of their diving props beat against his ears.

At the instant fire and smoke belched from the four machine guns synchronized through their propellers, he slammed his overhead hatch closed and yanked the control column of the Lancer back into his stomach. The big ship's nose came up, but not with the dazzling speed it had always shown in the past. Otherwise it would not have

could be happening to him *here*, thousands of miles away from lands where one might expect the skies to be perilous because of actual warfare. His finger clamped down on the electric gun trip of his own .50-caliber guns as he saw the two ships below him pulling out of their dives and stick their noses upward.

"All right!" he snarled again. "You asked for it!"

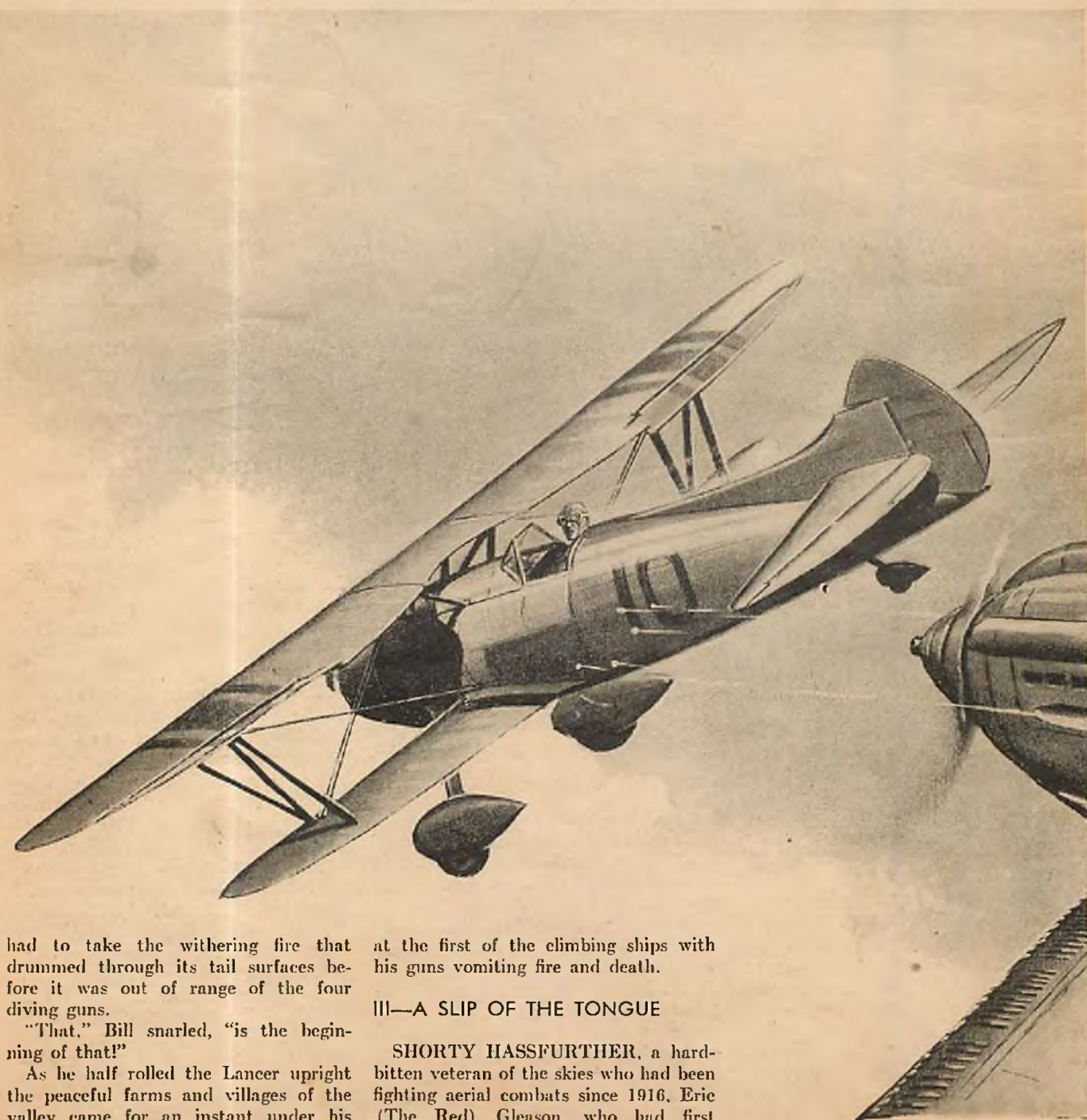
He didn't stop to reason who they were or why they had attacked him. He was a firm believer in the axiom that a strong offensive was the best defense in the air, and he acted accordingly. He whipped the Lancer around in a flashing chandelle and dove straight

lines in the same year, and the brown-eyed Bostonian of a latter era, Beverly Bates, sat in the office of Bill Barnes at four o'clock that same afternoon trying to make life miserable for young Sandy Sanders.

Shorty and Red were reciting accounts of their prowess in Spads and S. E. 5s over the German lines during the World War and in sundry other countries since that time.

"You know," Shorty said to Sandy, his blue eyes gleaming with amusement, "one time I shot down three enemy planes with just one round, one burst—one bullet."

Sandy was watching him with sus-



had to take the withering fire that drummed through its tail surfaces before it was out of range of the four diving guns.

"That," Bill snarled, "is the beginning of that!"

As he half rolled the Lancer upright the peaceful farms and villages of the valley came for an instant under his gaze, and he marveled that such a thing

at the first of the climbing ships with his guns vomiting fire and death.

III—A SLIP OF THE TONGUE

SHORTY HASSFURTHER, a hard-bitten veteran of the skies who had been fighting aerial combats since 1916, Eric (The Red) Gleason, who had first fought with Shorty over the German

picious eyes but his ears were eager for the story.

"Yes, sir," Shorty said. "Three of 'em were flying side by side, in perfect alignment. I dove from a thousand feet above them, leveled off on their port side and fired just one bullet. It hit the first pilot in the left ear, came out the right ear and kept right on going until it got all three of them!"

"Yeah," Sandy said, "and when you got back behind your own lines you made a landing, reached in your hip pocket and brought out the Kaiser!"

"No," Shorty said. "That was another day I brought home the Kaiser. That was——"

"Nuts!" Sandy said. "I wish you

lugs would get out of here. I have work to do. Bill told me to check up on some stuff before he got back and he's going to climb my neck if I don't have it ready to show him."

"Where is Bill?" Bev Bates asked, just as the telephone on Sandy's desk rang.

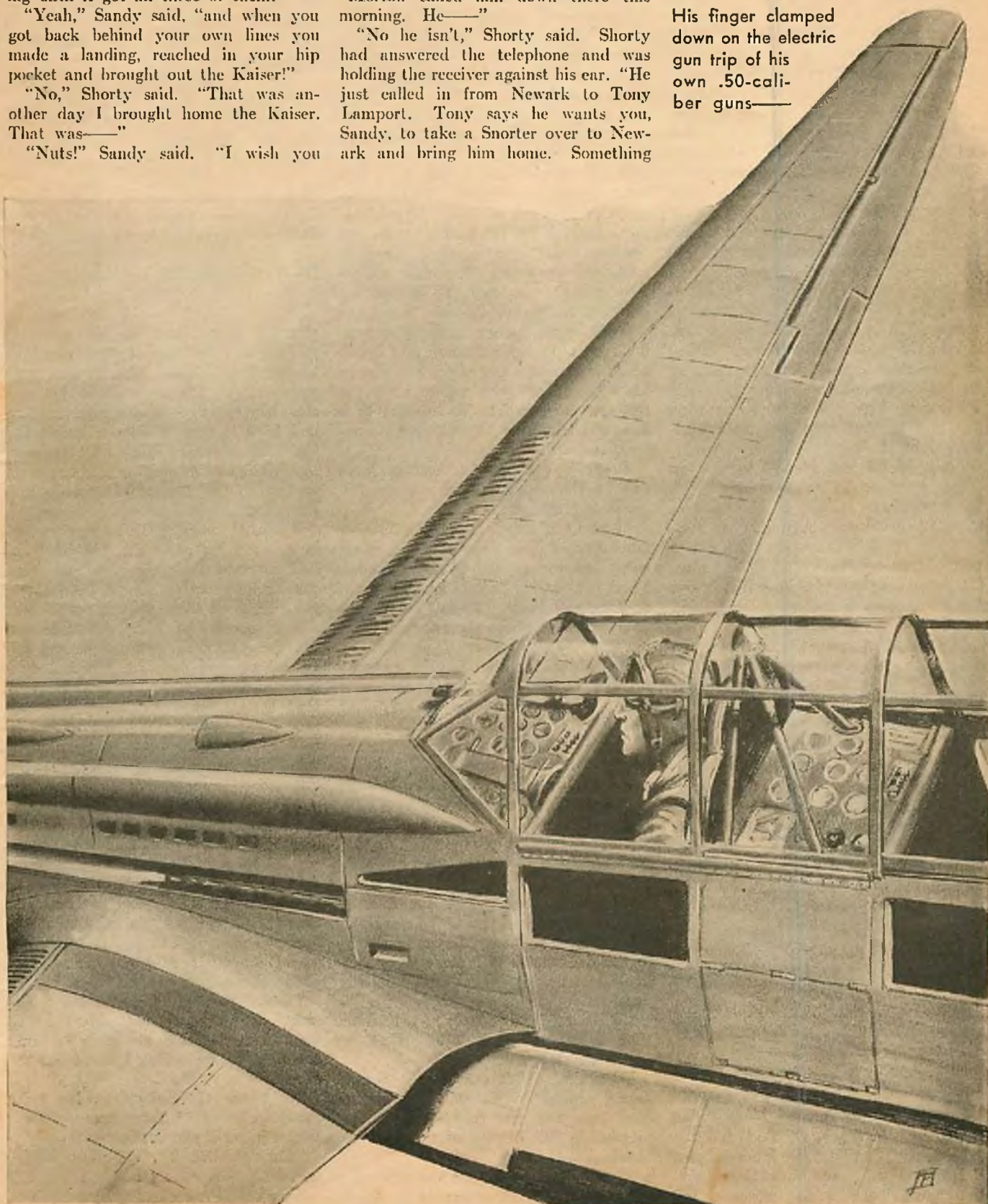
"He's in Washington," Sandy said. "Morton called him down there this morning. He——"

"No he isn't," Shorty said. Shorty had answered the telephone and was holding the receiver against his ear. "He just called in from Newark to Tony Lamport. Tony says he wants you, Sandy, to take a Snorter over to Newark and bring him home. Something

went wrong with the governor on his fuel pump assembly on the Lancer and he's got to leave her there until he can take the bugs out of her." He turned his head and spoke into the mouthpiece of the telephone. "Okay, Tony. Sandy will shove right away."

"Gosh," Sandy said as he got to his feet. "I'm just a street car conductor

His finger clamped down on the electric gun trip of his own .50-caliber guns——



around here. I'll take your Snorter, Shorty."

Sandy's pretended annoyance was only a screen to cover up his delight. His face was beaming as he watched a small tractor jackass Shorty's Snorter out on the apron. He climbed into the forward cockpit of the big scarlet-and-black-and-orange amphibian and kicked over the starter. While his eyes roved over his instrument panel he listened to the twin Barnes Diesels in the nose with the expression of a music fancier listening to a symphony by Sebelius.

He checked his ammunition counters and the two .50-caliber machine guns that fired from ports along the engine housing, and checked his radio with Tony Lamport, the chief radio operator and superintendent of communications on Barnes Field.

Then, at a signal from the traffic tower, he released his brakes and the big ship began to roll down the black-and-yellow-striped runway. In the center of the field where the main runways converged he tapped his rudder to kick it into the wind. The engines blasted and the flaps came down. A moment later the retractable landing gear slid up into the main float and the wing tips and the big ship became a varicolored bullet.

Long Island and New York harbor faded away as he made contact with the operations officer in the control tower of the Newark Airport.

"Okay, SSB," the operations officer told him. "Wind—northwest nine. Okay to come straight in. Watch out for Western Airliner five miles behind you."

"Okay," Sandy said. He took the Snorter in with a precision landing and asked the operations officer for instructions again.

"Taxi toward Gate Number Ten, SSB," the traffic tower told him. "Watch out for Western Airliner coming in for landing behind you."

Sandy taxied the ship around, killed his power plants and was about to slide out on the apron when he saw Bill coming toward him. He started to shout at him but something about Bill's expression stopped him. He waited in silence until Bill spoke to him.

"What did you do?" Bill snapped harshly. "Come by way of Chicago? I've been waiting for—"

"Why, gosh, Bill," Sandy said, "I got here just as fast as I could. I'm sorry if I kept you waiting. I—"

"All right!" Bill said. He climbed into the after cockpit and plugged in his earphones. "Let's get back to the field."

"Yes, sir," Sandy said. He wondered if Bill was sick. He knew that something had gone wrong because Bill looked as though he had eaten some-

thing that didn't agree with him. "Do you want to take her?" he asked.

"No," Bill said into the intercockpit telephone. "Get out of here as fast as you can. I want to get back to the field."

"What was wrong with the Lancer?" Sandy asked when he had five thousand feet under him and had laid the nose of the ship on Barnes Field.

"Something wrong with the governor," Bill said. "The fuel nozzles were shooting in their juice before the pistons were 28° before top center. Too much deceleration. She didn't have any guts. We'll have to go over there and knock her down again before she'll be safe to fly home."

Sandy thought about that for a moment because something in the statement didn't seem to click. After a moment he had it. Bill had said the fuel nozzles were injecting their spray of mist into the combustion chamber before the pistons were 28° before top center. Naturally, the air turbulence was not great enough to cause a combustion at the right moment and would result in a terrific loss of power. But he knew that the precise instant when the fuel was supposed to be injected in a Barnes Diesel was 18° before top center. Not 28°.

Sandy was about to mention Bill's slip of the tongue to him when Bill spoke to him again.

"Listen, Sanders," he said. "Never mind Barnes Field right now. Keep on going out to the end of Long Island. There is a marine Diesel plant out there at Montauk Point. I want to talk to their engineers about the Lancer's trouble."

Sandy didn't answer for the moment because he was confused in his own mind. Never within his memory had Bill ever called him anything but "Sandy" or "kid," unless he was introducing him to a stranger. He never called him Sanders. The name had an odd sound in his ears coming from Bill. He wondered if Bill was really sore at him about something, something besides his being slow in getting over to Newark.

He swung the nose of the Snorter around slightly and said, "Okay, Bill." He wondered if James Morton in Washington had told Bill something that made him act like this. And with his usual naiveté he asked him.

"What did Morton have to say about that newspaper stuff, Bill? Was he sore about something?"

When Bill didn't answer him Sandy swung around in his seat and looked back into the rear cockpit. The expression in Bill Barnes' eyes turned his blood cold.

They were no longer the friendly, laughing eyes he had learned to know and love. They were the snarling eyes

of a madman. And in his right hand, just behind Sandy's right ear, was a murderous-looking blackjack.

"Bill!" Sandy half-screamed as the blackjack crashed against his helmet. He slumped off against the side of the cockpit while he fought desperately to keep control of his senses.

Then it came again. Even harder this time. Only the thickness of his leather helmet kept his skull from being crushed or shattered as abysmal darkness descended upon him.

The man, who until now looked so much like Bill Barnes, locked the automatic pilot in the after cockpit and set to work lashing Sandy's wrists and ankles to his bucket seat.

But he no longer even faintly resembled Bill Barnes. He was a man who had been transformed into the personification of evil.

IV—THE ENEMY'S TERMS

BILL BARNES held his forefinger clamped down hard on his gun trip while that olive-drab fighter raced at him at terrific speed with its own guns jammering. He knew that he had closed in too fast for accurate shooting and tried to correct his aim before the biplane was out of range. But he saw his tracer smoke curling harmlessly off to the left of the speeding ship and knew that he had missed.

When he brought the Lancer around in a sweeping bank the two biplanes had reversed their direction and were coming back at him, one a little above the other, in a short, stepped-up column.

Knowing he would have to take the full force of their fire, he yanked the Lancer up and over and up and over in a series of dazzling Immelmann turns that threw him entirely out of their range. When he straightened out, ready to take the battle back to them, they were fast becoming mere dots in the clear air to the west as they nosed their ships down to add to their speed.

For an instant his blood seethed within him and he kicked the Lancer around to give chase. Then his inherent caution overcame the impulse to drive them out of the air. He reasoned that they had been instructed to follow him and shoot him down, where the act would not be seen, if there was no danger to themselves or their ships.

"That," he said again, "is the beginning. They know that Morton has warned me and they are ready to bring the fight to me. But I don't see the object."

He threw the switch on his radio panel and chanted Tony Lamport's call letters into his microphone.

"Calling BBX. . . . Calling BBX," he said. "BB calling BBX. . . . BB calling BBX."

"BBX answering BB. . . . BBX an-



Malignant puffs of smoke from the guns had followed in their wake during the long dive—

swering BB. . . . Go ahead, BB," Tony Lamport's voice said in his ear a moment later.

"Okay, Tony," Bill said. "I just wanted to make a report. I was attacked coming back from Washington by two olive-drab biplanes armed with twin machine guns. Tell Scotty to double the guards on the field and tell all the men to stand by until I get back there."

Bill heard what might have been a gasp from Tony and then heard him stuttering while he tried to speak.

"What's the matter, Tony?" Bill asked sharply.

"Listen, Bill! Get this!" Tony said. "Didn't you telephone me about an hour ago and say you had to sit the Lancer down at Newark on your way back from Washington because of engine trouble?"

"I—" Bill began.

"Didn't Sandy pick you up at Newark?" Tony interrupted.

"What the hell are you talking about?" Bill snapped. "This is the first time I've made contact with you since I left the field between twelve and one. I'm on my way back from Washington now and the Lancer is still good enough to get me home." Then he added sharply: "What about Sandy?"

"Just what I tell you, Bill," Tony said and his voice was almost shrill now. "I received a phone call—it sounded like your voice. You asked Sandy to pick you up in Newark with a Snorter. We haven't heard from Sandy since. He ought to be back here by now."

"I didn't talk to you, Tony!" Bill said. "Something is going to pop. Try to make contact with Sandy. Tell the men to stand by. I'm going to Newark. I'll pick you up from there. Signing off!"

Bill talked to Steve Porton, the man-

ager of the Newark Airport, for only a few moments. Porton told him all he expected to learn there in that time.

He told him a man who looked and talked remarkably like him had been waiting when Sandy brought in his Snorter. He, Porton, had not talked with the man because he had been too busy. He had seen him and thinking it was Bill had wondered why he hadn't taken a few minutes to come and talk to him because they were old friends.

Then Sandy had come in for a landing and had taken off again with the man in the rear cockpit. That was all they could tell him. The dispatcher let Porton know that Sandy had taken off, banked around and looked as though he was heading in the general direction of Barnes Field.

The cities of Newark, Manhattan and Brooklyn were blurred masses of dim lights in the dusk as Bill took the Lancer above them on his way to Barnes Field. He was trying, desperately, to get somewhere in his thoughts, with what little information he had.

It all circled back to the things Morton had told him about the man who had impersonated him on several occasions. There was no doubt this same man had climbed in a Snorter with Sandy.

But why?

He fishtailed the Lancer down on a shadowless sodium-vapor-lighted runway and taxied it up to its apron, where he turned it over to a crew of grease monkeys.

There was no one on the apron to meet him. Lights played in the various hangars, the Administration Building, infirmary, living quarters, and danced along the electrically charged fence that surrounded the field.

His eyes skimmed over the whole layout that was Barnes Field. Ordinarily

he would have glowed with pride at the thought that it was all of his own creation. But now, as he walked slowly toward his office through the shadows of nightfall, he felt a little old and not a little lonely. There was something lacking about it all, something that depressed him horribly.

He knew in his heart in those few minutes how much young Sandy meant to all of them. And he knew that whoever these people might be who were working against him, they had been smart enough to attack him in his most vulnerable spot.

They had the upper hand at the outset because they had Sandy.

He found Scotty MacCloskey, Shorty, Red and Bev Bates in his office waiting for him. Their faces told him only too well how they felt about the matter. They were a study in controlled fury and determination.

"Has Tony picked up anything?" he asked them as he went in the door.

"Nothing, boy," old Scotty said. "He has spread the alarm to every airport in the country. Nothing yet."

"Tell him to get me James Morton on the telephone," he said as he dropped wearily into his chair.

Then he told them all of the things that had occurred that day and what Morton had told him.

"That's all I know," he finished. "That's what we have to work on."

"They'll take their time contacting us, Bill," Shorty said.

"Yes," Bill said, "I know. That's the way those low, lousy scum always work. They let you suffer your heart out not knowing whether the victim is alive or dead until they get ready to make their demands."

His face looked ten years older as he took the telephone from Scotty MacCloskey and talked to James Morton, Chief of the Bureau of Criminal Investigation in Washington.

"Listen, Morton," he said. "I want you to use everything you have at your command down there to find Sandy. I've kicked in a number of times to help you fellows out. Now it's your turn. The sky is the limit. Keep everything as quiet as you can."

He listened for a moment. Then said, "I know you will, Morton. You can reach me here or they'll know where I am, night and day. The minute you get anything let me know. Good-by."

He slapped the instrument in its cradle and lifted his head. His men had never seen the man now before them. They had seen Bill Barnes face a thousand insurmountable odds and perils and overcome them; but they had never seen that light in his eyes before, or the ghastly determination stamped on his bronzed face. His mouth was a straight slash across his face as he pointed one finger at them.

"We're going to get them," he said, and his voice rose slightly as he said it, "if it costs each one of us his life!"

None of them answered him. They didn't have to answer, because they knew that he knew they were with him to a man in the face of anything that might happen.

In a moment Scotty MacCloskey said, "We'll find him, boy." That broke the tension. They settled down to analyzing what had happened, picking each little incident apart, speculating on the fearful weapon James Morton had mentioned. They did it all very calmly, but underneath there was a strain of desperation that might come to the surface at any time because of their helplessness. Each of them had the same thought—if there was only something tangible on which they could fasten their hands. Something they could see and feel!

They all went in to dinner together, a dinner that old Charlie, the cook, had taken special pains to prepare. He knew how they would be feeling because Sandy had always been a favorite of his and had always had the run of the kitchen and pantry.

But even old Charlie's broiled porterhouse steak and Lyonnaise potatoes and mushrooms could not tempt them. They pushed them around on their plates while a thousand thoughts rushed through their minds.

Through Shorty Hassfurth's mind ran a memory of shepherd's fires and a moon dancing across the clouds in far-off Maxembourg many months before. He remembered how young Sandy had gazed down the valley and had said, his voice hushed with intensity, "Gosh, Shorty! Isn't this romance for you? Look at the moon out there playing across the hills. Gosh—what does it make you think of?"

"Me?" Shorty remembered he had replied. "It makes me think I wish I had something to eat."

"Nuts!" Sandy had said. "The only place you can find romance is in a dish of sauerkraut!"

Shorty chuckled at the memory, then half choked on the food he was trying to swallow.

A messenger boy from the office came into the room and told Bill someone wanted him on the telephone.

"Tell Mr. Lamport to handle it," Bill said irritably.

"He tried to," the boy said, "but the party won't talk to anyone but you."

"Tell them——" Bill began and stopped. "Okay," he went on, pushing back his chair. "Tell Tony I'll take it in my bungalow. And tell him to get a tracer on the call before I start to talk."

"Yes, sir," the boy said and started on a run.

Bill knew when he lifted the tele-

phone out of its cradle that the call would have something to do with Sandy. He could feel it. He said, "Hello," into the mouthpiece and waited for a reply.

"Hello, Barnes," a voice with a slight foreign accent said in his ear. "I know you're probably tracing my call so I'm going to speak fast."

"Who are you?" Bill asked. Not because he expected to be told but to hold the man on the wire.

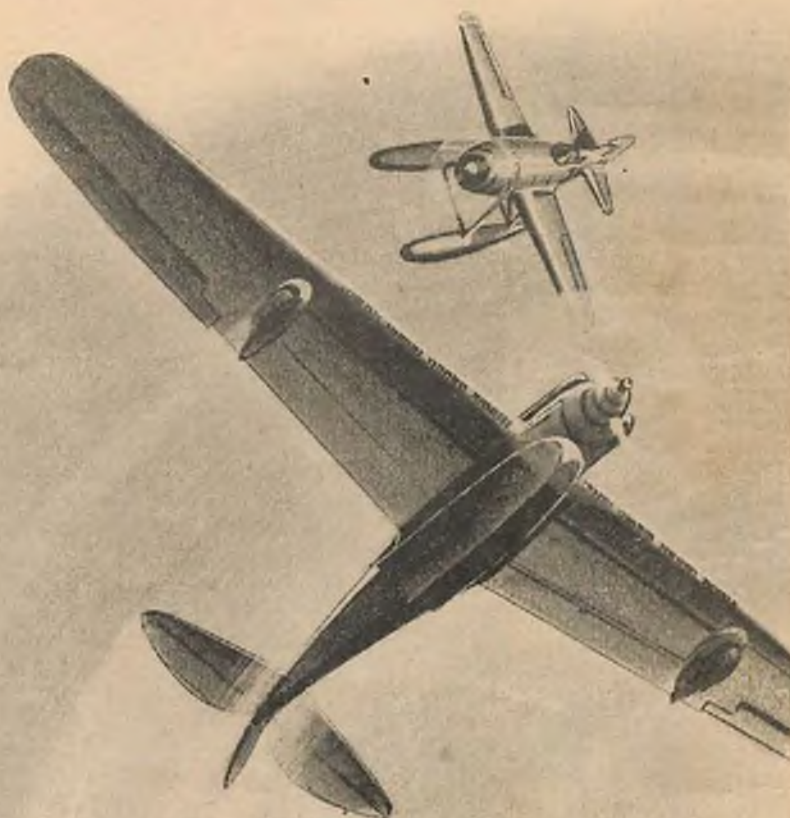
"That doesn't make any difference," the voice said, and it became hard and metallic like the clink of metal on metal. "Sanders is all right. We took his

pen to him and we'll send him back unharmed. If you don't you'll never see him again. Do you understand that?"

"Yes," Bill said. "I understand that. But what guarantee can you give me that you won't double-cross me? You might figure out a little later that you would be safer with him dead than alive."

"You'll just have to take our word for that, Barnes," the voice said. "They're our dice and we'll roll 'em our way."

"Listen!" Bill said and he tried to keep his voice calm. "You know me, you know I'll keep my word. You want me



Snorter and we took him. He isn't badly hurt and he won't be if you keep your nose where it ought to be—attending to your own business.

"We know why you went to Washington to-day and we know what Morton had to say to you. That's why we grabbed young Sanders. If you keep your nose and the noses of your men close to Barnes Field nothing will hap-

pen to mind my own business. All right. I'll do just that if you turn young Sanders over to me now. I'll give you my word on that. Then you can go ahead and write your own ticket without any interference from me."

"We're making the terms," the voice said. "We——"

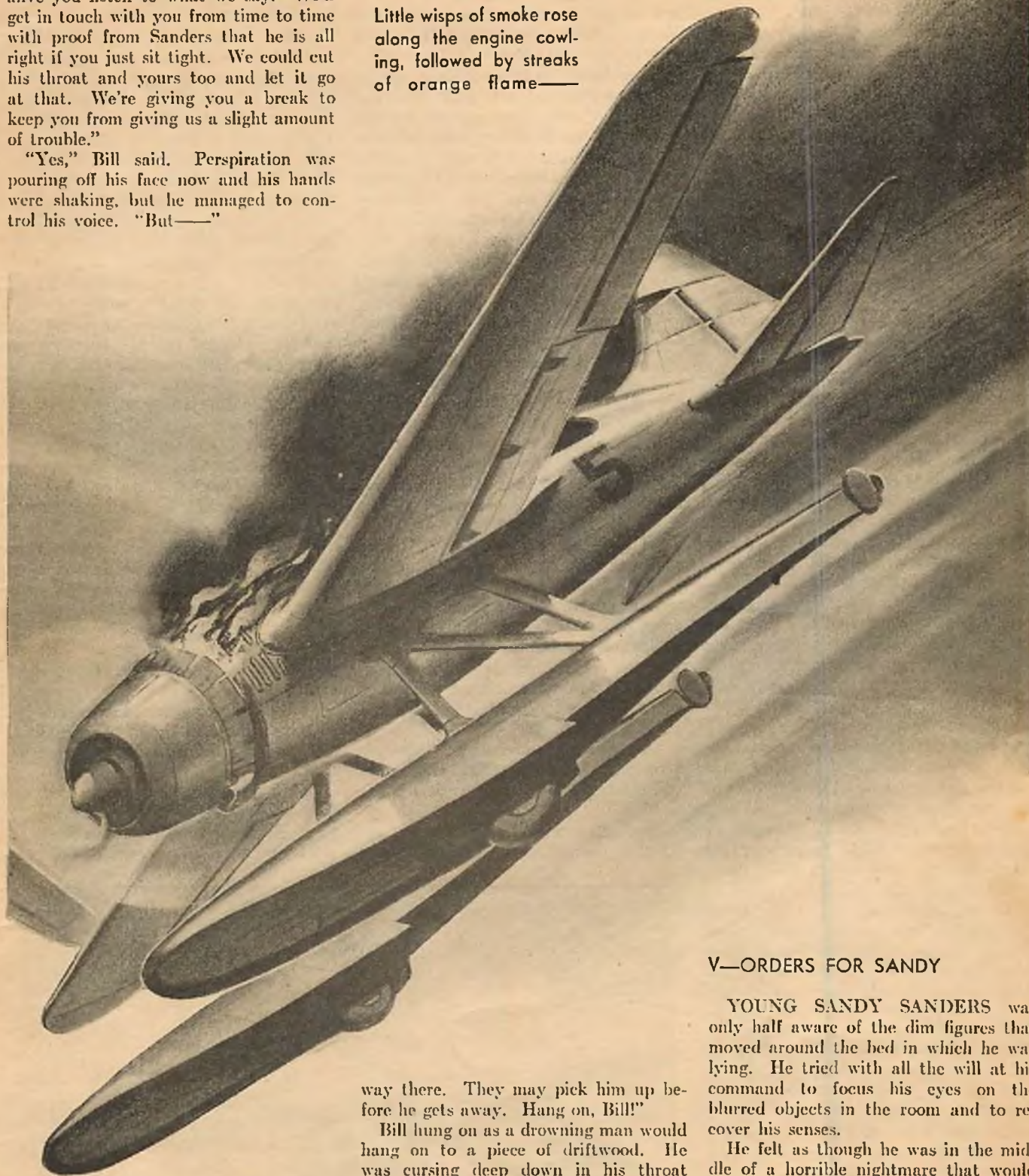
"But——" Bill began. He was trying desperately to keep his voice quiet

so he could hold the man on the wire without frightening him.

"I'll do the talking, Barnes!" the voice snarled. "If you want to see Sanders alive you listen to what we say. We'll get in touch with you from time to time with proof from Sanders that he is all right if you just sit tight. We could cut his throat and yours too and let it go at that. We're giving you a break to keep you from giving us a slight amount of trouble."

"Yes," Bill said. Perspiration was pouring off his face now and his hands were shaking, but he managed to control his voice. "But——"

Little wisps of smoke rose along the engine cowlings, followed by streaks of orange flame——



V—ORDERS FOR SANDY

YOUNG SANDY SANDERS was only half aware of the dim figures that moved around the bed in which he was lying. He tried with all the will at his command to focus his eyes on the blurred objects in the room and to recover his senses.

He felt as though he was in the middle of a horrible nightmare that would never cease. He groped with his hands and groaned as he tried to push away some grotesque thing that was trying to swarm over him and strangle him.

"Take it easy, Sandy," a voice said at his side, the words barely penetrating his consciousness. He gritted his teeth and tried again to focus his eyes on the tall figure beside him. He felt a hand brush his forehead and heard another

way there. They may pick him up before he gets away. Hang on, Bill!"

Bill hung on as a drowning man would hang on to a piece of driftwood. He was cursing deep down in his throat when Tony's voice came back on the wire.

"No—no soap, Bill," Tony said. "He was away before they got there. They're doing what they can to get him."

"Okay, Tony," Bill said, listlessly, and dropped the instrument back into its cradle.

He was still staring at it when his men came pouring into the room.

"That's all!" the voice said and a click sounded in Bill's ear.

"Did you get it, Tony?" Bill shouted into the mouthpiece.

"Yes," Tony Lamport said. "I got all of it. I got a tracer through and an alarm was sent out from police headquarters to radio cars. They're on their

voice say, "He's coming around. I'm sure there is no fracture. We'll have to keep him quiet."

"We've got to bring Gustoff in here to see him and talk to him," the first voice said.

"That can be done," the second voice said. "We'll give him instructions and a little dope. He'll click all right."

Suddenly, a half stifled cry came from Sandy's lips and he tried to push himself up in the bed. A hand that was not ungentle pushed him back and the first voice repeated, "Take it easy, Sandy."

"It's you, Bill?" Sandy said through the haze that surrounded him. He stared at the face of the man who had tried to reassure him and an expression of relief came over his own.

"What a dream, Bill," he said thickly. "What a dream! What happened to me? I'm all confused. Things seem to be pressing against my head. I—I—"

"Don't worry, Sanders," the same voice said. "You're all right."

Sandy's eyelids fluttered open again and he studied the face of the man above him. His voice and his face are like Bill's, he thought. *Yet he isn't Bill. There is something strangely different. What has happened to me—and to Bill?* It was as though he was in a different world than the dim one he remembered. The man above him wasn't Bill Barnes and he wasn't Sandy Sanders. He tried desperately to straighten the thing out in his mind. Then gave up in despair. He closed his eyes again and whimpered gently as he went back to semi-consciousness.

The next time he opened his eyes it was broad daylight and there was no one in the room. He rolled his head from side to side and failed to recognize any familiar object around him.

But this time he knew that something had happened to him. Something that had left him weak and a little dazed and with a terrific headache.

He pushed himself up on one elbow and tried to look out the single window in the room. A hundred yards away from the window he saw a scarlet-and-black-and-yellow amphibian that brought back partial remembrance. He saw the BB2 on the side and knew that it was Shorty Hassfurth's Snorter. But he didn't recognize the field on which it was standing or the single hangar that was within his view.

The man who came into the room a moment later brought everything back to him. Sandy stared at him through widened eyes. He could not believe what he saw.

The man had Bill's bronzed skin and the contours of his face were the same. His eyes crinkled at the corners like Bill's and his hair was the same color and of the same thickness. He was just Bill's height and had the same powerful body. He moved with that same easy grace of the trained athlete and his corn-

flower-blue eyes had the same lights in them as he watched Sandy's amazement.

"You—you," Sandy stammered, and ran a hand across his face.

"No, Sanders," the man said. "I'm not an hallucination. And I'm not Bill Barnes. Settle down and take it easy and I'll tell you about it."

Then Sandy remembered completely. He remembered the man who had climbed in the after cockpit of the Snorter at the Newark Airport and the slip of the tongue he had made about the Diesels in the Lancer. And he remembered seeing the same face transformed just before he slugged him, Sandy, over the head with a blackjack.

"Who are you?" Sandy asked. He was beginning to get a hold on himself now.

"My name is Brewer," the man said. "William Brewer, to be exact. But at the present time I'm using the name of Bill Barnes. There is quite a remarkable resemblance, isn't there?"

"Yes," Sandy said. "It's too remarkable. You're the man who has been impersonating Bill."

"I'm the lad," Brewer said. He sat down beside Sandy's bed and lighted a cigarette.

"Bill will take you apart for it," Sandy said with conviction.

"No," Brewer said. "He won't take anyone apart. But he may be taken apart himself if he doesn't overcome his inclination to be the fair-haired boy. And the same thing goes for you, Sanders. I don't want to hurt you. You won't be hurt any more than is necessary."

"All right," Sandy said. "What is necessary? Am I supposed to cheer when you hit me over the head with a blackjack?"

"No," Brewer said. "You were supposed to do just what you did do. But

no one will hit you over the head again if you do what you're told."

"That's nice to know," Sandy said. The color was draining back into his face and his natural cockiness back into his heart. "What's it all about?"

"That doesn't make any difference now," Brewer said in a different voice, a voice that was hard and harsh. "I'm going to bring a man in here to see you in a few minutes. His name is Gustoff. I'm engaged in doing a little business with him under the name of Bill Barnes. It's a business that isn't shouted from the housetops and he is a little suspicious of me. He can't understand why I don't do business with him directly from Barnes Field, Long Island. He ought to know better, but he's suspicious. That's one reason why you are here."

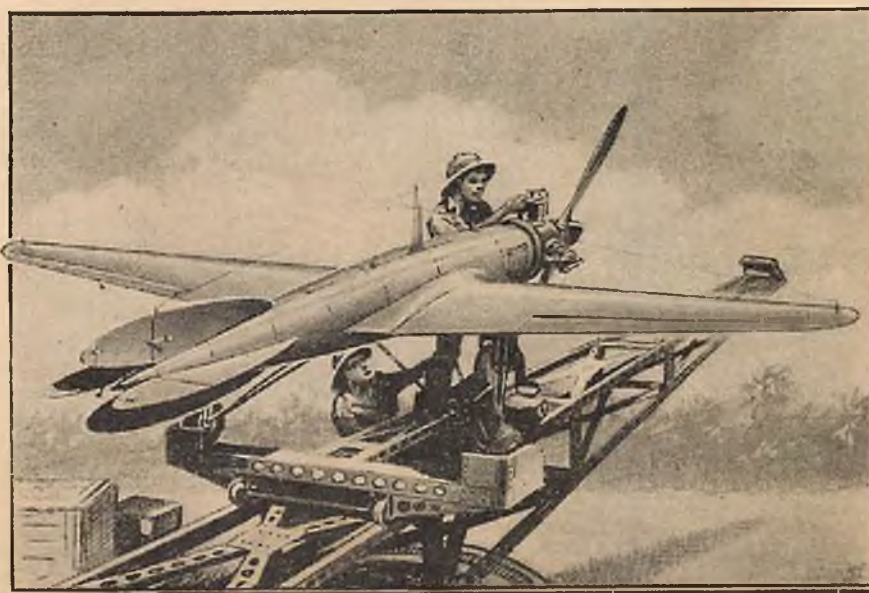
"When I bring him in here you are to call me Bill, and act the same as you would act if I were actually Bill Barnes. Is that clear?" Brewer's eyes were like pieces of cold steel now.

"Yes," Sandy said. "What you say is clear. But I still don't know why you want me to act that way. And suppose I don't? Wouldn't it be apt to spoil your little idea if I told him the truth?"

"It would spoil it entirely," Brewer said. He reached in a side coat pocket and pulled out a heavy, blue-nosed automatic. "One shot from this will spoil your future plans, too. I will have it in my pocket with the safety catch off. One word out of line from you will get you one bullet in the belly. One will be enough and I won't miss."

"I won't be of much use to you with a bullet in my belly," Sandy said. "Wouldn't this man be surprised at that?"

"He'd probably be so surprised I'd have to let him have one in the belly too," Brewer said. "Then I'd have to start my negotiations over again from



He saw that the miniature planes were not a great deal bigger than the largest of gas model planes—

a new angle. But you wouldn't be interested in that because you'd be dead. You're a pretty fresh lad, aren't you, Sanders?"

"No," Sandy said. "Just inquisitive."

He still sounded "fresh." But he wasn't. He knew that Brewer would do what he said he would do. He waited for him to speak.

"You just follow my lead," Brewer said. "Keep your mouth shut the rest of the time and speak only when you're spoken to. Your job is to build character for me. You and Barnes are supposed to be inseparable. It is a subtle little way of disarming Gustoff's suspicions. Do you get it?"

"Yeah," Sandy said. "I get it. And after that I'd like to have something to eat."

"Anything you want," Brewer said, "as long as you play ball." He propped Sandy up in the bed in a sitting position and said, "I've explained to him that you bashed your head on a crash pad coming in yesterday."

"That was thoughtful of you," Sandy said dryly.

Sandy shook hands with the tall, black-haired foreigner with the swarthy complexion and told him he was honored to know him. He saw the bulge in the right-hand side of Brewer's jacket and managed to smile at him in spite of it.

Gustoff and Brewer carried on a conversation that meant nothing to Sandy. He tried to fathom what they were talking about and jotted it all down in his memory. He was particularly interested in Brewer's statement to the effect that he and Brewer were leaving by air the next day for some place he had never heard of.

When they had finished talking Gustoff again shook hands with him and expressed the hope that he would have no difficulty in getting over the blow he had received on the head.

"Bill is taking good care of me," Sandy said. He saw Brewer grin at him.

Then Gustoff was gone and a man in a white uniform brought in a tray on which there was a bowl of chicken broth and some crackers.

Sandy consumed them and asked for more. While he was eating he tried desperately to link the things he had heard with the things that had happened to him. He got nowhere with it.

Brewer came back into the room and told him there was a guard outside his door who had orders to shoot to kill if he tried to leave the room.

Sandy nodded and said, "You might give me a break and tell me what this is all about, Brewer."

"You'll know eventually," Brewer said. "Right now it won't do you any good and it might do me some harm."

"Have you communicated with Bill Barnes in any way?" Sandy asked him.

"One of my men talked with him on the telephone," Brewer said. "He told Barnes to mind his own business and nothing would happen to you."

"That won't do any good," Sandy said with conviction. "He'll tear things wide open."

"All right," Brewer snarled. "We'll see. You'd better get some sleep if you can. You're going to have a long, hard trip beginning tomorrow. And remember you won't have a chance if you try to escape. My orders are to stop you at any cost."

Sandy didn't answer him. He could feel the strength coming back into his body. He waited fifteen or twenty minutes, then slipped silently out of the bed to the bare floor. He crossed the room and laid an ear against the door. After a moment he could hear someone moving about restlessly in a chair outside the door.

"There is a guard there," he said to himself, and went over to try the window.

He found that it was unlocked and slid it up as noiselessly as possible. He saw another man with a gun strapped around his waist sitting under the window.

There were a half-dozen figures moving around a single corrugated iron hangar that stood on the edge of a small landing field. An old orange wind sock fluttered from a mast on the roof. Beside the Snorter there were a large twin-motored transport, a two-place, open biplane and a low-wing monoplane. A dozen or more mechanics and grease monkeys were swarming over them. He gazed in every direction trying to identify the place by some landmark. Then gently closed the window.

He looked in the single closet in the room and found that it was empty. So were the drawers of a battered bureau. They had taken all of his clothes, leaving only the underwear he was wearing. He wondered if he could dive out the window, overpower the guard, get his gun and reach the Snorter before anyone shot him. He had no way of knowing whether he would be successful, but he decided to give it a try.

He had the window half open when he heard the door into the room open behind him. He swung around and saw Brewer standing there. Then he saw Brewer's hand jab at his jacket pocket and he whirled and leaped.

His right fist drove into Brewer's mouth with all the force of his moving body behind it. Brewer's head flew back as Sandy's left hand grasped at Brewer's right wrist. He felt Brewer's knees pumping up into his body and tried to throw himself out of the way as he held Brewer's right hand in his pocket. He knew he must keep the muzzle of the automatic that was there pointed down or he would get that promised bullet through the belly.

Then something exploded on the side of his head. He fought with all the strength he had in his tortured body as Brewer's face swung away from his fist. Then that thing exploded on his head again and it lolled back like the head of a dead man.

He pitched forward on his face, his body twitching. The guard who had hit him, with Brewer alongside, stood ready if he attempted to arise.

VI—MESSAGE FROM MADAGASCAR

DURING those next few days after Sandy's disappearance, Barnes Field was a seeming madhouse. Only those closest to Bill were aware that anything had happened to Sandy, but the whole organization knew that something was amiss.

They knew because of the double guards that had been put on all the guard posts and at the gates, because of the two planes that were always on the apron ready to go at a moment's notice.

Bill Barnes was like a human dynamo, neither sleeping, eating nor resting. He was pulling wires all over the world to get some trace of the man who was impersonating him and of the gang that had snatched Sandy. Cables and telegrams were pouring into Barnes Field constantly from four continents, but they mostly came from people who did not have access to the inner circles of intrigue and espionage that Bill was trying to reach.

The newspapers gave out vague hints that something out of the ordinary was happening on Barnes Field, and they were watching the place like hawks because they knew that it was one of the greatest sources of news in the world. But they had no hint, as yet, as to what was wrong. They had a thousand rumors: That Bill Barnes and his famous little squadron were going to the Far East to fight for a foreign power; that they were going to Spain to enter the cause of the Loyalists or Rebels.

As those first few days became a week, two weeks and then three, Bill Barnes became increasingly desperate. As clue after clue was traced down and found to be worthless, his face became lined and haggard. His men learned that to even speak to him was to ask for a tongue lashing. Then his irritability turned to sullen silence, and when he was spoken to his only answer was a glance from his hollow-rimmed, burning eyes.

He made trip after trip to Washington to visit James Morton, hoping against hope that Morton would have something tangible to offer. But they had nothing more to offer than Bill's chain of connections and friends that stretched around the world.

"But this man who was impersonating me and the people he represented,"

Bill said to Morton. "Your men ought to be able to find out something about them."

"Perhaps they ought to be able to, Bill," Morton said, "but they haven't. They have faded out of the picture very neatly. They were smart enough to see what was going to happen and went into their shell. It may take a long time to get to the bottom of it, Bill."

"And every day that passes," Bill said, "the chance becomes slimmer that Sandy is still alive."

"You've had no word from him or the man who snatched him?" Morton asked, automatically.

"No word," Bill said. "I'm going crazy, Morton, unless I can put my finger on something soon."

"This is one of those jobs where you have to grit your teeth and wait," Morton said. "I know you thrive on action, Bill. But this time you've got to sit and take it."

When Bill left Morton that day he had sunk to the lowest level of despair. For the first time in his life he was willing to admit defeat. His hands were tied because he had nothing on which to work. He was helpless. Any gesture he might make would be futile because it would lead nowhere.

"That," he said bitterly, "is where the whole thing came from—nowhere. Morton told me about a vicious ring that was trying to market a deadly device and about a man who was impersonating me. The next thing is Sandy's kidnapping by that same person and the whole thing disappears into nowhere."

Buck on Barnes Field, he slid out of the Lancer and started toward his living quarters. His head was bent forward and he was walking with the slow, measured stride of an old man. He was ready to admit his defeat. Even his fighting heart had left him—that intangible thing that had carried him over seemingly insurmountable odds a dozen times before.

He plodded into the living room of his quarters, sat down in a chair and buried his face in his hands. He was very much alone.

When the telephone rang he lifted his head and merely glanced at it. After a moment he got to his feet and lifted the instrument out of its cradle and spoke into the mouthpiece.

"Bill!" Shorty Hassfurther's voice said in his ear. "I've got something!"

Bill's body stiffened as though it had received a stiff shot of electricity. He knew that when Shorty Hassfurther spoke in that way it meant something. For an instant he couldn't answer.

"Do you hear, Bill!" Shorty said. "A cable from Dick Wyndam! He says that—"

"Bring it over!" Bill snapped.

He was standing in the doorway of his bungalow when Shorty came tearing up the steps. His hands were trem-

bling and his eyes were pathetically eager as he took the sheet of green and white paper Shorty shoved into his hands and read:

HAVE RELIABLE REASON TO BELIEVE
SANDY IS BEING HELD HERE STOP
NOTHING I CAN DO WITHOUT HELP
STOP ADVISE YOU COME AT ONCE
STOP CAUTION STOP WYNDAM

Bill read the message over a half dozen times before he took his eyes from it. He looked at Shorty's flushed face with an expression that was a mixture of hope and unbelief. He wanted to believe what he had read but he was afraid to.

"How did Wyndam know anything about it?" he asked Shorty.

"I don't know," Shorty said. "But Dick Wyndam wouldn't send such a cable unless he was quite sure."

"We'd better cable him to check it before we start," Bill said. "I'm willing to grab at anything now, but it seems fantastic. It might have been sent by someone else who is laying a trap for us. Let's get it off fast."

They went into Bill's bungalow and framed an answering cable to Richard Wyndam, younger brother of Major Virgil Wyndam, who had been the commander of Shorty's squadron, until his death, during the World War. Dick Wyndam was now the owner and manager of a large tract of valuable land on the far-away island of Madagascar, a French possession in the Indian Ocean.

They asked young Wyndam to confirm his cable and to tell them, if possible, on what premise he had based his information. After they had sent it off they began to discuss the probability that it was a fake.

"It's too fantastic," Bill said.

"No, it isn't, Bill," Shorty said. "Stranger things than that have happened to us. I was thinking about young Dick the other day. You know we pulled him out of a jam not unlike the one Sandy is in."

"Yes," Bill said. "It was similar. But Madagascar! I don't understand how Wyndam knew anything about Sandy."

"We've cabled everywhere in the world but Madagascar," Shorty said. "If that cable came from Wyndam—and I don't know who else could have sent it unless it's part of this whole screwy set-up—Wyndam knows what he is talking about. Hadn't we better start Scotty checking our ships?"

"Yes," Bill said. "I suppose we had. But I still can't believe it's a real clue, Shorty. It doesn't make sense."

"Oh, nuts, Bill!" Shorty exploded. "What the devil is the matter with you? It's the first real lead we've had and you shy away from it like a skittish colt!"

Color crept up out of Bill's collar and spread over his face. He looked at Shorty for an instant with surprised eyes, then quickly nodded his head.

"Thanks, fellah," he said. "I needed that. Let's go!"

He got Scotty MacCloskey on the telephone and began giving orders in the way Scotty recognized.

"The Lancer and three Snorters on the line ready to go!" he snapped. "Check on Red and Bev and tell 'em we may be going on a long hop."

"I can have them ready in a couple of days, Bill," old Scotty said.

"I may want 'em ready in two hours," Bill said. "Step on it!"

"That's more like it," Shorty said. "I'll let you know the second I get an answer from Dick."

The answer came five hours later. It read:

LEARNED SANDY WAS HERE FROM
ANONYMOUS SOURCE STOP CHECKED
INFORMATION AND BELIEVE IT IS
TRUE STOP MORE INFORMATION
WHEN YOU ARRIVE STOP CAUTION
STOP WYNDAM

"He seems to be strong on the caution," Shorty said as he and Bill studied the cablegram.

"These things are never tea parties," Bill said cryptically. "But now we've got something. We will get away at dawn. I'm going to leave Bev here just in case this turns out to be a red herring and something else comes in. He can handle it."

"What course do we take?" Shorty asked.

"I was just thinking about that," Bill said. "I think the quickest way will be Bermuda, Dakar in Senegal and over Africa to Mombasa in the Kenya Colony. From there to Tamatave."

"Two tough legs," Shorty warned. "From Bermuda to Dakar is a long water stretch. Dakar to Mombasa is a tough one too."

"What do you want—an aircraft carrier under you all the way?" Bill asked. "We'll make it, fellah."

"I'm not worried about that," Shorty said. "The shortest way is the route we want. The shortest and surest. The kid will probably be needing us badly by the time we get there."

"If we get there in time," Bill said softly.

VII—ATLANTIC DUEL

EARLY the next morning the props of two Snorters and the Silver Lancer were ticking over slowly on the apron. The goggled, white-helmeted heads of Shorty and Red jutted above the rims of the two fast amphibians. They were waiting impatiently for Bill to signal the dispatch tower.

An instant later the motor of Red Gleason's Snorter roared. A signal flashed. The Snorter rolled forward as Red released his brakes and gunned his engine. It streaked down the runway and the tail came up. Red took the ship

swiftly upward in tight spirals, to be joined a minute later by Shorty.

As the three thousand horses in the nose of the Silver Lancer snorted, Bill waved a hand of farewell above his head. His flaps came down and the wheels in the wing-tip pontoons left the concrete. The retractable gear rose smoothly to disappear beneath the fuselage. The Silver Lancer joined the circling Snorters overhead.

The three ships fell into a tight little formation with the Lancer at the point of a Vee and the Snorters a little back on each side of it. A solid mass of cumulus clouds came racing toward them as the sun rose blazing out of the Atlantic.

After twenty minutes Bill threw his

Shorty come out of his steep dive and level off in an inverted position. One of the silver monoplanes was directly in his path as he centered his controls and clamped his finger down on his electric trigger. Fire and smoke gushed out of the nose of the Snorter's powerful .50-caliber guns and drove into the tail of the silver enemy.

As the ship skidded off to the right, Shorty half-rolled the Snorter upright. The pilot of the low-winged monoplane looked back and up over his shoulder, as Shorty got him under his telescopic sights again. The strained whiteness of his face became a mask of terror just as Shorty's bullets drove into him. The silver ship nosed up until it seemed to be dancing on its tail. Then it nosed down

through the air with all the speed she would give him to escape their deadly onslaught. A half-dozen times he nearly "blacked out" from the terrific speed of his maneuvers.

Now and again he could feel the Lancer shudder in protest as enemy bullets drove into it. He fought on, his face tense and strained from the terrific concentration of avoiding death. He whipped the Lancer up and down, skidded and sideslipped, zoomed and dived, to avoid the streams of lead and fire that streaked toward him.

Perspiration cascaded off his face and ran into his open mouth as he gasped for breath. His hand was wrapped around his control column like a python around its prey. He used his guns only when he had a ship dead under his sights. He was using all of his natural ability and instinct to outguess and outsmart the three ships that were hanging on him so desperately.

Suddenly, he hung the Lancer on its props and probed the air to find Shorty and Red. They each were engaged with a single ship far off to the left. He saw that they were fighting as desperately as he had been against men who knew all the tricks of air combat. He poured soup into his Diesels to join them, as the three monoplanes came up on his tail again.

In another instant the skies above the restless Atlantic became a thundering, snarling madhouse as the five remaining monoplanes ganged up on Bill and his two men. Planes whipped and rolled and wheeled like feathers in a hurricane. It was a desperate duel to the death with five masters of their craft against three.

Shorty Hassfurther lost the man with whom he had been fighting a lone duel and singled out another silver monoplane as Bill flashed above him. In an instant they were locked in a terrific death grapple, each feinting and stabbing for the advantage that would mean survival.

Then, Shorty got under the whirling silver ship. He raked the belly of its fuselage with one long burst of fire. The pilot writhed up on the cowl as the rugged little fighter began its death spin to the waiting waters below.

Red Gleason darted after the silver ship that had tried to flee from the inevitable death in his guns. He tore after it with that reckless abandon so characteristic of him. His fingers clamped down on his gun trips as the plane came under his sights for that fleeting instant that is the difference between life and death. White streamers of lead pumped into the fleeing ship. It rolled off on one wing; the nose dropped; flames began to lick backward, fanned by the gale that raced against it. Something shot out of the fuselage and turned slowly over and over in the air.

Red came over in a half snap-roll and returned to the fight. Thirty seconds



Something shot out of the fuselage and turned slowly over and over in the air—

radio switch and spoke to Shorty and Red. He gave them their course and told them they would not make a stop at Bermuda unless something developed that might need attention before then.

"We'll hop straight through to Dakar unless something develops," he said.

"Okay," they said in unison. They all settled down to the long three thousand miles ahead of them.

A half hour later the light on Bill's radio panel gleamed red. He threw his switch and spoke into his microphone.

"Formation of eight planes," Shorty's voice said, briefly. "Flying at about fifteen thousand feet, keeping a parallel course. Silver monoplanes with amphibian gear. They look fast. Do you see them?"

"I have a glass on them," Bill said. "They look fast and they look like trouble. I hope so. If they've been planted to stop us we'll know we're headed toward Sandy. That we're going to the right place."

"They're coming, Bill!" Red screamed in his microphone. "The leader just gave the signal with his flippers."

A few seconds later the air was a roaring madhouse of slashing planes and clattering machine guns. The eight ships had broken their formation as they dove. Bill and Shorty and Red broke their own formation to avoid that first terrific concentration of bullets.

As Bill leveled the Lancer off he saw

and it began a dizzy, swirling descent toward the Atlantic.

Bill's face took on a warming glow of anticipation and pleasure as five of the eight ships swarmed toward him from as many directions. After three weeks of frightful worry and inactivity he was like a colt who has been stabled in a stall during the winter months. He was raring to go into action.

He stuck the nose of the Lancer down and gunned the engines in the nose to get out of the vortex of their fire. Then he chandelled up and back and tore into them with the wild fury and abandon of a man gone mad. The five ships went through every evolution known to airmen to get out of his flaming path. Bill's fingers were fastened down hard on his gun trips as one of them came under his sights. But the ship was away and gone before his bullets reached it.

He gunned his engines again and came over in a normal loop on the tail of another one. His line of tracer smoke curled harmlessly above the head of the pilot until he corrected his aim. Then his bullets crept forward into the engine block. Little wisps of smoke rose along the engine housing followed by streaks of orange flame that licked back toward the cockpit.

Then the air seemed choked with flashing silver monoplanes. They were like angry hornets darting here and there awaiting a chance to strike, their guns vomiting lead. Bill took the Lancer

later he brought his Snorter around in a flashing Immelmann, as two ships charged at him, their guns chattering. One of them yawed wildly and a wing tore away as it tried to nose downward. It became a whirling ring of silver as it plummeted to destruction.

Bill Barnes caught a swift glance of what seemed like a silver dart about to plunge into the back of his neck. He skidded the Lancer out of the way as the monoplane roared over him. Then he dropped the nose of the Lancer, and as it came out of its dive he pounced on the other ship with all his fury. He saw the white, contorted face of the pilot as he looked up and back—and abruptly Bill lifted his forefinger from his electric gun trip.

He reached forward and threw his radio switch, at the same time pulling the Lancer out of its dive.

"Shorty! Red!" he gasped into his microphone. "Let 'em go! They're trying to peel off. We'll have to drop down and cruise around for a bit to see if any of them are still alive. Are you both all right?"

"Those babies knew their business," Shorty panted in his ear. "I think you're right, Bill. They know about that cable from Dick Wyndam—or the person who put them out here to stop us knew about it."

"I'm sure of it," Bill said. "We'll keep right on through to Dakar now if you're both sure you're all right."

"I'm all right, Bill," Red said. "I don't think my Snorter took a half dozen bullets. No place that did any harm. How is the Lancer?"

"She's all right," Bill said, slowly. "But she's not what she used to be."

"Not what she used to be, not what she used to be!" Red Gleason sang.

"Shut up!" Bill snapped. "Get down and make a search."

They dropped down to a few feet above the restless Atlantic and circled in ever-widening circles for a matter of twenty minutes. They saw bits of debris and one half-submerged monoplane.

But that was all. The men who had piloted the little silver monoplanes so murderously and so gallantly had gone to their deaths.

"All right," Bill said after that twenty minutes. "Get back up to ten thousand. Same positions. Same speed. Same course. We'll pass above Bermuda in case anything develops between here and there."

"What time do you figure we'll make Dakar, Bill?" Shorty asked.

"About two o'clock our time," Bill said. "It will be just about dusk there if we don't run into any serious headwinds. The prevailing winds are from the east, so we may have trouble."

A half hour later a tiny spot of white coral dotted with spots of emerald green and flashes of red and orange, flashed

under their wings and was gone.

"That's the last possible stop for two thousand miles," Bill said. "You'd better lock your controls and get some rest."

For hour after hour the three ships droned on and on above the broad expanse of the South Atlantic. Once they ran into a front, or cloud wall, that rose to twenty thousand feet. They went through it flying blind and when they came out on the other side a forty-mile headwind held them back for nearly an hour.

Just before the sun plunged into the sea they sighted the low-lying city that was Dakar. They located the airport a few miles outside the city and swooped down for a landing just as the night settled on the surrounding desert.

Tony Lamport had made arrangements for the servicing and refueling of their ships during the night. When they appeared at the airport the next morning they were ready to go.

They made a quick routine check themselves and were in the air again a little after dawn. The morning sun sparkled brilliantly on the muddy waters of the Niger River. The air from the broad river rose cool and fresh, in sharp contrast to that from the great El Juf desert to the north, which had come at them like blasts from a fiery furnace.

At Naimey they picked up the regular course of the air line that came from Alger across the great Sahara, and followed it east above the famous French outposts at Zinder and Fort Lamy. The desert sands stretched away in a dead level, covered with a desolate gray brush. Skeletons of animals and an occasional gazelle were the only things that broke the monotony. Heat rolled in on them as they cut across the Belgian Congo, but relief came above the great Mitumba Mountains, rising fifteen thousand feet.

They flashed above the crystal-clear waters of Lake Victoria and the widespread villages of Kisumu and Nairobi. There they altered their course again, laying the noses of their ships on the coast city of Dar es Salaam, the capital of Tanganyika.

They set the three planes down on the field at Dar es Salaam with aching bodies and red-rimmed, burning eyes. A cool wind off the Indian Ocean revived them long enough to allow them to eat a hurried dinner and fall into their hotel beds utterly exhausted. Not even the intense heat could keep them awake. They were beyond talk.

At ten o'clock the next morning they rounded Cape Amber, the most northerly point on Madagascar. Taking a course that cut above the city of Diego Suarez, they fled down the coast of the rugged island to the spacious harbor of Tamatave. They circled low above the steaming city and then took a course in a southerly direction along a narrow

strip of land that was separated from the mainland by a series of lagoons.

On the easterly side, giant combers of the Indian Ocean came rolling in to break in a fury of foam and spray. They followed railroad tracks that took them steadily upward through the valley of the Vohitra. As the forests gave way to grassy uplands the air became distinctly cooler and brisk. Another climb brought them over the brim of a plateau that spread out as far as they could see. The province of Imerina lay below like a giant relief map. In the distance a long, blue ridge rose directly from the plain. On the very back of the ridge they could see the lofty towers of the



"Flying at about 15,000 feet—they look fast——"

royal palaces, and spread out all about them the pink dolls' houses that made up Tananarivo, the capital.

Young Dick Wyndam was waiting for them after they had set their ships down on the airport and had gone through the necessary formalities. Shorty was the first to shake the hand of the fair-haired Englishman who had been a lad of ten when Shorty first visited his home in England with Major Virgil Wyndam during the World War.

Four years before Bill and his men had located young Wyndam at the urgent request of his family. Since that time Bill and Shorty had made an occasional contact with him.

As young Wyndam smiled at him Shorty could see the smile of his older brother as he had smiled for the last time on that day in 1917.

"What ho—you made it!" Dick Wyndam said. "Did you have any trouble on the way?"

"A little," Shorty told him.

"We must go some place and talk," Bill said.

"Yes," Wyndam said. "We'll go to what I call my club. It's a bit muggy but you won't mind. You've got to work fast. Sandy is in great danger—if he is still alive."

VIII—BIRDS THAT EXPLODE

YOUNG WYNDAM threaded his car through bicycles, motorcycles, automobiles and oxcarts on the streets of Tananarivo. Handsome, straight-haired and brown-skinned natives walked

through the streets, clothed only in their *lambas*, bearing baskets of produce on their heads.

He led them to a table on a balcony overlooking the street at his club. He ordered drinks, without any ice, while Bill fumed at the delay.

"All right, Wyndam," he said finally. "Let's have it!"

"Righto," Wyndam thrust a hand in an inside pocket and brought out a wallet, from which he extracted a dirty envelope. From that he took a piece of white paper. "There it is," he said.

They all bent over it while Wyndam kept an eye on the native who was serving them. The missive read:

MY DEAR WYNDAM:

I am going to entrust this to a native for delivery to you. Sandy Sanders, who is here with me, tells me you are a friend of Bill Barnes. He says you will help him. He is being held a prisoner on a plateau between two tributaries of the Betsiboka River in the province of Imerina.

There are an air field, an arsenal and a few buildings here. The place is not known to the officials of the island as everything was brought in from the west coast.

Sanders wants you to cable Barnes telling him Sandy is here. Only the Malagasy natives know how to find the place. It will be dangerous for anyone who tries to get in here either by land or by air. Every precaution should be taken.

Do not go to the officials as they may alarm the people who are holding Sandy and cause his death. If you have any means of contact with the natives who live in the interior you can check the existence of the air field and station. After you have done that inform Barnes. But hurry. The time is short.

That was all. The letter was not signed. It was written in a firm, bold hand on cheap paper and the envelope looked as though it had gone through a hundred hands before it reached Wyndam.

"You checked?" Bill asked.

"I did," Wyndam said. "But I couldn't find out anything more than it tells in that letter. Something very odd is going on up there. Here, I'll show you the approximate location of the place."

He took a map of the island from his pocket and pointed to a spot deep in the interior. "That's about it," he said. "I learned that there is such a place up there through a native who trusts me. But he was afraid to do much talking. He mumbled something about *jumbies* and devils and all that rot. They're a superstitious lot. Someone has them thoroughly frightened."

"And the authorities know nothing about it?" Bill asked.

"Nothing," Wyndam said. "I made sure of that."

"What in hell does it all mean, Bill?" Red Gleason asked.

"I wish I knew," Bill said. "The only way I can figure it is that someone has established a research and experimental station there to work on this device Morton spoke about. They have someone who has been impersonating me to peddle the thing for them. Just why they grabbed Sandy and brought him out here I don't know. But I will know. What's the best way to get in there, Wyndam?"

"I don't know, Bill," Wyndam said. "But I imagine from the air. Are you satisfied that Sandy is up there?"

"I'm almost certain of it," Bill said, grimly. "Those eight ships that attacked us shortly after we left New York were there to wait for us to make a move. But before we do anything else I want to report to the American consul. That will clear us if we have trouble and we may need him."

"Then what?" Shorty asked.

"I'm going to fly into the interior and look this place over," Bill said.

The American consul, Eugene Fraleigh, greeted them cordially a half hour later. After a brief chat about this and that in the United States, Bill asked him a question that startled him.

"Mr. Fraleigh," he said, "do you know anything about an experimental or research station that has been established on a plateau northwest of the capital?"

Fraleigh's eyes narrowed and he gazed at Bill with an expression that was hard to analyze. He tapped his lips with the point of his forefinger for a moment before replying.

"There has been a great deal of subdued talk about such a place," he said finally. "But nothing out in the open. It is 'fady'—or prohibited. We know very little about it. Some curious tales have sifted through from the natives. They talk about big birds that shoot high into the air and explode."

"Big birds that shoot high into the air and explode?" Bill repeated. "Anything more than that?"

"Not anything factual," Fraleigh said. "Why?"

Eugene Fraleigh sat on the edge of his chair, his expression one of incredulous wonder as Bill unfolded the story of why they were in Madagascar. When Bill had finished, Fraleigh slowly relaxed, slid back into his chair as his breath whistled through his pursed lips.

"So," Fraleigh said. "That's it. We have all had the idea that it was a secret experimental station established by the French government to develop some new and dangerous weapon of war. We supposed that was why it was all done so quietly. If what you say is true the

thing should be taken to the governor-general at once."

"Not for forty-eight hours," Bill said. "Not until after I get Sandy out of there. I know how the French go about such things. They talk and wave their arms and argue before they do anything. Let me get Sandy, then I don't care what they do."

Fraleigh studied Bill's face for a moment and there was an expression of admiration in his eyes as he nodded his head.

"All right," he said. "I know what you mean. But you've got to work fast. Officially, I know nothing about it. I'll give you forty-eight hours. Those people up in the interior, whoever they are, probably know you are here. They're probably prepared. How do you expect to get Sanders out of there?"

"I don't know," Bill said frankly as he got to his feet. "All I want is a chance to try before they cut Sandy's throat. If I don't succeed I'll have to ask the governor-general for help myself. You forget that I even talked about the thing to you. I'll take the responsibility."

"I'll have to go to the governor-general eventually," Fraleigh said. "But I'll give you your forty-eight hours to make an attempt to get him."

"Fair enough," Bill said. "I'll report to you within that time. I may need your help afterward."

"You'll have it," Fraleigh said.

IX—GHOST FIGHTER

BILL took the Lancer into the air alone early the next morning. His face had been grim and unsmiling when he gave Shorty and Red final instructions before starting off on his reconnoitering flight.

"Stay in your ships, ready to make contact by radio," he said. "I may want you to come fast at any moment. I don't know what I'll find up there or how we'll get in to get Sandy. But we're going in some way."

He nosed the Lancer up above plains over which enormous herds of hump-backed cattle roamed. Some of them were guarded by half-wild herdsmen and shaggy, savage dogs. Lemurs, civets and wild cattle skulked in the bushes along the Tananarivo-Ankazobe road. Natives carrying muzzle-loading guns or long, formidable-looking spears glided along the trails.

A few minutes later the first rim of jungle appeared below him. It became more and more dense and then, abruptly, gave way to a short, stubby growth of bush as he neared the edge of a plateau surrounded by giant boulders.

He nosed the Lancer downward as he saw antlike forms that were men milling about in an inclosure close to the edge of the plateau. Suddenly, the whole plan of the place took form. He real-

ized that he was gazing down on a place that was heavily fortified.

There was a large cluster of native houses made of red clay covered with thatched roofs with projecting eaves. There was a spacious, crudely built hangar along the edge of a large landing field, and a half-dozen larger buildings that were teeming with activity.

Eight or ten silver monoplanes that were duplicates of the ones that had attacked them over the Atlantic were warming up in front of the hangars. Their ground crews were working feverishly to get them ready to take the air.

But the strangest thing that met his eyes were the several hundred miniature planes lined up side by side near a large device that looked not unlike the catapults he had seen aboard airplane carriers.

He swooped low and saw that the miniature planes were not a great deal bigger than the largest of gas model planes. But they were complete in every detail from miniature prop and antenna mast to tail wheel. He noticed also, in the brief glance he got, that there was some kind of a robot pilot sitting at the controls of each tiny fighter.

He banked around on one wing tip and started back to pass above the miniature fighters again, when all hell broke loose below him. He heard the *tat-tat-tat* of machine guns and felt bullets drumming into the belly of the Lancer as he nosed it up and hung it on its props.

The dull bark of an anti-aircraft gun came to his ears as the Lancer bounced like a bucking bronco and puffs of white appeared off to his right. He took the Lancer upstairs in swift, tight spirals, varying his course to throw off the aim of the anti-aircraft guns that were laying down a barrage all around him.

While he climbed he tried to take a mental picture of the little citadel below him, spotting the location of the anti-aircraft and machine guns.

He saw six of the silver monoplanes skim down the long, bumpy field and race into the air as he circled once more high above the field for a last observation before he laid the nose of the Lancer on the capital of Madagascar. He paid no attention to the six fast fighters as they sped upward. He knew that he could easily outdistance them when he was ready.

Then, he forgot all about them because he saw one of the miniature planes being launched by the strange-looking catapult. It soared into the air after a run of only a few feet and began an almost vertical climb. He saw that the nose was pointed directly at the Lancer.

And there was no pilot in the cockpit!

It passed the climbing monoplanes as if they were stationary, so great was its speed. The muscles in Bill's throat contracted and his hand was paralyzed on the control column for those few

seconds while he watched the thing plummeting toward him at terrific speed.

Fear, stark fear held him in its icy grasp. He saw the course of the tiny ghost plane alter as he poured soup into his Diesels and tried to kick it out of the path of the pilotless ship.

Bill knew now that the robot he had seen in the pilot's chair was some kind of a radio device that enabled men on the ground to direct the course and maneuvers of the miniature fighter. And he knew that it was probably loaded with high explosives that would detonate on contact with the Lancer.

He had time to think: "This is the hellish device Morton told me about. A fleet of them could destroy cities and armies without the loss of a single man. They could be aimed and fired for thousands of miles loaded with germs and poison gases and high explosives that would spread fire. Aerial torpedoes!"

He shivered down to the depths of his very soul as the horrible picture raced through his mind, and then he yanked the stick of the Lancer back into his belly to avoid the racing little craft when it was only seconds away from him.

As he leveled the Lancer off again he saw the miniature ship nose up until it came up and over on its back. Suddenly, while perspiration cascaded into Bill's astonished eyes, the little fighter half-rolled right side up and was plunging at him again, head-on!

He dropped the nose of the Lancer this time and the landing wheels of the little ship just grazed the tip of his rudder as he plunged to safety.

But now those six silver monoplanes had leveled off above the Lancer and were trying to pour machine-gun bullets into it from a safe distance. Bill saw that they didn't try to close in because of their fear of the pilotless plane that was trying to destroy him. They stayed clear of it as though they knew only too well its frightful powers of destruction.

In those few minutes while Bill fought desperately to avoid the machinelike precision of the pilotless plane, there flashed through his mind the tale of the headless horseman and the horror it had stirred in him as a child.

His lips cracked in a twisted grin as he made the comparison. Then, he was again barrel-rolling the Lancer to evade the thing. He had not tried to use his guns on it because, even in the face of death, his curiosity to know what the thing could do was too great to let him destroy it. And he doubted that he could get it under his sights long enough to allow him to use his guns without at the same time risking an almost certain chance of collision, because of its terrific speed.

The pilotless ship could execute turns and banks and pull-outs that no human being could have tried because of the certain knowledge that he would "black-

out" and go unconscious under the pressure of the blood rushing to his brain.

Bill knew that here was a machine against which man could not hope to survive because it did not have the frailties of man.

Maneuvering with all the skill at his command and using all of the power the Lancer could give him, he tried now to get the thing under his guns. He wished, fervently, that he had not been forced to take the 37mm. cannon out of the Lancer. With that, he thought, he might be able to destroy the pilotless plane. He saw his tracers lace above the racing ship and to the left and the right of it. If any of them drove into its fuselage they did it no harm. The sting of his bullets seemed only to whip the miniature fighter to more frenzied efforts to destroy him.

The guns of the silver monoplanes were silent now as they circled above the strangest fight that had ever taken place in the air. A fight in which a radio robot was matched against the greatest air fighter the world had ever seen.

There, above the barren wastes of a strange land in the Indian Ocean, with only a few of the human beings who were watching aware that they might be seeing the beginning of the age when machines would destroy men, the greatest aerial battle of all time took place.

Bill knew that the man who was directing the split-second precision of the little plane's maneuvers was a master at his craft. He himself was fighting the pilotless plane without an error in strategy or tactics, because a single error would have meant his death.

But Bill realized he could not go on forever. He was becoming weak and confused from the terrific strain of speed he had never encountered before. He knew that unless he got clear in some way he would make that single error destined to be his last.

And on the outside rim of the horrible battle cruised those six silver ships waiting to pounce on him and destroy him if he escaped from the pilotless fighter.

He studied the wing angles of the miniature ship as well as he could for a few seconds, and then yanked the nose of the Lancer up as he poured juice into his engines. He knew that he would have to go through a frightful hail of lead to get above those six monoplanes, but he knew they were not as dangerous as the thing that menaced him now.

The Lancer seemed to respond to his wordless prayer with all its old-time power. Its great sixteen-foot props tore holes in the air as it skyrocketed upward at terrific speed.

The silver monoplanes kicked their tails in the air and dove on him as he came up. Dove at him from a half dozen different directions, conveying their fire in a fusillade through which

he would have to plunge. It did not seem possible that anything could get through that wall of machine-gun bullets alive.

Bill saw in one swift glance over his shoulder that the pilotless fighter had leveled off. It was not following him. The next instant he whipped the Lancer around in a climbing turn, reversing his direction for five hundred yards of level flight. The silver monoplanes, taken by surprise, did not have the speed to converge on him again as he hung the Lancer on its props once more.

They dove at him with their guns yammering, but he was above them and away before they could get him in the vortex of their fire.

He closed his overhead hatches and switched on his oxygen as his sensitive altimeter read twenty thousand feet. He was so weak that the mere turn of the oxygen switch seemed almost too great an effort. He saw the silver fighters nosing up to follow him. But the imminence of their presence meant nothing to him as he took the Lancer higher and higher.

After a few moments the world brightened as the oxygen began to sing through his body and give him strength. The silver monoplanes were wallowing now,

here. And keep your eyes open. If you see what looks like a tiny fighter coming at you, don't go down to investigate it. Stay up where you are. Keep your altitude."

"A tiny fighter?" Shorty said in a puzzled voice. "What is it, Bill?"

"A ghost!" Bill said, grimly. "Pour in the soup!"

X—SANDY EXPLAINS

BILL was cruising in great sweeping circles at thirty-five thousand feet when Shorty and Red appeared, mere specks to the east. He threw his radio key and made contact with them in a voice that was grimly harsh.

"We've got to go in and attack," he said. "That will be our only chance of getting Sandy. They have a couple of anti-aircraft guns and a half-dozen machine guns besides eight or ten of those single-place fighters."

"What about those ghosts?" Shorty asked.

"I'll take care of them first," Bill said. "I'll bomb the catapult that shoots them into the air. They are small, low-winged ships not quite half the size of a Piper Cub. After they get in the air they are controlled by radio from the ground. Some of them probably detonate on time fuses and the rest on contact."

"They fly without a pilot?" Red asked, breathlessly.

"Just that," Bill said. "They are radio-controlled through a robot pilot in the plane. It is the most hellish device man has ever created to destroy man. But we don't have time to talk about that now. I can see a half-dozen of those silver monoplanes still in the air. They're waiting for us to come back. We've got to go in fast and half-demolish the place before they know what has struck them."

"What's your plan, Bill?" Shorty asked. "Shall we all try to make a landing?"

"No," Bill said. "We'll start a dive at twenty thousand feet. Don't pay any attention to the silver monoplanes. I'll bomb the catapult while each of you take an anti-aircraft gun. After I pull out I'll take care of the monoplanes while you make a landing, Shorty. Red, you use your Snorter as an attack ship. Stay a few feet above the ground to protect Shorty while he finds Sandy. I think the kid will be ready when you land. He knows we're trying to get him by this time. Unless he's locked up he'll be ready to go. We'll have to gamble on that, but I think he'll be set."

"Our success will depend on our demoralizing the place for the short time it will take us to get in there and get out again. After we're all back in the air we'll have to fight off those silver fighters. Any of us who gets out alive must get back to Tananarivo and report to the U. S. consul. Have you got it?"

"Okay," they said casually. They were veterans who had learned to take each task casually, hoping that they would survive, but ready for death if this was their day.

"You'll have to pick your objectives on the way down," Bill said. "They'll be firing so you can't miss them. Follow me!"

"Let her ride!" Shorty screamed into his microphone.

The tails of the three ships slipped into the air as their noses dropped. Down and down and down they plummeted, standing almost bolt upright on their rudder bars, their hands wrapped around their control columns like bands of steel. The baffled wind shrieked and screamed through their stout bracing struts as they shouted at the tops of their voices to relieve the frightful pressure.

At five thousand feet they began to pull out, only to drop their noses again in a shallow dive that would make their aim effective.

Shorty and Red pointed the noses of their Snorters directly at the group of men throwing shells into the breeches of the fast-firing anti-aircraft guns. Malignant puffs of smoke from the guns had followed in their wake during their terrific dives. The eight silver fighters that were in the air had tried ineffectually to intercept them with a fusillade of machine-gun fire. But their speed was too great.

Their twenty-five-pound bombs drove into the anti-aircraft guns and their crews as they zoomed upward only two hundred yards above the ground. They leveled off and came back with their machine guns trained on the survivors among the gun crews. Men ran about on the ground like rabbits trying to escape the frightful concentration of their fire.

Bill Barnes took a fleeting second to glance under the wing of the Lancer as he plummeted toward the earth. He saw men launching one of the tiny radio-controlled torpedoes. Saw it rise only a thousand feet from the ground to explode into a thousand flying fragments. It was followed by two more and he realized that they were laying down a barrage of shrapnel through which he would have to plunge.

But he knew that now his only chance for survival was to keep the nose of the Lancer down and depend on his terrific speed to take him through.

He stuck the nose of the Lancer directly on the catapult as he nosed down again in a shallow dive. He fought the big ship as it was tossed like a leaf in a gale. He fought it with all the courage and skill he possessed as he felt bits of the exploding planes tearing through it. Then, he got the catapult under his sights and released two fifty-pound bombs.



Dick Wyndam.

five thousand feet below him. The pilotless fighter was spiraling downward in great, sweeping spirals.

Bill threw his radio switch when he was only a dim speck to the glasses far below him. He threw his radio switch and chanted Shorty's call letters into his microphone.

After Shorty and Red had both checked in he said, "Get in the air! Get up to thirty thousand feet and stay there." He gave them his position as accurately as he could. "I've found the place," he went on, "and if we're going to get Sandy we'll have to go in and get him ourselves. I'll tell you the only possible way we can do it when you get

The dartlike projectiles sped true on their murderous journey. Dust and dirt, steel and wood, and things that had been men spouted into the air.

The place was a madhouse now. Bugles blared and men shouted orders that were not heeded. The *tat-tat-tat* of machine guns blended with the full-throated roar of airplane motors.

Shorty Hassfurth fishtailed his Snorter down on the field, his two powerful .50-caliber guns spraying lead before him. Above him Red Gleason zoomed and swooped, using the tactics of an attack plane at close quarters.

As Shorty started to climb over the side of his Snorter with a heavy automatic in each hand, young Sandy Sanders appeared in the doorway of a building not fifty feet away. His clothes were in tatters and his face was smeared with blood.

And he was carrying an unconscious man on his back. A man whose head was drenched with blood. As Sandy staggered under the weight Shorty saw him and ran to help him.

"Who is he, kid?" Shorty panted as they swung him into the after cockpit.

"Never mind now," Sandy said as he clambered in after him. "I wouldn't be alive if it wasn't for him."

The air was interlaced with machine-gun fire as Shorty gunned his Snorter and roared down the field. As he lifted the nose one of the silver monoplanes came swooping down from nowhere with its machine guns chattering.

The next instant the silver monoplane tore into the earth with a dead man at the controls as Red pounced on it from above.

Shorty hung his Snorter on its props and tried to get upstairs as two more of the silver ships swooped down and came up under his tail, followed by two more. All four of them were winging up as he brought the Snorter around in a flashing Immelmann close to the ground and then tried to climb away from them. But they were after him like so many vultures.

Then Red Gleason and Bill tore the alignment of the four ships to bits. They dove on two of them, raking them with lead. They whipped their planes through the sky like two mad bulls. The four silver monoplanes were like four

dogs with their tails between their legs as they dove and zoomed to escape.

As Bill saw Shorty straighten out the Snorter he shouted into his microphone: "Get out of here, Shorty! Red and I will polish things off. Get back to Tananarivo!"

"Right!" Shorty snapped. He laid the nose of his Snorter on Tananarivo as Bill and Red hung their ships on their props to get the advantage of altitude.

But when they leveled off at eight thousand feet the silver monoplanes had disappeared. Two of them had made landings on the field below and three were tiny specks in the distance.

Clouds of black smoke dotted with orange flame were rolling up from the buildings surrounding the landing field. The place had become a shambles in those few minutes from the time Bill and his men started their devastating dives.

"All right," Bill said into his microphone. "Get on Shorty's tail, Red. Our job is finished. The governor-general will do the rest."

Shorty and young Sandy were lifting that lifeless, blood-smeared form out of the rear cockpit of Shorty's Snorter when Bill and Red climbed over the sides of their ships and joined them.

Sandy shook hands with both of them. For an instant his infectious, twisted smile flickered on his face and then was gone. He shook his head from side to side as he gazed down on the inert form of the man who had been his friend.

"Who was he, kid?" Bill asked.

Sandy stared at him for a moment in astonishment. Then he said, "Gosh, I forgot you didn't know, Bill. His name is Brewer, William Brewer. If his head wasn't all bashed in you'd almost see yourself."

"He's the man who was impersonating me?" Bill asked. "What the hell was—"

"He was a good guy, Bill," Sandy said. "He was a soldier of fortune, a confidence man, a little bit of everything. He told me a lot about himself in the past few weeks. When he learned he looked like you he began to cash in on it."

"A Frenchman and a Hungarian came to him to help them market an inven-

tion. He took on the job not knowing just what he was trying to sell. He pretended that he was you and made some fine contacts. But the people he was trying to sell were suspicious of him so he kidnapped me, thinking that with me with him his clients wouldn't be so suspicious. He had representatives of the biggest munition concerns in the world trying to buy what he had to sell.

"But he didn't know what that was himself until he brought me here. When he learned what a horrible weapon they were trying to peddle he tried to pull out and take me with him. But they wouldn't let him go. He sent that note to Dick Wyndam. Is that how you found me?"

"Yes," Bill said. "That's how we found you. Where are the Hungarian and Frenchman who invented that radio-controlled plane?"

"They're dead, Bill," Sandy said. "Brewer killed both of 'em today. They were going to kill us when you first appeared today. Brewer went after them with his bare hands. They had kept us locked up for days. They knew in some way that we had got word through to you when you landed on Madagascar yesterday. They thought they had better get rid of us so they wouldn't have you on their neck. Their minds didn't work straight."

"No," Bill said. "I don't believe they did. Did anyone beside those two know the secret of those radio-controlled planes?"

"No one," Sandy said. "When you destroyed the catapult and the planes, and Brewer finished those two fellows, the secret died."

"Then the trip was worthwhile," Bill said. "If an aggressive nation got hold of that device they could destroy other nations without losing a man. They could destroy civilization at long range. It's too powerful a weapon for any nation to own. What are we going to do about Brewer?"

"I promised him I'd see that he was buried in Nebraska where he came from," Sandy said.

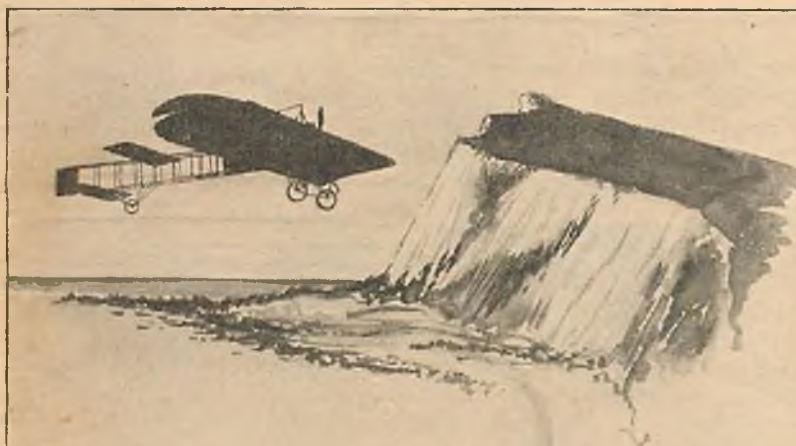
"He deserves it," Bill said. "We've got to report to the United States consul and the governor-general."

"Then let's go home!" Sandy said.

AN IMPORTANT ANNOUNCEMENT OF INTEREST TO OUR READERS

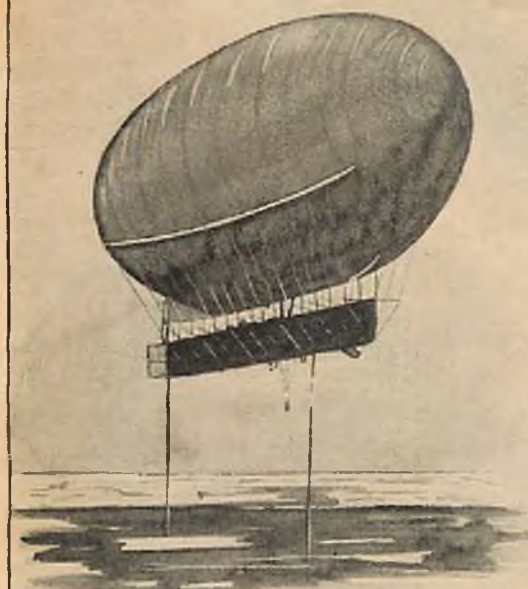
Beginning with the August issue of AIR TRAILS there will appear the first of a two-part article on DIESEL AIRCRAFT ENGINES by Paul H. Wilkinson, well-known author of the book by that name. This series by an international authority upon the subject should be of vital interest to everyone concerned with the safety and efficiency of the modern aircraft power-plant.

Pictorial History of Man in the Air



1909 - LOUIS BLERIOT AMAZES THE WORLD BY FLYING FROM CALAIS, FRANCE, TO DOVER, ENGLAND, OVER THE ENGLISH CHANNEL. HE LEFT CALAIS AT 4:35 AM. AND LANDED AT DOVER JUST AT DAWN AT 5:02 AM, COVERING THE 25 MILES IN 37 MINUTES. JULY 25th 1909

1909 - ON AUGUST 8th OF THIS YEAR MONSIEUR E. SPELTERINI, WITH THREE FRIENDS CROSSED THE SWISS ALPS IN A BALLOON. THEY COVERED THE 93 MILES FROM CHAMOUNIX, SWITZERLAND, TO LAKE MAGGIORE, ITALY, IN SEVEN HOURS. THEIR MAXIMUM ALTITUDE WAS 18,700 FEET OR NEARLY THREE AND A HALF MILES.



1909 - WALTER WELLMAN, AMERICAN JOURNALIST, TRIES TO REACH THE NORTH POLE BY AIRSHIP. ON AUGUST 15th HE SET SAIL FROM SPITZBERGEN, NORWAY, ONLY TO BE FORCED DOWN AFTER COVERING ONLY FORTY MILES. HE WAS RESCUED AND TOWED BACK TO SPITZBERGEN BY A GERMAN WHALER.

1909 - ALSO IN AUGUST OF THIS YEAR, WE FIND GLENN CURTISS WINNING THE GORDON BENNET TROPHY AT RHEIMS. COMPETING AGAINST THIRTY FLIERS OF DIFFERENT NATIONS, CURTISS WON BY COVERING THE 20-KILOMETER COURSE IN 15 MINUTES AND 50.6 SECONDS. THE WORLD'S FIRST AIRPLANE RACES TOOK PLACE DURING THE WEEK OF AUG. 22nd.

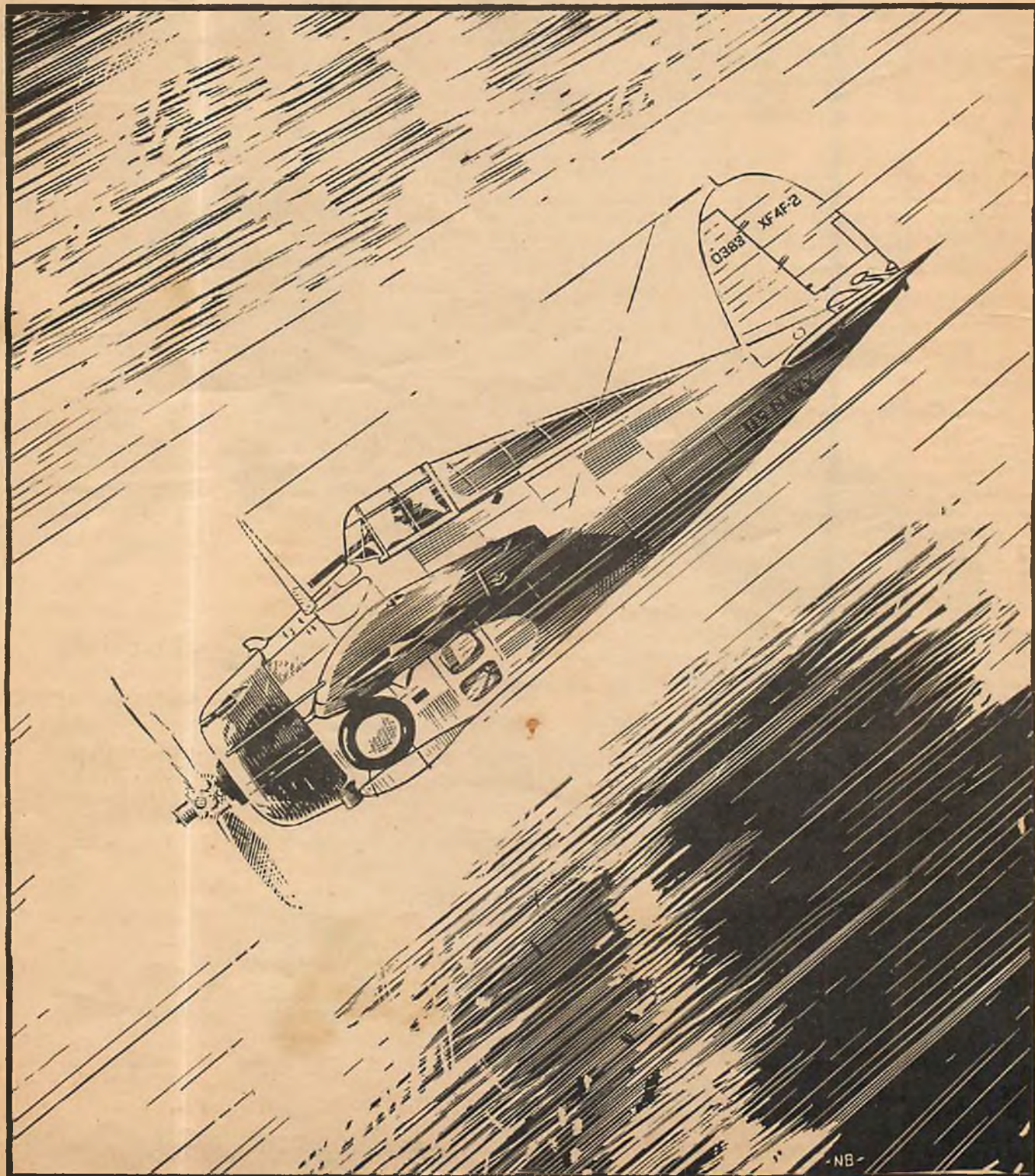


SHIPS IN BLACK AND WHITE

The Grumman XF4F-2 Midwing

IN the world-wide scramble for aerial supremacy fighter design has been keyed to speed. A few short years ago 200 m.p.h. was an all but impossible goal. Gradually, performance has been improved until even the 300 m.p.h. fighter is being relegated to the background. Grumman, already famed for their development of biplane designs, have finally gone monoplane. In the XF4F-2 is summed up the accumulated experience of a

finely attuned organization. The midwing can be expected to embody all the characteristics of stamina and performance that have long been synonymous with the name Grumman. When one considers that the late model Grumman biplane fighters are capable of attaining speeds just short of 300 m.p.h., it can only be conjectured just what the midwing will do. On it are focused the eyes of the aeronautical world.



MODEL MAKING—

Air Trails Department of Practical Construction

Guest Editorial

By William S. Berry

(Director, Quaker City Gas Model Association, whose work has done much to establish this organization as one of the most successful in the hobby.)

The Q. C. G. M. A. of Philadelphia is probably unique in gas model history. It is the result of three local groups joining together for the benefits of greater prestige and activities. The local groups have not lost their individuality. They carry out their own ideas—and combine with the other groups in putting across the association's program. This method of organization works splendidly. Since the local groups are composed of modelers living in the same sections of Philadelphia, it is more convenient for each of them to carry out a modeling program. Yet all members enjoy the privileges and prestige that only a large organization can provide.

The directors of the central group are the leaders of the local groups. The keynote in the success of the club has been the tie-up between fathers and sons. The board of directors is open to the father of any boy member. The purpose of this idea is to insure an interested financial backer for the work of the young flyer. This father and son team-up is one of the things of which we are most proud. Cooperation of the fathers has been helpful in working out the details of organization and promotion.

Members need not own a motor or a model when they enter the group. In fact, we prefer to help them select a model which they can build and which is worth the price paid for it.

Most of our members are under 16 years. Nevertheless, there is active participation in the monthly contests—fourteen of which have been held during the past year. One business meeting is held each month. The *News Flash*, the club paper, is sent to all members, and contains club news, contest dates, and technical information contributed by the members themselves.

Officiating at contests is done by members who voluntarily ground themselves for the day to give their whole attention to their assignment. By the time our big September meet rolls around, every member will have officiated in at least two meets. And just try and pull a "phoney" on an official who is also a flyer! They make the most efficient and capable judges known in the hobby.

9 Model Building Items

GUEST EDITORIAL	BY WILLIAM S. BERRY	57
<i>In union there is strength—about the organizational advantages in gas modeling.</i>		
THE TEXACO TROPHY WINNER	BY FISKE HANLEY	58
<i>The premier gas model design of the year—five pages of plans and directions.</i>		
THE DISCUSSION CORNER		63
<i>The pro and con of controversial model design problems. This month readers discuss "dihedral."</i>		
THE STOUT TROPHY WINNER	BY ROY E. STONER and PETER STAPILUS	64
<i>An outstanding rubber-powered model, a top flight championship design.</i>		
MODEL MATTERS		68
<i>Reporting the current events in the model hobby—new ships, builders, contests.</i>		
THE CONTEST CALENDAR		70
<i>A schedule of coming contests.</i>		
NORTH AMERICAN XO-47	BY MARTIN E. DICKINSON	71
<i>A beautifully drawn plan of a modern Army ship, complete to the most minute detail.</i>		
THE BOWLUS BABY ALBATROSS	BY PAUL PLECAN	72
<i>A four-foot flying model retaining all of the grace and performance of the original.</i>		
KNIGHT TWISTER	BY WILLIAM WINTER	76
<i>A popular baby biplane prepared as a replica in the 1/2"-1" scale.</i>		

AIR TRAILS ADVERTISERS—JULY, 1938

Aero Industries Technical Institute	Imperial Model Aero Supply	91
Back Cover	International Correspondence Schools . . .	3
Aeronautical Chamber of Commerce	Johnson Smith & Co. Third Cover	
Aeronautical University	Lincoln Airplane & Flying School	95
Aircraft Second Cover	Marchino Models	96
Aircraft Industries	Mechanix Universal Aviation Service . . .	96
Aviation Institute of America, Inc.	Megow's	81
P. Battles	Metal Products Co.	96
Hawley Bowlus	Model Airplane News	87
California Flyers, Inc.	Newell Pharmacal Co.	96
Dailey Model Aircraft Co.	Nimmo Aircraft Co.	96
Lyle Douglas	Peerless Model Airplane Co.	93
Fleischmann's Yeast	Roosevelt Aviation School	85
Franklin Institute	Transcontinental & Western Air, Inc. . .	92
G. H. Q. Motors	Universal Aircraft Co.	96
Gun Model Co.	Waterbury Model Builders Supply . . .	96
Heathe Model Airplane Co.	Wm. Yeager's Aircraft Photo Service . .	97



The student of design will note in these two pictures the requisites of a perfect model.



TEXACO TROPHY WINNER

Five pages of detailed plans and information for duplicating the most renowned gas model of the 1937-8 contest year—the 25th Air Trails championship model presentation.

By Fiske Hanley *In collaboration with Gordon S. Light*

THE TEXACO TROPHY is the outstanding award for gas models. All Texaco winners have been outstanding models. Hanley's 1937 winner continues this famous line of models. It incorporates the features which Hanley deemed necessary for a contest winner—fast climb, slow glide, and stable flight. The model lived up to all these requirements despite the fact that it was designed, built and test-flown two weeks before the National Meet.

It's a long way from Fort Worth to Detroit and this accounts for the attention Hanley paid to making his model demountable for ease in carrying. The wing is two-piece, the landing gear is detachable, tail removable, and the motor mount is readily detached.

CONSTRUCTION

It is difficult to include every construction detail in this limited space. Therefore the routine type of con-

struction will be passed over lightly and the special emphasis given to the features which make this model distinctive. All the drawings have been drawn to the scale indicated and measurements can be made directly from the sketches.

FUSELAGE

The basic fuselage structure is built from $\frac{3}{8} \times \frac{3}{8}$ " balsa in conventional fashion. The two side panels are built directly over a full-size layout of the fuselage and then joined by the top and bottom cross-braces. Formers and stringers are added to the top and bottom of this basic structure.

The formers are cut from two-ply $\frac{1}{8}$ " balsa. A typical former—top and bottom—is shown in the pattern of full-size parts. The other formers will have to be changed slightly to fit their particular location. $\frac{1}{8}$ " spruce stringers are used both top and bottom.

Two front fuselage formers are cut from $\frac{1}{4}$ " three-ply hardwood. One of these formers is attached rigidly to the front of the fuselage. The other former is used to make up the motor mount. Cut two motor bearers (pattern shown full-size) from $\frac{1}{4}$ " plywood. These bearers are nailed and cemented to the former. Spruce pieces— $\frac{1}{4} \times \frac{3}{4} \times 4$ "—are cemented to the inside of these plywood motor bearers.

The motor mount is attached to the fuselage by rubber-and-hooks on each side of the fuselage. The inside surface of the motor mount is lined with $\frac{1}{4}$ " square balsa which fits inside



Fiske Hanley holding the Texaco Trophy.

ABOUT FISKE HANLEY

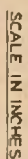
Good flying terrain and equally good flying weather are fast making gas modeling a favorite outdoor sport in Texas, recent though this interest is in that state. Fiske Hanley was one of the first to take up gas modeling in Texas—that was a little more than a year ago. He had ample modeling background for his gas model activities. He started building the "solid" variety when he was just old enough to start school. During the last four years he's been doing good work with flying models.

Last July in Detroit, Hanley earned a championship rating by winning the Texaco Trophy for gas-powered models. He matched a model of his own design and construction against the best in the country. His winning flight of 50 minutes and 29 seconds was well out in front. (His model landed in the Detroit River on the Canadian side.) The long trip from Fort Worth to Detroit hadn't dimmed the flying brilliance of his design.

About a year ago, Hanley's first gas model won the all-Texas meet. The prize was a Brown motor. It was with this motor that he later won the Texaco Trophy. Hanley is a member of the Fort Worth Gas Model Club and has placed well up in the regular monthly contests. The club has the enviable record of having a member take first in every contest the club has entered. As Hanley puts it, "We don't use big words for our model aerodynamics, but we sure do get results."

At present Hanley is finishing up his high school courses and plans on taking aeronautical engineering at the North Texas Agricultural College.

Hanley and his fellow-Texans have come a long way in the gas model hobby. Other modelers will do well to follow their work closely.



0 1 2 3 4 5 6 7 8 9 10 11 12

- ABOUT 18

the opening cut in the front fuselage former and helps hold the motor mount in position.

Batteries are replaced inside the front of the fuselage by taking off the motor mount. Clips are cemented to the motor mount to facilitate taking off the motor.

LANDING GEAR

The landing gear is demountable. The $\frac{1}{8}$ " diameter wire struts fit into extra-thick aluminum tubing which is cemented and wrapped to the bottom of the $\frac{3}{8} \times \frac{3}{8}$ " longerons. A "V" strut of .055 wire joins the two halves of the landing gear. It is attached with rubber bands to a similar strut fastened to the bottom of the fuselage. Rubber bands are used to connect the two sets of $\frac{1}{8}$ " diameter struts to keep them in place in the aluminum-tube sockets.

RUDDER

The bottom part of the rudder is cut from balsa and cemented to the bottom of the fuselage. Hollow out the inside of the balsa to reduce unnecessary weight at the rear of the model. A balsa block is added to the rear tip of the fuselage to round out the shape. The rudder is streamlined into the cockpit.

You'll notice from the drawing that the rudder-elevator unit is demountable from the fuselage. It is held in place on the fuselage by rubber-and-hooks at the leading edge and the rear spar of the elevator. A movable tab is built into the rudder. It is intended for making minor changes in rudder setting. Soft wire can be used for hinges. Ribs are symmetrical. The longest rib has a maximum thickness of $1\frac{1}{4}$ " and the others vary accordingly.

ELEVATOR

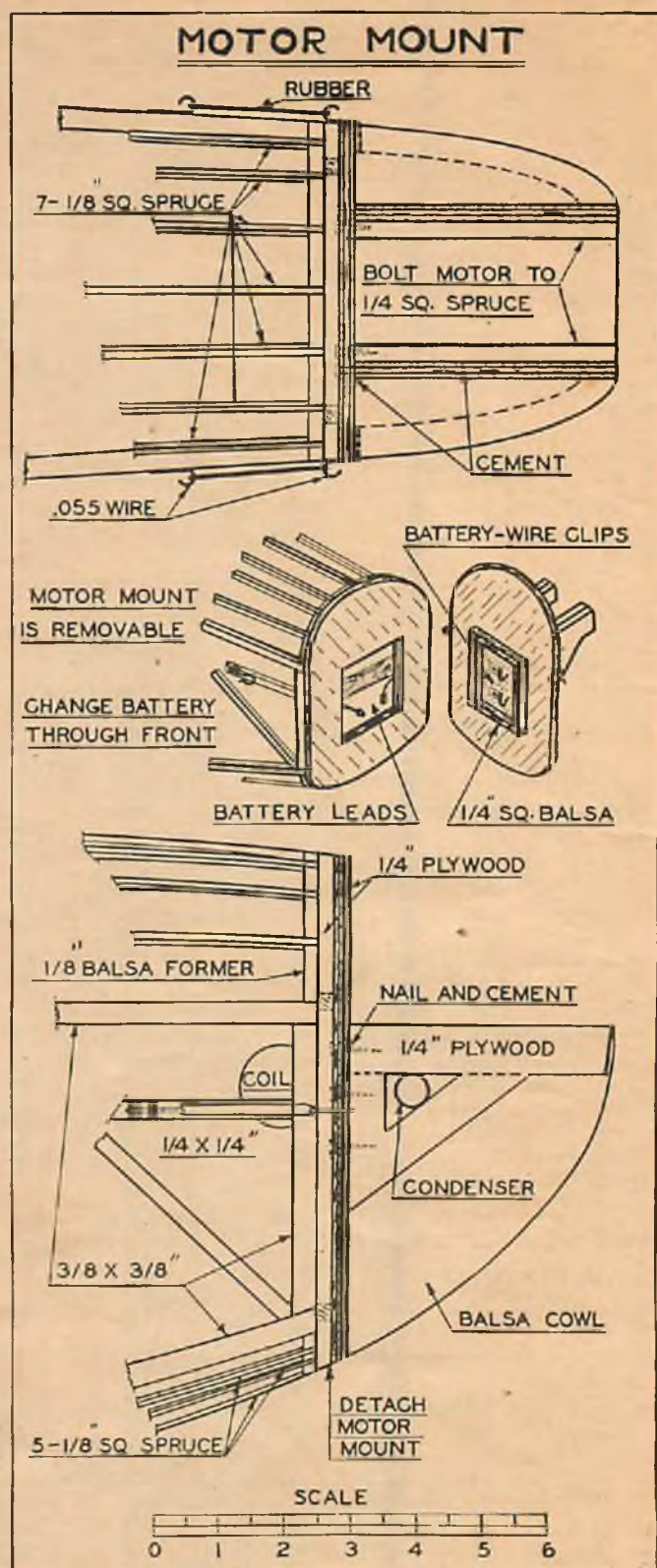
The elevator is rigidly built into the rudder. A streamline or symmetrical airfoil shape is used. The thickness of the center rib is about 1". The shorter ribs are tapered to form a smooth surface. The tips and the center are covered with $\frac{1}{32}$ " sheet balsa. The elevator should be mounted at zero incidence—referred to the top fuselage longerons. The tail assembly must be kept light-weight or the plane will be tail-heavy.

WING

The wing is built in two pieces—detachable at the center section. The rubber which holds it onto the wing mount also holds the two halves of the wing together. The spars are spruce up to the 4th rib from the center. At the center section these spars are covered with $\frac{1}{32}$ " plywood and silk. The other (Turn to page 93)



The model is a large one; its construction features many interesting fine points.



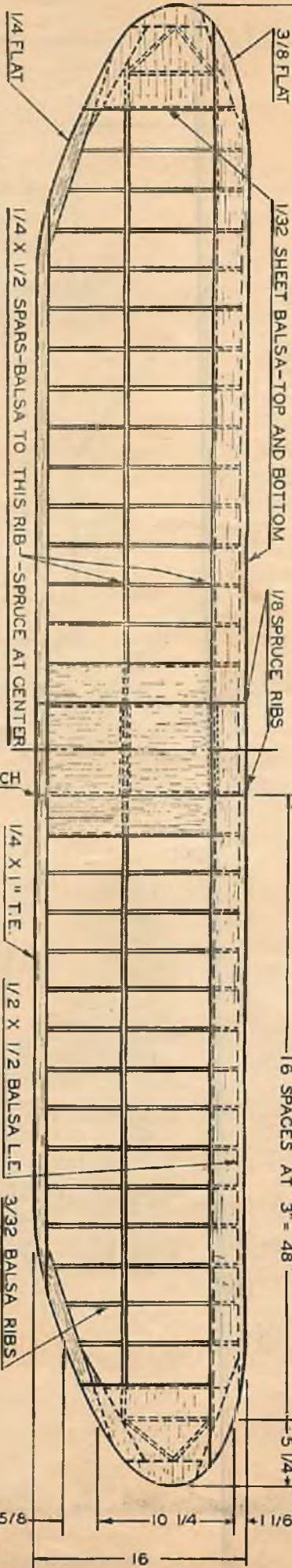
Fiske Hanley, the Texaco winner, and the Texaco Trophy.

WING DETAIL TEXACO TROPHY WINNER

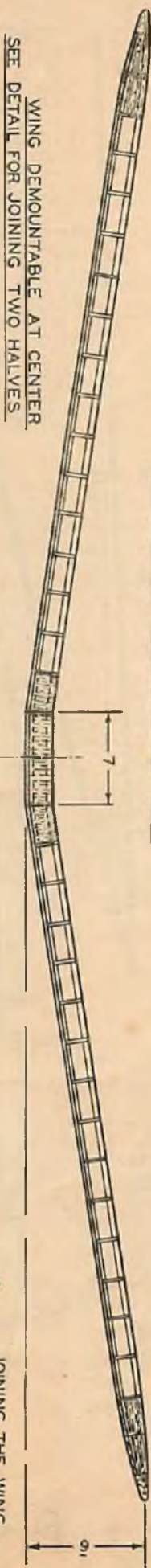
9'-5 1/2"

16 SPACES AT 3" = 48"

5 1/4"

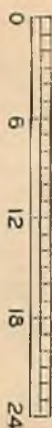


DIHEDRAL NOT SHOWN IN TOP VIEW

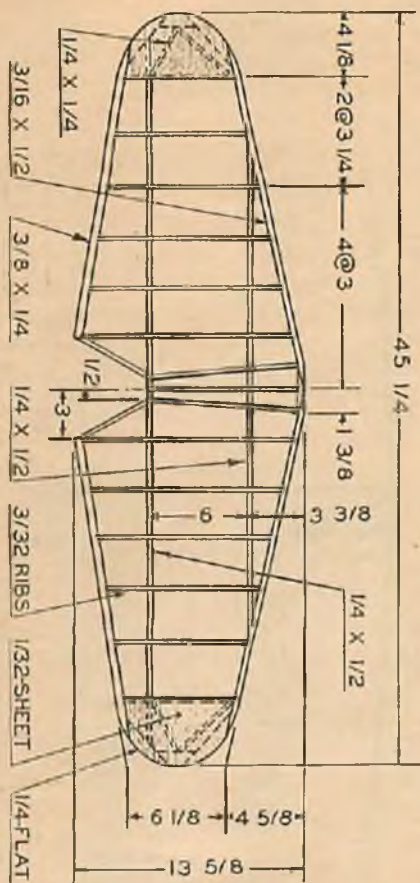


WING DEMOUNTABLE AT CENTER
SEE DETAIL FOR JOINING TWO HALVES

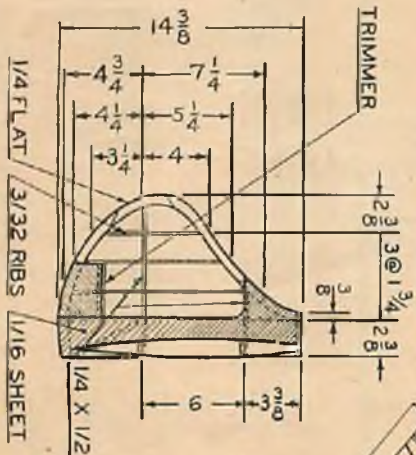
SCALE



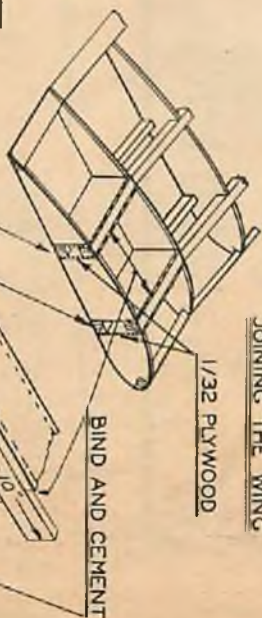
ELEVATOR



RUDDER

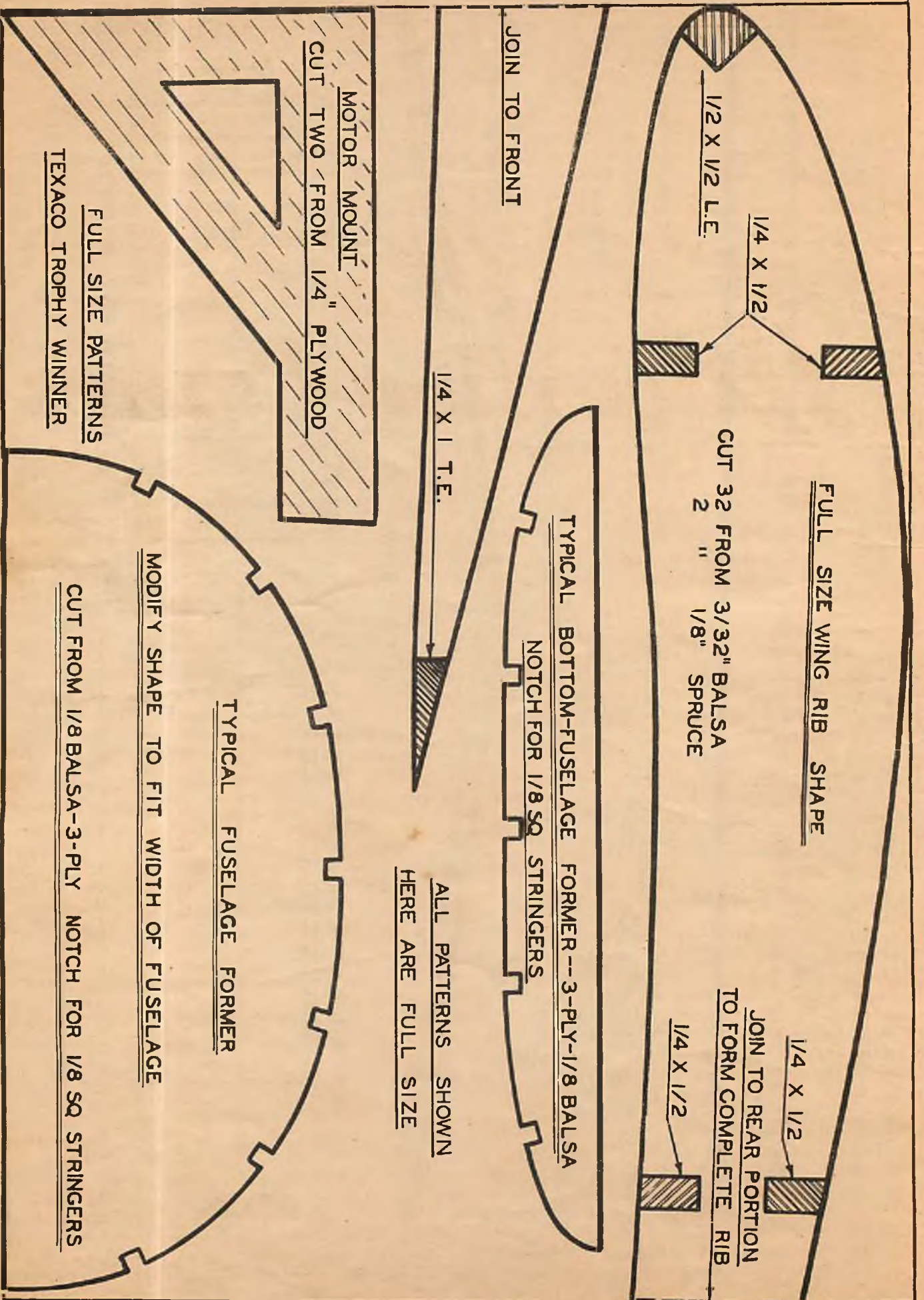


JOINING THE WING



SPRUCE
1/4 X 15/16
1/4 X 1/2

NOTE THE SPRUCE INSERTS ARE CUT
TO CORRECT DIHEDRAL ANGLE



The model art progresses through the exchange of ideas. The Discussion Corner is a monthly sounding board for your opinions. 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.

This month's topic: Other factors of design being equal, do you believe that dihedral should be used in excess of what is actually required for stability? Is excessive dihedral beneficial, or is it a dangerous design feature?

Next month's topic: Profile or lateral area.

For September: What do you consider to be the best location for the thrust line relative to the profile view of the model? Can general flight characteristics be improved by locating the thrust line definite distances from the centers of gravity and resistance? Answers must reach us by June 15th.

For October: In designing and constructing a gas model to be entered in contest events, do you believe that the larger gas models offer an advantage over their smaller rivals? Which would you prefer to build around, a $\frac{7}{8}$ " or a $\frac{5}{8}$ " bore class motor? Answers must reach us by July 15th.

The Discussion Corner

PRO

Be generous with your dihedral! You won't regret the results. Too much, of course, will result in a fast sinking speed, which is undesirable. I use about $1\frac{1}{4}$ " dihedral per foot of span in each half of the wing, together with 1 inch sweepback in each tip.—RICHARD HANSEN, St. Paul, Minn.

Excess dihedral is helpful. The slight decrease in lift is negligible. Yet the model will be assured of ample stability under every conceivable flight condition. In many cases excess dihedral proves helpful in adjusting an otherwise troublesome model.—MICKY BLAFKIN, Philadelphia, Pa.

Dihedral sufficient to produce stability in ordinary flight, in my opinion, is not enough to insure good, consistent results. About $1\frac{1}{2}$ " per foot of span is about right to permit a model to climb in tight spirals and glide in a tight, flat glide. This large amount of dihedral doesn't affect the efficiency of the wing to any noticeable degree.—EARL STAHL, Johnstown, Pa.

Excess dihedral is desirable on models with high wing loadings. Their flying speeds are relatively high compared to the slow-flying duration model of a short time ago. These models are not sensitive to slight variations in wing lift. Therefore the slight loss of lift resulting from excess dihedral is not felt. The extra dihedral is a valuable safeguard against spins and steep banks, and therefore can be called a beneficial design feature.—EDWARD LINFANTE, Jersey City, N. J.

Excess dihedral is helpful. Not one modeler in a thousand is able to tell just how much dihedral is required for stability. Large plane designers still find plenty of trouble with this feature. So "slap in" plenty of dihedral just to be on the safe side. You'll never notice the decrease in lift. And when your model gets into a tight spiral you'll be thankful you weren't stingy with the dihedral angle.—ROBERT D. ATWOOD, San José, Cal.

CON

I am opposed to excessive dihedral because: 1. It requires the use of a much larger rudder, raising the center of lateral area, which is the chief cause of spiral instability. 2. It lowers the wing efficiency considerably. 3. All that is required is that there be sufficient stability; any measures taken beyond this are unnecessary.—ALBERT H. McLELLAN, Macon, Ga.

Dihedral should not be used in excess of what is required for stability. Much of a wing's efficiency is lost by too large a dihedral angle. Excess dihedral is likely to raise the center of lateral area to a point above the center of gravity, where spiral instability will result.—PHILIP MORRISON, Ithaca, N. Y.

Excess dihedral is not dangerous, but it still is not beneficial. Large tip losses and less wing lift are not worth the extra stability gained. The very fact that a lesser dihedral angle gives your model sufficient stability, a good climb, and a flat glide leaves no reason for going to extremes.—HENRY COLE, Jr., Tacoma, Wash.

On duration models $1\frac{1}{2}$ " of dihedral per foot of span is adequate. Somewhat less may be used with tip or double dihedral. Excess dihedral increased the speed of models considerably and also produced spiral instability. My experiments tell me excess dihedral is out.—JOHN BRANDLMAY, Saskatoon, Sask., Can.

With an increase in dihedral over the amount required for stability there is a decrease in wing efficiency—all other factors being equal. I have seen models with 2 or more degrees of dihedral than actually required for stability go into a spin, although other factors affecting stability were equal. Many young modelers have added an inch or two more of dihedral to be safe and then wonder why their crates go into spin.—IRVING PEARLMAN, New York City.



The Stoner-Stapilus design features a combination of rectangular and triangular fuselage cross-sections.

THE STOUT TROPHY WINNER

By Roy E. Stoner
and Peter Stapilus

In collaboration with Gordon S. Light

Complete plans for reproducing the model that won the Stout outdoor event with a flight of 12:52.2—the 25th Air Trails championship model.

CAREFUL refinement of every part has resulted in a reliable and dependable contest model. The 12:52.2 flight last July in Detroit proved the value of design changes which Stoner and Stapilus have been making in this model ever since its origin back in 1935. Originally, the model had a straight wing, symmetrical stabilizer, and a motor stick. The changes they've made are obvious from the drawings and photos. But even further changes have been made since the model's winning flight last year. Photo of the most recent Stoner-Stapilus model is included with the views of the winning model itself. The plans and instructions describe the model flown by Stoner last July in Detroit.

FUSELAGE

The fuselage drawing is drawn to scale—the 1" divisions are indicated around the outside margin. Dimensions not indicated can be scaled off the drawing.

The three views of the fuselage point out that the cross-sectional shape changes from a rectangle to a triangle. The two bottom longerons fair into a single longeron about halfway back. $\frac{1}{8}$ " square hard balsa is used throughout the fuselage. The entire fuselage on the winning model was covered with $\frac{1}{16}$ " sheet balsa inlaid between the longerons and struts—flush with the outside edges. As a substitute, $\frac{1}{32}$ " sheet can be used to cover the outside of the fuselage. Apply it on the outside of the longerons and struts—bending it to the shape of the fuselage.

ABOUT STONER AND STAPILUS

The Stout Outdoor Trophy Winner is the result of three years of design refinement with one particular type. The work was started in the early part of 1934 by Roy Stoner and Peter Stapilus, modeling partners of Rockford, Ill. In 1935 a model of their design set a new city record of 13:45, flying more than 7 miles. They spent the next several months cleaning up their design and by 1936 they were ready to go places.

Stoner and Stapilus both entered the Madison (Wis.) State Centennial Contest. Stoner took two firsts—fuselage and glider—and won the junior high-point trophy. Stapilus took second in the senior glider event. From Madison they traveled to Detroit for the 1936 Nationals. Roy took seventh in the Stout Outdoor event.

The 1937 National Meet in Detroit proved to be Stoner's big year. The Stout Trophy was his after a record-breaking flight of 12:52.2. His modeling partner, Stapilus, had bad luck. In a test flight his model struck a fence and snapped a propeller blade. By the time the repairs were completed, helpful thermals were not available for long flights.

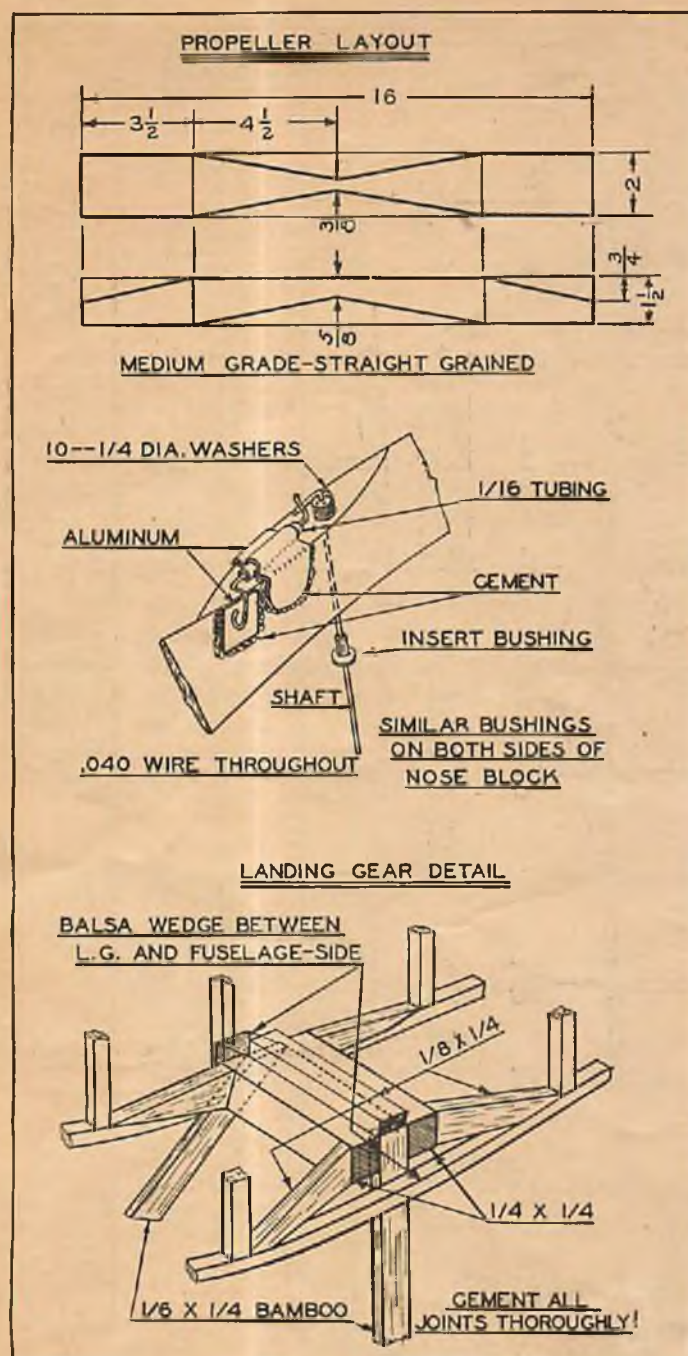
The success of these two Rockford boys proves the policy of developing a particular design until it has reached its maximum in performance. Winning the Stout Trophy doesn't mean the end of development with this model. Improvements have been made since last July and the Stoner-Stapilus design bids well to turn in an even better showing in Detroit this summer.



Roy Stoner with a recent version of the 1937 Stout winner.



Peter Stapilus with a single pusher of his own design.



The rear section of the fuselage is detached at a point 7" from the rear end. The tail section fits into the forward part in pluglike fashion. $\frac{1}{4}$ " laminated balsa is cemented inside the tail section to serve as an anchor for the rear hook and a plug to fit the opening in the front part of the fuselage.

The bottom portion of the rudder is made from $\frac{1}{8}$ " sheet balsa cut to streamline shape. It is an integral part of the fuselage and serves as a tail skid.

Cut the nose block from balsa $1\frac{1}{4} \times 1\frac{3}{8} \times 1\frac{1}{2}$ ". When drilling the hole for the propeller shaft, note the 2 degrees right- and 2 degrees left-thrust. Bushings are inserted into both sides of the nose block.

Bamboo landing struts are rigidly fastened to the fuselage. Careful precautions have been taken to prevent the struts ($\frac{1}{16} \times \frac{1}{4}$ ") from breaking loose under rough landings. The method of anchoring the struts is shown in the sketch (not drawn to scale). $\frac{1}{8} \times \frac{1}{4}$ " balsa is cemented across the top of the struts to prevent pushing through the

fuselage. In addition balsa wedges are inserted between the struts and the sides of the fuselage. These wedges can be cemented directly to the sheet balsa fuselage-side.

The landing gear struts are $8\frac{3}{4}$ " long. Landing gear tread is 9" and the wheels are moved $1\frac{1}{2}$ " forward of the strut-fuselage junction. The corners of the bamboo struts should be rounded off until the strut is oval cross-section.

Nosing and tail section are secured to the main section of the fuselage with rubber bands and hooks. Fine-wire hooks are cemented to the fuselage (top and bottom, front and rear). Similar hooks are cemented to the nosing and tail section. On their most recent model, Stoner and Stapilus have discarded this method in favor of extra-tight plugs—front and rear—which remain fixed to the fuselage even after the tension of the rubber motor disappears.

WING AND TAIL SURFACES

The drawing of the wing and tail surfaces is to scale as indicated by the 1" divisions marked around the border. Any additional dimensions can be readily scaled.

Only the center wing-rib has been shown full size. The slight taper ($4"$ to $3\frac{1}{2}"$) makes it possible to use practically the same rib throughout with slight modifications in length and thickness to suit the particular position. For a truly accurate taper-wing, each rib can be plotted from the table of ordinates given below the rib pattern.

All ribs—wing, stabilizer, and rudder—are cut from $\frac{1}{16}$ " balsa. $\frac{1}{16}$ " diameter bamboo tips are used on the three surfaces. The bamboo is pointed and inserted into the balsa leading and trailing edges. The top surface of the wing is covered with $\frac{1}{16}$ " balsa inlaid between the ribs and leading and trailing edges.

FULL SIZE RIB PATTERNS

EIFFEL 431

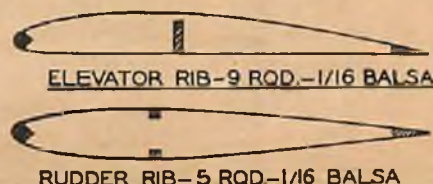


WING-RIB-CENTER

CUT FROM 1/16 BALSA

%	UPPER	LOWER	%	UPPER	LOWER
0	3.00	3.00	40	12.20	2.80
2 1/2	5.78	.56	50	11.50	2.50
5	7.10	.14	60	10.00	1.80
10	8.90	.30	70	8.00	1.20
15	10.45	.82	80	5.70	.80
20	11.40	1.50	90	3.00	.40
30	12.30	2.50	100	.00	.00

ORDINATES OF EIFFEL 431 AIRFOIL SECTION



The bottom surface of the wing is covered with sheet balsa up to the first rib. It is inlaid flush with the edge of the ribs and spars.

Both sides of the top of the rudder are covered with thin aluminum foil to help keep the model in sight on long flights. The sun flashing on the bright rudder and the highly polished propeller proves a definite help in adding seconds to the length of flight before passing out of sight.

The rudder is cemented directly to the top of the fuselage, the last rudder rib being beveled to the slope of the rear of the fuselage. The elevator is inserted through the rear of the fuselage. The $\frac{1}{16}$ " sheet balsa covering on the fuselage is cut to fit the elevator. The incidence is 2 degrees negative—that is, the leading edge is dropped about $\frac{1}{8}$ " below the trailing edge. The wing has $\frac{1}{8}$ " positive incidence, obtained by cementing a piece of balsa under the leading edge. The thickness of this insert will vary with the fore and aft position of the wing since the top surface of the fuselage is a curved shape. The wing is attached to the fuselage with rubber bands extending over top of the wing and around the bottom of the fuselage.

PROPELLER

Select medium-grade, straight-grained balsa block. Mark off the block as shown in the sketch. Cut away the excess balsa and then shape the blades. The blades of the propeller are sanded smooth with fine sandpaper and then doped with two coats of dope with intermediate sanding. Finish with one coat of polish and rub to a high gloss.

The free-wheeler is added to the hub of the propeller as illustrated. About 10 $\frac{1}{4}$ "-diameter washers are inserted between the shaft and the propeller to prevent the shaft from fouling the propeller when it is free-wheeling.



The new version of the 1937 Stout model features an inverted triangular cross-section throughout the rear of the fuselage. Elevator is above fuselage.

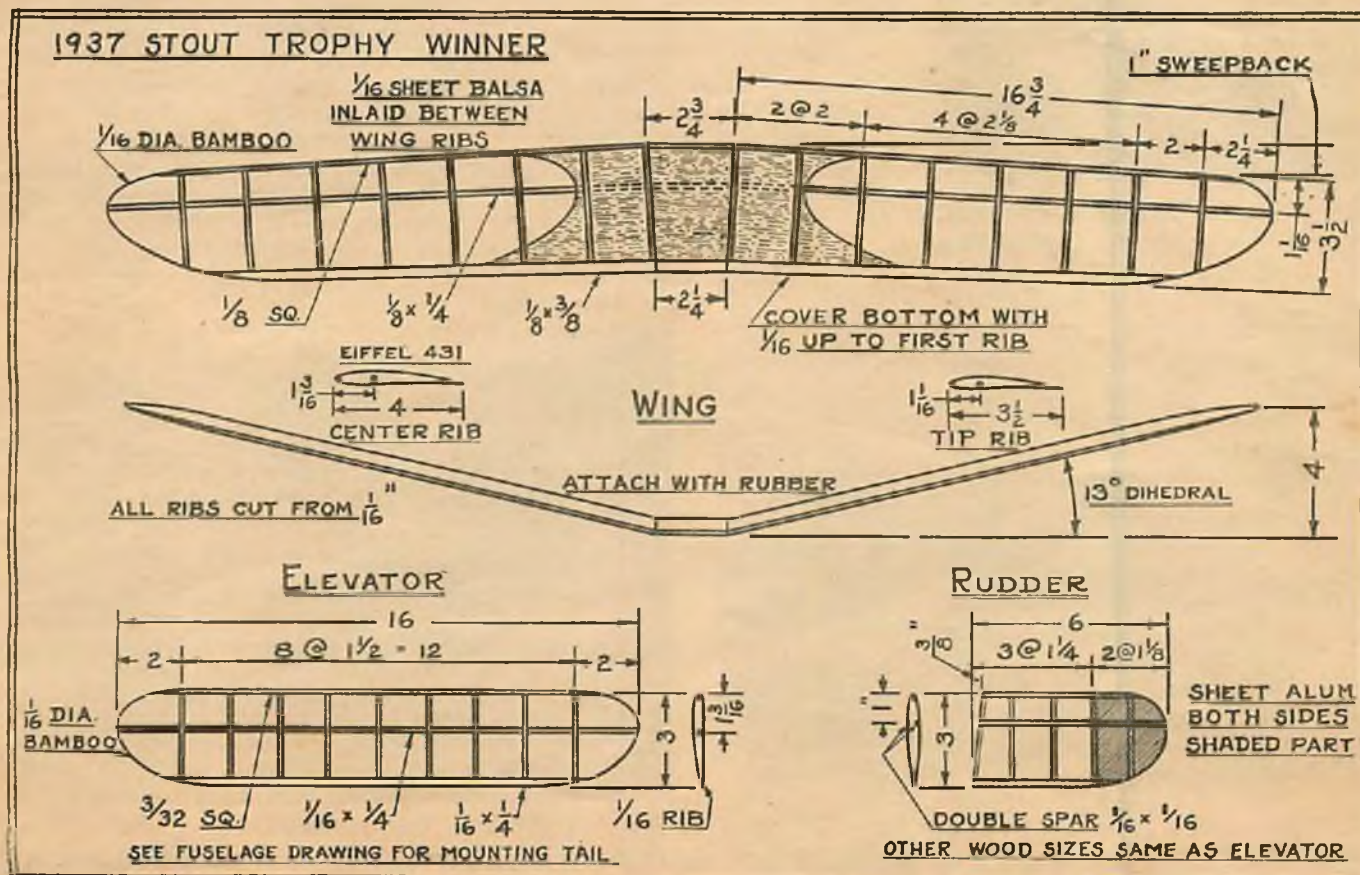
A loop in the front of the shaft to fit your winder (not shown in the sketch) will facilitate winding the motor from the front. The original Stout Winner was wound through the rear of the fuselage.

FLYING

The motor is 16 strands of $\frac{3}{16}$ " brown rubber about 28" long. The winding capacity is about 700 turns. The motor is lubricated with a mixture of soap and glycerin—both available from the nearby drugstore.

In the evening air—calm with no risers—the model climbs about 80-90 feet until the initial burst of power is gone. After this it continues to climb steeply to a high altitude. The average dead-calm evening flight is well over 2 minutes. During the power flight the model flies in tight circles against the torque (right circles with a right-hand propeller). In the glide the circle is also right—about 75-100 feet in diameter.

Ready to fly, the model weighed 4.75 ounces. The wing area is 125 square inches. This brings the model well within the minimum weight requirements of 3 ounces per 100 square inches of wing area. (Turn to page 89)



*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.)

On to Detroit!

The 1938 Nationals in Detroit are shaping up into the biggest meet the hobby has had in quite some years. An unusual feature this year is the title of National Champion to be awarded to the contestant who places in the most events—indoor and outdoor. A point system has been planned to determine the champion, and a handsome trophy and \$200 in cash go with the award. The contest dates are July 6th to 9th. There is still ample time to enter. Send your application-request to the National Aeronautic Association, Contest Com-



Mrs. Exilda Horton and a Denny Jr. she was building for the Central New York Gas Model Contest.

mittee, Dupont Circle, Washington, D. C. Enclose a self-addressed, stamped envelope. And make sure that your N. A. A. membership has been brought up to date. It will save you trouble in Detroit.

Entertainment arranged by the Detroit Exchange Club will make your stay in Detroit a pleasant though economical one. Reduced hotel rates, free box lunches and other courtesies will make it possible to shave expenses to a minimum. You'll probably be so busy with your models and talking shop with builders from all parts of the country, you'll not find time to spend much money anyway.

Flying scale enthusiasts will welcome the addition of this type of contest to the regular list of events. Following are the rules for flying scales:

The propellers must conform in diameter to the original, but may be altered in blade, width, and pitch. Wing area of models must not exceed 200 square inches. Weight must conform to the N. A. A. ruling on outdoor models—3 ounces for every 100 square inches. All models will be judged on the following points:

General Workmanship

1. Neatness of workmanship...	8
2. Amount of detail.....	8
3. Originality in reproduction of parts	6
4. Color and finish similarity to prototype	3
Total.....	25

Fidelity to Scale

1. Fuselage	5
2. Wings	5
3. Tail surfaces.....	5
4. Landing gear.....	5
5. Engine, propeller, etc.....	5
Total.....	25

In addition to the 50 points for general workmanship and scale, a model will be required to make a qualifying flight of 30 seconds. 25 points will be awarded for this flight. Additional points up to a maximum of 25 will be awarded to flights turned in above the 30-second qualifying flight.

A contestant may present only one model to be judged for workmanship. If this model cracks up before an official flight is made, a second or third model may be judged for workmanship. Exact scale outline plans from which the model was built must be submitted to the Contest Director, Hotel Fort Shelby, Detroit, Michigan, not later than July 5th. Indicate on the drawings the scale to which the model was built.

Although the contest itself does not get under way until July 6th, plan on getting to Detroit by the 5th so you'll have time to register and tune up your models. Contest headquarters have been set up at Hotel Fort Shelby, where special rates are available for modelers. From past contest experience, modelers usually fill all available rooms a considerable time before the contest. You can assure yourself of accommodations by writing in advance for rooms.



Captains "Hap" Russell and Johnny Martin, Flagship pilots for American Airlines, and their Ohlsson Pacemakers powered with Ohlsson engines.



Major Al Williams, looking over the open-division winner of the Scripps-Howard Junior Aviators. Model built by Charles Bleitner, St. Louis, Mo.

We'll be expecting to see you in Detroit!

Quaker City Gas Model Club

The 2nd Annual Quaker City Gas Model Contest is scheduled for September 10th and 11th at the Northeast Philadelphia Airport, Red Lion Rd., east of Roosevelt Boulevard. Four to five hundred contestants are expected from all parts of the East and Middle West. Camping grounds will be available. The operation of this contest has been discussed in detail for the past six months and everything possible will be done to make the meet enjoyable for all concerned. Six high-grade runways will be prepared for take-offs. A detail map of the roads and territory surrounding all sides of the airport will be given to each flyer.

A stunt flying event is a new feature of this year's contest. Prizes will be awarded to the contestant whose model turns in the most effective, unusual flight. Naturally, stunt flights will have to be declared as such before taking off.

A club championship meet was scheduled for June 11th. Charles Bossi was in charge of arrangements and energetically worked up an attractive prize list. His father, Enea Bossi, well-known airplane designer, donated an attractive trophy for first place. A 30-second engine run endurance was the only event. Unfortunately, news of this contest reached Air Trails too late. Announcement earlier would have been welcomed by modelers in the vicinity of Philadelphia.

J. A. L. CONTESTS

Results of a contest held April 2nd by the Junior Aviation League, of Boston, Mass.:

Stick (H.L.)

Cain, (senior), class B	11:03.1
H. Phillips, (senior), class C	9:35.5

Stick (R.O.G.)

H. Phillips, (senior), class B	10:10.8
Cain, (senior), class B	9:39

New Boston Records

Stanwick, (senior), class B, Stick ROW	7:52.6
R. Brown, (senior), class A, Stick ROW	5:48.8



A Curtiss Robin gas model built by Denny Delaroche of the Syracuse S. M. A. C.

The first summertime contest of the J. A. L. will be held at Smith Playground, Allston, July 16th. This contest marks the beginning of a new point system. The second summertime contest is scheduled for August 6th, with a concluding "brawl" for September 3rd.

Boston is Wakefield conscious. Glenn O'Roak is hard at work on his job. Captain Willus Brown has also come forth with a new Wakefield design. There's prospect of a special Wakefield event to be held at the New England Championships. Boston should certainly have a representative when the contest gets under way in France late in July.

S. M. A. C. Activities

The gas model division of the Syracuse Model Airplane Club scheduled its first open contest for Sunday, May 22nd, at the Syracuse Airport. A fuel allowance event was planned— $\frac{1}{4}$ ounce per pound model weight. An attractive list of prizes was offered. All N. A. A. licensed models and flyers were invited. Unfortunately, news of this contest reached Air Trails too late to be included in the Contest Calendar.

The gas model division of the S. M. A. C. was organized in October, 1937, and has 38 active members. The club has been operating under a series of elimination contests in which points are awarded to the competing club members. The high-point winner will be sent to the 1938 Nationals in Detroit.



Gas model built by Cecil Warren and Edgar Mikronis, Baton Rouge, La., winner of New Orleans contest.



A Bantam fuselage model constructed from plans in Air Trails by Eugene Linn, Wichita, Kan.



Howard Ruff, Alfred and Anthony DiOrio of Bergenfield, N. J., with their recently completed Quaker Flash. The power-plant is a Baby Cyclone.



A novel but successful gas job by the Rauch Brothers of Cresskill, N. J. The motor is mounted on struts above the wing.



A rear-quarter view of the Rauch model, showing the novel design and structure.



A Gwinn-powered TD Coupe, also the handiwork of the Rauch brothers.



A beautifully designed model by Richard McFarland, Tenafly, N. J. The engine is a Brown.

Chicago Indoor Meet

At a recent Chicago contest 108 contestants proved the popularity of indoor flying. Because of the large turnout, R. O. G.'s were flown in the gymnasium and gliders in the auditorium at the same time. The meet was held in Kosciusko Park under N. A. A. sanction, Bernard Schwartz being contest director. Extremely low ceilings in both halls prevented record-breaking flights. High-point winner of the meet was Robert Albrecht, who placed first in the Class A glider, second in the R. O. G., and second in the scale model event. Second high-point winner was Milton Huegelet, of the Aeronuts Club.

Eastern States Gas Model Meet

The lid was pried off the summer contest season for 1938 on April 24th, when the Official Eastern States Gas Model Airplane Championship Contest was held at Seversky Field, Farmingdale, Long Island, N. Y. The Polk brothers, Nathan and Irwin, directed the meet, along with A. Block. Officers and men from Mitchel Field acted as timers.

Gas model events included duration contests for engines of less than $\frac{5}{8}$ " bore and larger than $\frac{5}{8}$ ". In addition there were contests for scale models—two divisions determined by the engine bore named above.

First place in the duration event went to Edmund Seegmuler, Bronx, New York City, with a flight of 3:37. Others placing in this event were Mangus Anderson, Morris Shepard and Stanley Humphries. Trophies, engines, and model material were awarded as prizes.

Harold Spates of Baltimore, Md., took first in the midget duration event. Frank Ehling, Jersey City, 2nd; Gilbert Sherman, 3rd.

Roger Hammer, flying a model of the Taylorcraft, won the large scale model event; H. Jambo, 2nd with a Rearwin; Thomas Hintze, 3rd, with a Polish Fighter.

An Elf-powered Cessna of Frank Ehling's was the outstanding midget-engine scale model.

Model celebrities were present both in the entry list and as spectators. They included Walt Grubbs, Junior N. A. A. Executive, Avrum Zier, Walter Hurlman, William Berry, Capt. Frank Hawks, William Winter, and many others.

Junior National Air Races

The Junior National Air Races are scheduled for August 30th to September 2nd at Akron, Ohio. The contest will

Contest Calendar

READERS AND CLUBS. Notices should be mailed to the Contest Calendar, Air Trails, 79 7th Ave., New York City, 5 weeks in advance.

ANNUAL MODEL AIRPLANE CHAMPIONSHIP MEET. June 5th, for rubber-powered models, August 7th for gas models. Sponsored by the Flying Keystone Model Airplane Club. Rubber events will include hand-launched gliders, stick and cabin models and the Wakefield events. Gas events will be announced later in the season. Prizes will include merchandise, medals and trophies. For further information and requests for entry blanks write to Flying Keystone, Y.M.C.A. Building, Center Square, Allentown, Pa.

FLORIDA MODEL AIRPLANE STATE CONTEST. June 18th and 19th, at Paxton Field, Jacksonville. Sponsored by the Florida Aviation Association with the co-operation of Jacksonville Model Club. Contest under N.A.A. regulations. Special exhibition event. Entry fee, 50 cents, includes junior membership in the F.A.A. Entry blanks required by June 15th. For complete information address W. L. Timpane, Contest Director, Jacksonville Model Club, 2048 Roselle Street, Jacksonville, Fla.

STIX, BAER, AND FULLER NATIONAL ELIMINATION CONTEST. June 23rd-25th. Winners will represent S.B.&F. at the National Meet in Detroit in July. Modelers in vicinity of St. Louis are eligible.

NEW JERSEY STATE GAS MODEL CHAMPIONSHIP MEET. Hadley Field, N. J., June 25th. The meet will be under the direction of the Linden Model Aircraft Club and their senior adviser, Frank M. Kryslak. Only residents of New Jersey will be eligible and the winner will be recognized as the state champion. More than likely, however, an event for out-of-state flyers will be added to the events. Prizes will include permanent trophies, medals, gas engines, and kits. Entries will be limited to 100 competitors and will be received by mail only. An entry fee of 25 cents will be charged. Full information is available from Frank M. Kryslak, Old City Hall, Linden, N. J.

ANNUAL NATIONAL AERO RESERVE CONTEST. Rochester, N. Y., late in June. Definite date not established. Four events: stick R.O.G., cabin endurance, two built-up scale events. Prizes include four gas engines, kits, watches. For complete information address the Rochester Times-Union.

ANNUAL TRI-STATE GAS MODEL CONTEST. Sponsored by the Burlington Gas Model Association, June 26th. Prizes will be awarded. For complete information address Roy Marquardt, 1604 Osborn St., Burlington, Iowa.

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

NATIONAL CONTEST. Detroit, Mich. Date tentatively set July 6th to 9th, inc. Complete list of N.A.A. contests for the National trophies. Information and entry blanks, National Aeronautic Association, Dupont Circle, Washington, D. C.

SECOND ANNUAL ANTHRACITE GAS MODEL AIRPLANE MEET. July 17th, Scranton, Pa. Prizes totaling a value of \$100. Sponsored by Anthracite Gas Model Airplane Club. Complete information from C. A. Castellano, 1010 Jackson St., Scranton, Pa.

GULF STATES MODEL AIRPLANE MEET. July 16th and 17th, New Orleans, La. This will be the first meet of its kind and size ever held in this part of the country. Any N.A.A. chapter or individual in good standing is invited to compete. Events will be as follows: flying scale, endurance C and D, gas, and exhibition scale. Entries will be accepted from Gulf states only—Texas, Louisiana, Mississippi, Alabama and Florida. All correspondence should be addressed to Gulf States Model Meet, c/o Delgado Trades School, 610 Park Ave., New Orleans, La.

WAKEFIELD INTERNATIONAL CONTEST. July 31st, Caudron-Rennault Airport, Guyancourt, France. Competition for the Wakefield Trophy by the representative teams of each nation.

MIDWESTERN STATES GAS MODEL CONTEST. August 7th, 1938, at Chicago, Ill. Sponsored by The Chicago Gas Model Aeronauts. Information from R. L. Weber, 217 N. Desplaines Street, Chicago, Ill. Contest open to all modelers. One event—limited engine run consistency event.

ANNUAL GAS MODEL CONTEST. Miller Field, Staten Island, N. Y. C., sponsored by the Richmond Model Flying Club. Tentative date August 14th; announcements to be made later. For information address Richmond Model Flying Club, 26 Bond St., Staten Island, N. Y. C.

SIXTH ANNUAL MISSISSIPPI VALLEY TOURNAMENT. August 13th and 14th. A full list of indoor and outdoor events. Any modeler eligible. Trophies, medals, merchandise, trips, and other attractive prizes. Information from Contest Director, Stix, Baer, and Fuller Model Club, St. Louis, Missouri.

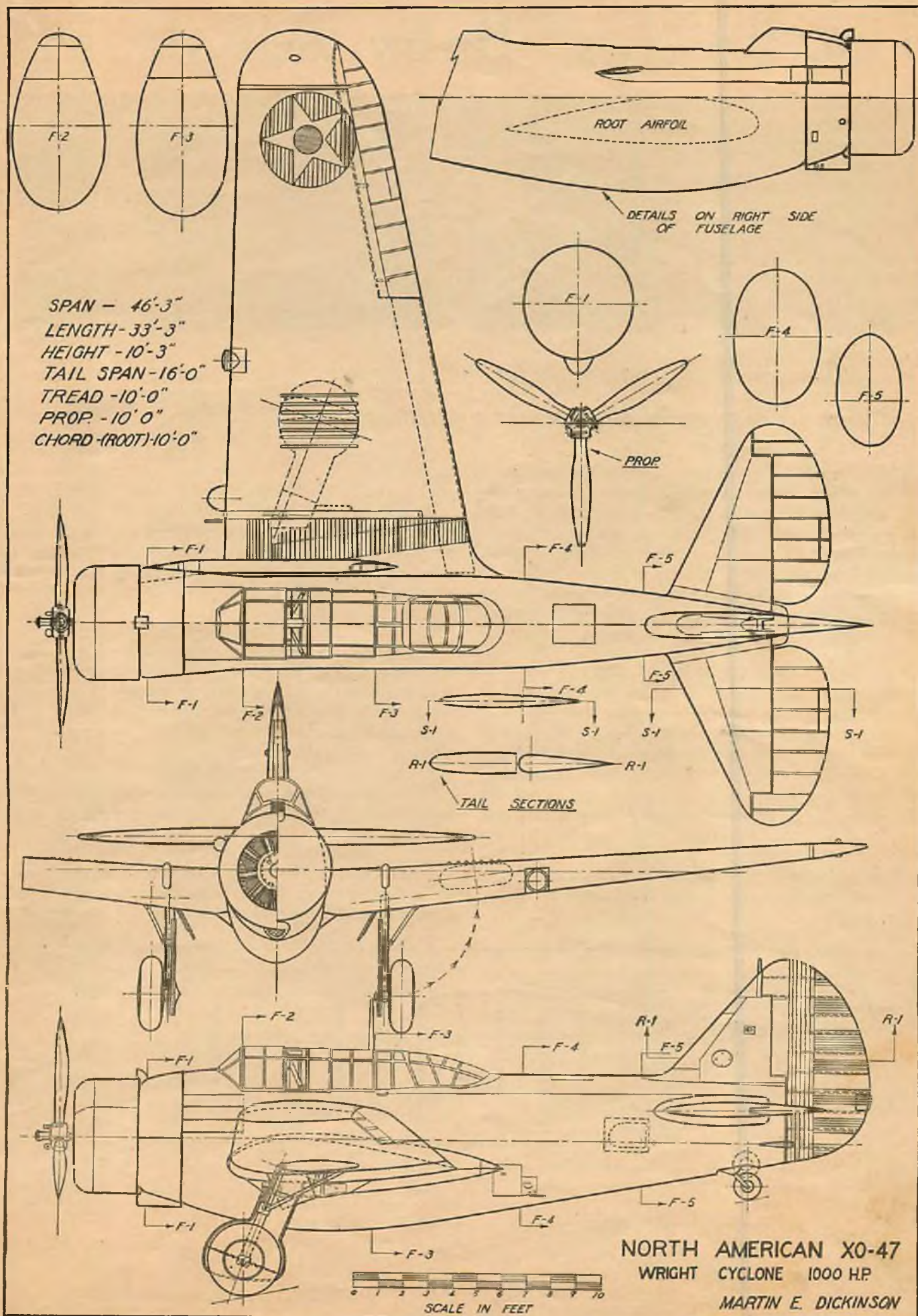
SECOND ANNUAL TRENTON EASTERN STATES GAS MODEL MEET sponsored by Trenton Chapter of the N.A.A. Permanent trophies and cash awards for first place winners; numerous awards for other place winners. Date: Sunday, August 21st; place: Meeker Airport. For further information address the Trenton Aero Society, 212 Centre Street, Trenton, N. J.

FIFTH ANNUAL OUTDOOR FLYING CONTEST. Lebanon, Pa., August 27th. Sponsored by the Lebanon Exchange Club; a full list of outdoor events—gas and rubber-powered models. Information from Contest Director, Lebanon Exchange Club, Lebanon, Pa.

CANADIAN NATIONALS. August 29th-31st. An annual feature of the Canadian National Exposition. Indoor and outdoor events open to all modelers. Information from Model Contest Director, Canadian National Exposition, Toronto, Canada.

SCRIPPS-HOWARD JUNIOR NATIONAL AIR RACES. Akron, O., August 30th to September 2nd, under the sanction of the N.A.A. Junior, senior and open events. Models must conform to N.A.A. specifications. Entrants are requested to register in advance at headquarters, Cleveland, O. Cash awards in seven events top \$2500. Kits, trophies, and subscriptions also given. For complete information address Ed Clark, National Junior Aviator Editor, Press Building, Cleveland, O.

INVITATION MEET. Quaker City Gas Model Club, September 10th and 11th. All modelers invited. Information from William S. Berry, 951 East Price Street, Philadelphia, Pa.



The Bowlus "Baby Albatross"



Plans and instructions for making a fine flying model of a modern sailplane.

By
Paul Plecan

Drawings by William Winter

THE name Bowlus has been identified for years with the finest soaring craft in America. Already distinguished because of the Albatross and other ships too numerous to mention, Bowlus is now producing the Baby Albatross. The new design is highly original, striking a pleasant note in this day of standardization.

The model, with the exception of alterations in the size and area of the tail surfaces and the addition of dihedral, is an accurate reproduction of its prototype.

CONSTRUCTION OF POD

Material sizes are not listed throughout this article—you will find them in the bill of materials at the end.

The fuselage or "pod" is carved from a solid block of soft balsa. After shaping the block to the required outside dimensions of the pod, draw the profile on the largest side. Cut away the excess wood and repeat the process to obtain the proper top-view shape. Shape the pod to the proper cross-sections, indications of which are drawn integral with the side view. Sand the finished pod to a temporarily rough but even finish. Cut the pod in half longitudinally and hollow each half until an electric light, held close, can be seen through the wood. A

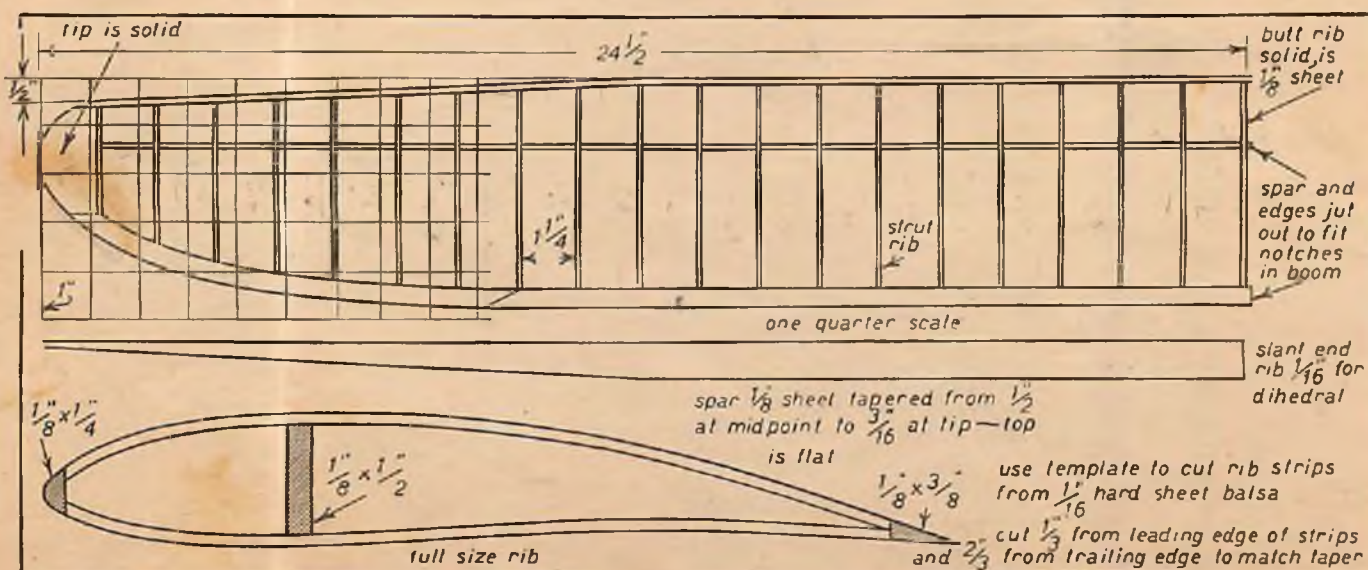
curved blade of some description would facilitate the work. The hollowed halves are cemented together and held, until dry, with rubber bands wrapped around the whole. Cut out the pod for the landing wheel and cockpit openings. Sand the surface of the pod with progressively finer grades of sandpaper. Blow off the dust after the final sanding.

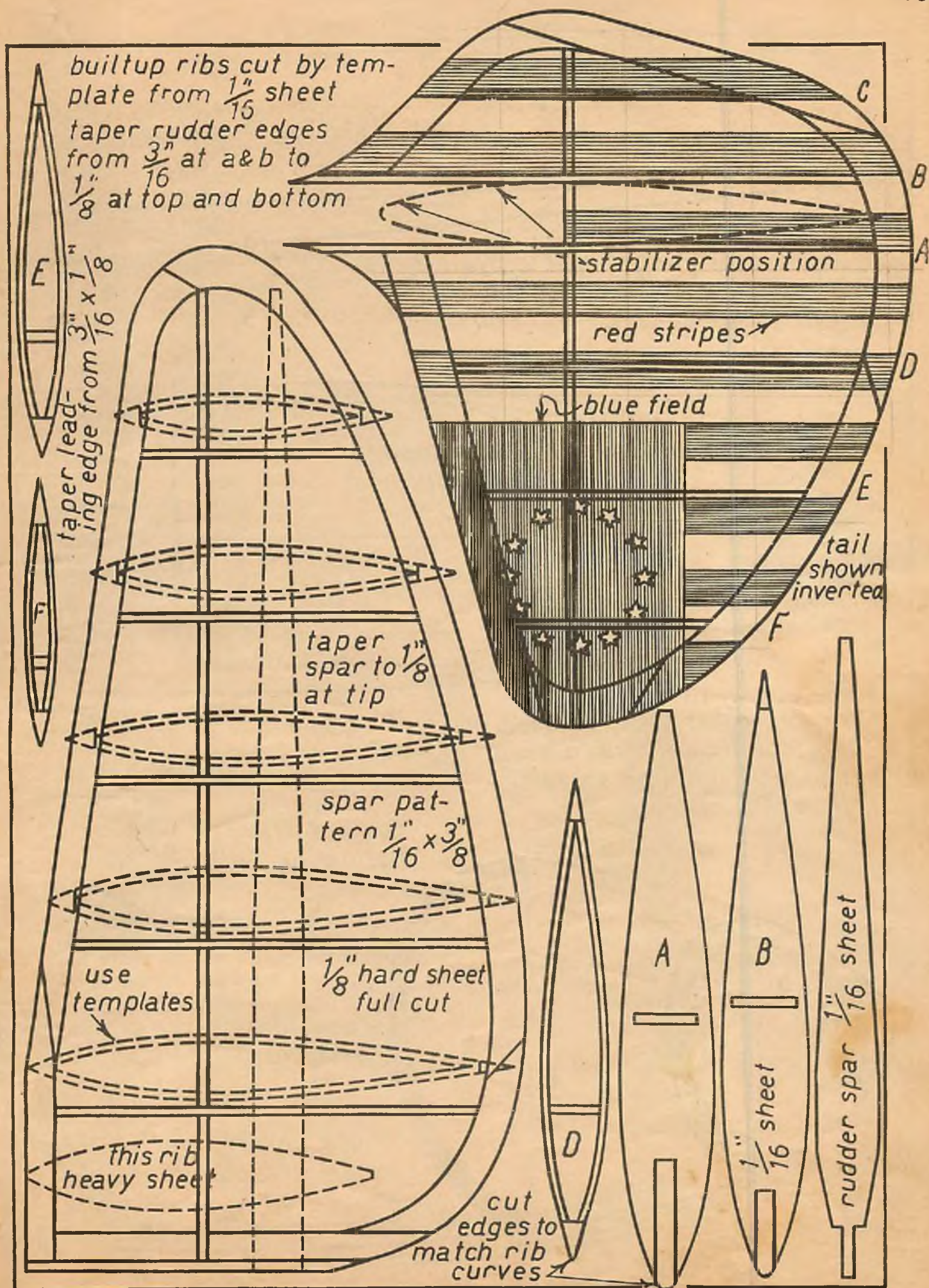
THE BOOM

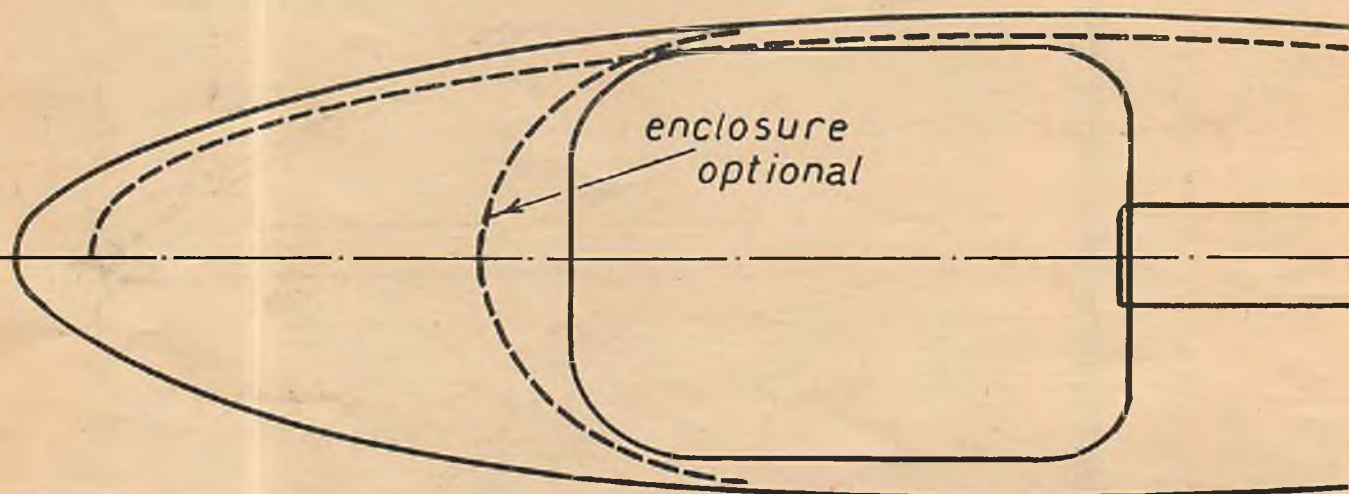
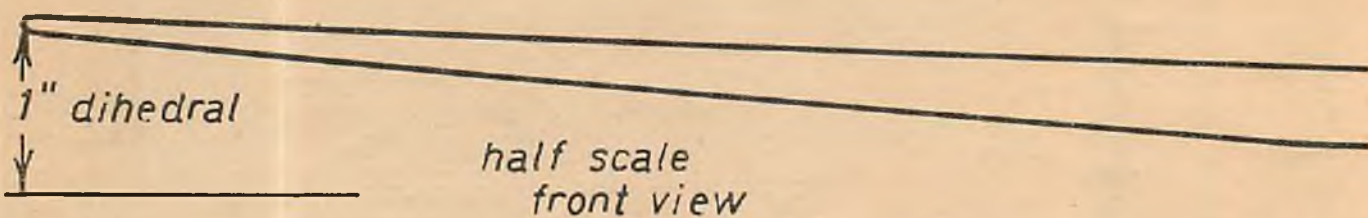
The boom is prepared from a square strip of firm balsa, the ends of which, even while the boom is being rounded, are left square to serve as a base to which the wings and tail can be cemented. Shave the corners of the boom until a true octagonal cross-section is affected. By drawing the boom through sandpaper held roundly in the hand, a circular cross-section can be worked accurately. The boom is left solid, sanded to a satin finish, and attached to the pod. Form the skid from bamboo and cement in place.

FINISHING THE POD ASSEMBLY

Give the pod and boom a coat of wood filler and, when dry, a sanding with the finest paper. If a prepared model filler is used, give the surface three coats, (Turn to page 94)







cockpit cover was not used on
original model due to the dif-
ficulty of forming twoway
curves in celluloid

cut out after
hollowing

fuselage
sections

shock absorbing
wheel attachment
bind

skid bent by
heat from $\frac{1}{4}$ bamboo

single wing strut on each side
runs to wing spar from just
above wheel axle

streamline strut
from $\frac{1}{8} \times \frac{1}{4}$

hollow from
block

notch boom to
take spar and edge
ends

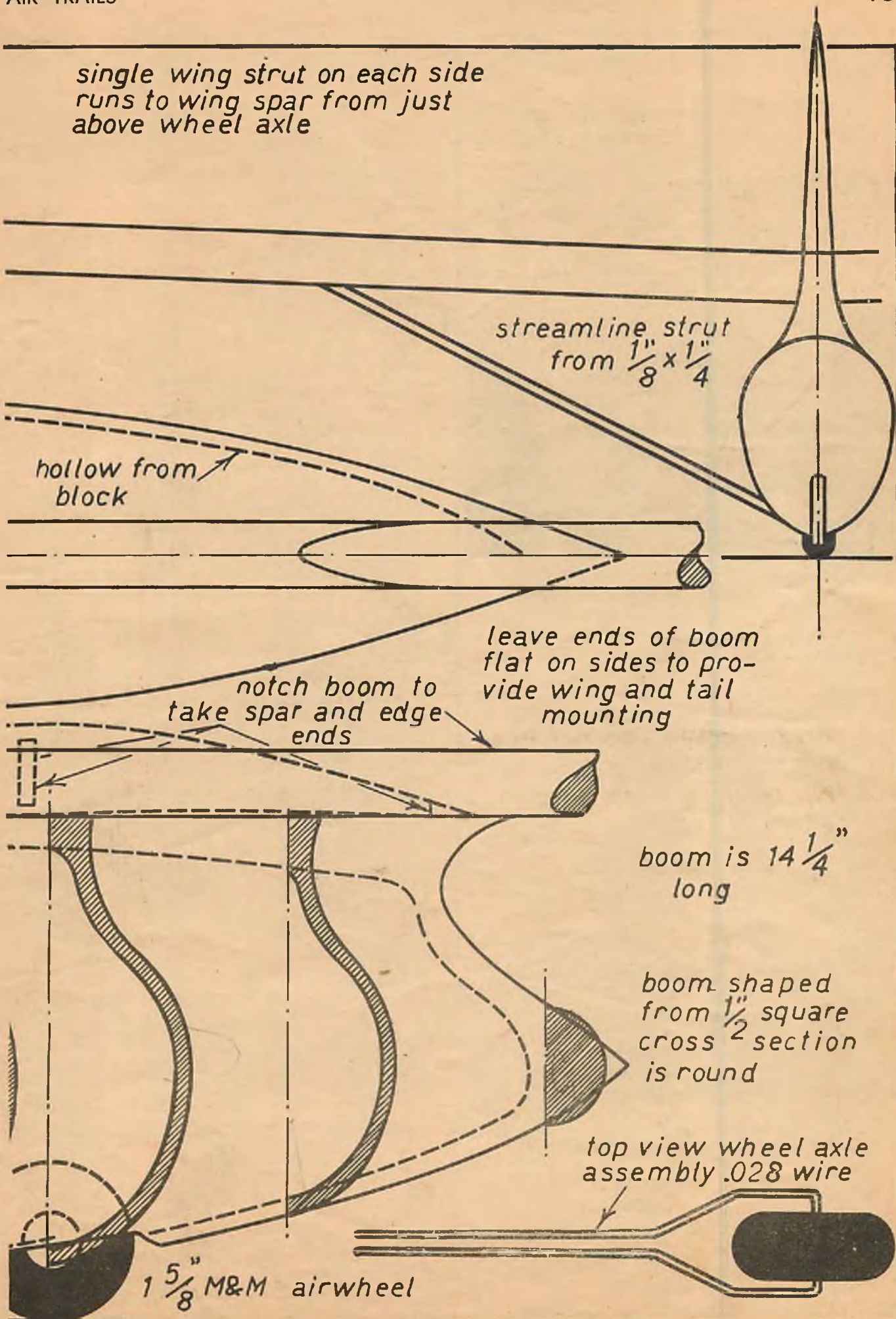
leave ends of boom
flat on sides to pro-
vide wing and tail
mounting

boom is $14 \frac{1}{4}$ "
long

boom shaped
from $\frac{1}{2}$ " square
cross section
is round

top view wheel axle
assembly .028 wire

$1 \frac{5}{8}$ " M&M airwheel



KNIGHT TWISTER

*Replica plans of a great
little ship*

By William Winter



The drawings of the model are prepared to the $\frac{1}{2}''=1'$ scale, the ship being so tiny.

CREATOR of the greatest furor in recent years among light plane enthusiasts, the Payne Knight Twister, with its tiny 15-foot wings, is the most interesting of kit-form ships (ship can be had complete or as kit). Size seems to be no handicap, for the Twister zips along at 160 m.p.h., climbs 1,122 feet per minute. Ceiling is 20,000 feet.

The ship is one-place, its fuselage of steel tubing. Complete data follows:

Upper Span	15'	Tankage	17 gal.
Lower Span	13'	Duration	4 hrs.
Length	13' 6"	Engine	70 or 75 h.p.
Empty Weight	460 lbs.	Landing Speed	45 m.p.h.
Loaded	750 lbs.		

BUILDING THE MODEL

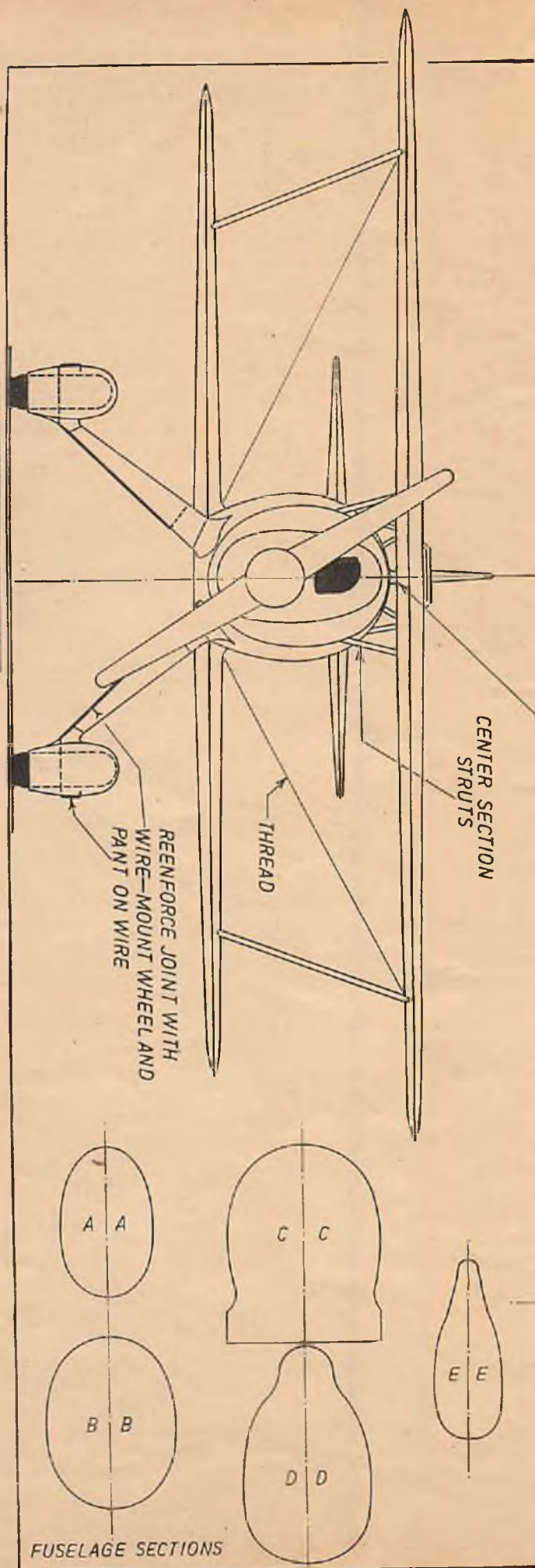
Refer to the bill of materials for dimensions.

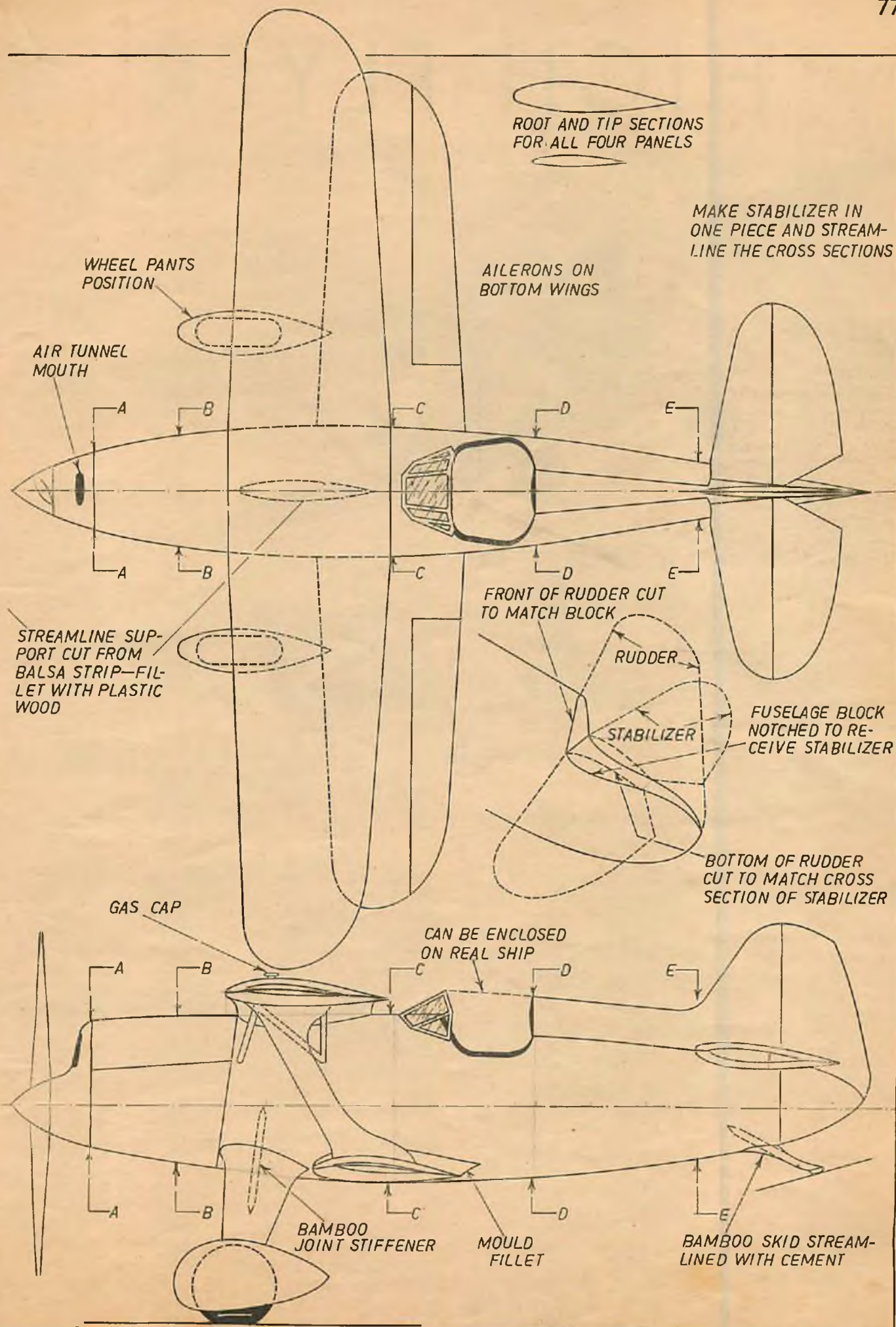
Cut the fuselage, first to profile then to top outline, from a soft balsa block. Shape to the required cross sections and sand. Cut the tail surfaces from sheet balsa, streamline the cross sections, and sand. Likewise, prepare the wings. All flying surfaces are sanded to a taper in thickness. Construct the landing gear from scraps and assemble the entire model with thickened cement. To complete, give the entire surface a filler coat of clear dope, sand lightly, and finish in white.

Mount propeller on a pin, free to turn.

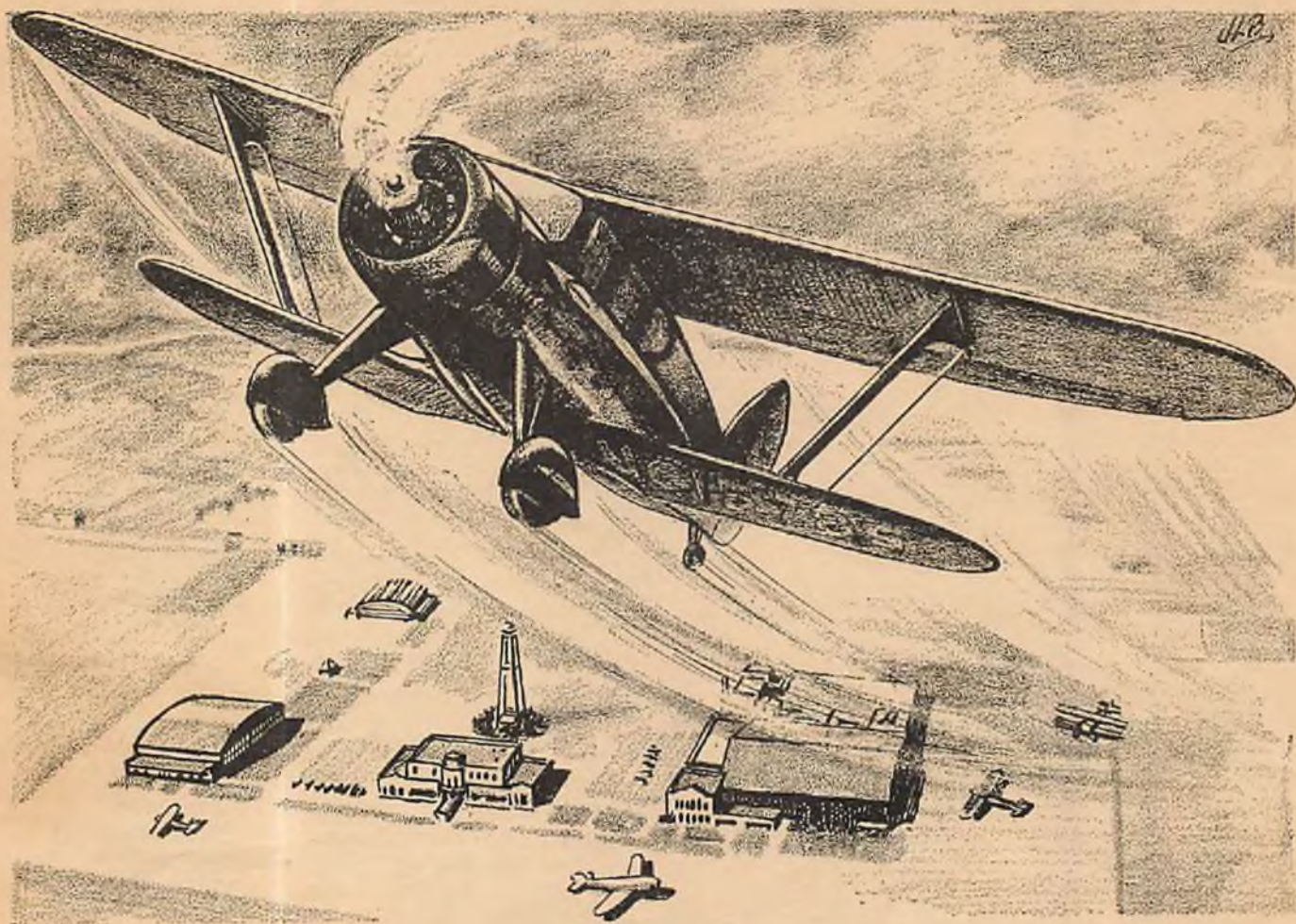
BILL OF MATERIALS

- 1 block $1\frac{5}{8} \times 1\frac{1}{8} \times 6\frac{1}{2}''$
- 1 sheet $\frac{3}{16} \times 2 \times 24''$
- 1 pair of $\frac{5}{8}$ - $\frac{3}{4}''$ wheels
- 1 vial cement
- 1 vial clear dope
- 1 vial white dope





HIGH FLYER



Streaking over the runway, the plane was off like an arrow—

By John Du Barry

FAR above in the cloudless blue that arched the airport a plane's propeller glinted in the pale afternoon sunlight. The faint drone drifted down slowly as if from an immense distance. Although it was Saturday, only a few people strolled along the line. A lone barker's voice, selling a sightseeing hop, labored against their end-of-season apathy. All sound seemed muffled in the still, clear air of the first cold day of fall.

Jimmy Trudell breathed deeply. It made his nose tingle. His thin face glowed healthily and his eyes sparkled in the nippy atmosphere. He turned and opened the hangar-office door. Warmth met him from a rosy electric coil. The man at the desk looked up.

"You're T. J. Anderson?" Jimmy asked. At the man's nod, Jimmy pulled off buckskin gloves and loosened the expensive coat of thick raccoon fur that swathed him. Throwing back the heavy collar, he drew a letter from his inner breast pocket. "The Hartford factory's sales literature says that you're the distributor of their Peevee in this section. I'd like to try one of the new models."

"Why, certainly, Mr.—er—?"

"Trudell—James Trudell," Jimmy told him.

"Glad to know you, Mr. Trudell!" The man was quite small when he stood up; he was bald and jovial. He

pumped Jimmy's hand enthusiastically. "We got a fine little plane. I think you'll like it. You're a pilot, I suppose? . . . Uh-huh. Well, if you never handled one of our new Peevees, you got a thrill coming. She's a sweet job—engineered to perfection—fit for anybody!" Still talking, he shouldered into a leather jacket and led the way into the hangar, where a mechanic worked away at a bench in the far corner. "Joe! Open the doors and we'll take out Number Three."

When the little high-wing ship had been rolled onto the apron, to stand brave and gaudy in its new paint, Anderson conducted Jimmy on a tour of her exterior while the mechanic warmed her up.

"Welded steel tubing. . . . Fully sprung skid!" he howled, as the engine racketed to full-power bursts. "Double cables. . . . Goodyear brakes. . . ."

They climbed in at last, Jimmy taking the front seat in the tandem enclosure. He wrapped his hand around the rubber grip and tried the stick for play. At Anderson's suggestion, he taxied her toward the outside runway. She moved smoothly enough.

When he headed her up and fed the gas, her tail rose almost instantly and a jog of the stick lifted her off.

"Short run," Jimmy commended.

*He wanted to fly. And to fly you needed a plane.
Some day—— A short short story.*

"From a dime—from a dime!" Anderson boasted.

The little plane carried them up a slow, steady grade until the edge of the field moved under them. Then Jimmy banked her gently to the left. The housetops wheeled below them. He glanced at the instrument board.

"No turn-and-bank indicator," he said.

"Hey?"

"I said"—Jimmy raised his voice louder above the drumming of the forty horses at the nose—"there's no turn-and-bank indicator. No compass, either!"

"They're extra—any make you want—we'll do the installing free!"

Jimmy nodded absently and concentrated on the plane's performance. Leveling off, he toyed with the throttle. The neat little horizontal-opposed engine yodeled and the plane took the speed changes without a quiver. He set her on the horizon at full gun, noting the airspeed figure. Then he brought her up in tightening circles until she began to feel loggy.

"Spin?"

"Sure—you can try!" Anderson chuckled in his ear.

Jimmy kicked the rudder and drew on the stick; the plane tilted and settled sluggishly. He tried again. On the third attempt, she almost half-rolled before she shook free of stability and headed down. But as soon as he released the controls, she snapped out.

"Nice, eh?"

Jimmy nodded. She was nice, all right. No foolishness, no bad habits.

The field was almost under them, so he took her around the traffic turn and slipped in. When the ground neared, he glided for the beginning of the runway. She made contact somewhat beyond.

Stretching his legs on the apron, he eyed her slim lines thoughtfully.

"She floats some," he remarked.

Anderson smiled apologetically. "That's a light plane. But it's a feather-bed landing. And so slow you can stop her with a sneeze."

Jimmy buttoned the fur coat against the chill in the shadow of the hangar. Anderson talked on persuasively.

"Our price is thirteen hundred, delivered here. You can't go much lower than that. The extras don't add hardly anything. She's real economical to run. But then"—as Jimmy drew on his gloves—"I guess it's not price, eh? It's real, honest, dependable quality you're interested in, a plane that——"

"I don't know," Jimmy said slowly. "The Peewee has good points. I'm wondering about speed and range. Two hundred and twenty-five miles on a full tank isn't very far. Maybe it's a faster plane I want. I can't make up my mind, because I like the Peewee—very much."

"Well—as you say, Mr. Trudell. When you're ready, we'll give you quick service."

Jimmy watched him and the mechanic drag the gay little plane into the hangar's maw. The Peewee was tempting, in its small way. Yet it was limited. If you were wise, you chose a plane that didn't depend on handy pastures. You chose a plane that would make Miami in three hops, instead of nine.

Walking along the row of hangars, he found himself facing two sleek biplanes, one maroon and the other a deep blue. They were drawn up side by side. He noted the odd stagger of the stubby double wings. They were Cloudcruisers—a make of plane he'd never tried. Four-seaters. More room than he needed, but then, as luggage space, it could be useful. Might be worth a test.

A grease-monkey, his soiled white dungarees bulging over sweaters and his breath pluming in a frosty white cloud, looked around from whatever he was doing to the rudder pedals as Jimmy approached.

"Is this plane for sale?" Jimmy asked.

"Yep."

"If the manager is here, I'd like to speak to him."

The mechanic straightened and fingered an oil smear on his jaw while he regarded Jimmy's tall, fur-wrapped figure. Then he said, "Yes, sir," and went inside.

Through the window in the corner office the mechanic's face and another's peered out at him. After a moment, the door opened and a spectacled man came out briskly.

"I'm looking for a plane," Jimmy said. "Something that's fairly easy to fly, yet something fairly fast—something with more performance than the average light sport plane. Can you tell me the range of these Cloudcruisers?"

The man told him. "You're, er, interested in this plane for yourself? For your own use, that is?"

"Yes. Personal flying. There's no satisfaction in renting or chartering. I want to get a ship before I go South. Make the trip in my own plane."

"You know, I think the Cloudcruiser is just what you want," the man decided. "Let me show you how well it handles. I'll just get my coat. Turned cold quickly, didn't it? I'd like to be going there myself. Maybe you'd rather wait inside?"

But Jimmy thrust his hands into deep pockets and huddled snugly in fur while the manager hurried off. The mechanic came forth and ground the starter of the blue plane. The engine was obviously cold. After a few false sputters, however, it caught hold. The mechanic gradually advanced it until the powerful nine-cylinder radial bellowed thunderously and the plane trembled against its chocks.

The manager appeared again and seated himself beside Jimmy, throwing over to him the wheel control. The mechanic pulled the chocks away. Jimmy taxied out to the field.

The pivoting tail wheel slid them around silently. The engine's full power came softly through the sound-proofed cabin. Streaking over the runway, the plane was off like an arrow. The climb was swift and steep.

The easy, speedy flight took hold of Jimmy. Power counted, all right. The Peewee was good, but it was like air-sailing. This Cloudcruiser was better; this was really traveling. He settled back, comfortable even in a thick fur coat, with plenty of seat space and leg room.

"The stabilizer adjusts with that crank," the manager pointed out, "and this operates the rudder tab. Try them."

Jimmy experimented, holding the nose fixed on the horizon. Then he lifted his hands tenta- (Turn to page 92)

AIR ADVENTURERS

(Continued from page 35)

deluging us with their examination papers this month and our Craftsmen are coming in by the dozens. We noted a wider spread of interest, also, for we received papers on practically all subjects covered in our department.

Shelby Martin of Ross, Cal., qualified handsomely for his Photographer ticket with a grand print of a new Taylor—sorry—Piper Cub belonging to the Monarch Flying Service which was taken at the Bay Airdrome. He used an Eastman box camera, Kodak Verichrome film of V-116 size, and had his prints made up on Eastman Velox. Shelby is full out for Air Trails and wants more American planes. He also makes an interesting suggestion concerning our model-plan pages which may find favor with many readers. He suggests that we perforate the inner edges of these pages so that they can be torn out easily for tracing. The idea is good, but whether it could be fitted into our mechanical formula is another thing.

Leonard Heidebrecht of Vermilion, Alberta, scores high for his Flight Captaincy with a full paper on aeronautical communications and a list of five new members. Leonard's paper on communications was one of the best we have ever received. He shows a full understanding of the various problems concerned and sees adventure in every phase of the business.

Jerry Baer of Madison, Wis., has passed his Engine Mechanic and Airplane Mechanic tests with two sound papers on both subjects. He also sends us a very complete list of the features

he likes in Air Trails. He's crazy about Frank Tinsley's drawings, Air Progress and Air Trails Gallery. He also sends us a pack of swell pictures of planes he has taken on his travels.

Warren Vreeland of Pittsfield, Mass., comes through for his Airplane Mechanic's ticket with a swell article on "Streamlined Airfoils" in which he displays a keen understanding of airfoil design. He goes into his subject thoroughly and we wish we could add his report to one of our model plane features. His photographic offering is the picture of the Pittsfield Airport blinker beacon, which we are presenting herewith.

Norman Dauber of Toronto, who has passed his Engine and Airplane Mechanic's test, has come through with four grand pictures to win his Photographer's award. Among the prints taken with a 2A Brownie are two showing Sir Hubert Wilkins' Consolidated flying boat taking off to hunt for the lost Russian flyers.

A new Air Adventurer, John Stough of Dallas, Texas, sends us two fair drawings of the B.A.14 and the B.A.9, both military types. He is much impressed with his Creed and wings and promises to send us a full discussion on the current issue of Air Trails.

A new Observer is Claude J. Badeusz of Chicago, who has turned in a swell report on the Chicago Air Show. Claude got in everything that was going on—except that he failed to mention he had visited the Air Trails booth or had dropped around to report. We'll let you

get away with it this time, Claude, but you'll be on the carpet if you miss again.

One of the best efforts of the month is that of George E. Goodhead, Jr., of Tulsa, Okla., who has captured two ratings, Airplane Mechanic and Photographer, with his new-design, low-wing monoplane model, and the photograph he took of it. Goodhead explains that he built the model to show that a good light plane can be produced in much the same manner as a good cheap automobile. His model is built up on stamped-out parts, or parts that are made to represent mass production stampings, and he has tried to interest several wealthy men in the proposition. They turned him down stating that there would be no sale for such a plane—because the public is afraid of airplanes. It was from this letter that we selected our topic this month, and we thank George for his detailed letter accompanying his photo, presented herewith.

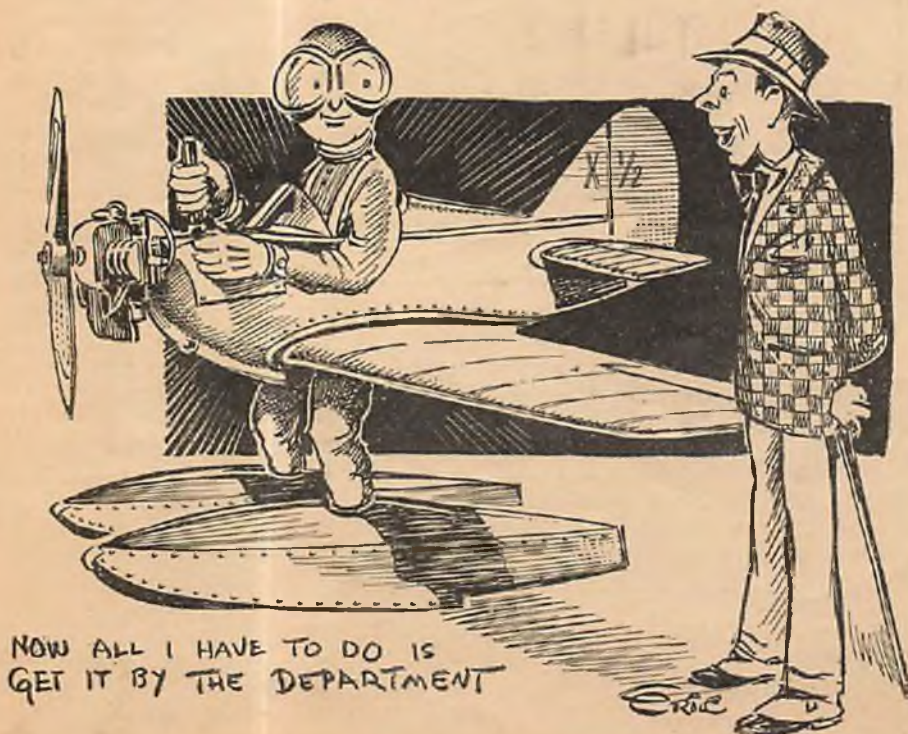
These Canadians continue to more than hold up their end in Air Adventurers. This month we received a swell letter from G. Howard of Brockville, Ontario, who sends in a grand picture of his Boeing P-26A pursuit ship all decked out in the colors and insignia of the 34th Pursuit Squadron. Howard tells us he spent 55 hours on the model and it certainly shows it in detail and careful construction. Needless to state we were glad to award him his Airplane Mechanic's ticket.

Charlie Genait of Toronto is working hard to get other members for his group, and while waiting for a couple of pals to return from up north he sat down and did three pretty smart drawings of modern military planes. We might also add that he sent us a newspaper clipping of a plane and asked what type it was. From what we could make out of the ship, which had been wrecked in a bad take-off, it appears to be a Cub.

Remember the Dart glider we presented in Air Trails some time ago? David Thompson of Orlando, Fla., has completed one with which he has made several flights of more than one minute in duration. The average flight is something nearer 30 seconds. David has sent us a picture of the glider and we are more than delighted to award him his Airplane Mechanic award on it.

Frank O. Barnette, of San Bernardino, Calif., whose pet peeve is those who think the air is still unsafe for humans and will argue at the drop of an aileron with anyone who thinks so, sends us an interesting shot of a Waco taken over the tail of a Beechcraft.

Frank also wants to know about sending in drawings for Air Trails. Fire away, Frank! Make them any size convenient and in black ink if possible, otherwise we'll go over them here.



CRASH

(Continued from page 23)

surfaces to shake and flutter off by themselves, Lowell Bayles crashed and burned at Detroit in February of 1932. He was doing about 300 m.p.h. only 75 feet above the ground when his right wing told him good-by.

What happened subsequently occurred too quickly for the eye to follow, but fortunately, the news-reel camera told the story. It was a terrific scene for the movie audiences to watch the airplane splatter and the high test gasoline flames leap a hundred yards skywards. But to the engineers it told the story, our old bugaboo—aileron flutter.

The late Jimmy Wedell had the same thing happen with one of his own racing planes but, thanks to his parachute, he was able to bring back the story. Later, the Gee Bee and Wedell-Williams racing craft were all free from this defect.

Flutter is now avoided by means of several devices. The first is a weight balance ahead of the hinges of a control surface. To correct flutter, strength of parts is not important. What *does* count is rigidity, also the periods of vibration of various parts, which must be kept out of synchronization with each other. This can be compared with a horse breaking a bridge by merely trotting across it. The bridge can "bounce" enough to break.

In paving the way to higher speeds, we found many drastic differences in the conditions under which air goes past an airplane. The air could leave the wings with a broken and turbulent flow, then hammer the tail surfaces hard enough to knock them completely off the airplane. The late Lieutenant Woodring, the last to die of the famous "Three Musketeers", of our Army stunt flying team, was killed this way. When his airplane disintegrated in midair he was thrown clear. Unfortunately he must have been knocked out by a chunk of wreckage, because he kept falling without making a move to open his chute.

Other racing jobs would leave a blanket of "dead" air back over their tail surfaces. Then, as their speed was increased, they would become unstable or uncontrollable. Although much has been learned regarding the correcting of this evil, it is still a No. 1 headache for designers of fast airplanes.

Jimmy Wedell was later killed in a strictly freak accident with what was supposed to be one of the world's safest training airplanes. After all he had gone through and done, it was equivalent to skidding on a banana peel and dying thereof. His last airplane had automatic slots on the wings which were supposed to prevent stalling or spinning. For some unknown reason, on a take-off, the slots automaticked on one side to

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BEAR OF OAKLAND—Admiral Byrd's	15 1/2"	1 1/2"
ARABELLA—Captain Blood's	15"	2 1/2"
SEA BIRD—19th Century Brig	17 1/2"	3"
XEBEC—Robinson Crusoe	17 1/2"	2 3/4"
HISPANIOLA—"Treasure Island"	17"	3"

New

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throw the ship on its back and then nose straight into the ground from an altitude of about a hundred and fifty feet.

It would seem best to leave the controls up to the pilot. Automatic gadgets cannot think of all different conditions. Likewise, they are so much more machinery to go wrong.

Everyone who has done a fair amount of flying has been up in bumpy air. At slower speeds this does not mean much. At high speeds, the airplane can pound like an outboard in a choppy sea and the seat will spank the pilot the way his daddy used to do.

Now our fast commercial airplanes are

flown above such bumpy air or else slowed down. Our racers are flown wide open just off the ground, so the only answer is to build them strong enough to withstand the hammering. Otherwise, a wing is likely to depart from the plane; and at so low an altitude the pilot probably couldn't use his parachute even if he wore one. Against this are charged the deaths of Roy Liggett in a Cessna Special Racer at Chicago, Labor Day of 1933, and Lee Miles at Cleveland, during the National Air Races of 1937.

The racing pilots have always been pioneers in supercharging motors. Even in 1932 we would take a stock commer-

cial engine and operate it about twice its normally rated horse power. This meant we had to use special fuels and lubricating oil. To cool the "hopped up" engines required new cowlings. Baffle plates of sheet aluminum wrapped tightly around air-cooled cylinders were used for a long time in racing planes before being adopted by the industry. For in-line air-cooled engines, the racers developed the tapered intake air scoop to equally cool all cylinders, also the idea of venting the heated air from completely around the cowling such as is done with the now standard cowlings of radial engines.

Of course these over-powered engines are liable to go bad at any moment. On Decoration Day of 1937 at St. Louis, Roger Don Rac had an engine go to pieces and break completely loose from his airplane. There was no choice for him but to crash his job. Though he was badly injured, the doctors were able to repair him so that he is now going on as usual. Aviation's own inimitable Roscoe Turner has just barely made it back to an airport on a number of brilliant forced landings. During the Bendix transcontinental race of 1936, Turner had his engine quit while over a barren desert in New Mexico. When he tried to land amid the cactus and sagebrush, he scattered his racer all over the desert. His broken ribs and other injuries retired him from circulation for about a week.

Benny Howard has contributed as much to racing in both designing and flying as anybody. In the Bendix race of 1936 he and his wife with him were in the lead and slated to win. Out over New Mexico, their propeller went to pieces from being run too long and far above the power for which it was intended. Our friends ran out of altitude before they could take to their parachutes.

In the resultant crash, each suffered compound fractures of both legs, both above and below the knees, together with many other injuries. For months the doctors did not expect them to live. They had had the motor shoved back into their laps. Benny Howard is now back on the job and doing very well with a new artificial foot.

Quite a few airplanes have gone to pieces in the air when more power was added to their power plants than they were originally designed to withstand. Obviously, if you keep adding power to any given airplane there will be a limit reached somewhere when things will begin to happen.

Florence Klingenschmidt, entering the races on Labor Day of 1933 at Chicago, had a Gee Bee speed job which was originally designed for a 210 h.p. Lycoming motor. She had changed to a Wright Whirlwind engine supercharged to 600 h.p., giving the ship a possible speed of

260 m.p.h. As she whipped around the home pylon the airplane started to go to pieces. She managed to pull a few hundred feet higher, get the cockpit cover open, and in trying to parachute home was about halfway out of the cockpit when she hit. All of us hated to lose such a beautiful and skillful member of the racing fraternity, but all we could do was send regrets and flowers.

Doug Davis was one of the most capable, friendly and best-liked people in the business. He won the Thompson Trophy Race back in '29, using a Trave-laire "Mystery" ship, and thereafter established a great record as a pilot for Eastern Air Lines. For his vacation in 1934, he was flying around in Jimmy Wedell's old pet "No. 44" Wedell-Williams racer, at the National Air Races. He was leading the field during the Thompson Trophy Race with Roscoe Turner right behind him and only two laps to go. Suddenly his ship performed some crazy antics, dove straight in. Both Doug and the airplane splattered.

This crash was never definitely explained. Structural failure was suspected. It was the fifth year of racing for this airplane which had originally been built for a 400 h.p. Wasp engine, but which now had a heavier Wasp Sr. hopped up to 800 h.p. It was also suspected that Doug might have become too groggy from so many pylon turns. At racing speeds, each turn is equal to a sharp pull-out from a power dive. When the turns come about twenty seconds apart, they soon become tough to take. Since then it has been positively decided to hold all Thompson Trophy Races on a longer course.

This was another of many instances when spectators actually fought over choice bits of wreckage for souvenirs. One woman tore a button off Doug's leather jacket and shortly afterwards sold it on the spot for ten dollars. A young man tried to steal Davis' helmet and goggles, as the body still lay in the wreckage. It does seem that human beings should prefer souvenirs of luckier or happier events.

There have been a few collisions in the air. Whether by luck or just to amuse the spectators, the boys have usually managed to pull this stunt while turning the "home" pylon in front of the grandstands. I saw one of these affairs at Cleveland in 1932, in which both airplanes were so thoroughly scrambled and mixed together that it was really difficult to tell which parts belonged to which plane. For a miracle, both pilots eventually recovered after long sojourns in hospitals. Freddie Lund, one of the best race and test pilots of all time, was killed just this way.

From the cockpit in quite a few racing airplanes, the pilot has not been able to see at all straight ahead and not much to either side. Pilots aptly call

these jobs "blind as a bat." Some airplanes have had the exasperating but unnecessary habit of loosing a fine spray of engine oil to fog up their windshields. This bad visibility has been responsible for some of our worst crashes and many hairbreadth escapes. If only in fairness to others in the race, it would seem logical to enforce certain minimum standards of visibility. For instance, it could be required that the pilot's windshield should rise at least eight inches above any forward part of the airplane.

Inexperienced pilots often have come to grief by spinning into the ground while banking around a pylon. About half of these wrecks are fatal. It would seem logical for race managements to be more hard-boiled about allowing entries in the contests. In doubtful cases, the pilots could be required to do a lot of practice flying around the course by themselves before undertaking the added problem of competition in the actual race.

Sometimes engine exhaust fumes have poured into the cockpits. This is particularly bad since carbon monoxide poisoning can sneak up on the pilot without his realizing it. Then the pilot may slam into another racer or into the spectators. This is blamed for Captain Page of the Marine Corps scattering himself and his airplane all over the airport while leading the Thompson Trophy Race at Chicago in 1930. This cause is also suspected in several other spectacular crashes.

It has always been a great temptation to put smaller wings on the racers, let the landing speeds be what they may. In 1932 I flew a Gee Bee in the Bendix transcontinental race. When I landed in the thin air of the high altitude of Amarillo, Texas, I actually sat down, coming in on the ground at about 150 m.p.h. When loaded with gas for the long hop to Cleveland, the airplane needed about 200 m.p.h. in order to take off. Fortunately, Amarillo airport has a runway of over two miles—and we needed most of it. Jimmy Doolittle had a sister ship with a larger engine, so he set a new landplane speed record and won the Thompson Trophy Race that year.

Although these airplanes were noble experiments, Jimmy and I both considered they were too hot for anybody to handle. We believed that we had used up a considerable portion of our earthly share of luck. We never even sat in them again. We really didn't consider ourselves any more skillful than the boys who later crashed these jobs. Our guardian angels had just stood by us in our hour of need.

Neither of these two airplanes afterwards ever finished a race. Their score was five wrecks and two men. Jimmy Haizlip was just about to land one, when a wing-tip snapped into the ground. For

a miracle, Jimmy was able to walk out of the wreckage with only a few scratches and sore spots and a surprised expression on his face. Russel Thaw had one of these jobs behave the same way, but luckily only tore up a wing before the plane flopped back to roll on its wheels. Yes, those Gee Bee's were jinx ships.

Roy Minor had just made a good landing with a mile of airport before him. But the grass was wet. Then he locked his brakes. But he was still sliding merrily along when he ran out of airport. The airport remained intact, and so did Roy, but the airplane needed a complete rebuilding. During Roy's lifetime, he did some of the greatest racing and hardest flying that has been done. But he died of pneumonia in 1934.

While taking off, Russell Boardman had one of these famous Gee Bee's flop over on its back, then slide along the ground, upside down, for about a thousand feet. It was claimed that this did not kill him; he lived for a couple of days with a fractured skull. Cecil Allen scattered himself and the last hot Gee Bee. He had tried to take off with a big load of gasoline for the Bendix transcontinental race.

Many of our racing airplanes have been highly unstable or have had all sorts of bad handling characteristics. Usually, these bad habits are never corrected. Perhaps we pilots are like the fellow whistling in the dark while passing the graveyard. Although we have seen our buddies outfitted with wooden kimonos, and have sent flowers to their funerals, we kid ourselves into a sublime mental peace by preferring to believe we are skillful enough to keep one trick ahead of an airplane. Regardless of the evidence, each of us says "it can't happen to me."

Many racing planes have a rigid landing gear with no means of shock absorption except tires about the size of doughnuts. Some of these jobs are always trucked, and not flown from one race to another. It takes only a very little bump in the field to make junk out of one of these ships, or at least make necessary an expensive rebuilding job. Fortunately, the pilots can usually be repaired by a sawbones after this type of wreck, and it does provide good, clean sport and amusement for the spectators.

The pity of it is the expense. The boys claim that the greatest danger in aviation is starvation. You may think a pilot wealthy because he has an airplane. On the contrary, that is likely to be the reason why he's broke. Since it would be as fair for one as the other, maybe a help would be for the boys to agree to use landing gears with reasonable shock absorbing and snubbing qualities.

Airplanes get worn out or become

over-aged like any other piece of machinery. When that day comes for these ships, they deserve to be retired gracefully or permanently parked in a museum. Almost without exception, our racing airplanes have wooden wings fastened together with glue and nails. Under the terrific punishment they undergo, the flying life for these jobs is only a few short hours.

Captain Burt Skeel, for example, had an old racer go to pieces while he was diving for the start of a race. He lit on marshy ground and went in so far that it took about a day to dig him out. Now the gunnery camp of the famous First Pursuit Group of our Army is named Camp Skeel to honor his memory. The folks who mopped up this wreckage didn't bother about digging out the engine. It must have gone about halfway from here to Australia. The diving start has not been used since in an airplane race.

Most racing planes have a pylon or celluloid cover over what in days gone by would have been an open cockpit. The covered cockpit has less air drag and makes the airplane faster. Military and commercial airplanes have now learned this lesson from the racers. For an edge of safety for pilots, it should be required that the cockpit covers be arranged to be opened quickly and easily from inside.

Racing planes have been built without even the pretense of trying to calculate the strength of parts. It is not necessary to go to extremes of caution on this subject but some sensible standards should be enforced. Airplanes can be flight tested at altitudes safe for parachute jumping.

A lot of grief has resulted from trying to build a new ship or overhaul an old one in too little time before a race. I should not object on this score, since I am one of the luckiest sinners still alive in the business. To set a horrible example, in 1933 at Chicago, I was flying a Wedell-Williams "No. 92" racer. One of the girls crashed it for me on landing, after having won the women's race. Our mechanics tore into it and rebuilt it overnight, the speediest such job on record. The airplane was still in terrible condition, but I won second in the big race the next day. I should have broken my neck.

A strictly freak accident happened to one of the gang in the Bendix transcontinental race of 1936. He was flying a Northrop low-wing belonging to Gar Wood; the one in which Frank Hawks had set so many records. Merrily he flew along until sparks from his radio touched off some gasoline fumes. When our friend woke up after the explosion he found he had been blasted right out of the cockpit. So he opened his parachute. As a matter of fact, airport officials at Floyd Bennett Field, where he

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look off, had to persuade him to carry a 'chute.

For plain, unadulterated foolishness, low-altitude stunt flying is especially recommended. In late 1928, the late Lieutenant J. J. Williams, lovingly nicknamed "Two Jay" by his friends, was the leader of the famous Army "Three Musketeers" stunt flying team. He ran out of altitude while flying upside down. He amazed the doctors by living for a few days with a fractured skull and many other injuries, any of which alone should have been sufficient to kill him.

Speaking of crashes, there was a Navy Squadron of single-seat fighters that staged a good race among themselves at Chicago in 1930. As each ship roared low across the finish line, it would add the flourish of a climbing slow wing-over-wing roll. One ship tangled up in the propeller wash of the others ahead of it and slammed into the earth upside down. To make it a sweet mess to unscramble, there were several spectators underneath the wreckage. This race finish has not been used since.

Among other crashes, "Speed" Holman, who won the 1930 Thompson Trophy Race, always claimed that he would rather be known as one of the best pilots and not as the oldest. Every one concedes that both his wishes were granted. The next year, at Omaha, something went wrong with his airplane while he was flying upside down. "Speed" was just barely able to make the flying field to manage to crash on it and avoid taking any one else along with him on his trip to join his ancestors.

It is hard to discourage some of the boys. At the Cleveland Races in 1937 the great German pilot, Count Otto von Hagenbeck, just *would* fly a trifle too low. In the crash, his airplane was thoroughly demolished, but luckily he was only well bruised and scratched. He had learned his lesson, so when Captain Alex Papana of Roumania was kind

enough to loan him another airplane, this time he flew upside down higher—about six inches higher.

There have been times when pilots have tried stunting directly above the crowds or diving at the grandstands. This is too much thrill for our dear spectators. For such frivolity, our Department of Commerce inspectors will revoke the pilot's license or take what other measures they deem necessary to discourage such goings-on.

Actually, permits for low-altitude stunting are issued to very few and specially selected pilots. For instance, that old veteran, Tex Rankin, may be fairly safe performing his antics. But most of the boys would just be committing suicide if they tried to imitate him.

Some of our tiny racers are so cramped that the pilot can't wear a parachute. In some cases they must even take off their shoes. It would still be fair competition to require that all race pilots wear 'chutes. Those things come in very handy sometimes. Thanks to some of those silken canopies, I can now write this article instead of being planted down below the sod to push up the daisies.

Shortage of funds is one of the reasons why many of our racing pilots' planes are not as safe, for instance, as their builders would like them to be. This is particularly sad, because dollar for dollar, racing has done more to further aviation science and design than any other flying activity. Any way that additional money is made available will mean more progress and, we do hope, fewer crashes.

There is much that our government could do. Even out-and-out subsidies would be amply justified. The net benefit per dollar expended would be far greater than the average of present government expenditures. Whenever possible, our Army and Navy planes should be an added attraction at even our

smaller air meets. This expense should not be borne by the air races, as in the past. Instead, the amount thus released should be added to race prizes.

Over the period covering the last ten years the builders and owners of racing planes have won back in prize money only a small fraction of what they have spent. It would seem fair to assign a definite portion of any air meet, say one-third, to the racing airplanes. With that fact definitely clear, most people would be happier to pay an admittance fee instead of gazing from outside the airport.

Granted, it takes a tremendous amount of groundwork to operate a flying circus. Along with other necessary expenses is the National Aeronautical Association which supervises airplane racing and records. However, ground executive jobs need not be political plums nor designed to pay excessive salaries.

Insofar as the future is concerned, the home-grown variety of airplane built out almost anywhere will always be a spur to the aviation industry. Also, some of the youngsters who are now just growing up will continue to surprise the dignified experts.

What it takes to be a racing pilot is competitive spirit, and most of the boys have it, big. Should many of the racers be allowed entirely to follow their own inclinations, they would fly on to a quick, inevitable end.

It should not be necessary to repeat mistakes that have previously been made. To do so would only prove that all crazy fools are not dead, and most of us already know that.

I also hope to see my exasperating but charming friends keep alive as long as possible. Regulations could be enforced as an aid and not a hindrance to progress. Ingenious airplane design should be emphasized instead of dangerous flying.

IN THE AUGUST AIR TRAILS:

WINGS OVER TRUJILLO

A Great BILL BARNES Novel
of Aerial Adventure

N. A. A. NEWS

(Continued from page 25)

work at no more than your pay for a round of golf or a canter along a bridle path. Some have perhaps set as their goal positions in the industry, but most of them simply fly for fun, and get it.

These enthusiasts found that by pooling their efforts they would do a better job and get lower rates than if they tried to learn separately. Now the club has over 60 members, headed by Albert F. Griffith, president, and owns three airplanes.

The cost to members for flying the Taylor Cub is \$1 per hour; the Taylorcraft, \$1.50 per hour; and \$2 for the Porterfield. New members pay \$30 to join and \$10 per month until the \$150 charter fee is liquidated. Any time a member wishes to withdraw from the club, he may sell his charter fee for the original price to some one else.

The club recently moved to its new field, Grande Vista Airport, where for the thirty days prior to the transfer, members were busy rebuilding one runway and constructing a new one. Planes are kept "in the pink," all work being done by members. The club is to be commended on its motto: "Sure, Sure, Safe."

CIVIL AVIATION BILL

It is with keen interest that the N.A.A. is watching the bill to create a five-member board to regulate and promote civil aviation, recently advocated by Chairman Lea of the House Interstate and Foreign Commerce Commission. Under the terms of the measure, President Roosevelt will have executive authority in connection with those functions which affect foreign affairs and national defense.

Appeals from decisions of the board to the Circuit Court of Appeals, without the customary delay, are provided by Chairman Lea.

Under the plan, Lea says, the powers now held by the Department of Commerce over civil aviation and the powers held by the Interstate Commerce Commission to fix air-mail rates, would be taken over by the Board. Regulation over passenger and express rates and the issuance of the certificates for the operation of air lines would be among the powers delegated to the board.

Proponents of the bill believe that it may be the answer to the perplexing problems that have so long beset aviation.

GLENN L. MARTIN, N.A.A. GOVERNOR

Box kites flown on Kansas plains are a far cry from high-powered trans-oceanic airliners, but that has been the career of Glenn L. Martin, one of the



Edgar Laughinghouse

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truly great figures in American—and world—aviation. Today this man who dreams, and puts those dreams into scientific blueprints, envisages new super-flying-boats that will surpass even the most fantastic ideas of but a few years ago.

Glenn Martin was born in Macksburg, Ohio, one stormy night in January, 1886, when the thermometer stood at 25 below zero. Nothing was flying that night but snow.

As soon as Glenn was able to put things together with his tiny hands he began building kites. Meanwhile, his family had moved to Kansas, where his handiwork was made famous far and wide by the strong winds. The ever-thrifty youngster did his first aircraft manufacturing in a corner of his mother's kitchen, and sold his kites for 25 cents apiece.

He was the third man in the world to build an airplane and teach himself to fly. At the age of 23 he took his place in the ranks of such immortals as the Wrights, Glenn Curtiss, Voison, and Farman.

By 1913, he had at Santa Ana the world's largest airplane-manufacturing plant. It was still just a church, the abandoned building in which he had started, and each machine was still built, piece by piece, by hand. But that didn't keep it from being the world's largest, and the youthful Glenn was proud of it.

Martin was one of the first American pilots to win the coveted F. A. I. license.

In 1912 he performed one of the outstanding flights of the day, flying in a plane reinforced at the last moment with silk thread and his mother's hairpins, from Newport Bay, California, to Santa Catalina Island. It was the first time an airplane had ever ventured over the ocean. For a life-preserver the

courageous Glenn wore an inflated inner tube about his body, and an instrument panel was provided by a compass strapped securely to one of his wind-blown knees.

In 1914 Glenn set three records in one day, carrying two passengers. He traveled the farthest, stayed aloft the longest, and climbed the highest.

By 1916 he found that he could make more money on the ground. Orders for airplanes came in in ever-increasing numbers from the army, private interests, and foreign governments. Following a venture into what was popularly termed a ten-million-dollar merger, Martin sold out and moved his organization to Cleveland, Ohio.

Until the 1930s he specialized in war craft. The Martin Bombers of both the War days and of modern times have become a byword in aviation. In 1933 he received for developing his high-speed bomber the Collier Trophy, awarded annually for "the greatest achievement in aviation in America, the value of which has been thoroughly demonstrated by actual use during the past year." Now his plant at Middle River, Md., near Baltimore, is one of the world's finest.

Although he still builds high-performance military craft, he is at present dedicated to ocean flight. His Clippers, which have been used on the route across the Pacific, are too well-known to require comment.

Today, Martin has his eye on the Atlantic, on faster and larger flying boats. He is characteristically forehanded and methodical. Hard work is his creed, and aside from occasionally hunting birds and casting for trout, he spends all his time directing the activities of his great organization.

The N.A.A. may well be proud of its governor for the State of Maryland.

LIGHT PLANES

(Continued from page 29)

hangars and feels that he must make his apologies to all within a mile when he starts his 40 h.p. motor. When he actually rattles out to the runway, he senses that about twenty vitriol-spurting traffic managers are glaring down at him from the control tower, each one sincerely hoping that he will hurry up, take off and conveniently bury his nose in about twelve fathoms of green slime outside the airport boundaries.

Instead, he should take off with a proud and self-respecting air, because in all the "mess and b'lin' of 'em," he's the only one who is actually putting his buck on the line.

If our light-plane firms are producing from two to six planes a day, as they boast, isn't it time that someone realized that the light-plane pilot (the guy who buys 'em) must be something of a factor in aviation? How long then must we wait until something is done to help him carry this load—provide aviation insurance at a reasonable rate, clip a little off the gasoline tax and give him fields where he can carry on at his own game and keep things generally humming?

Or does light-plane flying come under the head of luxuries?

There is a great deal of satisfaction in sensing that once in a while we put over an idea that appears to be sound and constructive and which eventually reaches the right ears.

Those of you who have been reading this department for the past six months or so will remember that in the January issue of *Air Trails* we printed an article to the effect that there could be no real advance in light-plane flying until something was done about providing suitable landing fields for the light-plane fraternity; fields far away from the heavy air traffic of our modern main-line airports.

It was with a great deal of personal pride then, when we read that W. T. Piper, president of the Piper Aircraft Company, manufacturers of the famous Cub, saw fit recently to tell a meeting of national aviation officials that "it is indeed unfortunate that municipal officials have been put under the spell of high-pressure air-line promoters. The terrific expense of long hard-surface runways and elaborate lighting facilities is not commensurate with the revenue received from four or six air-line and air-mail stops per day."

He also stated that "the average person can no longer be expected to carry the amazing growth of aviation unless more airports are built. It is a well-known fact that the automobile did not reach its great popularity until better roads existed. Likewise the airplane will

be confined in us until more airports are established."

While we agree to a small degree with Mr. Piper, we do not feel that light-plane flying should be advanced at the sacrifice of transport flying, and we might again remind him that we made a far better suggestion—one in which we said that the hundreds of so-called emergency fields set along the main air routes could be improved for light plane and club flying.

LIGHT-PLANE TEST PILOTS

The most interesting figure in aviation today is not the daring young man on the wing root of an exhibition ship who is just about to leap off into space for a delayed drop. He is not the glamorous, uniformed air-line pilot. He's the light-plane test flyer.

Few realize the important part this man plays in our light-plane industry. His job is not as thrilling or as publicized as that of the 9-G military test man, but it is equally as demanding, and certainly as important.

The modern high-production test man is probably one of the most skilled pilots in the business, and it might do many of our young light-plane pilots a lot of good if they looked into this angle of the game as a real profession. It is not all take-offs, climbing turns and routine maneuvers. In some of our light-plane factories where productions are coming off the line as fast as six a day, there is plenty of steady, detailed work for the test pilot.

Once a ship is turned over to the test pilot, he makes his own visual examination from the pilot's point of view before he even starts the motor. He checks all controls, movable surfaces and fuel lines. He gives every important item a close inspection before he leaves the ground.

Any untried machine, regardless of the fact that it is one of hundreds of the same type, is likely to have queer twists in its personality. While the wings, fuselage and other features have been built up on standard jigs, and to all appearances are exactly like the hundred others that may have gone before it, there is always a possibility that the general grouping of any set of parts will result in a plane that has a "quirk" in some respect. This is what the test pilot looks for long before he tries out any of the orthodox test tricks.

For instance, once he has made his visual inspection of the plane, the engine is started and checked for r.p.m., and then the first actual take-off is made. The pilot usually knows his wind strength and calculates the distance in which the ship should take off under ordinary flight conditions. Once in the air, he begins his quiet and careful check-up of all instruments and the

reaction of the controls under normal handling.

Tests for light planes are different in many ways from those designed for heavier models. For instance, in a light plane carrying a full fuel load and a pilot, certain maneuvers should be carried out with a certain ease, and no vices should appear when she is being brought out of a stall turn. If the tank is only one-quarter full, slightly different reactions will be noted and will be looked for. If they do not appear, the test pilot will want to know why and have the ship completely checked the instant he gets down.

The ship must respond in a certain manner in a down-wind turn. It must pull out of a spin with the controls in neutral within a certain distance, or within so many complete turns. It must fly hands-off for long periods in reasonably calm air and show no sign of wing-flutter in high-speed dives or turns.

The light-plane test pilot must be so skilled in the characteristics of his mount that he can tell instantly what is wrong and be able to jot down the details of his test on a suitable blank sheet strapped to his thigh. He checks its speed over a measured distance, its take-off capabilities, and any tricks it might display near the ground where the effect of "ballooning" may be noticed.

She is flown hands-off for long periods in all directions and under several degrees of throttle, and once she has disclosed that she is safe to fly the test pilot can chance the more demanding maneuvers, such as rolls, loops and tight power-spins.

After all the defects or flying vices are checked, the ship is returned to the rigging and assembling departments, where these vices are corrected while the test pilot takes out another new one and puts her through the paces. Eventually the first one returns for another check flight, and if she passes O. K. she is loaded with her licensed pay load and put through the routine again.

Some of our good test pilots can handle as many as six ships a day, but two or three is the more usual number. When they are coming off the assembly line "right," the job is fairly easy, but the test man dare not relax his vigil an ounce, because he knows full well that at any minute a series may start in which the maladjustment of any two screws or bolts may provide the required danger-ratio that spells trouble and places the "bugs" where they are hardest to find.

THE IDEAL PRIMARY TRAINER

Messrs M. E. Hartley and B. B. Elder of the Curtiss-Wright Technical Institute of Glendale have done me the honor of asking my opinion on what I might consider an ideal primary training plane. Hartley and Elder are students at the

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Curtiss-Wright school and are apparently seeking the mass opinions of a number of aviation writers, in hopes that they can hit on the ideal.

We have sent in our report, which may be interesting to the readers of Air Trails. Perhaps some of you have constructive criticism along this line and probably would like to voice it. If so, we'll be glad to look over any general ideas you might send along. It should be understood of course that Hartley and Elder are seeking a primary trainer, not simply a light plane for the sportsman pilot. The power available will range between 50 and 75 h.p., and the ship will have to be kept down to a reasonable price figure.

Our idea of a good primary trainer would be a low-wing monoplane using a 50 h.p. opposed four-cylinder job or 70 h.p. Le Blond radial. It would include a fairly large center-section incorporated into the fuselage which would involve considerable steel-tube structure. The outer wing panels would be built up on a box girder and covered with plywood. As a primary trainer it would carry only ailerons. The reason for the wooden panels of course is cheapness of construction and ease of repairs. The main center-section would carry about one-third of the total wing area and accommodate the fuel tank, oil tank and basic features of the controls and a fairly wide landing gear.

The fuselage would be metal-tube from the engine mount as far back as the rear cockpit seat, and from that point the unit would again become wooden structure, which could be easily removed or repaired. Thus my primary trainer would be built about a sturdy metal structure which would accommodate practically all the important features of the ship.

The cockpits would be set tandem with dual controls, and the front cockpit would carry a slide-away cover which could be brought up, streamlining the dome for single-seater flying. As a trainer the instructor would use the rear seat, and the student the forward compartment until he had made his first few dual-control landings. After that he would be shifted back and forth at the discretion of the instructor.

Assuming the ship is to be given about 70 h.p., I would like a top speed of approximately 125 m.p.h. and a cruising speed of 105. It should be rigged to land at something like 37 m.p.h.

Again, I must remind my readers that these specifications refer to a primary trainer, not as the ship I would design for my own personal pleasure.

NEW SHIPS

We were interested to learn that the Payne Aircraft Corporation of Joliet,

Ill., is marketing a new job for the home builder. This plane, which has a wing span of 19 feet and an overall length of 15 feet, 8 inches, will do 120 top, using the Continental A-40 engine, according to the manufacturers.

Shop blue prints and materials for building the Sky Kitten, as it is known, may be purchased from the Payne company, and for you who are interested we suggest that you first send for a three-view drawing, which will be mailed for 60 cents. We also suggest that you make full inquiries as to licensing and whether it can be built at home with any assurance of being passed by the Department of Commerce. In all probability it will, but one should make sure.

The Sky Kitten is a single-seater biplane and is manufactured by the same firm that produced the Knight Twister some time ago.

We might also bring to your attention the advertisement of the Welch Airplanes of South Bend, Indiana, which is forming what is known as the National Flying Squadron. This interesting experiment may find favor with many who wish to obtain aeronautical training under group systems. At this writing I know very little about the scheme, but you can't lose anything by dropping the firm a line and requesting their booklet.

MODEL MATTERS

(Continued from page 70)

be open to model builders from all parts of the world, with no restrictions or entry fees. Attractive prizes are offered. Trophies, air trips, magazine subscriptions, model material, and \$600 in cash will be distributed among the first ten place winners in each of the twelve events.

H. M. Jellison of Akron will be the contest director. N. A. A. rules and sanction will govern the events. Events include stick, fuselage, speed, gas, scale, and glider contests. An interesting event is the "Most Original Model Idea"—to be judged on original ideas presented in model form that seem to be most beneficial to both model and large-scale aviation.

The Akron Chamber of Commerce and the Akron Times-Press will be hosts to the modelers. Flying will be carried on at the spacious Akron Airport—one of the best in the world for model flying. A full five-day program of amusement has been arranged. And in addition the winning contestants will attend the opening day's ceremonies at the National Air Races in Cleveland. In Cleveland they will be treated to a banquet at which Major Al Williams will be toastmaster. The luncheon proceedings will be broadcast.

Entry blanks and complete information about the contest can be obtained from Ed Clarke, National Junior Aviator Editor, Cleveland Press, Cleveland, Ohio.

Hangar No. 13, Beloit, Wis.

Hangar No. 13, Y. M. C. A., Beloit, Wis., recently took part in the community hobby show and was awarded first prize for club displays. In addition, many club members carried off individual honors. Places were awarded to Conrad Hansen, Jr., club adviser, George Niebauer, club president, Wilfred Treder, secretary, Hen Varner, Melville Spence, and James Youngwith. The club contributed about thirty models, including fifteen to seventeen finished and unfinished gas models, eight scale models, and two microfilm indoor jobs.

Hangar No. 13 is an active model group and anyone living in the vicinity of Beloit will do well to contact them at the Beloit Y. M. C. A.

Scripps-Howard Contest Winners

Winners in the Scripps-Howard Gulfhawk Scale Model Contest were recently announced. There were three

divisions: open (over 18 years), senior (14 to 18 years), and junior (up to 14 years). Models entered in the contest represented twenty-three cities in the United States and one each in Canada, Norway, and Germany. All the models entered in the national meet were the winners in preliminary elimination contests.

Top-place winners were Charles Bleitner, 23, St. Louis, Mo., William Sharp, 17, Avalon, Pa., Michael Jugan, 13, Duquesne, Pa. They received a \$50 cash prize and a Comet Gas Model kit.

2nd place winners: Frank Hoffer, 22, Cleveland, O., John Reye, 17, Cleveland, O., Milton Hosman, 13, Denver, Col. Second place carried a \$25 cash prize.

3rd places went to: Richard Jennings, 21, San Francisco, Cal., Robert Dittmer, 17, Denver, Col., Robert Martin, 13, Cleveland, O. \$10 was awarded to each 3rd-place winner.

Major Al Williams was given the difficult job of selecting the model which was the most accurate reproduction of his own famous airplane, Grumman Gulfhawk. Some of the models had tiny electric wing lights and landing lights. Others had tiny electric motors concealed inside the motor cowling to drive the propeller—giving the model a realistic appearance.

CROSS WINDS



ACROSS

- ✓1—Science of lighter-than-air flight
- ✓11—Model adhesive
- ✓12—Element of dirigible framework
- ✓14—Either

- ✓15—Shape of inline aero engine in which two cylinder rows meet at less than 180° angle
- ✓16—Single
- ✓17—Civil engineer, abbrev.
- ✓18—Pinch

- ✓20—Adjusted a magnetic compass
- ✓22—Familiar name of Bill Barnes' flyer from Boston
- ✓23—Liquid drop illustrating ideal streamline shape

- 25—Prefix meaning outer
- 26—One boundary of a geometrical plane or solid
- 27—Land surrounded by water
- 29—Curve of wing surface
- 31—Toward
- 32—Sixth musical syllable
- 33—Type of Short flying boat
- 37—Wear away by friction
- 40—Emperor who fiddled while Rome burned
- 41—Britain's air service, initials
- 43—One of vertical rows
- 44—Endeavor
- 45—Trap
- 47—Mineral spring
- 48—Aluminum, chemical symbol
- 49—Queen . . . is name of British radio-controlled target plane
- 50—Make of Rumanian plane, as known by initials
- 52—First half of Bible, abbrev.
- 53—What the air regulations require for night flying

Answers for June

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

- ✓55—Fly at greatest fuel efficiency
- 57—Moth-flake material

DOWN

- ✓1—High perches
- ✓2—Printer's measure of line length
- ✓3—Air slang for one complete turn of engine crankshaft
- ✓4—Units
- ✓5—Boiled slowly
- 6—Navigational globe line along which needle points to true north
- ✓7—Bell sound
- 8—Wrath
- ✓9—Cadmium, chemical symbol
- 10—Withdraw from group

- ✓11—Make of new A-50 light-plane engine
- ✓13—To echo
- ✓19—Friend
- ✓21—Aloft
- ✓22—Protective breast cloth
- ✓24—Aspect . . . is relation between wing chord and span
- ✓26—Shrewd
- ✓28—Neither
- ✓30—Priest's white robe
- ✓34—Type of powerful Rolls Royce liquid-cooled aero engine
- ✓35—Move with a lever
- ✓36—First name of Admiral Cook, Navy air chief
- ✓37—The Dark Continent
- ✓38—Three-toed sloth
- ✓39—Remove from office
- ✓42—Anti-aircraft, military abbreviation
- ✓45—One of Adam's sons
- ✓46—Nobleman
- ✓49—Brake horsepower, abbrev.
- ✓51—Repent
- ✓54—Southern state, abbrev.
- ✓56—Preposition of location

NEW ANNUAL EDITION
FLYING for 1938
America's Popular Book on Aviation

256 Pages—More than 250 Halftone Illustrations and Drawings—11 Chapters



I—Adventures Over Land and Sea. II—With the Army Air Corps. III—With the Navy's Air Forces. IV—Coast Guard Aviators. V—Air Lines of the United States. VI—Private Flying. VII—Aerial Service Operations. VIII—Airways and Airports. IX—Training and Education. X—New Things in the Air. XI—Federal Government Activities.

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P.O. Address.....
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.....
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STOUT TROPHY WINNER

(Continued from page 67)

MATERIAL REQUIRED

(Balsa unless otherwise noted).

Fuselage

- 8 $\frac{1}{8} \times \frac{1}{8} \times 26''$ longerons and struts
- 1 $1\frac{1}{4} \times 1\frac{3}{8} \times 1\frac{1}{2}$ nosing
- 6 $\frac{1}{8} \times 1\frac{1}{2} \times 2\frac{1}{4}''$ sheet balsa covering, wheels, tail plug
- 1 $\frac{1}{8} \times 1\frac{1}{4} \times 3\frac{1}{4}''$ bottom rudder
- 2 $\frac{1}{8} \times \frac{1}{4} \times 8\frac{3}{4}''$ bamboo landing gear struts
- 1 foot .040 piano wire, shaft, rear hook, and axles
- 6 inches fine piano wire, nose and tail-section attachment hooks
- 2 bushings, nosing
- 1 $\frac{1}{8} \times \frac{1}{4} \times 8''$ landing gear brace
- 1 $\frac{1}{4} \times \frac{1}{4} \times 4''$ landing gear brace

Wing

- 2 $\frac{1}{8} \times \frac{1}{8} \times 16"$ leading edges
- 2 $\frac{1}{8} \times \frac{1}{4} \times 16\frac{3}{4}"$ spars
- 2 $\frac{1}{8} \times \frac{3}{8} \times 16\frac{3}{4}"$ trailing edges
- 2 $\frac{1}{16}$ diameter x 8" bamboo tips
- 2 $\frac{1}{16} \times \frac{9}{10} \times 24"$ ribs
- 3 $\frac{1}{16} \times 2 \times 12"$ sheet balsa covering

Elevator and Rudder

- 1 $\frac{3}{32} \times \frac{3}{32} \times 14$ " leading edge
1 $\frac{3}{32} \times \frac{3}{32} \times 7$ " leading edge
1 $\frac{1}{16} \times \frac{1}{4} \times 16$ " spar
2 $\frac{1}{16} \times \frac{1}{16} \times 6$ " spars
1 $\frac{1}{16} \times \frac{1}{4} \times 13$ " trailing edge
1 $\frac{1}{16} \times \frac{1}{4} \times 5$ " trailing edge

- 3 $\frac{1}{16}$ x $\frac{3}{8}$ x 12" ribs
2 $\frac{21}{2}$ x 3" aluminum foil top-rudder
covering
3 $\frac{1}{16}$ diameter x 6" bamboo tips

Additional Items

- 1 1½x2x16" propeller block
10 ¼"-diameter washers
1 small piece sheet aluminum
3 ounces cement
3 ounces dope
3 sheets tissue
38 feet of 3/16" flat brown rubber
soap and glycerin (rubber lubricant)

HISTORY OF THE TROPHY

The Stout Trophy was put into competition in 1930 by William E. Stout.

famous airplane and automobile designer. Since then it has become one of the country's outstanding model awards. Following is the list of modelers who have held this trophy:

Joseph H. Ehrhardt, St. Louis, 1930,
duration unknown.

Emanuel Feinberg, Detroit, 1931,
28:30.

James F. Parham, Indianapolis, 1932,
duration unknown.

Maxwell B. Bassett, Philadelphia,
1933, 22:225.

James B. Cahill, Indianapolis, 1934,
4:28.

Kenneth E. Ernst, Indianapolis, 1935,
20:05.

Erwin Leshner, Philadelphia, 1936,
36:01.

Roy E. Stoner, Rockford, Ill., 1937,
12:59.2.



A Burnelli over New York City.

Please mention AIR TRAILS when answering advertisements.

ELEMENTARY AVIGATION

(Continued from page 27)

a clockwise movement in the southern. Figure 10 illustrates both types.

To obtain a better picture of what is meant by the two terms it must be understood that these areas may be of vast extent, covering sometimes as much as a third or more of the United States. They refer to the general barometric conditions over the country and are not to be confused with such

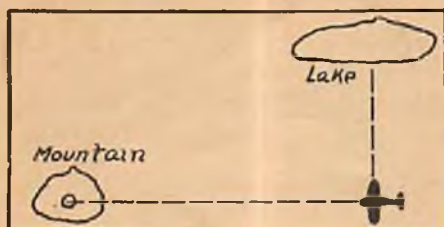


Fig. 8

local phenomena as twisters and tornadoes merely because of the names used to designate them.

The weather maps depict the cyclones and anticyclones by drawing continuous connecting lines through the localities of equal barometric pressures. When completed these figures resemble irregularly shaped systems of concentric circles or ovals and are labeled "lows" or "highs" depending upon whether the barometer readings decrease or increase as their centers are approached. By remembering that good weather is usually present in high-pressure (anticyclonic) areas and bad weather in low-pressure (cyclonic) areas, the pilot can determine by a glance at a weather map what sort of weather to expect in any locality in which he happens to be interested.

Of course there are variations to the general forecast rule, depending upon the shape of the highs or lows depicted, and their related positions. For instance a V-shaped low, formed by a system of concentric ovals which are more or less pointed on their southern ends, usually has heavy rains on its eastern side and clearing weather on its western side, with strong winds in between. On the other hand a wedge-shaped high, which usually forms between two lows, presages good weather in that area.

Both high and low-pressure areas have a general movement to the eastward over the United States; hence by observing what type of area lies immediately westward on the weather map, a pilot can pretty well surmise what kind of weather to expect in his locality during the next few days.

DANGEROUS ATMOSPHERIC CONDITIONS

Usually the pilot has sufficient warning of the approach of wide-area storms

to enable him to cancel his proposed flight or to seek the shelter of an airport if he is already under way. There are, however, several types of dangerous atmospheric phenomena which are not always easily forecast, and airmen should become acquainted with their peculiarities so that they may be able to recognize and avoid them.

Fog constitutes one of aviation's greatest hazards. So well established is this fact that all weather broadcasts include what is called the "dewpoint" among their reports. The dewpoint is the lowest temperature at which the moisture in the atmosphere will remain in vapor (invisible) form. In other words, if the temperature drops below the dewpoint temperature, the water vapor in the air will condense and form fog or clouds.

The two general types of fogs are known as radiation fogs and advection fogs. The first type is brought about when the land or water in which saturated air is in contact, cools off and

adjacent to a cold surface. This occurs when the wind carries moist air from a warm area across a colder section. As an example, this type can be expected in winter whenever the wind blows across the land from seaward, or when the wind from a warm moist land blows across a cold region.

Fog of the radiation type is usually dissipated by winds; this is not the case, however, with the advection type.

As has been stated before, the dewpoint temperature is always included in radio broadcasts from weather reporting stations. Inasmuch as the existing air temperature also accompanies the report, pilots are able to judge with considerable accuracy whether or not fog is likely to form at, or near the station from which the report is broadcast. For example, if during the late afternoon a station reports the air temperature as 55° Fahrenheit and the dewpoint as 50°, pilots bound for that locality will know that fog can be expected as evening draws on. This is because of the normal expectancy that the air temperature will fall as sunset is approached and will probably reach the dewpoint temperature of 50° Fahrenheit around that time.

Another much discussed but less familiar hazard to aviation is that of ice formation on aircraft in flight. Under certain conditions ice may gather on the wings, struts, windows and even propellers of airplanes under way. Whether or not the ice formed constitutes a serious danger depends upon the character and extent of the icing area which the airplane encounters; for this reason pilots and navigators should be familiar with the underlying principles of the phenomena so that the advisability of undertaking or postponing a proposed flight can be reliably gauged.

There are three general types of ice formations: (1) clear ice; (2) clear ice mixed with snow or sleet; (3) rime.

Clear ice is smooth, transparent, and very tenacious; it conforms fairly well

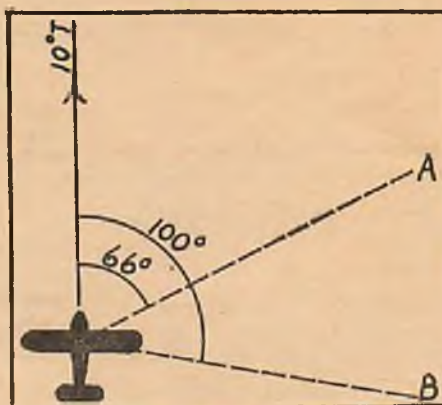


Fig. 9

causes the temperature of that air to fall below the dewpoint. This usually occurs in the evening after the sun has set or during the night, and may last until the sun has had an opportunity to warm the earth on the following morning. The advection type is brought about by the mixing of warm saturated air with the cold air that is

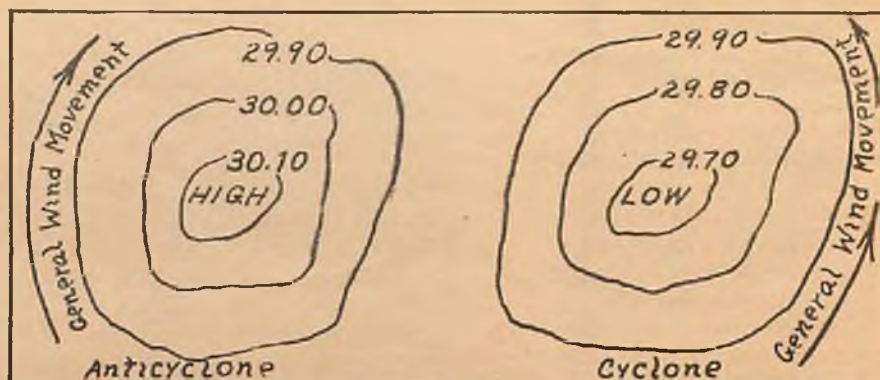


Fig. 10

to the shape of the object which it forms on, so that the general shape of the object, although enlarged, is pretty well preserved.

Clear ice mixed with snow or sleet forms a rough, irregular coating over the object upon which it forms. On wings and struts it tends to build up a blunt frontal area diminishing in thickness toward the rear. Inasmuch as this irregular-shaped ice formation, like all other types, builds up almost entirely on the first one-third of the airfoil (where the lift is greatest), it very quickly impairs the aerodynamic quality of the wing.

Rime is a white, granular, opaque formation which builds up on the leading edges of struts and wings. Because of the fact that it is not very tenacious and does not as a rule extend any great distance back from the leading edge, it does not constitute a source of great danger.

The major causes of the ice formation under discussion are due to the existence of supercooled droplets of water within clouds, supercooled rain falling from the clouds, and falling moist snow.

It has been definitely determined that the water droplets contained within clouds can be reduced in temperature to as low as $(-)$ 45° Fahrenheit without freezing; this is unusual, however, and it is seldom that droplets exist in the liquid state with temperatures lower than $(-)$ 20° Fahrenheit.

One theory advanced in explanation of this oddity is, that in order for the water droplets to condense out of the atmosphere in the first place, certain foreign substances have to be present in the air for them to form upon. Once the condensation has taken place, then, each water droplet and the dust or salt particle upon which it has condensed, unite to form a solution. When this has occurred the freezing point of the droplet will be considerably lowered because of the fact that the freezing point of a solution is always much lower than that of water alone.

In addition to the cause mentioned above perhaps the surface tension of the individual droplet contributes to the resistance against freezing.

Whatever the cause, it is a well-established fact that supercooled water droplets of various sizes do exist in clouds of high relative humidity and also that supercooled rain does fall from therein. These droplets will remain in the liquid state only so long as they are not struck by another object, or do not come in contact with ice.

It becomes plain then, that whenever a fast-moving airplane enters a cloud containing supercooled water droplets, the droplets will freeze and adhere to the parts of the airplane which strike them.

Whether clear ice or rime is formed

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Deluxe kit including 3 1/2" pneumatic wheels, timer, and 1 1/2" carved hard wood prop., postpaid. \$8.50

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1/16x3/16, 35 for 5c Silver, ea. 5c

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1/16x3/4, 15 for 5c

1/16x3/4, 5 for 5c

3/32x3/32, 30, 5c

3/32x3/4, 30 for 5c

3/32x3/4, 12 for 5c

3/32x3/4, 10 for 5c

3/16x3/16, 8, 5c

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ALWAYS FLY TWA!

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Shortest..Fastest..Coast-to-Coast

HIGH FLYER

(Continued from page 79)

tively. The plane bored on, flying itself hands-off steadily, without deviation. Jimmy smiled in reply to the manager's confident grin.

Then he flew. He took the Clouderuiser into every situation that he could devise. Balance and power brought her out smoothly under fingered control. Was this it—was this the plane? He hated to bring her down. Only when the manager looked at his watch did he bank for the field. Flaps settled her quickly.

"Now, this is a demonstrator," the manager said, while the mechanic leveled the prop, "but it's had only four hours. It's the same as new. It would save you waiting for factory delivery. At six thousand, nine hundred and ninety, the Clouderuiser is the outstanding buy."

Jimmy gazed out where lengthening shadows slanted across the landing strips.

"I won't decide now," he said finally. "I'm already late for an appointment in town. The Clouderuiser seems to have about everything I want. I'll let you know."

He bundled the fur collar under his chin as he left them.

Behind the administration building, at the far end of the parking lot, he came to a rather shabby little auto van. On its side was the lettering, "Adams—Cleaner & Dyer." He unlocked the rear doors, took off the fur coat, and carefully hung it on the rack within.

Climbing behind the wheel, he brought the motor to clattering life and drove out onto the highway. The frigid wind was keen, and he turned up his jacket collar. The boss would bawl him out for the delay. But it was worth it. What if he was broke, if he still owed Al for the flying lessons, if his last year's overcoat was in hock? He just had to fly. And to fly, you needed a plane.

Some day . . . maybe. . . .

GLIDING

(Continued from page 16)

Sherman M. Fairchild Trophy

Trophy to the holder of the highest number of points.

Marine Midland Bank Trophy

Trophy and \$100 cash for the first pilot to reach the Allegheny Mountains.

Columbia Rope Co. Prize

Prizes consisting of six lengths of tow rope of 500 feet each to the groups whose ships compile the highest number of points.

Elmira Precision Tool Co. Prize

Typewriter to the first woman to qualify in the contest.

American-La France and Foamite Corp. Prize

Trophy and \$100 for longest soaring flight with passenger.

Wightman Trophy

1. Trophy and \$30 for longest aggregate distance in utility ship.

2. \$15 for second longest aggregate distance in utility ship.

American Soaring Champion

The title of American Soaring Champion is determined by the point award system, by which the pilot aggregating the greatest number of points during the contest wins the honor. Last year the Soaring Society of America donated \$2,000 towards the point award system, each point being worth 54 cents. This year the money has been transferred to the American Open Soaring Contest, to be held at Frankfort, Mich., August 27th to September 5th, so that the point award system at the Elmira meet will be used only to determine the American Champion and will not carry any remuneration with it unless somebody comes forth and donates the necessary fund.

TEXACO TROPHY

(Continued from page 60)

side has a spruce insert between the spars which fits into the center section. This method of making a two-piece wing is popular in Texas.

The leading edge of the wing is covered with $\frac{1}{16}$ " sheet balsa back to the first spar—top and bottom. Therefore, the front parts of the ribs will have to be notched to receive the sheet balsa. In the full-size pattern, the exact rib pattern is shown. The notch for the sheet balsa is not included.

WING MOUNT

The mount is rounded to fit the top of the fuselage. Spruce is used, adequately braced with piano wire diagonals. The mount should be rigid enough to hold the wing without any possible twisting in flight. It is attached to the fuselage by rubber bands.

COVERING

The model is covered with bamboo paper except over the sheet balsa covering, which is silk-covered. In covering sheet balsa with silk, take care to work out all the wrinkles. Dope all parts of the model with at least two coats of medium thick dope.

FLYING

The approximate fore and aft position of the wing is shown in the drawing. Naturally, this will vary with the particular model. Move the location of the wing mount until the model trims at about one-third back from the leading edge. $\frac{1}{8}$ " incidence is put into the wing. That is, the front top-edge of the mount should be $\frac{1}{8}$ " higher than the rear as measured from the top fuselage longerons. The elevator and the rudder are both set at zero angles.

The model seems to have considerable torque effect. Hanley used ample right-thrust in the motor. After take-off, the model climbs about 25 feet, then turns to the left and appears to be diving at the ground, but is in reality flying level. When it gains enough speed down-wind it starts climbing to the left. As long as the motor runs it makes left circles. The glide is in right circles. 250- to 300-foot diameter circles have been found most convenient for both power flight and glide.

ADDITIONAL ITEMS

The total weight of the model ready to fly is 6 pounds. Minor changes and repairs have boosted the weight to 6 $\frac{1}{2}$ pounds without any effect on the flights.

An important feature of this type motor mount is that it is shock-absorbing as well as demountable for servicing and carrying.

MATERIAL

(Balsa unless otherwise noted)

Fuselage

- 8 $\frac{3}{8}$ x $\frac{3}{8}$ x66" longerons, bracing
- 8 $\frac{1}{4}$ x $\frac{1}{8}$ x12" diagonals
- 1 $\frac{1}{4}$ x5x11" hardwood 3-ply, motor mount and fuselage formers
- 14 $\frac{1}{8}$ x $\frac{1}{8}$ x48" spruce stringers
- 1 $\frac{1}{4}$ x $\frac{3}{4}$ x8" spruce motor mount
- 5 $\frac{1}{16}$ x2 $\frac{5}{8}$ x24" top-fuselage formers
- 4 $\frac{1}{16}$ x $\frac{3}{4}$ x24" bottom-fuselage formers
- 1 $\frac{1}{8}$ " I.D.x12" heavy aluminum tubing
- 5 $\frac{1}{2}$ ft. $\frac{1}{8}$ "-diameter wire
- 2 $\frac{1}{2}$ ft. .055"-diameter wire
- 2 $\frac{7}{8}$ x1 $\frac{1}{2}$ x12" bottom of rudder
- 2 $\frac{1}{2}$ x1x5" motor cowling
- 1 $\frac{1}{2}$ x1 $\frac{7}{8}$ x3" rear tip of fuselage
- 18 $\frac{1}{16}$ x2x24" top and bottom covering
- 1 10x12" sheet celluloid cockpit covering
- 2 4 $\frac{1}{2}$ "-diameter airwheels
- 1 ignition switch
- 2 auxiliary battery plug-ins
- 2 battery-wire clips

Wing

- 8 $\frac{1}{4}$ x1 $\frac{1}{2}$ x40" spars
- 4 $\frac{1}{4}$ x1 $\frac{1}{2}$ x27" spruce spars
- 2 $\frac{1}{4}$ x2 $\frac{1}{2}$ x17" spruce inserts
- 2 $\frac{1}{32}$ x2x14" hardwood 3-ply center section
- 2 $\frac{1}{2}$ x1 $\frac{1}{2}$ x45" leading edge
- 1 $\frac{1}{2}$ x1 $\frac{1}{2}$ x7" leading edge center-section
- 2 $\frac{1}{4}$ x1x38" trailing edge
- 1 $\frac{1}{4}$ x1x7" trailing edge center-section
- 2 $\frac{3}{8}$ x1x10" tip
- 2 $\frac{1}{4}$ x1 $\frac{3}{8}$ x16" tip
- 2 $\frac{1}{4}$ x1 $\frac{3}{4}$ x7" tip
- 16 $\frac{3}{32}$ x2 $\frac{1}{4}$ x24" ribs
- 1 $\frac{1}{8}$ x2 $\frac{1}{4}$ x24" spruce center ribs
- 12 $\frac{3}{32}$ x3x36" wing covering
- 4 $\frac{1}{4}$ x1 $\frac{1}{4}$ x18" spruce wing mount
- 2 $\frac{1}{8}$ x1 $\frac{1}{4}$ x16" spruce wing mount
- 2 $\frac{1}{2}$ ft. $\frac{3}{32}$ " diameter wire wing mount
- 2 .010x1x10" sheet brass wing mount
- 5 ft. .040 wire wing mount

Elevator

- 2 $\frac{3}{16}$ x $\frac{1}{2}$ x21" leading edge
- 2 $\frac{1}{4}$ x $\frac{3}{8}$ x18" trailing edge
- 1 $\frac{1}{4}$ x $\frac{1}{2}$ x43" spar
- 1 $\frac{1}{4}$ x1 $\frac{1}{2}$ x33" spar
- 2 $\frac{1}{4}$ x1x16" tips
- 7 $\frac{3}{32}$ x1x24" ribs
- 5 $\frac{1}{32}$ x2x12" tips
- 1 $\frac{1}{4}$ x1 $\frac{1}{4}$ x14" tips.

Rudder

- 2 $\frac{3}{32}$ x1x18" ribs
- 2 $\frac{1}{32}$ x2x18" covering
- 1 $\frac{1}{4}$ x1x24" outline
- 1 $\frac{1}{4}$ x1 $\frac{1}{2}$ x14" spars

Additional Items

- 1 qt. cement
- 1 qt. dope
- 10 sheets bamboo paper (24x36")
- 4 brads, soft wire, thread
- 2 yds. silk covering for sheet balsa

PEERLESS TAYLOR CUB GAS MODEL



6 FT.
SPAN

A tested and tried contest winner—sold by leading Department Stores and Hobby Stores everywhere.

Complete kit contains all materials for constructing plane as pictured including full size detailed plans with pictures, clear notes and instructions. There is nothing else to buy except the motor. Special COLOR CODE helps identify the different strips of balsa and bass.

Complete Kit, less motor, with balsa wheels..... **\$5.50**

Complete Kit, less motor, with pneumatic rubber airwheels and single pole double throw snap switch **\$6.90**

(Add 50c to either Kit west of Denver or to Foreign countries.)



SYNCR ACE MOTOR

$\frac{1}{2}$ h.p. 800 to 8000 R.P.M. Oil-lie bearings. Champion spark plug. Complete with coil and condenser.....

\$13.75

BROWN JR. MOTOR "D" \$10.00

COMPLETE OUTFITS — P E E R L E S S Taylor Cub kit with rubber airwheels and double throw switch, Brown Junior Motor "D" and 14" **\$18.30**

propeller.....
PEERLESS Taylor Cub Kit with rubber airwheels and double throw switch, Syncro Ace Motor and 14" **\$22.05**

propeller.....
(Add 50c postage to all Complete Outfits West of Denver and to Foreign Countries.)

PEERLESS FLIGHT TIMER \$2.00

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IMPORTANT ANNOUNCEMENT
NEXT MONTH**

PEERLESS FLYING 10c MODELS

—Fokker DVIII, Cessna C37, Rearwin Speedster, Waco Cabin, Red Bird R.O.G., Monocoupe 90A, Aeronca Low Wing, Stinson Taper Wing, Howard's DGA 8, Ryan S-T, Nieuport XVII C1, Kinner Sport, Al Williams Grumman, Vought V143.

10c SOLID MODELS—Ryan S-C, Rearwin Speedster, Seversky BT-8, Beechcraft B-17, Al Williams Gulfhawk, Waco "D", Ben Howard's "Mr." Mulligan, Curtiss Hawk 111C.

25c MODELS—Cessna C-37, Kinner Sport-wing, Monocoupe 90A, Rearwin Speedster, Taylor Cub, Heath Midwing, Stinson Taper Wing, Aeronca Low Wing, Fleet Trainer, Ryan S-C.

50c MODELS—Aeronca C-3, Hawker Monoplane, Fokker DVII, Taylor Cub, Junior Endurance, Monocoupe, Percival "Vega Gull."

MANY OTHERS—53" Taylor Cub \$1.00

54 $\frac{1}{2}$ " Corben Super Ace \$1.95

SUPPLIES—A complete line of all supplies for gas or rubber powered models.

Send 10c for copy of 1938 catalog No. 8 and free plan.

THE PEERLESS MODEL AIRPLANE CO.,
3090 W. 106th St., Cleveland, Ohio.

THE BOWLUS "BABY ALBATROSS"

(Continued from page 72)

sanding lightly between each. Allow at least 15 minutes between coats. Finish with three coats of the top color desired. Sand between each with wet or dry sandpaper. After the final coat, rub the finish with especially prepared model rubbing compound. Polish the surface



The Ross-Stephens sailplane model featured last year's annual gliding and soaring number. Plans appeared in the December issue.

with a flannel cloth to bring out the luster.

LANDING WHEEL

Mount a $\frac{5}{8}$ " M & M airwheel on a .028 wire axle. The assembly can be easily worked into position and cemented through the cockpit and wheel opening in the pod.

TAIL SURFACES

The stabilizer rib strips are all cut to the same shape and size from sheet balsa by means of a rib template. The shorter ribs are attained by cutting one-third from the leading edge portion and two-thirds from the trailing edge portion of each rib until the lengths match the plan. Place the two stabilizer halves—one left-hand, the other right—on the bench. Cut the edges from sheet balsa and assemble the entire unit in the form by placing small blocks beneath the pieces to be elevated. After the ribs have been fitted and cemented, shave the edges to the required cross-sections—conforming with the contour of the rib section. The rudder is constructed in like manner with the exception of the various details noticeable on the plans. Since the edges are thickest at the point where the rudder has the greatest breadth, it will be necessary to use the thickest sheet balsa required, for the entire outline. The edges can be cut from the sheet balsa, cemented together on the bench, and then sanded

to a gradual taper toward the top and bottom.

WINGS

Prepare a wing rib template and cut all the wing rib strips required, both top and bottom. It will be noticed that the sheet balsa spar tapers from its midpoint to the tip, being flat on the top throughout its entire length. As was done with the tail surfaces, make the shorter ribs by cutting one-third of the surplus length from the front ends and two-thirds from the rear. Slide the lower rib strips beneath the spar, pin the spar and edges in place, (elevating the leading edge with small blocks), and cut the ribs to the exact fit. The butt rib is of $\frac{1}{8}$ " sheet and is solid. It is slanted $\frac{1}{16}$ " for dihedral. The tip is a solid piece of sheet.

COVERING

Run the grain of the paper spanwise on the wings and tail. Attach the paper, first to the tip and butt ribs, stretching tightly until adhered. Dope down the leading and trailing edges. The paper may then be lightly sprayed, the units being pinned to the bench until dry to prevent warping. Dope the finished surfaces with thinned clear dope. Cement the wing panels, the stabilizer and rudder to the squared boom ends. Brace the wings with a single streamlined strut on each side as called for in the plans.

FLYING

Use a 100-foot heavy thread or light cord for a tow line. Place a loop around the skid and move forward to tow the ship into the air. The resistance of the air will slide the tow line off the skid after sufficient altitude has been obtained for gliding. Balance the job with small pieces of lead. Gliding trim can be obtained by gliding the model from the hand over tall grass.

COLOR SCHEME

The real ship is painted as follows: white wings, gold trim; natural veneer finish on pod; metallic boom; red, white, and blue tail. For simplicity, a blue or black fuselage and yellow or red wings are suggested. The same tail design serves as a decorative value.

BILL OF MATERIALS

- 1 $2\frac{1}{2} \times 3\frac{1}{4} \times 12$ " soft block
- 1 $\frac{1}{2}$ sq. x $14\frac{1}{2}$ " medium strip
- 1 $\frac{1}{8} \times \frac{1}{4} \times 36$ " hard strip
- 1 $\frac{1}{8} \times \frac{3}{8} \times 36$ " hard strip
- 1 $\frac{3}{16} \times 2 \times 12$ " hard sheet
- 1 $\frac{1}{16} \times 2 \times 36$ " soft sheet
- 1 $\frac{1}{8} \times 2 \times 36$ " hard sheet balsa
- 1 $\frac{1}{16} \times 2 \times 24$ " hard balsa
- 1 $\frac{1}{16} \times \frac{1}{4} \times 10$ " bamboo
- 1 sheet Jap tissue
- 1 oz. cement
- 1 oz. clear dope
- 1 piece .028 wire
- wood filler, colored dopes as required

The Taylorcraft gas model, plans of which appeared in the April issue, won the Eastern States scale event at Seversky Field. Ship built by Paul Plecan, flown by Roger Hammer.



AIR PROGRESS

(Continued from page 6)

The scheduled air lines of the United States flew 1,839,799 per accident during the last half of 1937, according to the Bureau of Air Commerce. During that period there were three fatal crashes in which twenty-nine passengers, three pilots, three co-pilots and two crew mem-

Cross, according to the April issue of the Air Corps News Letter. Boushey displayed "heroism and extraordinary achievement" while on an aerial flight on October 5th, 1936, by bringing a plane safely to earth after both ailerons were lost through wing structural fail-



Outlines of a battleship painted on the western desert for recent air bombing practice.

bers lost their lives. More than one-fourth of the total accidents were laid to weather conditions, 24.54 per cent to pilot error and 22.73 per cent to airplane failure.

An interesting feature of the 1937 operations of American Airlines, Inc., was the carrying of 300,571 passengers, which was an increase of 17.7 per cent over 1936. This company was the first to carry more than 1,000,000 revenue passengers and is one of the leading air lines of the world. Against all these impressive figures the company reports a loss of \$93,623, whereas in 1936, when it carried only 255,324 passengers, they showed a net profit of \$4,589.

Colonel Edgar Gorrell, president of the Air Transport Association, recently told a Senate sub-committee that the nation's air lines must find more cash if they are to continue operations. He suggested the establishment of a Federal Aviation Authority with powers over commercial aviation. With the establishment of such a national policy, the air lines could go into the investment market and obtain much-needed funds to keep up with the rising costs of operation.

AIR FORCES

A contract for thirty-seven Douglas C-33 transport planes to cost \$2,327,724 was recently awarded by the War Department to the Douglas company of Santa Monica. These planes are modernized versions of the DC-2 and will be powered with two Wright Cyclone engines. They will be used for the transport of supplies, equipment and technicians so necessary to maintain the rapid, long-distance mobility of the General Headquarters Air Force.

Lieut. Homer A. Boushey, Jr., was recently awarded the Distinguished Flying

ure. After a descent of 2,000 feet Boushey ordered his mechanic to take to his parachute and then with great skill and disregard for his own life brought the plane down to a safe landing. The act enabled government engineers to make a complete study of the structural failure in this new type of airplane.

The mystery of the British Royal Air Force long-range Wellesley which disappeared on February 24th with a crew of three, has been confirmed as a loss through the discovery of a Dunlop tail wheel which was found floating in the sea off the coast of Norway. It has been identified as a wheel belonging to a Wellesley.

Holland has ordered eighteen Dornier Do-24K flying boats equipped with three Wright Cyclone engines to be built under license at their Avioler works. They will be used by the Ministry of Defense.

Belgium has ordered sixteen British Fairey Battles, five of which have already been delivered.

France's new Amiot 340 bomber, powered with two Hispano 12Y engines, each producing 1,200 h.p., is said to have a top speed of 348 m.p.h. It has a service ceiling of 32,800 feet and a range of 1,550 miles.

According to Anthony Fokker, noted Dutch designer, future wars will be decided by great fleets of swift aircraft against which there will be no form of defense. He pictured mass flights of 200 planes, each carrying 3,000 pounds of high explosive, and he predicted that 350 m.p.h. would be tops for combat planes, believing that anything faster than that would be too difficult to maneuver in aerial battles.

Captain Liddel-Hart, noted British military authority, has stated that mod-

\$75.00
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BUILD THE
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ALBATROSS
SAILPLANE
(THE SHIP ON THE COVER)

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HAWLEY BOWLUS

Kit complete with all material and instructions **\$385**
First unit **\$75**
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KIT BUILT SHIPS
READILY LICENSED!

Ship ready to fly complete with instruments \$800, f. o. b. San Fernando, Calif.

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DEALERS WANTED!

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SAN FERNANDO, CALIF.

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TRAIN NOW AT THIS GOVERNMENT APPROVED LINCOLN SCHOOL for a Good-Pay position as Pilot or Mechanic. Aviation's great expansion program calls for thousands more well trained men. Lincoln Trained Men in Demand. **BE A SKILLED PILOT.** Lincoln's Government Approved Flight Training prepares you for any Pilot Rating up to Transport, (Commercial), 14 modern Training Planes. Government Rated Instructors. Night and Blind Flying. **BE AN AVIATION MECHANIC.** Learn Airplane Engine Maintenance, Overhaul and Repair. Learn Airplane Construction, Sheet Metal, Welding, 12 Shops and Laboratories. Training prepares you for your Government Mechanics Rating. **COME NOW TO LINCOLN.** A few short months of Government Approved Lincoln Training can have you ready for a Good-Pay position in Aviation. Employment Service given our Graduates. **WRITE TODAY** for complete information.
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YOUR YOUTHFUL SKIN A MASS OF PIMPLES?

Take steps now to help keep your
blood free of skin-defiling poisons

Stop being an object of shame and scorn among your friends. Find out what often causes those repulsive-looking pimples . . . and get rid of them.

Between the ages of 13 and 25 your body is changing rapidly. Important glands develop. These gland changes upset your system. Waste poisons from the intestines are often thrown into the blood stream and are carried to your skin, where they may bubble out in ugly, shameful hickies.

You must help keep your blood free of these skin-irritating poisons. Thousands have done so, just by eating Fleischmann's Yeast. The millions of tiny, living plants in each cake of this fresh food act to help you fight pimple-making poisons at their source—in the intestines, before they can get into the blood. Many get amazing results in 30 days or even less! Get Fleischmann's Yeast now. Eat 3 cakes a day—one before each meal—until your skin is clear and fresh again.

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GOOD PAY BIG FUTURE
IF YOU ARE INTERESTED IN TRAINING YOURSELF FOR A HIGHLY PAID POSITION IN THE AVIATION INDUSTRY—Write, immediately, including stamp.

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If we haven't got your name on our list of model airplane fans—we will send you a *Surprise Gift* of curious interest. Just send a postcard—and you shall have "IT" absolutely FREE!

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An opportunity to contact a large field on a small lineage. Rate 10c per word (Minimum 20 words). Cash with order. Address:

AIR TRAILS CLASSIFIED ADVERTISING
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FREE AIRPLANE with motor purchase. Easy terms, only \$12.50 down. 200 pounds useful load. Welded steel construction. Propellers—all types—98c up. Sensational values. Illustrated information 25c. Universal Aircraft, Fort Worth, Texas.

SAVINGS on model airplane supplies. Write for free price list. Dealers, Clubs. Our discounts mean real profits. Waterbury Model Builders Supply, 131 Cherry Street, Waterbury, Connecticut.

STAMPS—20 different, free to applicants for my U. S. and foreign approvals. P. Battles, R. 2, Kansas City, Mo.

HIGH SPEED SPORT PLANE. Build it at home—Details 10c. Three-view 75c. Complete Blueprints \$2.75. Nismo Aircraft Company, Box 27, Dept. T, Santa Monica, Calif.

LEARN AIRCRAFT CABLE SPLICING at home. Earn your way through flying school splicing cables. Complete detailed instructions one dollar. Metal Products Co., Dept. K-11, Okmulgee, Okla., Box 93.

18½" RYAN S-T, completely assembled and finished ornamental detailed scale model, \$5.00. Many others. Marchino Models, 13130 Turlington, Harvey, Illinois.

DO YOU WANT TO STOP TOBACCO?

Banish the craving for tobacco as thousands have. Make yourself free and happy with Tobacco Redeemer. No habit, no habit forming. Write for free booklet telling of injurious effect of tobacco and dependable, easy way to relieve the craving many men have. **FREE BOOK**

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COLT

45 CAL. Frontier Model

Blackwood construction kit with working plans and all necessary hardware. Barrel and cylinder are machined. **\$1.45**

COLT 45 Cal. "FRONTIER" model kit.

6½" barrel.....\$1.55

COLT 45 Cal. "FRONTIER" model kit, 7" barrel. 1.70

COLT 45 Automatic Pistol Kit. 1.00

COLT 25 Cal. automatic pistol kit. .50

THOMPSON SUB MACHINE GUN model kit. 3.00

Savage Cal. 32 automatic pistol kit. .75

LUGER 9 M/M auto. pistol kit w/3" barrel. 1.75

LUGER 9 M/M auto. pistol kit w/6" barrel. 1.90

All kits make beautiful full scale models. Postpaid in U. S. A.

GUN MODEL CO., Dept. W-48, 2908 N. Nordica Ave., Chicago, Ill.

ern bombing planes are too fast for accurate bombing, and cites several instances in the Spanish war to justify his claim. High speed has offset the improvement in bomb sights and diminished accuracy. Targets 500 yards long and 150 yards wide were seldom hit, he claims.

Pilots of the First Pursuit Group, who have been given the new Seversky P.35 pursuit ship, are loud in their praise of its performance. It flies well in maneuvers and is very easy to control. They did a regulation formation flight from Selfridge Field to Camp Skeel, a distance of about 150 miles, in less than thirty minutes, giving rise to the belief that the ship has a top speed of about 325 m.p.h.

British authorities are urging the purchase of American military planes to aid the rearmament plans and to keep abreast of Germany and Italy. No details were given out, but it is believed that the British have a high opinion of the Consolidated flying boats, the Douglas bomber and the Northrop and Vultee attack ships. They also hope to invoke the manufacturing resources of Canada in building up the Air Force.

The House recently voted a sum of \$448,116,280 for the U. S. Army, which includes a sum for the purchase of 476 additional war planes for the Air Corps in the hope that the objective of 2,320 serviceable planes will be available by July 1, 1940.

A new British aircraft factory designed to turn out forty planes a day is being built at the Speke Aerodrome near Liverpool. When it is completed, it is believed it will produce the Bristol Blenheim bomber, which is said to do 280 m.p.h.

MISCELLANEOUS

Commander Charles E. Rosendahl continues his one-man fight for the dirigible and recently testified before the Senate Committee on Naval Affairs on the authorization of at least two lighter-than-air ships for experimental purposes. Rosendahl believes that a modern helium-filled camouflaged, airplane-carrying rigid airship equipped with a sub-cloud car or observation basket would play a big part in a naval engagement either in the Atlantic or the Pacific.

It is believed that \$12,700,000 will be allotted to the Army for anti-aircraft guns to protect the 5,000 miles of coastline surrounding the United States. Much strength will be added to the harbor defenses of New York City and Chesapeake Bay.

Fire destroyed the No. 1 hangar at the Miami Municipal Airport on April 2nd, burning up fourteen planes and

causing a general loss of about \$700,000. Jimmy Mattern's Lockheed Electra, Seversky's special speedster and a Grumman amphibian owned by Gar Wood were among the ships destroyed.

Spencer Tracy, noted motion picture star who plays the lead with Clark Gable and Myrna Loy in "Test Pilot," recently stated that he never went up in an airplane during the time the picture was being filmed. This should make a study of the picture interesting to those who "know" modern aviation.

Richard V. Rhode, connected with Langley Field and employed as an engineer with the National Advisory Committee on Aeronautics, was awarded the Wright Brothers Medal for a paper he presented to the Metropolitan Section, Society of Automotive Engineers, entitled "Gust Loads on Airplanes."

A new air mail stamp of 6-cent denomination was issued in connection with the celebration of the National Air Mail Week, May 15th-21st. It was first placed on sale in Dayton, Ohio, on May 14th.

Aircraft engineers recently issued a statement to the effect that young men who wish to become airplane pilots of modern aircraft were warned that to qualify for such jobs they must go through training more severe than that of a medical student before he receives his license to practice. It was stated that nowadays it takes about ten years to train a first-class transport pilot, and that he has to go back to school every two years to learn how to use the newest instruments and devices which have been developed, and to keep up with the swift-changing designs of modern aircraft.

A French parachute jumper has hung up a new mark for delayed drops. Bailing out at 27,560 feet he did not pull his rip cord until he was about 1,000 feet from the ground. Some military authorities believe that fighting pilots should be taught the value of the delayed drop in case they are forced to leave a burning or broken machine, and to avoid being fired on by enemy airmen while descending to the ground.

The Germans have rung up another distance mark with a non-stop flight from England to the coast of Brazil. They used a Dornier Do. 18 powered with Diesel engines.

In flying from London to New Zealand and back, a distance of 26,500 miles, Flying Officer A. E. Clouston and Victor Ricketts set up no less than ten new records in their own category. The round trip was made in less than eleven days in the De Havilland "Comet," a machine which is now more than four years old.

COMING:

Carl Goldberg's "Valkyrie" Gas Model

Please mention AIR TRAILS when answering advertisements.



LEWIN B. BARRINGER

The third American to gain a Silver "C" was Lewin B. Barringer. He reports as follows:

"I suppose my aviation career really started at the age of ten when I built model airplanes and constructed a crude glider by putting a wing on a sled. Although I had already accumulated some fifty hours in the air as a passenger, I did not learn to fly until after my college days when, at the age of twenty-two, I took a course with the Ludington Flying Service in June, 1929. Two years later I received my transport pilot's license. In 1933 I joined the aviation unit of the Pennsylvania National Guard with the rank of Second Lieutenant and received my wings as an Army pilot.

"In 1931, while working for the Wings Corporation of Philadelphia, I started first operations at Wings Field

with a gliding school. Using Waco primary gliders I taught 62 students, ranging from a girl of 14 to a man of 65. My longest flight in a motorless craft was 4 minutes until Richard duPont invited me to fly his Bowlus-duPont high-performance sailplane *Albatross II*, at the 5th Annual National Soaring Contest in 1934.

"On my first soaring flight for my 'C' license I was so thrilled that I stayed up 40 minutes, hardly realizing that I had been up over the ten minutes advised, as my contest flights would not count until after I had landed from this qualifying flight. A few days later I covered 77 miles on my first cross-country soaring flight, which took me to Ransom, near Scranton, Pa., and lasted 4 hours, 5 minutes. On this flight I reached a height of over 4700 feet, so it qualified me for altitude as well as distance for my Silver 'C.'

"The third requirement of the Silver 'C,' 5 hours' duration, I did not make until September of the same year. On a soaring expedition to the Shenandoah National Park in Virginia I flew along with Warren Eaton on what was the first 'formation' soaring flight in America. Warren was flying his mahogany Bowlus-duPont *Falcon*, and I was again in its spruce sister ship, the *Albatross II*. It was a difficult flight along the rugged Blue Ridge Mountains and we soared from Big Meadows to Front Royal, Virginia, and landed in the same field after covering 31 miles in 5 hours, 15 minutes.

"The following year, in April, 1935, after much careful preparation, I made my best soaring flight when I flew from Ellenville, N. Y., to Picketown, near Harrisburg, Pa., an airline distance of 155 miles, in 6 hours, 45 minutes."

EDITOR'S NOTE: Since this was written, friend Barringer has broken the existing American distance record with a splendid flight of 210 miles from Wichita Falls, Texas, to Tulsa, Oklahoma. Moreover, he reached an altitude of 7,500 feet, a new American altitude record.

ALBATROSS

(Continued from page 19)

may be purchased piecemeal. The complete price is \$985, divided into a first unit costing \$75 and nine subsequent units at \$85 each.

No one reasonably familiar with tools need hesitate about buying a Bowlus sailplane kit. All parts, hardware, fabric, dopes and varnish necessary for complete assembly are included. Many of the parts are assembled in jigs at the factory. If the ship is built with approved workmanship, it will be eligible for license.

To assure the correct alignment of the wing assemblies, the leading edges, spars and ribs come assembled in the kit so that only the trailing edge ribs and ailerons must be added by the purchaser. The wing root and strut fittings are bolted in place before the kit leaves the factory. The dural boom is completely milled and assembled and comes ready for attaching to the pod. All castings are fully machined and drilled, except where factory installation is provided to insure correct alignment. Control wires are cut to length with all splices made, and the leading edges and spars of the tail unit are assembled and aligned at the factory.

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