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AIR TRAILS

AT LAST...AN AMERICAN SAILPLANE...Page 22

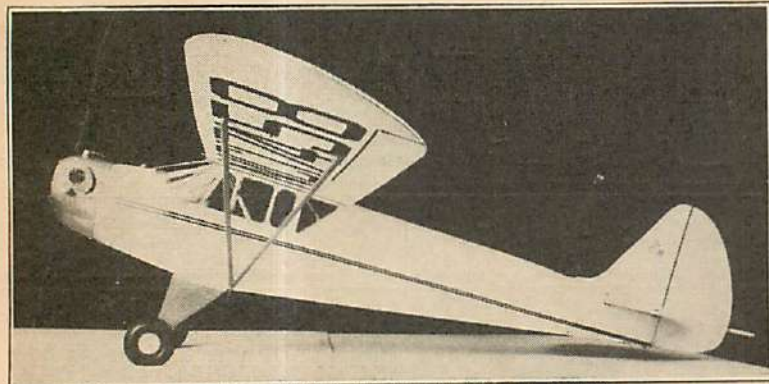
DECEMBER, 1937



THE ARMY'S NEW AUTOMATIC LANDING DEVICE—Page 18
Light Plane Clubs • Gliding and Soaring •
Trophy Winning Models • 30 Fact and Fiction Features
COMPLETE BILL BARNES AIR NOVEL IN THIS ISSUE

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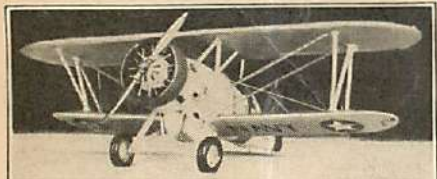
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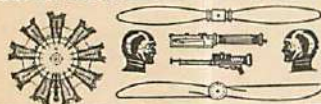
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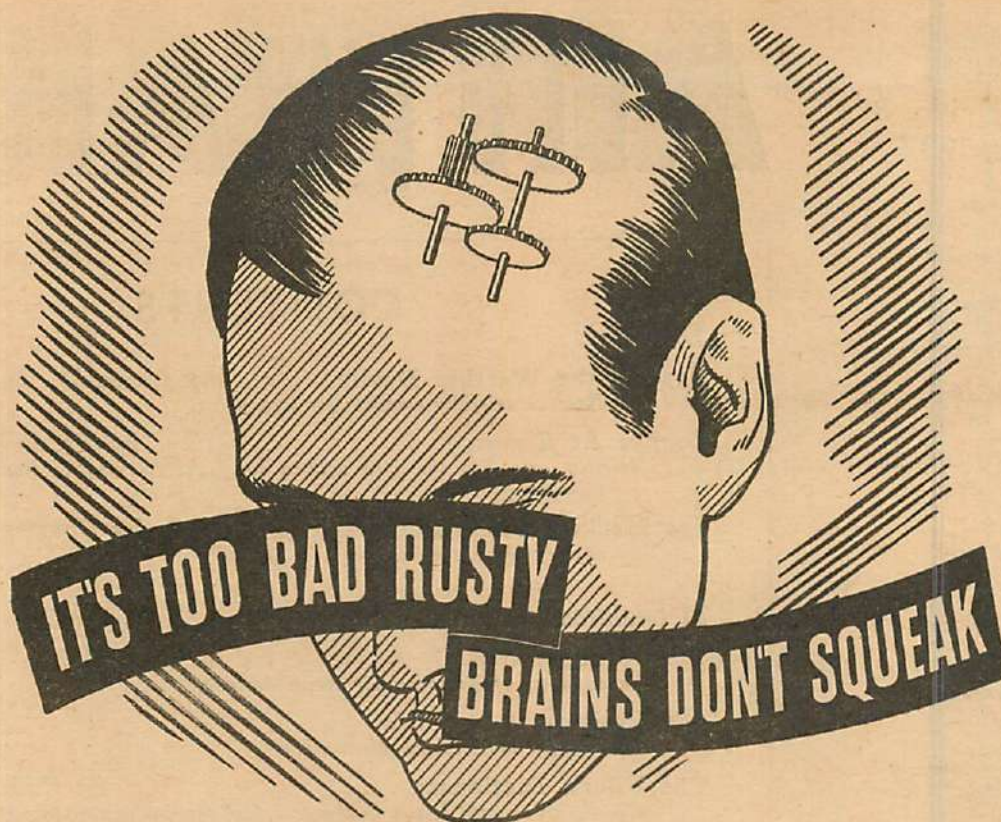
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CONTENTS

3 Articles:

- Beating the Weather Devils . . . by Lieut. W. M. Wood 8
Air lines successfully combat zero-zero flying.
- Zephyr At Elmira . . . by Frank Tinsley 22
America comes to the fore with a top-flight soarer—the Ross-Stephens sailplane.
- Joe Mackey, Stunt Pilot . . . by Charles Verral 26
An odyssey of aerobatics.

11 Features:

- This Winged World . . . 4
News photos of airplanes, air events, airmen.
- Air Progress . . . 7
The current news review of aviation.
- The Flier's Dictionary . . . by C. B. Colby 11
The twenty-seventh lesson in the technical terminology of the air.
- Split-second Action . . . by Jon L. Blummer 15
Aerial adventures that happen once in a lifetime.
- U. S. Army Air Corps Automatic Landing System . . . 18
Robots make possible landings through fog and darkness.
- What's Your Question? . . . by Clyde Pangborn 24
A page of expert information on technical questions for Air Trails readers.
- The Air Trails Gallery . . . 25
Photographic studies of new planes.
- Carrier Development . . . 27
A pictorial lesson in basic principles.
- Pictorial History of Man in the Air . . . 37
The early days of powered flight.
- The Bill Barnes Snorter . . . 76
Three-view drawing in response to popular request.
- Cross Winds . . . 79
The Air Trails Aviation Crossword Puzzle Page.

2 Stories:

- The Brass Ring . . . by Harold Montanye 12
At 5,000 feet the big ship plunged out of the cold drab fog and stuck its nose into a world of glorious sunlight—
- Counterfeit Wings (Bill Barnes Air Novel) . . . by George L. Eaton 30
The Lancer, shivering with the vibration from the hammering Diesels, lunged ahead— The stick came back and the ship was up and away—

3 Departments:

- Light Plane Flying Clubs . Conducted by Gerald H. Smith 16
A department of light plane flying for every one—featuring the light planes at the National Air Races, home-built airplanes and club news.
- Gliding And Soaring . . . Conducted by Alexis Dawydoff 20
Sectional contest results and news.
- Air Adventurers Club . . . Conducted by Albert J. Carlson 28
An association for the advancement of aviation.

11 Model Building Items:

- Model contents are listed on a separate page . . . 38

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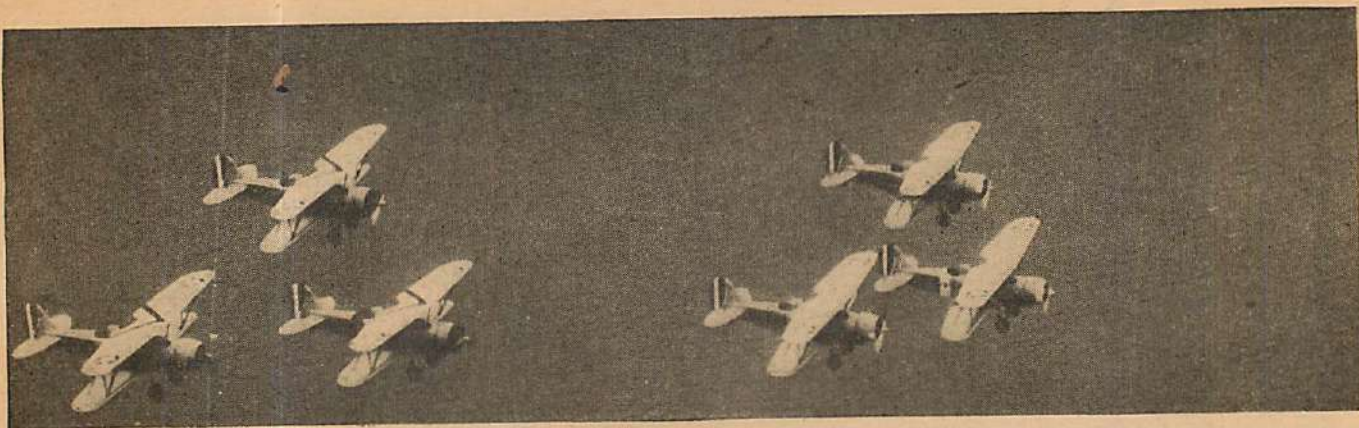
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This Winged World



"Devil Dogs" take to the air at Quantico, Virginia. Flying in formation over the Atlantic, they practice precision maneuvers for their exhibition at the Cleveland Air Races.



Above: 24 hours and 20 minutes aloft in a Taylor Cub is the accomplishment of Charles Davis. The ship was refueled by hoisting gas tins from a speeding auto.



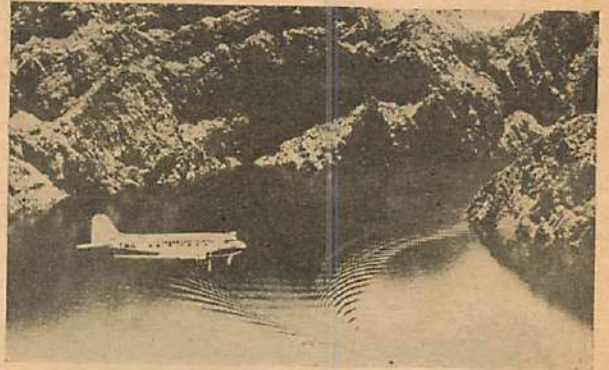
Above: Mimic wars in Europe are taken as seriously as actual conflict. These pilots of the 65th British Fighter Squadron rush to man defending ships in the most recent test in which 400 planes took part.

Left: Grotesque in high-altitude attire, this interceptor pilot prepares to fly in the "defense" of London.

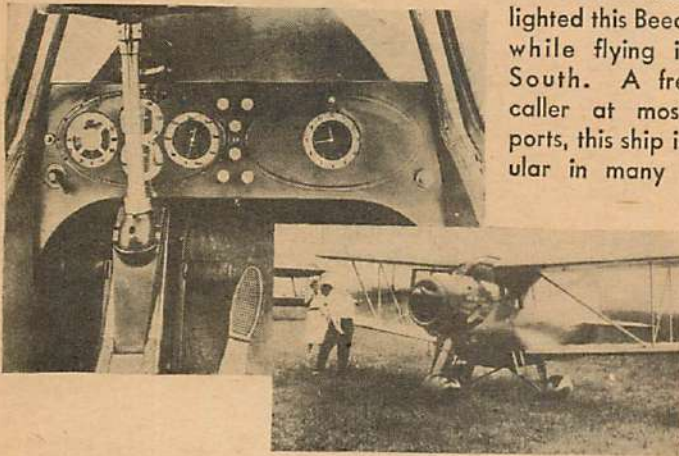
Below: Autolike in general arrangement of controls, throttle and dash, this Gwinn Aero Car was tested recently by Frank Hawks. Rudderless, the craft turns automatically when banked. The tricycle landing gear makes landings safer.



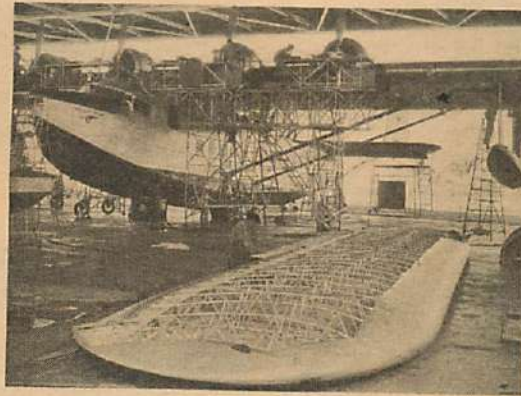
Below: Flying the scenic Grand Canyon route, a TWA Skysleeper passes over Meade Lake, above Boulder Dam. The tiny ripples on the lake mark the progress of a speeding motor boat, dwarfed by the gorge. Newly inaugurated by TWA, this new route has proven popular with air travelers.



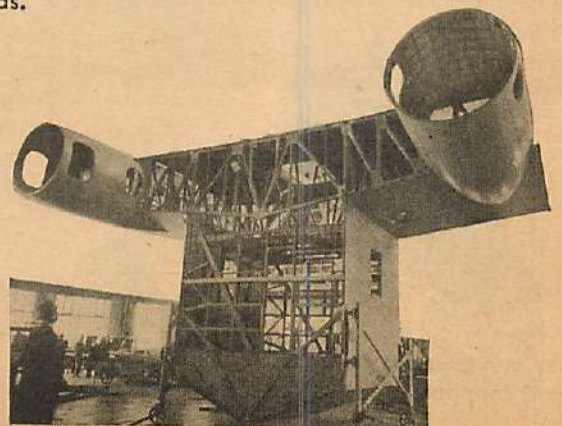
Florida sunshine highlighted this Beechcraft while flying in the South. A frequent caller at most airports, this ship is popular in many lands.



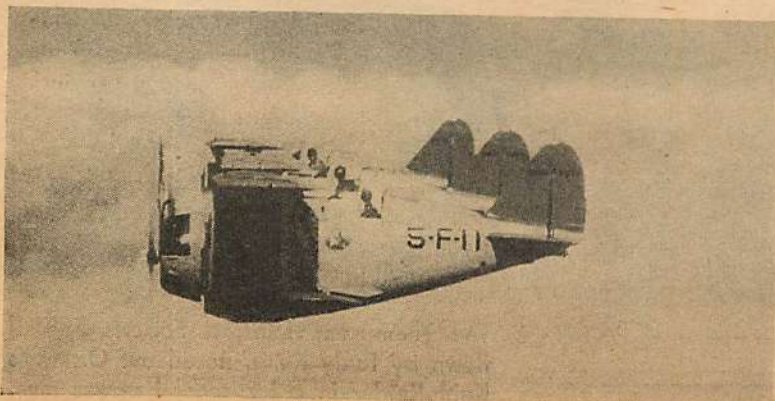
Right: Half hidden by a maze of scaffolding, the Brazilian Clipper undergoes its periodic inspection and overhaul. Work benches built into horizontal platforms enable mechanics to work uninterrupted. Giant airliners have caused revolutionary changes in servicing methods.



Below: The 1st of 6 Pan American giant Clippers takes form at Boeing's Seattle plant. This center section will contain the dining salon and, above it, the baggage compartment. The engine nacelles stand 25 feet above the assembly floor. When completed these 41-ton monsters will enter service over the Atlantic.



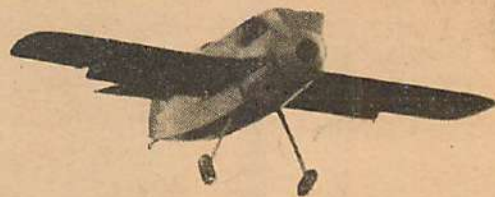
Below: A pursuit element, 3 Grumman fighters from the "Yorktown" in formation above the ocean clouds.



Action pictures of the National Air Races; Thompson Trophy photos taken at start and finish of that event.



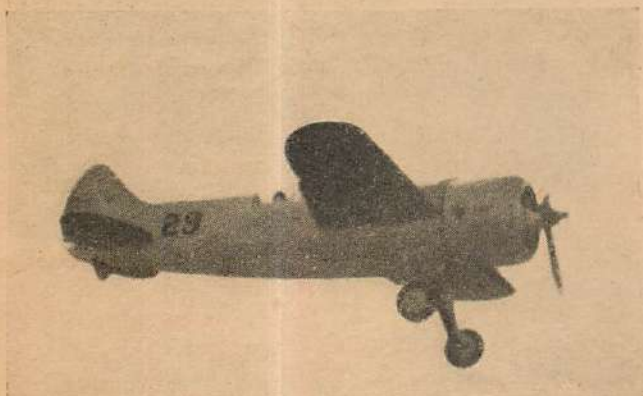
The Bendix winner, Frank Fuller's Seversky, taxis onto the apron at Floyd Bennett Field after its California-New York speed dash. Its sister ship, a high-altitude fighter, was at a disadvantage in the low-altitude Thompson event.



Wittman's "Special," forced out of the Thompson Trophy Race by a bent propeller tip, was leading the field when this picture was taken.



A remarkable picture of the Sundorph Bendix entry, its aileron shaken loose by vibration, landing to avert a crash.



Roscoe Turner's "Meteor," here leading the pack, missed a pylon in the Bendix due to an oil-smeared windshield. Turner placed 3rd.



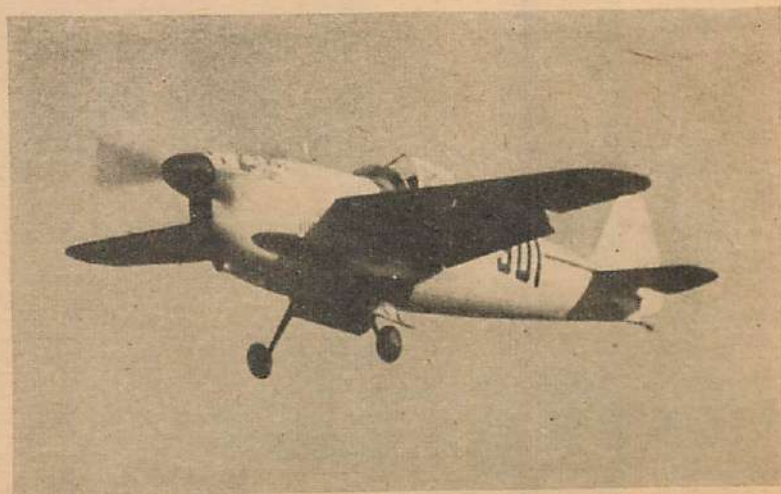
Flaps and wheels down, a Folkerts racer comes in for a fast landing.



Earl Ortman's Keith-Reider placed 2nd in the Thompson, losing by a hair in a thrilling finish.



With lugubrious ease this Ford trimotor, actually snapped at the top of a loop, was stunted in a novelty exhibition.



The Thompson victor, a Folkerts Special flown by Rudy Kling, nosed out Ortman's Keith-Reider in a last-second power dive.



AIR PROGRESS

A Summary of Aviation News

The Boeing fighters, three of which are pictured stunting in formation at the National Air Races, were for years classed with the world's premier pursuit. Now their days are numbered by the all-metal, low-wing designs.

TRANSPORT

The 22 air lines in this country flew a total of 44,363,670 passenger miles during the month of July in 1936. In July, 1937, they flew a total of 50,798,434 passenger miles, which gives some indication of air-passenger progress. In July of 1937, 611,562 pounds of express were carried and 120,571 passengers were carried.

To break up the crowding over regular airports, plans are now under way to develop what is known as the Flight Strip program, a measure to provide landing strips of 1,000 feet wide and about one mile in length, outside the regular boundaries of busy airports. They may be used in an emergency, or for regular landings by private or student ships, and will probably be handled by State highway departments and financed by highway funds.

France is looking forward to trans-Atlantic air-line work with keen enthusiasm. One of their first moves along this line is to place a "weather ship" out on the ocean in a position between the Azores and New York, where complete weather observation will be studied. Already the ship *Cari-mere*, the first floating weather bureau, has been sent out and is now cruising that area in the Atlantic with a complete weather observation station aboard. She will first complete a set of weather charts of the various areas of the At-

lantic and then eventually settle down and report full ocean weather conditions to ships and planes engaged in trans-Atlantic crossings.

The United Air Lines, in celebrating its 10th year of air operations, claims to have flown 120,209,435 air miles, carried 1,057,359 passengers and 42,357,951 pounds of mail and 8,039,927 pounds of express.

Kite flying by schoolboys has been banned in the area of the Brooklands (England) Airport, as the result of many complaints made by pilots using the field. This problem has also been brought up in this country, in areas where aircraft are engaged in routine passenger carrying. In Germany kite flying has been banned anywhere near airports or along the frontier borders.

Two French girls, Maryse Bastie and Suzanne Tellier, have just completed a 15,500-mile round trip from France to Siberia. They did the trip in less than a month, using a Caudron *Simoun*.

The Boeing School of Aeronautics has completed a new training monoplane equipped with a 320 h.p. Wright Whirlwind motor. The wing has an aspect ratio of 9/1 and, in spite of the fact that it has a fixed undercarriage, it has an estimated cruising speed, at 10,000 feet, of 223 m.p.h. The machine was designed to reproduce many of the characteristics of modern transports. (Turn to page 89)

30 Years Ago

The Aerial Experiment Association, sponsored by Mrs. Alexander Graham Bell, which included such figures as Alexander Graham Bell, Captain Tom Baldwin, Glenn Curtiss and Lieutenant Selfridge, moved its quarters from Baddeck, Nova Scotia, to Hammondsport, New York, to be near Glenn Curtiss' engine factory.

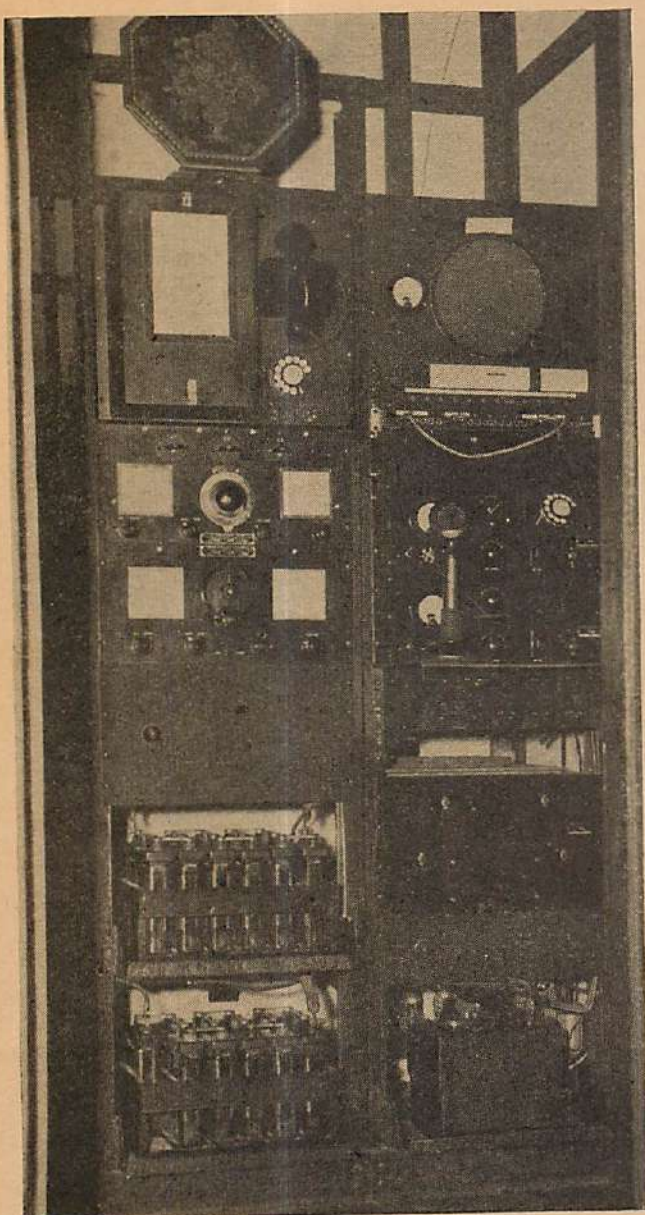
Glenn Curtiss built the first glider the organization used to test out their theories in December, 1907. It was a biplane-type craft with lateral control surfaces on the wing tips.

The list of recognized licensed aviators was given out by the International Aeronautical Association, and the United States was honored with the first two numbers. They ran as follows: 1, Orville Wright; 2, Wilbur Wright; 3, Vuia, France; 4, Ellehammer, Denmark; 5, Santos Dumont, Brazil; 6, Voisin, France; 7, Bleriot, France; 8, Farman, France; 9, Pelletier, France; 10, Delgrange, France; 11, Count de la Vaulx, France; 12, De Pischoff, France; 13, Boyer, France; 14, Dr. William Whitney Christmas, U. S.; 15, Thomas Baldwin, U. S.; 16, Lieutenant Thomas Selfridge, U. S.; 17, Glenn Curtiss, U. S.; 18, J. A. D. McCurdy, Canada.

Vuia, the first Frenchman to be awarded an international license, won his ticket with an odd-looking high-wing monoplane mounted on a set of tricycle wheels. The small motor was mounted in the center section above the pilot's head.

Leon Delgrange, listed among the French aviators, was the first man to take a passenger into the air and he was the first pilot to take a woman into the air in a heavier-than-air machine.

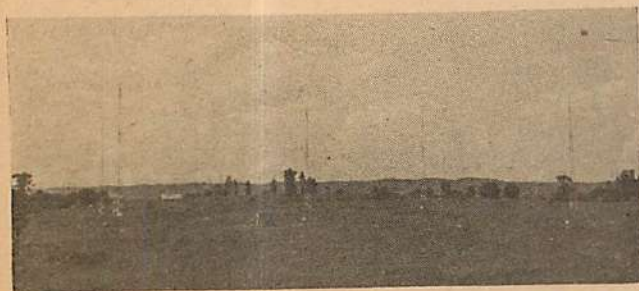
On December 6, 1907, Lieutenant Selfridge was taken into the air on Professor Alexander Graham Bell's famous Tetrahedral kite. Selfridge was in the air a total of seven minutes, over Cape Breton Island.



Broadcast booth in an airways' radio station.

THERE ARE devils in the heavens, and if you leave this solid earth to go prowling through their cloudy domain you'd better take care that the devils aren't at home—or else go well equipped with armor and charms.

From the earliest days of air-transport pioneering, the men who fly the airways have been up against these devils. The chief one is moisture, in the form of clouds or fog, rain, sleet and snow. And his ally is the cold.



Radio-communications stations have been established every 200 miles along the airways.



A pilot-dispatcher in two-way communication with a plane in the air.

BEATING

*The story of the air lines'
conquest of static
and the ice menace—*

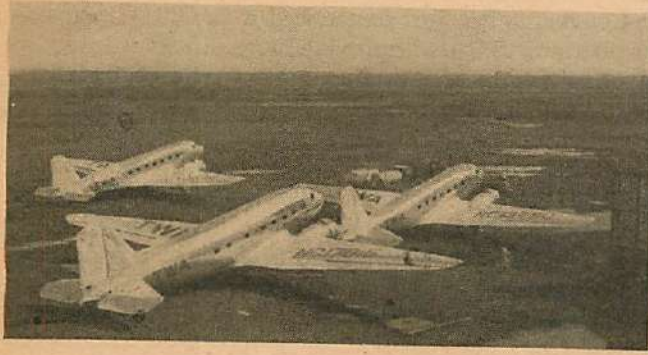
Many exciting battles of pilots, some ending in tragedy, many in thrilling escapes, could be recounted, covering the whole period of weather-flying pioneering, down even to the first months of 1937. But the true drama is where the victories are won, and the victories are won in the laboratories of patient and persistent scientists, the men who have devised the armor and contrived the charms which foil the devils of the air.

That was a splendid battle, and I say "was" because there are many indications that the year 1937 is a landmark in the history of the battle against weather. It seems that the victory is about won. Apparently only one or two problems, such as blind landings, remain to be solved in general practice, and they already have been solved experimentally, and in practice to a limited extent in Europe.

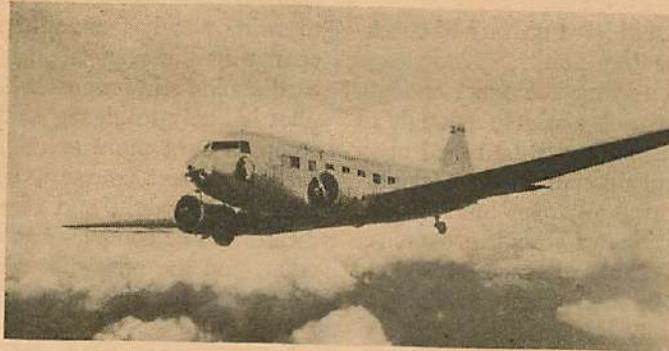
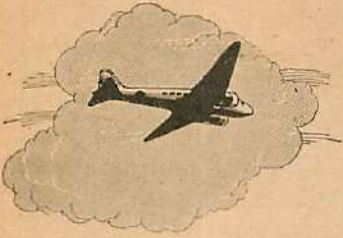
Let us take a quick glance at the progress of the first period of the battle against weather, and then examine more closely some of the most recent accomplishments.

The story naturally divides itself into two parts. The first covers the period when efforts were bent chiefly to the problem of avoiding bad weather. The second deals with the period, since about 1932 or 1933, during which the air lines have been defying the weather devils in their previously undisputed territory—and fighting more diabolical tricks than they ever anticipated.

When pilots first began flying they soon found that clouds, and moisture in other forms, would cut off their vision and leave them groping blindly and helplessly, unable to find a landing place, afraid to risk an approach to the earth. Many thus caught did risk blind approaches



Anti-icing carburetors and shielded ailerons arm these airliners against ice.



Newly developed equipment includes anti-static shielded loop antennae on the under surface of the fuselage above.

It used to be dangerous to fly above the clouds. Now air-line pilots do it as a matter of course.

THE WEATHER —the development of blind flying, air-line radio and navigation aids. DEVILS

By Lieut. W. M. Wood

and were lucky enough to come out into the clear at safe altitudes. Others, especially air-mail pilots, who were caught most frequently, jumped out and came down safely by parachute through the mist. And some ended up disastrously on the sides of mist-shrouded hills and mountains. No doubt about it, the thing to do was not to get caught out of sight of the ground. It was the era of contact flying. Bad weather was to be avoided.

Until about 1929, pilots had to depend on weather reports, which were not very reliable, handed to them before they took off. This information would often be "stale," and unexpected soupy weather encountered a hundred miles or so away would force them back home or to an emergency landing—if they were lucky enough not to be trapped where no landing could be made.

But it happened that a former army pilot named Thorpe Hiscock, employed by Boeing Air Transport, had refused in 1928 to accept the general opinion that short-wave radio could not be adapted to two-way telephonic communication between planes and ground stations. He experimented with a set in an automobile, then installed it in a plane, which he had thoroughly bonded and shielded to prevent ignition interference. Assisted by Edmund Allen, a Boeing test pilot, he worked the worst "bugs" out of the apparatus, and then turned it over to a manufacturer for further development and production.

Late in 1928 the department of commerce began broadcasting weather reports to pilots along the New York-Chicago airway, using a long-wave frequency as at present. Planes of National Air Transport had been

equipped with receivers. Airway weather broadcasting expanded rapidly in 1929 and later.

Also in 1929 the department of commerce began building its great teletypewriter system connecting the airway weather reporting stations, and, in cooperation with the U. S. Weather Bureau, established the beginnings of the "secondary net" of off-the-airway stations to collect weather information and make reports every three hours. Country-wide reports were increased from two to four a day, and hourly reports were made along the airways. Aviation meteorology advanced rapidly and is to-day a highly specialized and most important profession.

Even the present well-developed weather-reporting system is complained of at times by persons seeking always to improve it. But compared to the earlier situation the new facilities, developed in 1929, were from the beginning marvelous aids in the business of avoiding bad weather. During the early 1930s the new aircraft radios were steadily improved and came into general use. Pilots were enabled to keep informed, while in the air, of weather conditions over a wide area. If bad weather blocked the way to their destination they could learn where good weather might be found.

Pilots could even fly above solid clouds and storms, by dead reckoning, if they had information to the effect that they would come to an area near their destination where they could come down through a break in the clouds, ascertain their position by checking points on the ground, and then fly by contact under an adequate ceiling to their destination. But when the clouds formed a solid overcast, as they frequently do during a large part of the year, with a fairly low ceiling into which mountains in some places pushed their crests, the pilots could not take their planes up over the clouds and the mountains, even though they might know that the ceiling was adequately high at their destination.

The reason was that they would have no way of checking their exact position above the clouds. Knowledge of wind velocities and directions was not exact enough, and magnetic compasses were not accurate enough to permit dead-reckoning position finding to be relied upon to the extent of risking a blind descent through clouds, unless the ceiling over a very large area was much higher than it usually is under conditions of complete overcast. Moreover, flying for a considerable distance, absolutely blind, was very difficult with the instruments available at that time, and pilots universally stuck to areas of fair visibility and did contact flying.

The airliners were liberated from the necessity of contact flying and permitted to defy the weather devils as a result of the introduction of two extremely important airway aids, and two new instruments. The airway aids were the radio directional-range beacons and the marker beacons, now universally considered the backbone of the modern air-transport navigational system. Every reader of aviation magazines knows something of their operation (see AIR TRAILS, July, 1937). The range beacons (or radio beams) are narrow pathways extending outward from the broadcast station in four different directions. When a pilot is on the path he can hear a continuous hum in his ear phones, interrupted by the call letters of the beam station. When off the path on one side, instead of a steady note he hears the letter A (dot-dash). When off on the other side he hears the letter N (dash-dot). By cutting across the beam in accordance with a certain procedure, he can tell which of the four legs of the beam he is on. Directly over the range station there is a "cone of silence," where the signals suddenly disappear.

The marker beacons are low-powered stations broadcasting call letters which can be heard only when the plane is within five to seven miles of the station.

There were nine range beacons at the end of 1929, thirty-three by the end of 1930, and sixty-eight by 1932. On airways of approximately the same number of miles there are now about one hundred and seventy range beacons. The beacons were extended very slowly because of lack of money, and there still aren't enough. In some places planes stay on the ground when they might otherwise be flying. As this is written the Bureau of

Air Commerce has just announced a \$7,000,000 expansion program which will provide more directional ranges and other facilities, including a new type of high-frequency "fan" marker beacons. But that is another story.

The two new instruments which began about 1932-33 to be widely used by the air lines were the directional gyro and the gyro-horizon. They, together with the radio ranges, made extensive blind flying practicable. The automatic pilot followed and made the job easier.

The directional gyro is an instrument which shows the pilot immediately the exact number of degrees he has swerved from his course. Magnetic compasses, especially when headed in certain directions, have a tendency to swing slowly from side to side, and to lag behind any change in the plane's position. Moreover, the compass card stands still longest when at the end of a swing, so a pilot is likely to zigzag back and forth, which makes the compass even more erratic. The directional gyro is set for the correct course as near as possible and then the pilot flies straight and steady by watching the gyro indicator. The compass has a chance to settle down somewhat, and the pilot discovers his actual magnetic course by noting the mid-position between the extreme read-

ings of the slowly swinging compass. Thus he can reset the gyro to the correct course, if he is still off. The gyro has to be reset rather frequently, as it tends to develop an error. But this is easy.

The gyro-horizon, or artificial horizon, is an instrument which shows the figure of a little plane on a dial against a horizontal line. The line takes the same position in relation to the little plane that the actual horizon has with reference to the actual plane. So the pilot simply keeps the little plane on the dial in the proper position. This instrument is much more satisfactory than the turn-and-bank indicator which had been in use for some time previously.

Now pilots had the directional gyro and the gyro-horizon to make blind flying easier; they had the radio beam to keep the plane on the right course, regardless of side winds; and they had the cones of silence, the marker beacons, and the "fixes" obtained by noting the points where two radio beams crossed, to show the exact position over the ground, even though unable to see anything but murk. Thus armed, they braved the weather which they had avoided before. All that was necessary now was to know that there was adequate ceiling and visibility at the airport of destination. A pilot could fly to the cone of silence over the range station near the airport, get information as to ground conditions by radio, and mush down through the clouds, confident that he would come into the clear without hitting any hills or mountains. Exact landing procedures were worked out for each airport.

But the weather devils were waiting with a bagful of tricks. The devil of moisture was ready, with his ally, cold, and together they encrusted wings, propellers and control surfaces with ice, destroying aerodynamic efficiency and throwing planes out of control. Not content with this, they stuffed the carburetors (Turn to page 77)



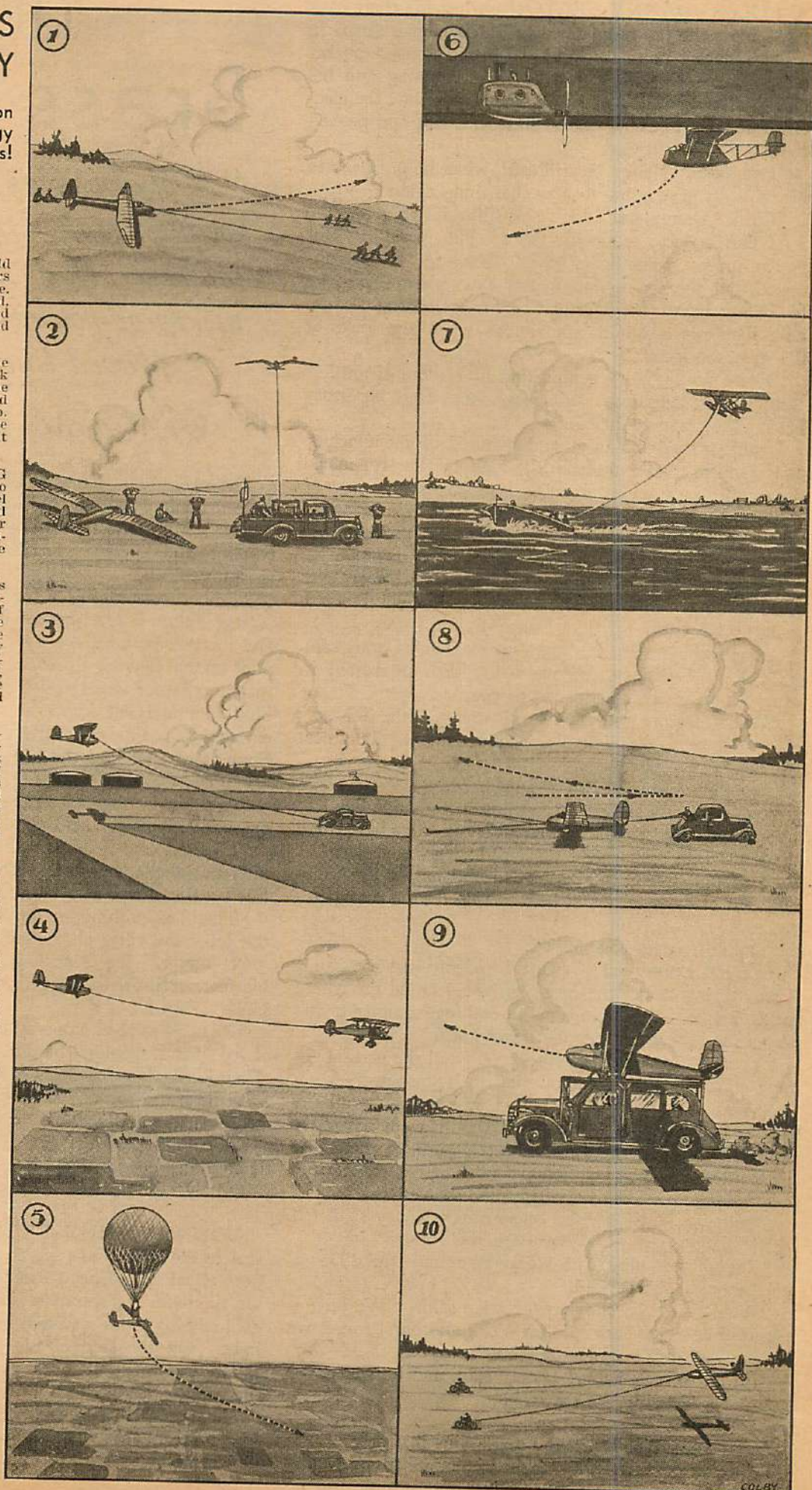
Planes equipped with anti-static devices will receive directional signals from this radio range broadcasting station. The tower at the left is for the "beam." The one at the right for weather reports.

THE FLIER'S DICTIONARY

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

GLIDER LAUNCHING METHODS

- 1 **SHOCK CORD**—Men hold tail of glider while others stretch long rubber cable. When cable is stretched, men release the tail and the ship shoots ahead and up as indicated.
- 2 **WINCH LAUNCHING**—The machine winch in the truck driven by a gas engine winds up a cable attached to the nose of the ship. This is released by the pilot when maximum height is reached.
- 3 **AUTO-TOW LAUNCHING**—The glider is attached to the auto by a long steel cable that may be released by either the pilot or car driver. When the maximum height is reached, the cable is dropped by pilot.
- 4 **AIRPLANE TOW**—This should only be used by experts. The plane takes off towing the glider at the end of a long steel cable that may be dropped by either pilot. When the altitude or location is reached, the glider pilot releases the end of the cable attached to his ship.
- 5 **BALLOON LAUNCHING**—As used by several European pilots, the glider is attached to the bottom of the basket of a regular gas balloon. When the desired altitude is reached, the glider is cut loose. It drops slightly and then goes into a glide.
- 6 **DIRIGIBLE LAUNCHING**—Lt. Barnaby of the U. S. navy was dropped from the bottom of the dirigible *Los Angeles* while in flight. He flew for twelve minutes.
- 7 **MOTOR BOAT TOW**—In this case the glider must be equipped with pontoons for a water landing. The boat tows the glider to the maximum height the cable will allow and then the pilot releases the glider.
- 8 **AUTO SHOCK-CORD LAUNCHING**—This is a new method of using the elastic cord with an auto doing the stretching. The two ends of the elastic cable "V" are securely pegged down and the tail of the glider attached to the rear of the car. The car draws the glider back to stretch the cables, releasing it upon a signal.
- 9 **AUTO-TOP LAUNCHING**—This has been used successfully, but should be done by experienced men. The glider is attached to the top of the car by a special framework in which the skid of the glider rests. When enough "take-off" speed has been attained, the pilot releases the glider from the frame.
- 10 **MOTORCYCLE-TOW LAUNCHING**—In this type of launching the motorcycles are used either to stretch the elastic cord as in method No. 1, or tow it to a launching height.



YOUNG DANNY FELTON pushed his chair back from the tap-room table in the Beekman Arms in Rhinebeck and stuck a hand in his trousers pocket seeking a coin. His blue eyes were laughing and his blond hair was a little mussed as he approached the electric recording machine, put a dime in a slot and pushed the No. 7 Button twice.

"I suppose," Nancy Herrill said, when he got back to his table, "you're going to play that thing again."

"Gosh," Danny said, "don't you like it?"

"I like it once, or maybe twice," Nancy said. "But you've played it six times now." She tried to look annoyed, but the expression in her eyes when she spoke to Danny belied her words. She was looking at him with that expression a woman has when she looks at the man she loves.

"There's a big story behind that little piece of music," Danny said, laughing. "At least there is a big story behind the reason I like it."

Danny turned his head and grinned at the machine as the music that came from the loud-speaker resembled the organ music on a carrousel.

"Oh, the merry-go-round broke down," he sang. "Rum te tum tum tum tum—rrrum pum bum, rum pum bum. Oh, the merry-go-round broke down!"

"Tell me about it," Nancy said, and her brown eyes were shining. She was thinking how pleasant life was going to be with a guy like Danny Felton.

"I'm afraid you wouldn't be very excited," Danny said.

"Tell me," Nancy commanded. "I'm interested in everything that ever happened to you."

"Well," Danny said, "when I was a little tike, say about ten years old, I had a very bad habit. It almost got me."

"Smoking opium?" Nancy suggested.

"No," Danny sighed. "Nothing in the dope line. It wasn't even cigarettes. It was merry-go-rounds. There used to be an amusement park right near our place. I used to pull weeds in the garden and empty the ashes and run errands to get nickels to ride on the merry-go-round."

"Didn't it make you sick?"

"Yeah," Danny said. "But I rode it just the same. I was trying to get the brass ring so I could get a free ride. I spent all the money I earned one summer trying to get the brass ring. And I never got it."

"Youthful frustration," Nancy said and she was laughing. "Maybe that's what's wrong with you now."

"My mother found out how I was spending all my money and she told my father," Danny went on. "He asked me about it and I told him the truth. I remember he muttered something about foolish perseverance and determination. Then he whaled the seat off my pants."

"And you never got the brass ring," Nancy said. "I think that's a shame. Where are you going?"

"I'm going to play 'The Merry-go-round Broke Down' once more," Danny said.

"We'd better be shoving," Nancy said. "We have a ninety-mile drive back to New York and don't forget we fly the leg to Chicago to-morrow."

"I'll not forget, baby," Danny said, and he went over and put a nickel in the machine.

THREE MEN sat in the operations manager's office of Midwest Airways at about the same time young Danny put a last nickel in the electric recording machine.

THE Brass Ring

"A chain is as strong as its weakest link," the operations manager had said. But a merry-go-round-minded pilot proved him wrong.

By Harold Montanye

The operations manager and chief pilot of Midwest were listening to Jed Macon, pilot of the big twin-motored Meredith that would carry Danny Felton as co-pilot and Nancy Herrill as stewardess the next morning.

"To be frank with you," Macon said, "I don't know. Young Felton is level-headed and he's a marvelous pilot. But whether he has the guts to be put on as a full-fledged pilot on that new leg to Nashville is another question. A man can be an expert pilot with lots of experience behind him and not know how to handle himself in an emergency. I'm not sure Felton has what it takes. Sometimes I've had the idea that he has a weak spot some place."

"A chain is only as strong as its weakest link," the operations manager said ponderously.

"I'd like to see Felton get the job," Macon said. "He's nuts about the stewardess on our leg, Nancy Herrill. She's a fine girl. They want to get married."

"That has nothing to do with our selecting him for the job," the chief pilot snapped.

"It might," Jed Macon said, cryptically, and got to his feet. "She'd be a good steadying influence for any pilot."

The chief pilot and operations manager both wondered if Jed Macon wouldn't like to be in young Danny's shoes. They knew that Jed Macon was a hard-boiled old-timer with little use for any woman and no use for the stewardesses the air lines were carrying.

"We'll think it over," the chief pilot said. "Let us know if anything occurs that gives you a definite opinion."

"O. K., gentlemen," Jed said. "I'll be seeing you."

YOUNG DANNY FELTON sat in the co-pilot's seat in the nose of the big twin-motored Meredith transport when Jed Macon came aboard the next morning. On the breast of Danny's jaunty uniform were a pair of golden wings that sparkled brightly in the morning sunlight. On the side of his blond head was perched a jaunty cap with "Midwest Airways" embroidered across the front.

Nancy Herrill sat beside him in the pilot's seat, dressed in a uniform that was quite as jaunty as Danny's, while he warmed up the powerful motors. Inside the terminal, while the passengers were having their tickets registered,

a loud-speaker was bawling "Plane leaving for Cleveland, Toledo, Chicago, and points west in ten minutes!"

"Oh, the merry-go-round broke down," Danny sang, as he manipulated switches and levers with one hand and hung onto Nancy's hand with the other.

"You and your old merry-go-round!" Nancy said.

"Scram, kid!" Danny said, as he looked into his rear-view mirror. "Here comes Jed."

Miss Nancy Herrill scrambled. She was out of the pilot's seat and walking down the runway between the seats before Jed Macon noticed where she had come from. He swung his pouch of registered mail out of her path and touched the tip of his cap as she passed.

"She's sweeter than a baby's breath this morning," the irrepressible Danny said to Macon.

"Trip No. 7—Trip No. 7," he chanted. "Calling Station WEPP—WEPP."

After a moment he pushed back his ear phones and spoke to Danny. "Ride the beam, kid," he said, and Danny listened to the interlocking A and N that told him he was on his true course.

A half hour later fog and clouds came rolling toward them, fog that cut them off entirely from the rest of the world. Danny checked his instruments constantly as the fog licked against the coated window glass and big drops of rain began to splatter on the metal wings.

"What do they say about our ceiling at Cleveland?" he asked Jed.

"About three thousand," Jed answered, and pointed toward the deck to tell Danny to get out of the clouds.



He threw a last twisted smile in Danny's direction and dived head-first into space—

"Look out she doesn't boil over," Jed growled, as he stowed away his registered mail. "Check over the passenger and cargo lists."

"Aye, sir!" Danny said, as the passengers fled down the runway and were assigned to seats. The metal doors were closed and Jed Macon taxied the big ship to the longest runway into the wind. As the dispatch tower gave him his signal he poured soup into the two powerful engines and skimmed down the runway. The tail rose and the big ship began its spiral upward, as Nancy flashed a sign reading: "Smoking Now Permitted," and offered the passengers cigarettes.

Jed Macon threw the control wheel of the big ship to Danny after he had leveled off at twelve thousand feet, and pressed the button on his radio transmitter.

At five thousand feet the big ship plunged out of the cold, drab fog and stuck its nose into a world of glorious sunlight. The fog stopped so abruptly it seemed as though an invisible curtain cut it off at a given point.

"This," Jed Macon said, "is a little better."

Danny nodded his head and looked into his rear-view mirror to see a child of three, who was riding on his mother's lap, try to massage the back of the neck of the passenger in front of him with a lollipop. He chuckled to himself. Then he happened to get a glance at the face of the man in Seat No. 5 on the port side. He swallowed his chuckle as he saw the man's pasty face twitch a half dozen times.

"We got a snowbird riding in five on the port side," he said to Jed Macon.



It was only his high speed that saved his life, as De Rocco fired three shots at him—

pay. The cops are going to meet him in Cleveland with the key to the hoosegow. The thing we've got to do is keep him pleased."

"Maybe if you went up behind him and stuck your automatic in his back we could tie him up and—"

Danny began.

"Nuts!" Jed Macon snapped. "I don't want to get my pants shot off and we've got to think of the other passengers. If he's full of dope he's dangerous."

"I might fix a drink for him and put him to sleep," Nancy said. "I've got some pretty strong stuff in my medicine kit."

"Leave him alone!" Jed snarled. "Don't give him anything or pay any attention to him unless he asks for it. If he gets suspicious he might go

haywire. You go out there and act twice as tactful as you ever did before and keep your eyes off him."

"Gosh, I'm scared," Nancy said. "I hate to go back out there."

"Hold everything!" Danny said sharply. "You may not have to go back out there. He's coming in!"

Jed Macon whirled in his seat as the door opened behind him and the man with the pasty face stuck his head inside. There was a mad gleam in his eyes that joined with his buck teeth and twisted mouth to make his face weird and horrible. He had the zipper bag in his left hand and his right was shoved down inside his coat. He slid the door shut behind him and nodded his head toward the curtain that closed the pilot's compartment off from sight of the passengers.

"Flip that curtain, sister," he said in a husky voice.

Nancy flipped the curtain with a hand that was anything but steady.

"Now gimme your gat, skipper," De Rocco snarled. "Don't put your finger on the trigger or I'll blow your head off!"

"This is a hell of a time for a stickup," Jed said. He had been debating in his mind whether to go after the gun strapped to his side. He decided against it, because of the passengers.

"This ain't no stickup an' you know it," De Rocco sneered. "I saw the dame come in here and I saw you all give me the once-over and begin talking on your telephone. You're wise to me. Well, get this—they ain't goin' to pick me up alive. See?"

"We're not going to bother you," Danny said. "Go back to your seat. We won't use our telephone the rest of the way into Cleveland. It's up to you when you get there."

"An' walk into a bevy of coppers," De Rocco said. "Ain't you a help. Now listen! If you guys play along you won't get hurt. If you don't you're goin' to be so full of lead they could melt you down and sell you for ammunition."

(Turn to page 80)

"We got a what?" Jed asked.

"A hophead—a dope," Danny said. "He's getting as many r.p.m.s out of his face as we're getting out of the motors. We better tell Miss Herrill to keep an eye on him."

It was just at that moment that Nancy slid the door to the pilot's compartment open to announce that she had been keeping an eye on him.

"That man in five on the port side," she said. "Don't look at him now, he's watching me. He's acting awfully funny. When he came aboard I tried to take his zipper bag and stow it away with the rest of the luggage. He almost took my head off. He acts as though he might be going to begin seeing pink elephants."

"He's a coke sniffer," Danny told her. "Leave him alone. He'll be all right. Give him anything he asks for and don't start anything with him. We'll take him off at Cleveland if he doesn't behave."

"Wait a minute," Jed Macon said, as he adjusted his ear phones. "Trip No. 7—Trip No. 7," he chanted into the microphone. "This is Trip No. 7. Go ahead!"

Jed Macon's eyes grew large and round as he listened to the things the "goat head" at WEPP had to tell him. When he gave his all-clear signal and pushed his ear phones back, his face was grim.

"You're right," he said to Danny. "He's a dope. His name is De Rocco. The police have been hot on his tail for three weeks. He and two other men stuck up a bank in Jersey and killed the cashier. The cops got the other two, but De Rocco managed to slip through them. They traced him to our airport this morning. He's armed to the teeth and full of dope. That zipper bag probably is filled with cash."

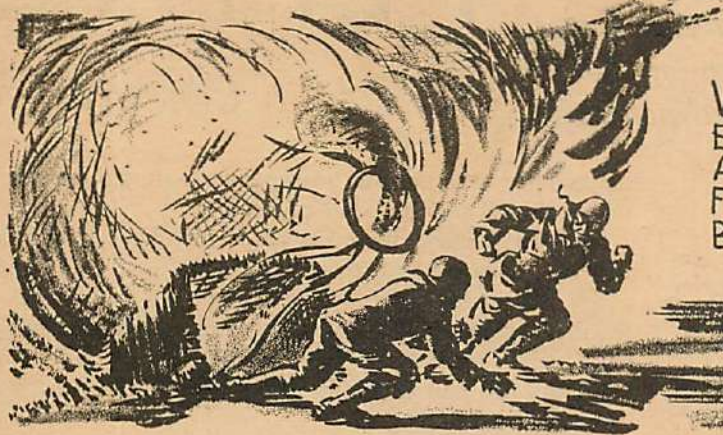
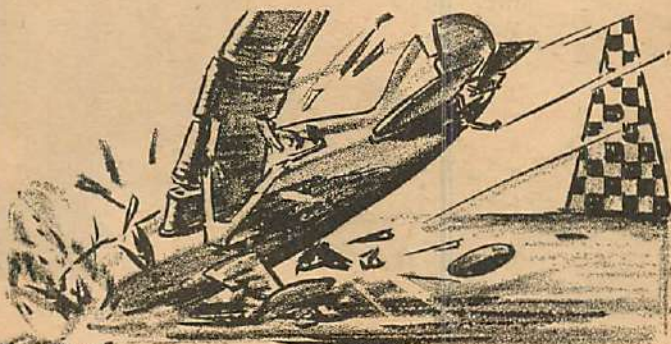
"You're sure, skipper?" Danny asked. "Did they describe him?"

"They did," Jed said. "They even told me about his buck teeth. Keep your eyes off him, Miss Herrill! Don't let him think we know anything or there will be hell to

SPLIT-SECOND ACTION

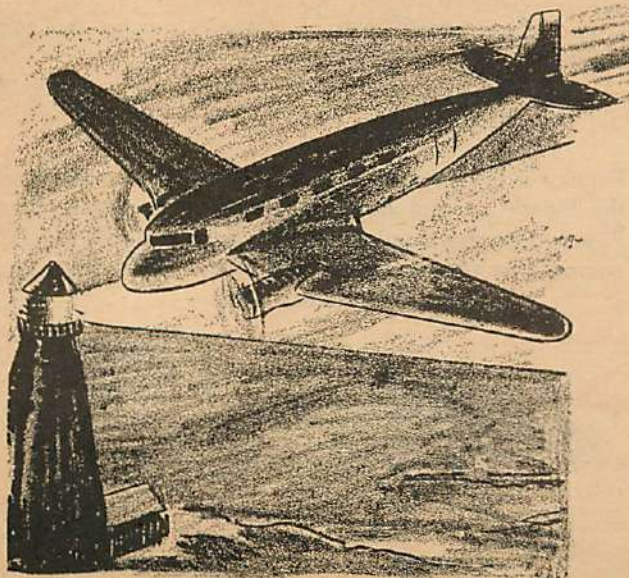
Hair-breadth escapes, hair-trigger decisions, dangerous moments that come once in a lifetime.

ROGER DON RAE ESCAPED DEATH IN A SPECTACULAR CRASH AT THE RECENT AIR RACES. SPEEDING AT 250 M.P.H. CLOSE TO THE GROUND A BIRD, APPARENTLY, SHATTERED HIS PROPELLER. RAE FOUGHT HARD FOR CONTROL, BUT THE TINY SHIP CRASHED. RAE RECEIVED ONLY SEVERE HEAD CUTS.



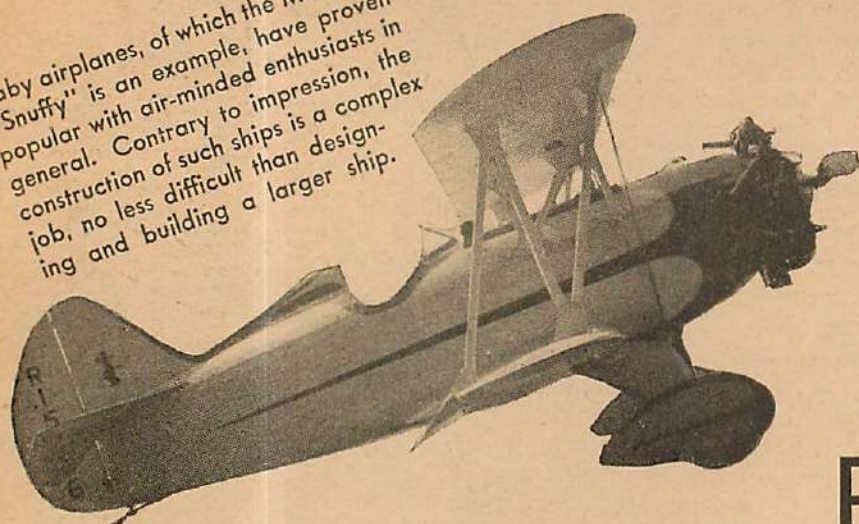
WHEN THEIR BALLOON CRASHED AND EXPLODED, CAPT. H. MACCORMICK AND LIEUT. J.A. TARRO WERE THROWN FREE OF THE BASKET, JUST AS THE BURNING FABRIC COLLAPSED OVER IT.

ADRIFT FOR THREE DAYS IN HEAVY ARCTIC SEAS, THEIR PLANE BATTERED BY ICE FLOES, ANTONIO LOCATELLI AND THREE COMPANIONS ON AN ATTEMPTED 'ROUND-THE-WORLD FLIGHT' ESCAPED AN ICY DEATH BECAUSE A FLICKER OF LIGHT WAS SEEN ONE NIGHT BY A LOOK-OUT ON THE U.S. DESTROYER RICHMOND TEN MILES AWAY!



IN AN EFFORT TO ESCAPE A TERRIFIC SLEET STORM THE PILOTS OF A TRANSPORT PLANE ON THE MIAMI-NEWARK RUN SHUTTLED ABOUT BETWEEN FLORIDA AND SOUTH CAROLINA. THEIR RADIO DEAD, UNABLE TO PICK UP THE RADIO BEAM, WITH GASOLINE FOR SCARCELY TWO HOURS' FLYING, VISIBILITY SO POOR THEY WERE UNABLE TO LOCATE LANDMARKS AND WITH THE POSSIBILITY OF BEING LOST AT SEA, THEY WERE LUCKY ENOUGH TO SIGHT A LIGHTHOUSE AND FOLLOWING THE LIGHT BEAM WERE ABLE TO MAKE A SAFE LANDING IN A NEAR-BY FIELD. **JON L. BLUMMER**

Baby airplanes, of which the M. G. W. "Snuffy" is an example, have proven popular with air-minded enthusiasts in general. Contrary to impression, the construction of such ships is a complex job, no less difficult than designing and building a larger ship.



Send me the news about your club, its flights, new pilots, everything—or about your own plane if you have one; also pictures if you have them. Do it now!
—G. H. S.

LIGHT FLYING

Light planes at the National Air Races, the Light Plane Derby; facts on home-built airplanes; club news and activities.

Conducted by

FLIVVER PILOTS SHOW REAL STUFF

By Samuel Taylor Moore

"The Sunday Drivers' Brown Derby" was what National Air Race humorists nicknamed the Flivver airplane derby for the C. G. Taylor Trophy, opening event of the 1937 air classic, thinking to compare the pilots of popular-priced light planes with those incompetent and half-witted drivers whose names make up the fatality lists in Monday morning newspapers.

The humorists proved to be quite wrong.

The first three of fifteen prize winners flew a dog-leg course of 135 miles, previously unknown to them, within less than a minute of their own forecasts of flying time—with all watches sealed! E. H. Spiller of Aurora, Illinois, who won the C. G. Taylor Trophy and \$150 in cash, was but 23 seconds off from his predicted flying time. A single second separated the next two contestants for place and show, Bill Graham of Pittsburgh, Pennsylvania, and Carl McQuigg of Lewiston, Pennsylvania. They finished, respectively, 39 and 40 seconds at variance with their forecasts. Considering that timing began with the first turn of the wheels on take-off to a taxi finish with tail skid over a formal finish line, veteran transport pilots could hardly have done better.

As to other contestants, all were within from one or two minutes, up to fifteen minutes, of their estimates, save for a single inexperienced youth who, mistaking Canton for Akron, Ohio, was something more than an hour late.

Despite squalls and rain all came through from Columbus to Akron, Ohio, by way of Bucyrus.

The following day the contestants received the applause of the thousands assembled for the opening ceremonies of the National Air Races as, expertly spaced in echelon, they passed in review before the grand stands at Cleveland to let air-race fans and the world in general know that the Flivver plane had "arrived."

Because speed normally is the goal of the National Air Races, the Flivver derby represented the only truly new event in the air races this year. For the first time an air-

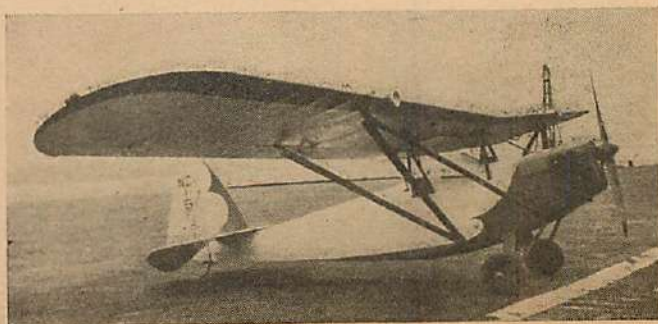
plane derby was evolved where speed was no consideration and only piloting skill counted.

The idea for this unique event, which beyond question will be a regular feature of future National Air Races, really originated when Cliff Henderson, headman of the races, picked a Taylor-Young airplane as his personal ship. Cliff, after many forced landings and one serious crack-up, has had to admit that a Flivver plane is all he can handle safely.

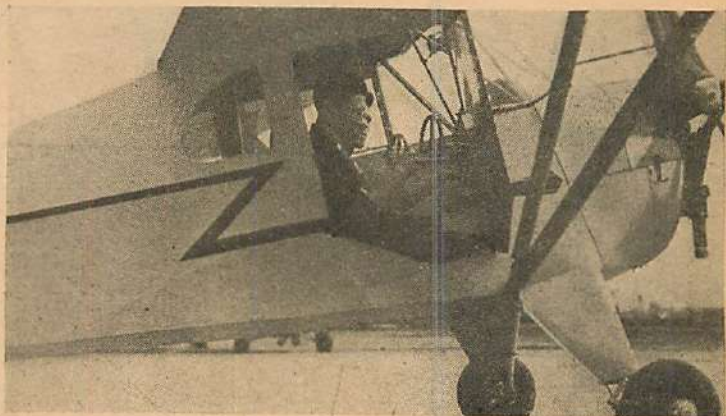
Talking with C. G. Taylor, the shy little man who has designed two thirds or more of all Flivver planes now flying in the United States, Cliff allowed as how he would like to give a prominent spot on the National Air Race program to Flivver planes to let the world know of their growing popularity, if only some simple formula for a derby could be evolved. From ten years' experience, ranging from the "Powderpuff" to derbies for both men and women, the necessity of devising formulas to equalize the varying speed and range of many makes of ships has been a headache to the air race management, never failing to produce a record crop of squawks among the competitors.

C. G. Taylor, interested only in promoting piloting skill, had an immediate answer. The derby would be

Popular a few years ago both in kit and assembled units, the Heath parasol appeared recently in sturdier form. Powered by the Continental 40 h.p. engine, the Heath is comparable with successful light planes of the day. Note the landing lights.



The modern light plane is fast, reliable and commodious. Of special interest is the Aeronca Model K. Controls are dual and ample space is provided for 2 persons. Such ships are ideal for aerial outings, vacations or even business.



PLANE CLUBS

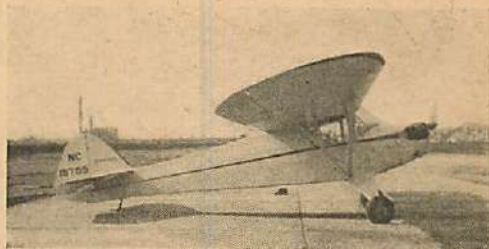
Gerald H. Smith

limited to planes costing \$2,000 or less and restricted to ships powered with aviation engines of 40 horse power or less. Insofar as every pilot should know the performance of his or her own plane, each contestant should be allowed to forecast his own flying time from starting point to finish. The only thing the pilot would not know in advance was the length of the derby route he would be required to fly. Thus, this simple formula included the fundamentals of flying skill, knowledge of the characteristics of one's own plane, plus ability to interpret weather information for helpful or hindering winds, and plain navigating talent in cross-country flying from point to point.

Mr. Taylor offered a valuable trophy to the winner and among manufacturers of light airplane parts he raised \$675 additional for cash prizes, Continental Motors, Titanine Dopes, Firestone Tires, Sensenich Propellers and Scintilla Magnetos doing their part. Socony-Vacuum furnished free gas and oil, and Cliff Henderson raised the ante with free season passes to the races to all pilots competing.

That there were not more entries in the derby was largely due to (Turn to page 93)

The Taylor-Young has the appearance of a much larger ship. Distinguished by its symmetry of line, smooth handling is an attribute of its design.



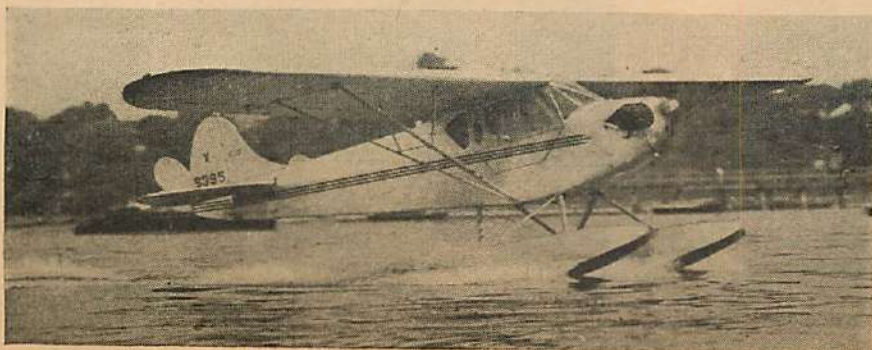
Unusual among marketed light planes is the Rose "Parrakeet." Seating the pilot only, the craft is sensitive to control.



Popular with Canadian and British fliers, the 2-place De Havilland "Moth," D. H. Gipsy 1 90 h.p. motor, has seen years of popular usage.

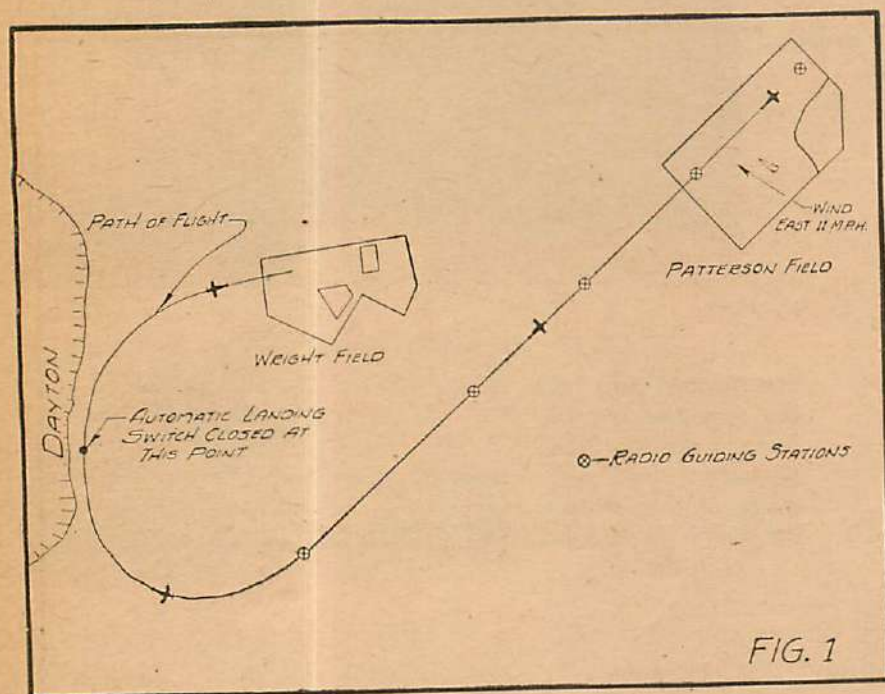


Flown by Tex Rankin at both the Cleveland and St. Louis air races, this Ryan S-T was stunted to gaping crowds. Rankin, piloting the Ryan, won the International crown at St. Louis.



Equipped with floats, light planes have proven the feasibility of visiting lakes and harbors otherwise inaccessible by air. A pontooned light plane, this Taylor "Cub," for an example, provides safely excellent experience in the water handling of sea-going aircraft.

U. S. ARMY AIR CORPS



The new developments in modern aircraft, to insure high performance, have required an increasing number of cockpit devices, all of which demand the attention of the pilot at some time or other during any given flight.

Pilots have felt the need for simplification of the various controls. This means that many of the functions now performed by the pilot in flight control and navigation must be done automatically.

The Materiel Division, over two years ago, began development of the procedure of instrument landing.

Figure 1. The path of the first automatic flight and landing, made August 23, 1937 between Wright Field and Patterson Field.

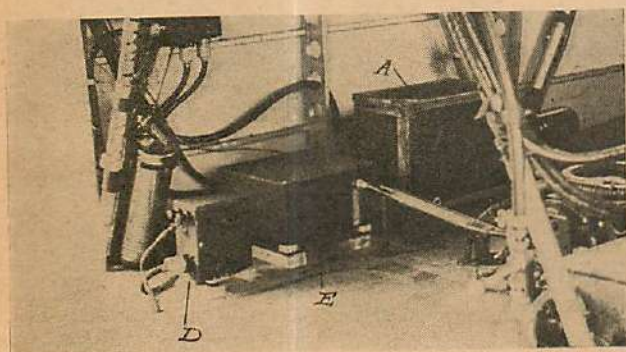


Figure 3. A—This device maintains proper altitude during initial approach; D—marker beacon receptor; E—frequency selector (see D in Figure 4).

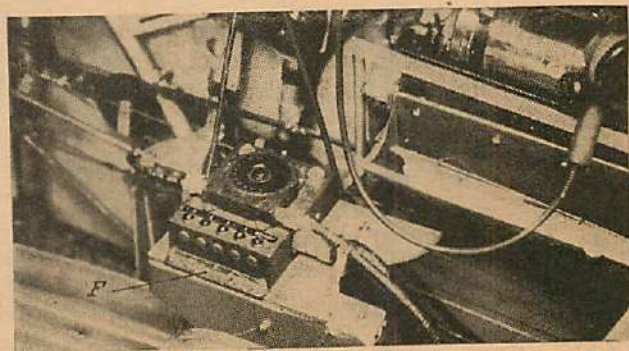


Figure 5. The pilot of the airplane checks the correctness of the automatic landings by observing the frequency selector F.

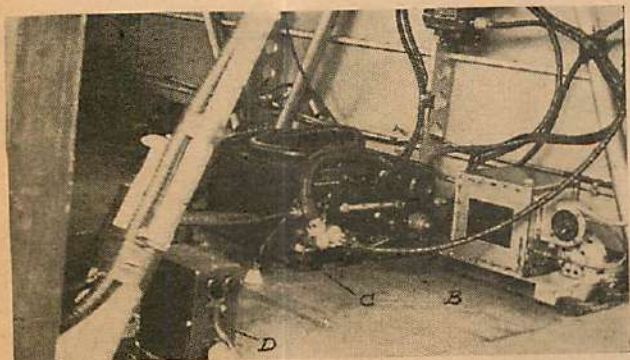


Figure 4. C—The radio compass, frequency of which is set by the interaction of the marker beacon receptor D, working in conjunction with frequency selector E.

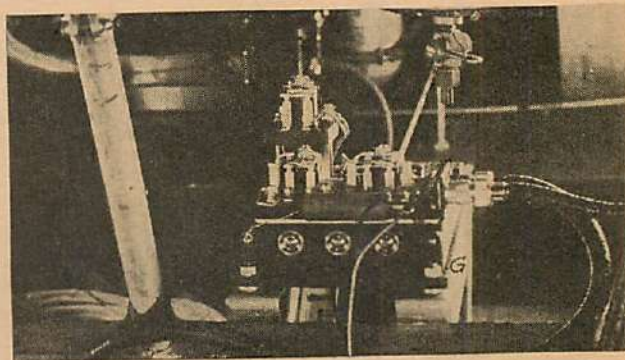


Figure 6. Through devices A to F the plane heads to the compass station farthest from the field. As plane reaches each station in line, the frequency is automatically changed to that of the next station. The automatic throttle G operates simultaneously.

AUTOMATIC LANDING SYSTEM

Test airplanes from Wright Field have been flown automatically as far as Texas and return, under the new control system. Several flights have also been made from Wright Field via Buffalo, New York to Newark, New Jersey and from there via Langley Field, Virginia, to the home field.

Obviously the automatic landing system involves other factors besides control of direction. These factors are control of altitude and glide, engine control in flight and after landing.

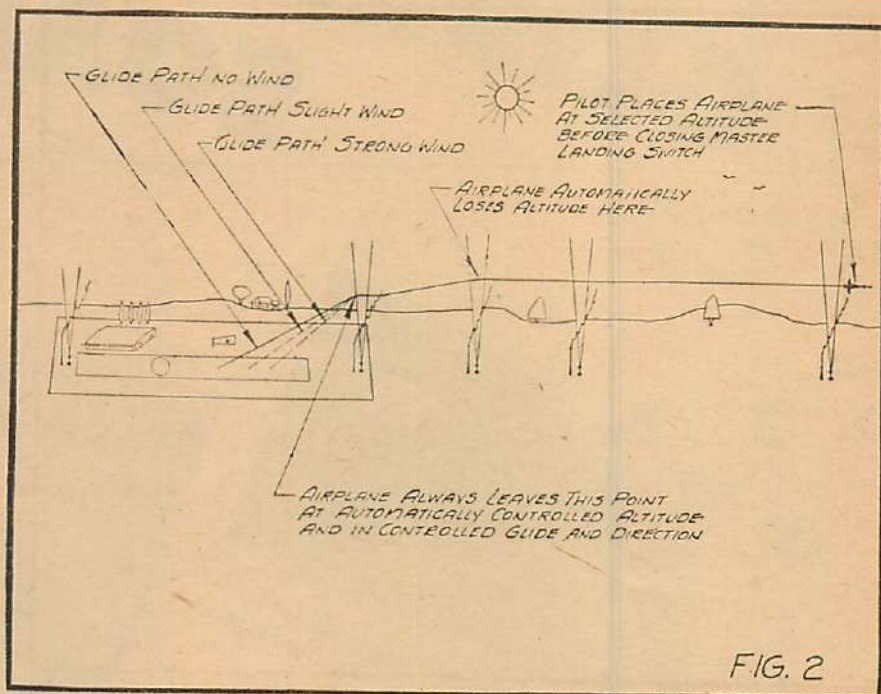


Figure 2. A vertical view of the experimental flight's landing path. The diagram is self-explanatory.

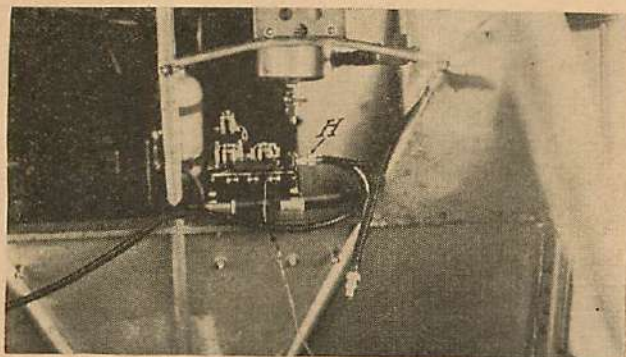


Figure 7. When last station is passed over, the interconnected altitude and throttle controls automatically recover required minimum altitude. Plane maintains selected glide angle and rate of descent. H—Automatic throttle actuating motor.

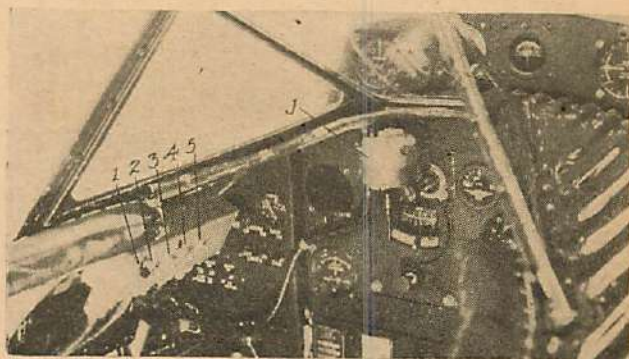


Figure 9. J—Sperry Gyro Pilot for flight control; 1—master landing switch; 2, 3, 4 and 5—auxiliary reset switches.

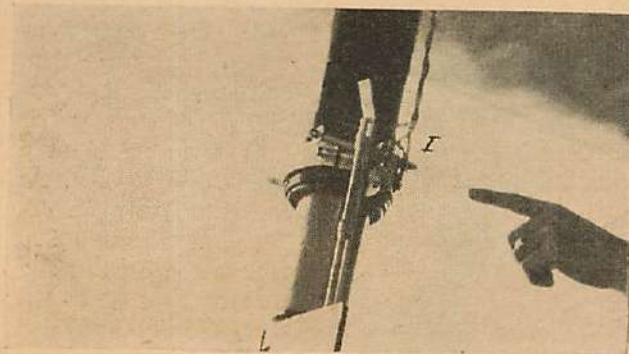


Figure 8. I—Landing gear switch activates throttle and brakes for full control after contact with the earth has been made.



Figure 10. Fokker C-14 Cargo airplane, the ship used for experimentation in automatic landings. The test landings were made under cross-wind conditions, the wind velocity being as high as 11 m.p.h.

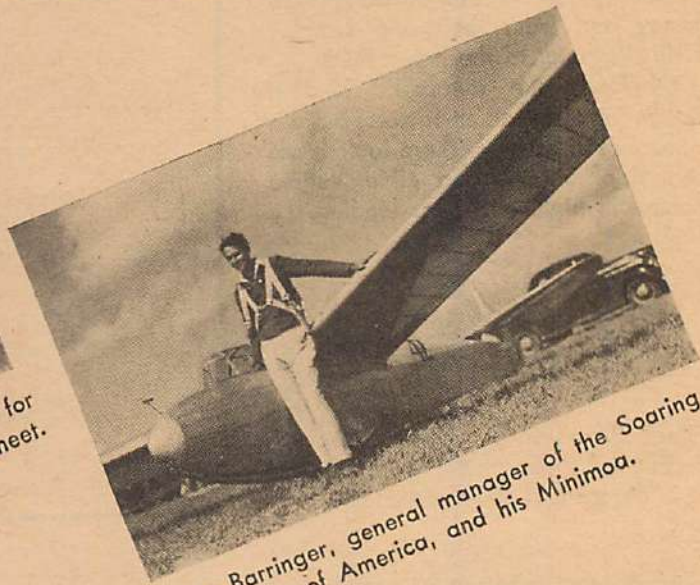


GLIDING AND SOARING

*Conducted by
Alexis Dawydoff*



Emil Lehecka prepares to take off in his Cadet for a stunting exhibition at the Augusta, Maine meet.



Lewin Barringer, general manager of the Soaring Society of America, and his Minimoa.

CLUB NEWS

THE Northern California Society is one of the most active in the country, as well as one of the best equipped. It owns several sailplanes, among them a two-place ship and a couple of primaries for teaching purposes—all of which were built in the club shop. That shop is fitted to tackle any construction problem from welding to monocoque work. One of the society's craft, belonging to Gil Walters, carries a radio transmitter and receiver whose call letters are W6DS. A number of meteorological instruments help the ground crew to check flying conditions. Official photographers record all activities so that a complete picture history of the organization is being kept.

Officers of the society include Ernst Langley, president; F. D. Atherton, secretary; and Albert F. Hoefflich, publicity director. Coöperating with the Southern California Soaring Association, this club is building public interest by holding meets that are enthusiastically attended. Read Harvey Stephens' report on the one held at Arvin, near Bakersfield, during September:

"Our site was the Wild Wolf Ranch, part of the vast Tejon prop-

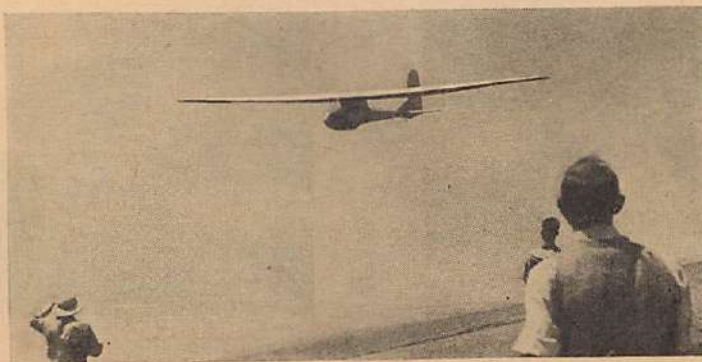
erty. The townspeople of Arvin were excellent hosts, even sending a fire truck to help guard against the constant hazard of brush and forest fire. The meet was simply a 'testing' proposition and had received little advertisement, yet over 2,000 spectators attended. There is a natural grand-stand hill just behind the one used for take-offs. It's out of the range of possible accident and still gives a clear view of all the events.

"There were ten or eleven ships present with pilots from as far away as Seattle. The fellows camped out under the trees, and a lot of reminiscing took place around the camp fire at night.

"The outstanding flights were made by Woody Brown in his 'Swift' and Harland Ross in the 'Little Buckaroo,' owned by Harvey Stephens. Brown gained an altitude

of 3,000 feet above the valley floor and maintained it for more than half an hour. Ross explored the valley for over forty miles, at a height of 3,000 feet. At another time he descended to within 200 feet of the ground and then climbed up to the take-off hill and landed there.

"Jay Buxton in the Hugill-Buxton two-place ship made twenty-five passenger hops over the surrounding coun-



Gil Walters, preparing to land the Langley sailplane, feels out ground currents atop the Altamont Range, California.

The Langley is equipped with radio apparatus.



The glider camp at the Arvin, California meet. Although lacking in facilities, the site afforded the enjoyable novelty of open-air camping.

try. James Gough and F. A. Walters of San Francisco, in the 'Pegasus,' rose to 2,500 feet, as did Louis Harper and Stanley Corcoran in the 'Cinema'—yes, they're from Hollywood. Volmer Jensen of Van Nuys attained 2,600 feet in his 'Silver Bird,' while Dan Sanborn in his Gruneau-8 got up to 2,800 feet.

"Myron Wells allowed Miss Audrey Artman of Oroville, Washington, to use his primary glider for a few hops. The smallest ship present was the 'Gnat,' owned by H. Morrison of Seattle. Don Stevens and Frank Wolcott were on hand with their Elmira veteran, the 'Zoegling.' Charles Patterson, of Inglewood, brought his two-place ship.

"Walter Hoefflich took motion pictures of the meet from his plane. Hawley Bowlus supervised all the take-offs and there wasn't a single accident. The new system of using a 'deadman' and a number of pulleys worked very well. The towing automobile being at right angles to the ship, the driver can gauge how much speed is needed.

"A group of Bakersfield men were so impressed by the entire meet that they are forming a club and buying a ship. They plan to trek to the next Elmira contest."

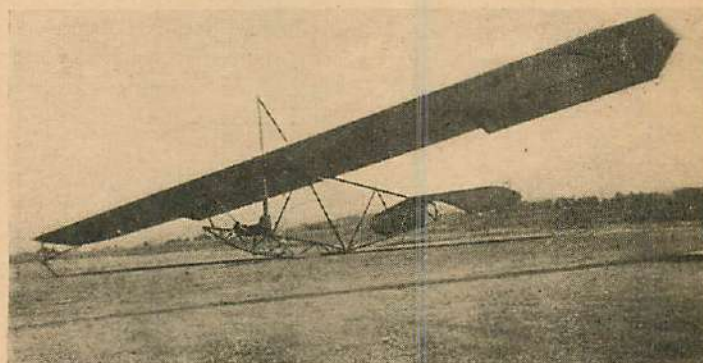
From California also comes the welcome news that Hawley Bowlus, a pioneer builder of gliders, is again active in the field. He is bringing out a new secondary ship to be known as the Baby



The Schweizer all-metal utility glider, a sturdy and durable craft.



Louis Harper and Stanley Corcoran, foreground, with the "Cinema"; Charles Patterson's Franklin, background. Both ships performed at the Arvin meet.



The Waco primary, because of its relatively large wing area, is capable of soaring flights.

Ernst Langley, in the Langley sailplane, takes off for a flight over Livermore Valley in the Altamont Range, California. Strong slope currents there enable unusually quick tow releases.



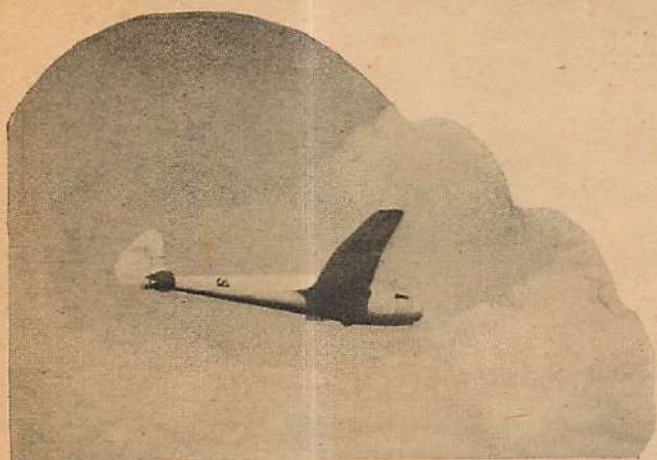
Albatross, which is to be sold in a kit form for \$350. It will be available in a ten-unit plan at \$35 per unit, f.o.b., San Fernando, California, for those wishing to buy in installments.

Your correspondent and Emil Lehecka were among those present at the Augusta, Maine meet. Emil's stunting exhibition with his Cadet glider drew special praise from Tex Rankin, international stunting champion and another participant. The crowd was so enthusiastic it demanded an encore. Emil is considering a tour of the country that will feature similar exhibitions in the Cadet. Meanwhile, his Rhonsperber is for sale.

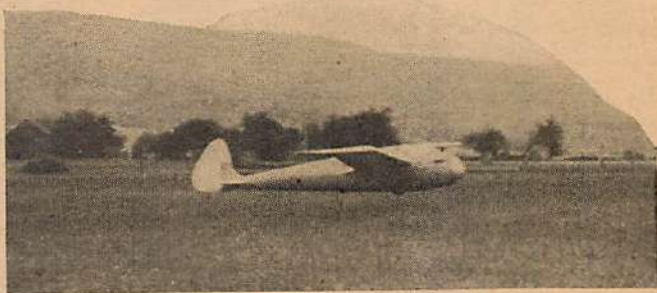
The Newark Glider Club of Newark, New Jersey, has finished its Bowlus sailplane and planned to test fly it recently.

New Jersey's Associated Glider Clubs held their annual meet, sponsored by the (Turn to page 84)

ZEPHYR



The fine exhibition by the Ross-Stephens sailplane at Elmira can be traced to the ship's perfection of streamlining. Capable of gliding 23 feet forward for every foot of altitude, this new sailplane promises yet more brilliant performances.



Landing, the craft reveals its carefully designed fuselage profile. The cockpit cover forms part of the unbroken fuselage contour, sweeping evenly to the nose. Most high-performance sailplanes have more abrupt windshields.

THE silent soaring beauty of birds in flight has always been a source of man's wonder and admiration.

From the earliest dawning of human history, mankind everywhere has joined in the deification of these swift creatures of the air. Euphonious words have sprung into being in every tongue to describe their beauty and strength. In the ancient world warriors and kings likened themselves to noble birds of prey and strove by word and deed to emulate their air-borne virtues. Even in our modern, sophisticated world, man still speaks of speed as the swiftness of the eagle, links acuteness of vision with the eye of the hawk and likens our sweetest music to the song of the lark.

Civilizations as old as history have bequeathed legends of men who dared to imitate the flight of birds. One such man was the ancient Greek, Daedalus, who gathered the feathers of eagles, fastened them to frames with dabs of wax and thus fashioned wings for himself and his son Icarus. The old tale goes on to tell how, overpowered with his ability to fly, Icarus soared so high that he approached the sun itself. Old Sol's wrathful heat melted the waxen fastenings. Shedding eagle pinions as he fell, the venturesome youth plunged to his death in the sea.

This ancient legend is the first written account of man's repeated efforts to conquer the air. There are many subsequent records of instances in which daring would-be airmen leaped from tall towers, equipped with various forms of movable or fixed wings. Among them was the attempt of Simon the Magician, a practitioner in the black arts, who hurled himself from the top of the Roman Forum in the presence of Emperor Nero.

Half a century later, in 1100 A. D., one Saracen of Constantinople attempted a similar feat before the Sultan of Turkey and the Byzantine Emperor Comnenus in the Hippodrome. Both efforts ended fatally.

Toward the close of the Dark Ages in Europe interest in the problem was revived. Again men sought a key to human flight. Prominent among them was the famous artist-engineer of the Italian Renaissance, Leonardo Da Vinci, whose designs for man-carrying, muscle-operated

ornithopters are famous even to this day. As far as we know, Da Vinci's plans were never actually carried to completion. In any event, no records of an actual test are in existence.

In 1607 the problem was attacked from a different angle by Fausto Veranzio, a Venetian architect. Constructing a rectangular, saillike parachute from the plans drawn by Da Vinci more than a century before, the intrepid Italian made several successful drops. The approach of the eighteenth century ushered in the lighter-than-air balloon and for many years wings were abandoned in favor of gas bags. It was not until early in 1891 that they were to reappear, this time more successfully.

After many years of intensive research in ornithology, two Germans, Otto and Gustave Lillienthal, built the first practical man-carrying, heavier-than-air machines. These took the form of fixed-wing gliders, both monoplanes and biplanes in which many successful flights were made from the top of an artificial hill. News of the Lillienthals' achievements resulted in further experimentation with gliders. Pilcher in England and Chanute and Montgomery in the United States built craft of their own design, improving on the originals and further developing the knowledge of flying technique.

In 1900, the Wright Brothers became active in aviation and constructed several successful gliders of their own design. These showed a decided improvement over the earlier models of the Lillienthals, Pilcher and Chanute, since they were equipped with more efficient, movable controls. Spurred on by their success, the brothers built a much larger machine, which they equipped with a gasoline motor and propellers. This they flew over the sand dunes at Kitty Hawk, North Carolina in the first successful powered-airplane flight in history. Entranced by the possibilities of motored flight, the Wrights abandoned gliders and the art of soaring once more fell into the discard.

It wasn't until October, 1911 that Orville Wright, while on a vacation trip to Kitty Hawk, renewed his pioneer interest in gliding. This time his ship was a vast

AT ELMIRA

The Ross-Stephens is the outstanding sailplane in America to-day and is considered equal to, if not superior to, the foreign ships formerly necessary to import for first class soaring.



The actual landing of a sailplane is a difficult task, the extraordinary gliding angle enabling the craft to float almost indefinitely a few feet off the ground. Spoilers, small surfaces opening from the top surface of the wing, reduce lift to facilitate landing.

improvement over the former models, both in gliding angle and control. Eight long years of power flying had also taught him a great deal more about air currents than he had known back in 1903. As he took off directly into a strong wind sweeping in from the ocean, the veteran airman felt confident that he could stay aloft for a considerable time. He soared over the dunes, moving up and down the surf-pounded beach. For nine minutes and forty-five seconds, the little glider rose and fell in the turbulent air. When it finally came to rest on a hummock of sand, Orville Wright had hung up a new world's record for motorless flight; a record that was to stand for ten long years.

The outbreak of the World War in 1914 put an abrupt end to any further glider experiments. The immediate need for high-powered military aircraft turned every available aeronautical brain into the channel of combat airplane development. Glider design languished until 1920 when, by an ironic twist of events, the same agency that had cut short its development six years earlier was the cause of the present renaissance of motorless flying.

Forbidden to build power planes by the provisions of the Treaty of Versailles, the Germans proceeded to prove the ineffectiveness of repressive regulations as applied to a determined and resourceful nation. Financed by government funds, a rapid and intensive development of the glider was initiated. Within a year, Germany had far (Turn to page 90)

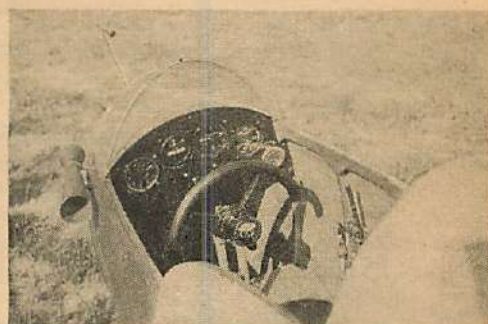


Harvey Stephens, left, Harland Ross, right—partners.

BY FRANK TINSLEY



The Air Trails Trophy for 1937, awarded to Harland Ross for his outstanding "C" flight of 121 miles, made in the Ross-Stephens sailplane.



The instrument equipment includes turn-and-bank indicator, directional gyro, air-speed indicator, sensitive rate-of-climb indicator and sensitive altimeter. The compass is mounted in the control wheel hub.



The Ross-Stephens as it appeared in flight at Elmira.

What's Your Question?

By CLYDE PANGBORN

Wing Commander



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

Question: What rank would a man get if he entered the army air service without going through West Point? J. B., Middleboro, Massachusetts.

Answer: Candidates from civilian life or West Point get the same rating at Randolph Field—that of a flight cadet. Once appointed the man from civilian life gets exactly the same training as the former West Pointer.

Question: Can a variable-pitch prop be controlled from the cockpit? Can it be controlled during flight? J. G., Moline, Illinois.

Answer: There are several forms of variable-pitch props. Some change pitch automatically to fit conditions. Others are both automatic and manually operated. The modern variable-pitch prop is operated during flight by the pilot from the cockpit.

Question: Would you be able to drive two propellers in opposite directions on a radial, such as the Pratt & Whitney Wasp or the Wright Cyclone? B. G., Sacramento, California.

Answer: On first consideration, I would say no. However, it might be possible through a system of gears. But what advantage might be gained is questionable. It would cut down propeller torque, but whether you would get full benefit of the power available is a question. Still, you have brought up an interesting point.

Question: Where can I get plans for a gas-powered De Havilland Comet? Would it carry a six-pound radio set? K. C., Greensboro, North Carolina.

Answer: I have turned your letter over to our model editor. Your question will be taken care of in another department.

Question: Does flying injure a pilot's physical condition very much? At about what age do most pilots have to quit flying? R. K., Bridgeport, Connecticut.

Answer: Under modern conditions a man should be able to fly until a ripe old age. Transport and service pilots,

of course, come under greater strain, and they are carefully watched by responsible physicians. Modern air-line pilots should be able to continue flying until they are well into their fifties, but many graduate to more responsible and lucrative ground jobs before that age. In the future, when ships are larger, pilots will become something like ships' captains, doing only the command jobs, while the actual flying will be in the hands of instruments and younger men. There is no reason why air pilots coming along to-day should not be able to fly until they are well along in life, their careers, of course, depending on their physical condition. But there should be no more injurious results from piloting, than from commanding surface vessels at sea.

Question: I should like to know a little about the Boeing F4B-4 and how much it costs. Does any private pilot own a Boeing F4B-4? R. F., East Hartford, Connecticut.

Answer: The F4B-4 is a military pursuit built by the Boeing company of Seattle. It is used by the U. S. navy service and with a very comprehensive military load has a top speed of 187 m.p.h. It uses the Pratt & Whitney Wasp engine and is considered one of the finest navy-type fighters in the world. I do not know the actual cost of one of these ships, as they are usually sold under contract prices along with a certain amount of spares, etc. I know of no private pilot who has purchased one.

Question: How many German Zeppelins were shot down during the World War? Who shot down Baron von Richthofen? A. K., Ottawa, Quebec.

Answer: According to the most reliable figures available, sixteen Zeppelins were actually shot down during the War. Seventeen others were hit by enemy gunfire and had to be wrecked. Thirty-one were wrecked through storms, forced landings, and bad landings. Six were lost through fire in flight. Four were destroyed through crude ground crew handling and seventeen were destroyed by fire in their sheds, as the result of

aerial bombing. The Baron von Richthofen argument still rages. One side claims that he was shot down by Captain Roy Brown, a Canadian in No. 209 R. A. F. Squadron, while an equal number claim that Von Richthofen was shot down by two Australian machine gunners. In all probability the argument will never be settled.

Question: Where is the Bellanca Aircraft factory? W. C. A., Swarthmore, Pennsylvania.

Answer: The Bellanca Aircraft Corp.'s plant and field is located at New Castle, Delaware, and that address will find them.

Question: Who invented the Spad plane? Can you suggest a book that carries pictures of all planes used in the World War? J. H. Canton, Illinois.

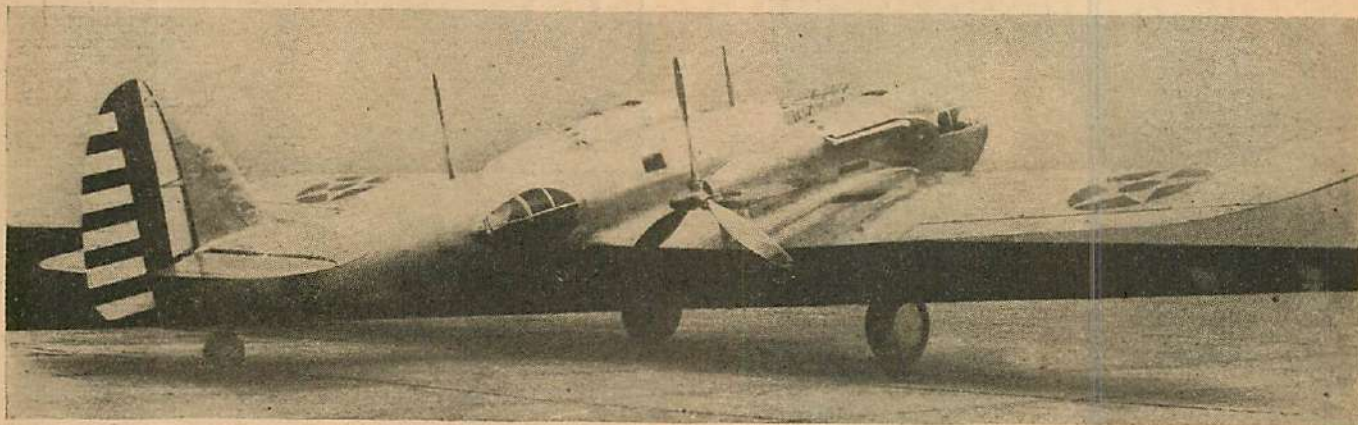
Answer: The Spad, a Wartime pursuit ship, was the product of the S. P. A. D. Co. in France. At that time Louis Bleriot was their chief engineer and designer, and it must be presumed that Bleriot is to be given credit for the plane. I know of no book that offers all planes used during the War, but "All the World's Aircraft," for 1919, will get as near to it as anything I can think of—it costs, however, about one hundred dollars. Another is "Fighting Planes and Aces," by W. E. Johns, published by John Hamilton of London. The same firm also published "Planes of the Great War," which contains fifty very fine prints of Wartime planes.

Question: What is the cause of fuel lines breaking, as they seem to do so often, on long-distance flights? W. S., Detroit, Michigan.

Answer: Vibration is the usual cause. Where fuel is piped from a wing or fuselage tank there is always a possibility that vibration over a number of hours will break the copper pipes. Great care has to be shown in designing planes for long flights, so that there is no particularly long length of fuel pipe that is not braced or carried in rubber blocks.

AIR TRAILS GALLERY

A Picture Page of Modern Planes for the Collector

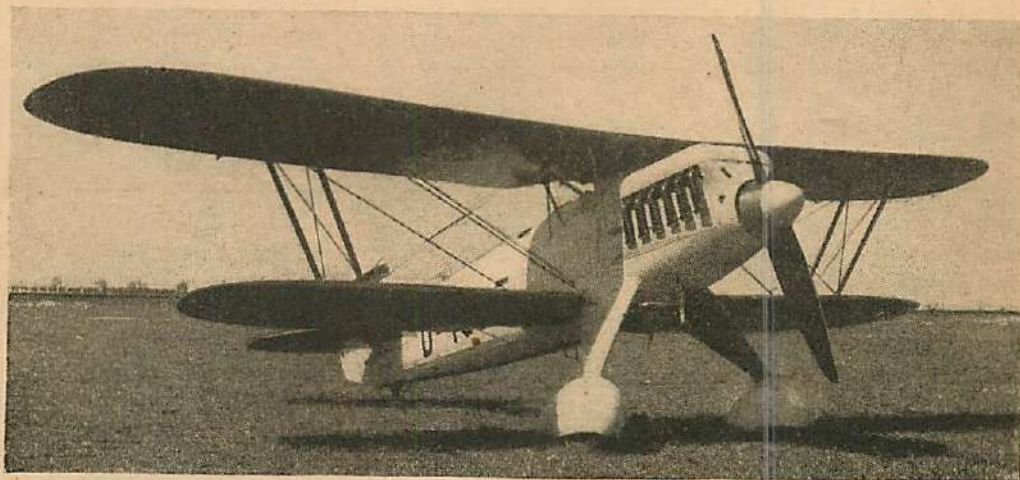


BELL XFM-1 FIGHTER

Believing that the best defense is a good offense, the Bell twin-engine fighter was designed to combat the flying fortress type of bomber. Its radical arrangement includes pusher propellers, cockpits in the engine nacelle noses and gun blisters aft.

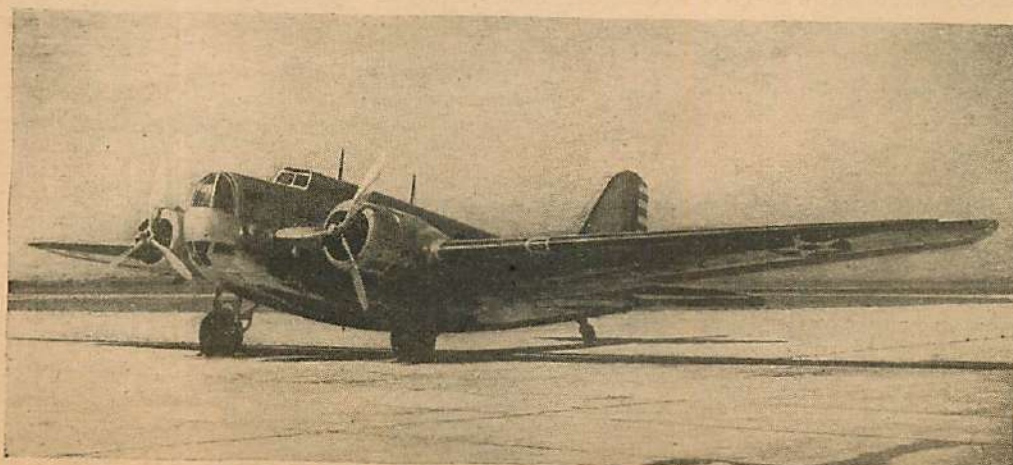
This new high-altitude fighter is capable of 300 m.p.h. Crew members can exchange positions during flight. Engines are 12-cylinder Allisons developing well over a 1,000 h.p. Propellers are Curtiss constant-speed.

Nucleus of the rebuilt German air force, the Heinkel He-51's high speed of 217 places it in a speed category midway between the Boeing F4B-4 and the Grumman F2F-1. The He-51s are, nevertheless, scheduled for replacement.



HEINKEL HE-51, GERMAN PURSUIT

The power plant is the 600/750 h.p., unsupercharged B. M. W. Cooling is liquid. The construction is of metal with fabric covering.



DOUGLAS B-18 BOMBER

An adaptation of the transport, the B-18 is capable of speeds exceeding 225 m.p.h. The engines are 1,000 h.p. Cyclones.

Already to be seen in service, the B-18s are now being turned out in fulfillment of large army contracts.

The ship in the photo is equipped with de-icers.

A crew of 7 men is carried.

Using Waco Taperwing stunt planes, the Linco Aces trace a precision smoke loop.



Joe Mackey.



By Charles Verral

Joe Mackey, STUNT PILOT

Joe Mackey has stunted to crowds at home and abroad. His precision aerobatics insure the success of any air meet.



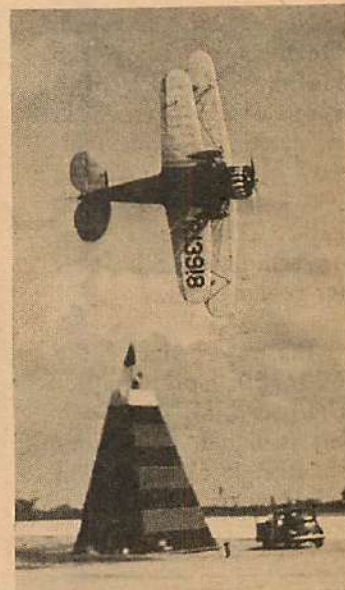
Bill Sweet, veteran announcer.

It was 4:30 on the afternoon of a clear day. A hundred thousand spectators lined the municipal field when Joe took off in his powerful Waco Taperwing. He bulleted up in a tight climbing turn and switched on his smoke trail to mark his next maneuver. It was a triple snap roll smothered in smoke. Then he went into his specialty—low inverted aerobatics.

The Waco zoomed back to a thousand feet. Down on the ground Announcer Bill Sweet yelled into his mike, "It's going to be an outside loop!"

It was—and a honey. But when Joe hit his stride on the bottom of the loop and was just starting to tuck his nose for the back side, it happened—

The motor cowlings ripped loose and flew back over the top wing, tearing fabric and breaking wing ribs. Joe was knocked out. The Waco went wild. It screamed down in a split power dive straight at the municipal hangar. Suddenly the nose shot up; the ship rolled over into an upright position. (Turn to page 88)



Winner of the Freddie Lund Trophy, highest American aerobatic honor, Joe Mackey rolls past the home pylon in a stunting exhibition.

THE GRAND STAND that flanked one side of the Lancaster, Ohio, airfield was crowded with people.

All eyes were on a trim Waco Taperwing as it cavorted across the blue sky, weaving an intricate trail of billowing white smoke. The Waco swooped away from the field and came back, flying low, slowly, its speed cut down by a strong head wind. The wings flipped over. The biplane coasted past the grand stand in an inverted position.

The engine suddenly coughed and stopped. The biplane lost forward speed—seemed to stand still. Then, still in its upside-down position, the Waco began flying backward.

A man high in the grand stand nudged his companion and said, fearfully, "Look!"

His companion nodded. He didn't know about the dead engine and the strong head wind. He just shrugged and said, "Sure. She's flying backward, all right. But Joe Mackey's in her."

And that seemed to explain everything.

There's a legend out in the Buckeye State. It seems that a certain stork was assigned to bring little Joe Mackey into this world one day in 1908. This stork had just sighted Lancaster, Ohio, and was circling for a landing when his passenger, little Joe, suddenly took over the stork's controls and did an outside loop, a whip stall and a power spin!

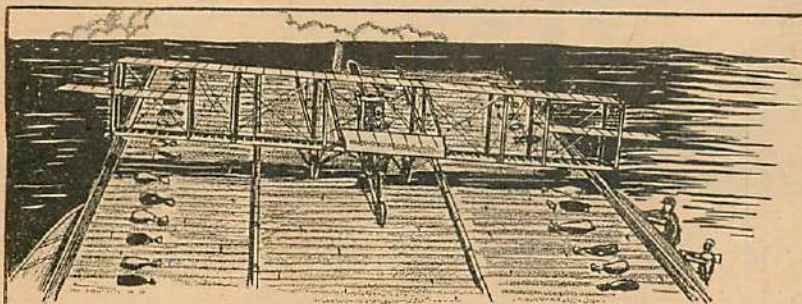
Of course, the truth of that can't be vouched for, but by the time Joseph Creighton Mackey had reached the age of twenty-nine, he was acknowledged to be one of America's foremost stunt pilots, skywriters and air showmen. In addition to that, he had his own airport, a fleet of six modern planes and a gang of pilots and mechanics.

During those twenty-nine years a lot of sky had swept under Mackey's wings and he had persistently refused to start pushing up daisies. There had been narrow escapes—like that time in 1936 at the annual air show at Dayton, Ohio.



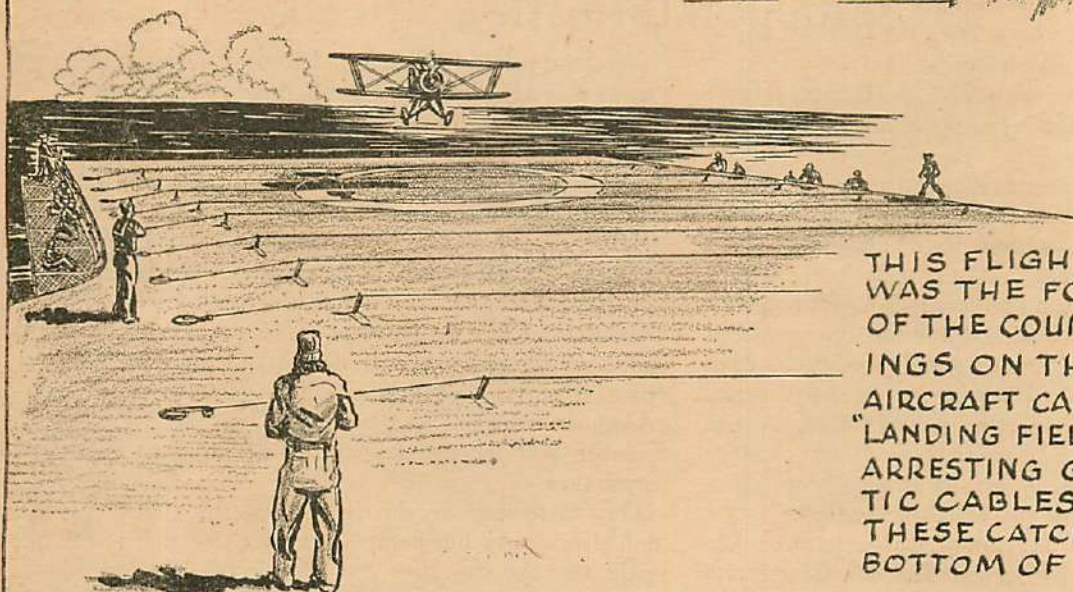
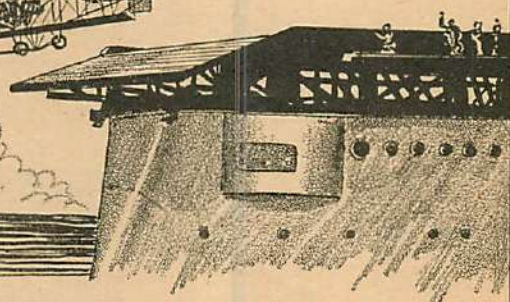
Left to right: J. Taylor, ground man; E. S. Leach, operations manager; Lt. Mackey; W. Hightower, skywriter; M. Murphy, stunt ace; W. Sweet, announcer.

CARRIER DEVELOPMENT



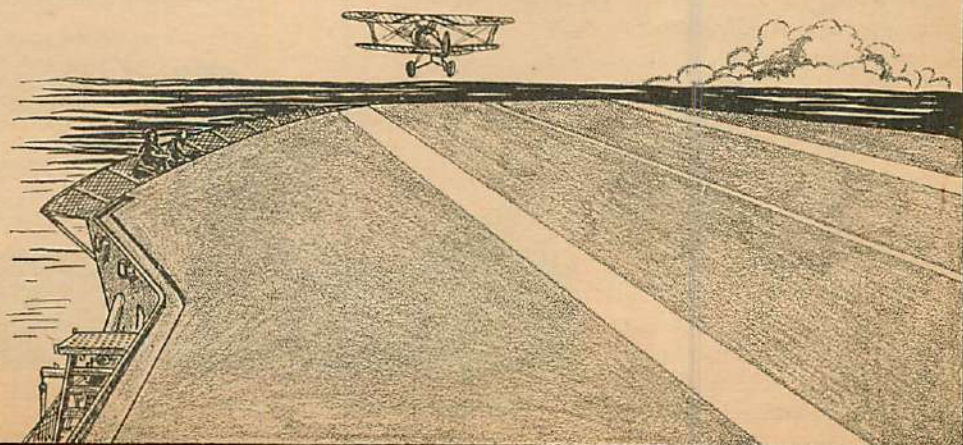
THE FIRST SHIPBOARD LANDING WAS MADE ON THE CRUISER PENNSYLVANIA BY EUGENE ELY, NOTED CURTIS FLIER. HE LANDED HIS MACHINE AT 40 MILES AN HOUR ON A NARROW BOARD PLATFORM LITTLE WIDER THAN HIS PLANE.

ON THE SAME DAY, JANUARY 19, 1911, HE TOOK OFF AGAIN FROM THE SAME CRUDE "RUNWAY" AND FLEW BACK, TO LAND AT THE PRESIDIO IN SAN FRANCISCO.



THIS FLIGHT OF ELY'S WAS THE FORERUNNER OF THE COUNTLESS LANDINGS ON THE MODERN AIRCRAFT CARRIER'S BROAD "LANDING FIELD." NOT THE ARRESTING GEAR OF ELASTIC CABLES TO STOP PLANE, THESE CATCH IN HOOK ON BOTTOM OF FUSELAGE.

THE DIFFICULT TAKE-OFF OF ELY FROM THE CRUDE PLATFORM HAS BEEN SIMPLIFIED BY BROAD, CLEAR TAKE-OFF DECKS.



AIR ADVENTURERS

The Honor Roll For December

FLIGHT LIEUTENANT

E. D. Sharp, Santa Fe, N. Mex.
Ed Allen, Lompoc, Cal.
Abraham Munson, Chicago, Ill.
Warren C. Allen, Jr., Swarthmore, Pa.
Jacob Kosofsky, Philadelphia, Pa.
Billy R. Butler, Galveston, Tex.
Billy Southworth, Venice, Cal.
Walter West, Philadelphia, Pa.
Warren Atkinson, Toronto, Ont., Can.

OBSERVER

Terence A. Taylor, Featherston, Wairaraha, New Zealand
Thurman Manes, Webb City, Mo.
Stanley Peterfreund, City Island, N. Y.

W. G. Williams, Vancouver, B. C., Can.
Warren C. Allen, Jr., Swarthmore, Pa.
Randal W. Corran, Vancouver, B. C., Can.
Bill Lynch, Rutherford, N. J.
William H. Robey, D. O., Sullivan, Mo.

AIRPLANE MECHANIC

Erwin Humpal, Calmar, Iowa
Miss Kay Goff, Riverside, Cal.

PHOTOGRAPHER

Charles C. Macauley, Grand Rapids, Mich.
Macklin Wilson, Shelton, Wash.
Kenneth Rusch, Manitowoc, Wis.
John Bonentz, Ozone Park, N. Y.
Michael Serduck, Thomaston, Conn.

Clyde Wallace, Madison, Ind.
Melvin DuPont, Rutland, Mass.
Bill Prosser, Hamilton, Ont., Can.
Emanuel De Taillefer Taylor, San Francisco, Cal.
Earl Hertel, Omaha, Neb.
Charles R. Nichols, Modesto, Cal.

TOPOGRAPHER

Bill Tulloch, Toronto, Ont., Can.
Jack Loughheed, Detroit, Mich.

ENGINE MECHANIC

Charley Brateres, Castle Rock, Wash.
Irene Nanesta, Chicago, Ill.
Billy Southworth, Venice, Cal.

Straight Information

GREETINGS, Air Adventurers!

You know, we here in the United States are a pretty lucky lot when it comes to aviation and all the angles that pertain to it.

We believe we are far ahead of the rest of the world as far as commercial aviation is concerned, and we certainly take no back seat to any of them when we look over our military equipment. What we lack in military aviation is no fault of design or the amount of equipment available. The real story is that so far we have not had to face the possibilities of war over our borders as have so many European powers. They *have* to have a powerful air service and if that occasion ever arises here, we feel no qualms as to our ability to come through and produce machines—and men—worthy of our heritage and more than equal to anything that may force our hand.

But take our standing in commercial aviation. We most certainly lead the world in efficiency, speed and maintenance of schedules. We build the finest transports and are usually eighteen months ahead of the rest of the world. We have to keep stepping to do it!

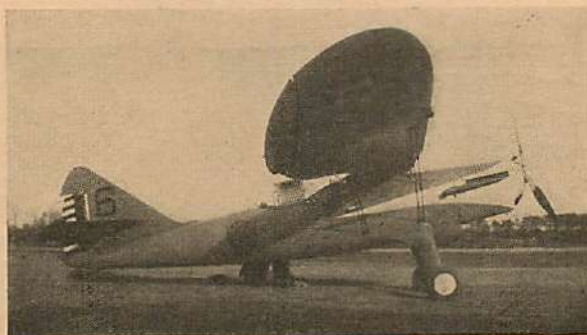
There are reasons for all these things. They don't just happen. For one thing, we have tremendous resources at hand to work with. We have access to the finest oil wells in the world and mines that provide the metal for frames and motors. Our school systems assure us of trained men and engineers.

We have a broad expanse of country to work on. Our great cities are widespread and justify air line travel, or there would not be the demand. We enjoy temperate weather and can fly air line schedules over complete twelve-month periods. All this and our general financial standing gives us a great edge over the rest of the world.

Most of our commercial flying is carried on within the widespread borders of the country. We do not have the bother of frontiers and customs that beset the commercial operator in Europe. We do not have to co-operate with any other nation in the matter of laying down airports, beacon lines or the setting up of meteorological bureaus. We have 3,000 miles of territory to fly over and we use it without asking any one else's permission.

Our factories are the most modern. We have the high production business down to a fine point with the result that we can turn out good airplanes and motors much cheaper than any country in the world. Our public enjoys a high standard of living and can afford to fly the air lines when distance and time warrant. But not enough of us fly because we want to fly our own plane.

That is something that Air Adventurers will have to take up and solve. You have no excuse in the world if you really want to fly. You have the widest possible area in which to fly safely and you can buy the best plane in the world at the lowest price. Fuel



Air Adventurer Rolf Gray, Hot Springs, Ark., snapped this Douglas O-43-A.

and maintenance come lower. You can even get insurance at lower rates than anywhere else in the world.

But I started out to tell you something else, and the subject simply ran away with me. What I really started to say was that we are all so lucky in the fact that we can get the finest advice and information in the world right from our own Bureau of Air Commerce in Washington. I have just been thumbing through a few of the free booklets that come out of our department of commerce and am amazed at the amount of good information they contain.

Bulletin No. 7, for instance, gives full and clear details of all types of licenses. It outlines the general details of the physical examinations and standards demanded. It tells about the various grades of transport licenses and how to apply for medical examinations and primary flight tests. This bulletin may be obtained free by writing to the U. S. Department of Commerce, Bureau of Air Commerce, Washington, D. C.

Another interesting bulletin is No. 7-A, which goes into detail concerning the airworthiness requirements of aircraft. This explains in full the required standards of wings, control systems and surfaces, landing gear, boat hulls, engine mounts and miscellaneous structural requirements.

Bulletin No. 2 offers pertinent information on airport design and construction.

Bulletin No. 18 carries full information on State aeronautical legislation and the uniform State laws which should be very interesting to those who are always fighting against State aircraft control. You Air Adventurers should get this and learn just what the rules are in your particular State. It will save you heaps of trouble in the future. All these bulletins are free.

Now I must close with the usual farewell, hoping that all this is interesting to our hundreds of new readers. I also hope that many of you will be interested enough to apply for membership in our Air Adventurers club. You know by now the seven points of our Creed. If you don't, write in for a copy and we'll send it to you with the requirements for craftsman's awards and lieutenant's or captain's ratings.

Clip out the membership coupon on this page, inclose ten cents for your wings and certificate and leave the rest to me.

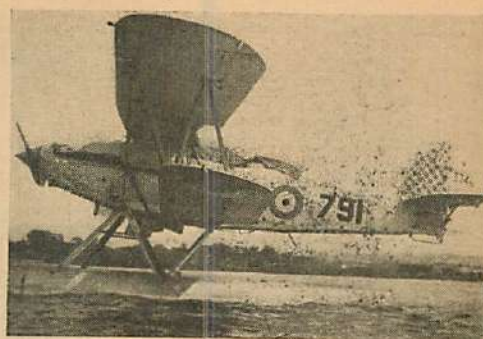
Your Flight Commander,

Albert J. Carlson

AIR ADVENTURERS NEWS

JOHN ERICKSON of Brooklyn is a newcomer to Air Adventurers and we were certainly glad to get his application. John is a mighty fine photographer and has sent in several samples of his work, including Dick Merrill's Lockheed Electra taken at Floyd Bennett Field and another of Clarence Chamberlain's "Miss Stratosphere" snapped out at Farmingdale, Long Island. John tells us he has traveled extensively and has a fine list of foreign ships he will show us. He plans to write a spe-

British
Hawker
"Osprey" by
Ivan Kington
of Hamilton,
Ont.



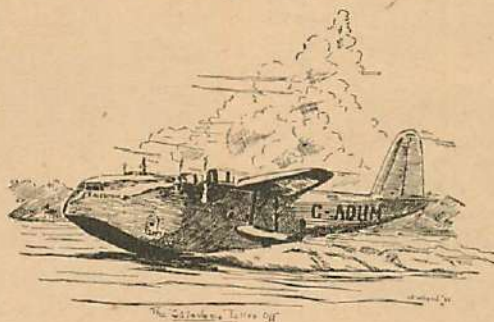
cial article on aviation in Sweden which he hopes will prove to be an interesting comparison to that written by Bernt Balchen. Send it along, John.

Richard Mackey, another new Air Adventurer, has applied for the requirements of a craftsman's award and plans to go ahead to a flight captaincy. He sends us a neat drawing of the new Curtiss pursuit which shows he has a lot of talent and a particular eye for line and shadow.

We have had a marvelous letter from a member in Napier, New Zealand, named H. Holder. He tells about a flying club he belongs to out there which offers training all the way up from primary gliders to full-sized power machines. They use three types of gliders and end up with an American Waco. You can see they do things right out there. They launch gliders by means of a drum mounted on a car and the glider pilot releases his ship by means of a special hook.

The club has been in operation for five years. In 1931 the city of Napier was wrecked by an earthquake and the ground which they now use as a field was once under ten feet of water! The hangars are reconstructed from relief huts hurriedly built to take care of the homeless people. There is always something to be thankful for, even in an earthquake!

Mr. Holder tells us one that would be good for Ripley. The New Zealand East Coast Airways has a line running between Napier and Gisborne and they have what is believed to be the smallest administration building in the world. It consists of an old tram (Turn to page 85)



A drawing of the "Caledonia," by Air
Adventurer G. T. Hilliard, Belmont, Mass.

(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.

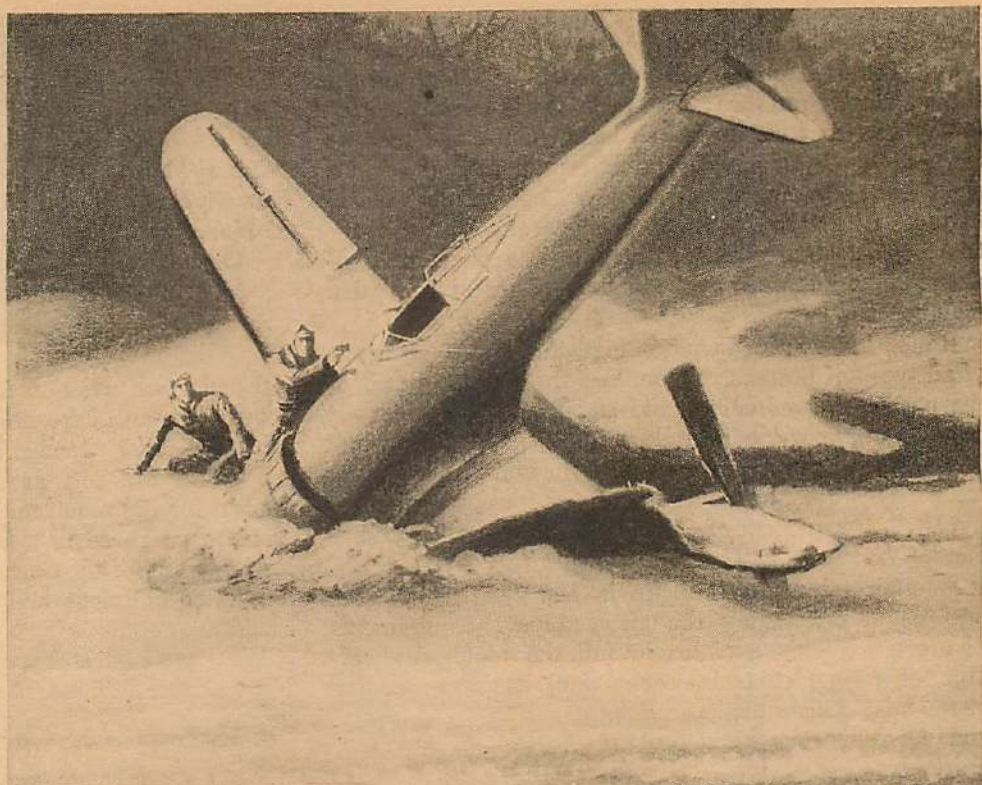
Name Age

Address

☐ Check here if interested in model building.
(This coupon may not be used after January 15, 1938.)

A new
BILL BARNES
 Air Adventure
 Novel complete
 in this issue.

By
 George
 L.
 Eaton



Shrouded by the pitch-black night of the Everglades, Bill Barnes sat tensely in his Lancer waiting for the hum of the ship that had outwitted the entire U. S. Secret Service.

Counterfeit Wings

IN THE seventeenth century, Jesuit priests had come to a valley in what is now the State of California and found the rich soil of its basin crowded with wild flowers. They had named it Valle de Flores—Valley of Flowers—and at one end had erected a mission house to the glory of their God. The valley was Nature's garden—a place of blue skies, of clear suns, and gentle, scent-laden breezes.

The Jesuits had long since gone and their mission house stood in decaying solitude when the noted perfumer, Baron Hauss von Struben, came to the valley and bought it in its entirety. The place was precisely what he had been seeking. And there he established his gardens, his greenhouses and his laboratories for the blending and making of his exotic perfumes.

He called in a famous architect. The mission house was remodeled into a magnificent residence. And so skillfully was it accomplished that, even with the modern trappings of outdoor swimming pool, tennis courts and a private airport, the ancient grandeur of the old mission still remained: the whitewashed walls, the wood weathered to greenish-gray, the rooms large and cool.

It was in one of these rooms that the baron's fourteen guests were grouped around a roulette wheel on the afternoon of November 7, 1937. They were gambling. But not so Baron Hauss von Struben. He stood apart from the others, immaculate as always in rough tweed jacket and flannels. His amber-tinted monocle was screwed securely into his right eye and gave his tanned face an arrogant cast.

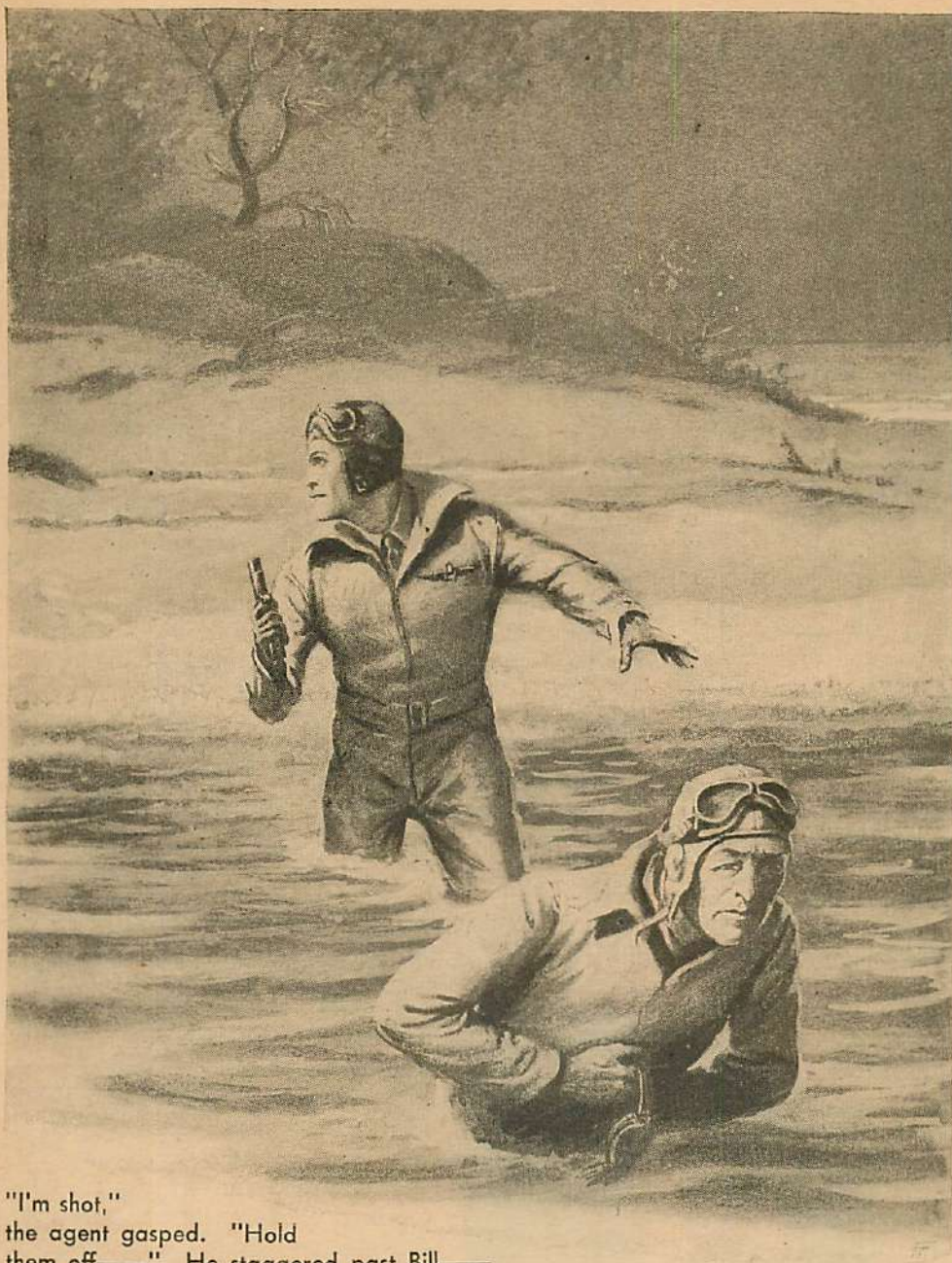
Watching the play at the roulette wheel, his attention was centered on one of the players, Richard Claymore, III.

But Richard Claymore's eyes were riveted on the spinning ball. He saw it slow and drop into a slot. The color left his cheeks as his final pile of chips vanished. He tried to make his shrug careless as he backed away from the crowd.

"I'll sit this one out," he muttered. "Maybe my luck will change."

He looked up and met the gaze of the baron. Claymore motioned with his head and then went across the room.

There he picked up a cigarette and shakily lighted it. The past month had seen the last penny of his once-large



"I'm shot,"
the agent gasped. "Hold
them off——" He staggered past Bill——

inheritance vanish and his bills mount. The splurge of gambling, instead of alleviating a critical situation, had added to it.

His plight was desperate. Yet, at the last moment, an ace card had come to him—a card that would call upon all his courage to play it. But, if the baron refused him further credit, it would have to be played.

Baron Hauss von Struben crossed the room to where Claymore waited. He said, "You wanted me, Dick?"

Claymore nervously punched out his cigarette. "Yes," he said, his voice low-pitched. "Will you take my note for ten thousand more?"

The baron's long face was serious. He shook his head regretfully. "I am sorry, Dick," he said. "I cannot afford to take any more. I have fifty thousand of your notes now."

Claymore flushed. "You mean—you're afraid I'm not good for——"

Baron Hauss von Struben adjusted his eyeglass. "From things I have heard, Dick," he said quietly, "you may have trouble paying back that fifty—without adding any more. You had better stop."

"So that's it," Claymore said, and the fear of what now had to follow tightened his throat.

"Yes. That is it," the baron said.

Claymore drew in his breath. He was conscious of his heart's acceleration, of the wet palms of his hands. He said, "All right. I'm going to my room. Meet me there. And bring those notes with you. I'll pay you off."

Baron Hauss von Struben showed his surprise. Then he half bowed. "I have your notes here in my wallet, Dick," he said. "I will go with you now."

They went in silence to Claymore's suite in the east wing of the rambling L-shaped house. The baron seated himself, took two pieces of paper from his wallet and dropped them on a low table. "There are the notes, Dick," he said. "If you want to pay them—excellent. But I am not insisting. I can, of course, give you more time."

"No. The pay-off comes now," Claymore said quickly. He tried to steel his shaken nerves. "I'll get my check book."

He went to a dresser drawer and took out a nickel-plated .32 revolver.

The baron's dark eyes flickered. "I would not do that, Dick," he said.

Claymore felt the comforting weight of the gun in his hand. He took a chair opposite the baron. "I won't, unless it's necessary," he said. "Just tear up those notes."

Baron Hauss von Struben looked at the leveled gun and his thin lips tightened. He leaned back in his chair and carefully reset his eyeglass. "I do not believe I shall," he said.

Claymore moved the gun barrel slightly to the right. "You see that newspaper there?" he asked.

"Yes." An edition of the *New York Star* lay on a table. "I see it," the baron said.

"Read that left-hand column," Claymore said. "It's about a flood of counterfeit bank notes that's sweeping the country."

Baron Hauss von Struben's eyes never left the other man's face. "Very interesting. But are we not slightly off the subject, Dick?"

Claymore ignored the question. "I've been reading about that bogus money. The secret service is very worried. You see the bank notes are almost perfect. Whoever is turning them out must be making quite a profit, baron."

"Probably, if you say so."

Now that he was well into the business, Claymore felt a surge of courage. "Perhaps I'd better lower my voice, baron," he said, "when I tell you what happened to me last night."

A high-light slid across the baron's eyeglass as he moved. "I am not interested in scandal, Dick," he said. "I came here to get your check for these notes—"

"I got very drunk last night, baron," Claymore went on. "Possibly you remember. It was your excellent rum. I was so drunk that I scarcely recall the latter part of the evening. I must have wandered away from the house. When I came to I found myself lying under some bushes beside the hangar at the airport. It was after three in the morning. I had been asleep. I felt terrible. When I sat up I heard two men talking. One was you."

The baron's slender fingers had tightened on the arms of his chair. He sat without other movement and said nothing.

Claymore leaned forward. "You remember what you said?"

Baron Hauss von Struben yawned. "I suppose that rum is strong if one is not used to it."

"You said a lot of things," Claymore continued. "At first I intended getting up and letting you know I was there. But when I heard that you were head of this counterfeit ring, I—"

The baron started from his chair. "You can tell me the rest of your drunken dream some other time, Dick. My guests—"

Claymore kept the gun level and said, "Not so fast. Sit down. You can't fool with me, baron. I know about that engraving plant you have hidden under your green-houses. I know something about your system of distributing the money by plane to the passers. If you think back, you'll remember that you gave me a very clear account of how close the government came to trapping your plane and pilot last night and only failed because their ship was too slow."

"This is ridiculous, Dick," the baron said.

Claymore's face was flushed. "I even heard you say that the government would be sure to use a faster plane next time," he said. "And that the logical one for them to get was Bill Barnes' Lancer. You can't afford to let me do any talking, baron. If I do, your scheme of going to New York to-morrow and signing up Bill Barnes for an advertising flight, before the secret service can get to him, will be out."

"And you suggest?" the baron said softly.

"I suggest that you tear up those notes and give me a little pin money each week," Claymore said.

A smile came to the Austrian's lips. "You are cleverer than I thought," he said. "Under the circumstances we can naturally do business. Fortunately, I can think of no one I would rather deal with than you, Dick."

Claymore's face brightened. "I knew you'd see it my way," he said. His tense figure relaxed and he lowered the gun until it was pointing at the floor.

The baron said, "How would this suit you? I will

tear up these notes. And I will pay you five thousand each week."

Greed widened Claymore's eyes. "That—that would suit me fine," he said.

Baron Hauss von Struben chuckled. "Excellent. It is a deal." He stood up, took the two notes from the table and walked across to Claymore. "Here, take them. Tear them up. Or better still, burn them."

Claymore reached out his left hand for the papers. But just as his fingers were about to close on them, Baron Hauss von Struben suddenly jerked the notes up and threw them into Claymore's face.

Before the younger man could recover from his surprise, the Austrian had seized his gun hand, and, with a quick twist, had jerked the muzzle upward toward Claymore's head. The baron tugged Claymore's trigger finger. The .32 fired.

The white skin under Claymore's jaw was ripped into redness. Baron Hauss von Struben stepped back. Claymore rolled off the chair, tried to speak and died.

The baron looked down. Claymore lay on his side. The nickel-plated gun was still tightly clenched in his right hand. He had fired it himself. The position of the shot would show that. The promissory notes for fifty thousand dollars were on the floor a few feet away.

Everything was excellent. A suicide. A desperate debt-burdened man had taken the only way out.

Baron Hauss von Struben adjusted his monocle and opened the door.

II—MEETING

HE WAS again adjusting that monocle as he sat in Bill Barnes' office the following morning.

Bill said, "Glad you dropped by, von Struben. Haven't seen you since the Cleveland show." He laid his hand on the morning newspaper that was folded on his desk. "Say, I was sorry to read about what happened at your place yesterday."

The baron, trim in gray suit and topcoat, crossed one creased leg over the other. "Quite regrettable. A pleasant young chap, Claymore," he said stiffly, and then added abruptly, "I have a proposition to talk over with you, Barnes."

"Another charity air show?" Bill asked.

"No. This is business," the baron said. He took his monocle from his eye and gravely polished it.

Bill lounged back in his chair and waited. He had met Baron Hauss von Struben many times before, principally at air shows. The wealthy perfumer was an ardent sportsman pilot and no ham at the controls, either. But somehow, Bill had never cared for the man himself. It wasn't because he was a foreigner. Bill had plenty of good friends outside the United States. And, for that matter, von Struben was a naturalized citizen. But—

Bill's gaze swept over the baron. Perhaps it was that damn circle of glass he was always playing with, or his perfect clothes, or maybe it was his air of detached superiority.

The eyeglass, having been scrupulously polished, went



Baron Hauss von Struben

back into the right eye. The baron looked up. "I have recently blended a new perfume," he said. He spoke slowly, with the studied intentness of the foreigner. "I have named it The Princess, in honor of the beautiful Princess Mahara of Persia. She is to be married next month. I wish to present the first bottle to her highness."

"Uh-huh," Bill said absently. His attention had been suddenly caught by a sight outside the office window. The ivory-colored Beechcraft in which the baron had landed minutes before was standing on the concrete apron. And racing around the machine was "Sandy" Sanders, the kid pilot of the famous squadron, in pursuit of Alphonso, the monkey. Alphonso was clutching a pair of goggles and keeping his distance from the kid. The two then disappeared from sight and Bill heard Sandy's far-away angry shout, "Come here, you little thief!"

The baron coughed. "I said I wish to present the first bottle to her highness."

Bill jerked himself back. "What? Oh, yes. She'll probably get a big kick out of that. Nice of you."

Von Struben methodically reset his eyeglass. "My motive is scarcely that, Barnes," he said. "The presentation will be an excellent advertisement for this perfume. That is why I wish to make it as spectacular as possible. And that is why I have come to you."

Bill raised his eyebrows.

"I will pay you sixty thousand dollars to fly this bottle of perfume from my laboratories at Valle de Flores to Tehran, Persia."

"Wait a minute," Bill said.

The baron held up a gloved hand. "Please allow me to finish," he said. "I wish you to use your famous Lancer and to endeavor to make the flight nonstop. The sixty thousand will be clear profit. I will pay all expenses. I have contract papers for you to sign."

Bill said, "Can't do it."

Baron Hauss von Struben looked astonished. "I beg your pardon."

"I can't do it," Bill said. "Sorry."

"Perhaps a little more money. Is that the trouble?"

"No. I'm sewed up on a job right now, von Struben. Your proposition sounds attractive, but—well, I can't."

The baron frowned. "This is really most unfortunate, Barnes," he said. "I had quite counted on you. You and your Lancer would give the presentation the necessary color and glamour. What is this other—ah—job that forces you to turn down my offer, if I may ask?"

"Confidential," Bill said bluntly.

"I merely meant that if you were bound by contract, perhaps my lawyer could—"

Bill shook his head. The annoyance he always felt when von Struben was around had now increased. "I'll be tied up for two months on this job."

He thought grimly to himself. A job! Coming from Steve Drake and the secret service it was practically an order. Drake hadn't told him much, just to hold himself and the Lancer ready for action. And even now, working behind locked hangar doors, government technicians were installing an infra-red-ray detector on the Lancer.

Baron Hauss von Struben smiled stiffly. "I suppose I will have to make other arrangements. I had hoped to work with you, Barnes."

Bill started to speak and checked his words as he saw Alphonso walk casually in through the open door. The monkey climbed up on a big leather chair near the desk, squatted down and solemnly surveyed the two men.

"Allow me to introduce Alphonso, von Struben," Bill said, grinning.

The Austrian turned to look at the small monkey. As he did so a high-light glittered across his eyeglass. "Yes, I have heard of him," the baron said. "Cunning little chap, isn't he?"

Alphonso's beady eyes were directed at the perfumer as if he had heard his words. Suddenly, the monkey sprang from the chair to the floor and with a quick bound leaped straight at the baron. He landed in the man's lap and darted out a hairy hand for von Struben's face.

The Austrian was taken by surprise. He jerked his head back, brought up his arms to ward off the animal.

Bill was out of his chair like a shot. He seized Alphonso by the hindquarters and tossed him to the floor.

At that exact moment Sandy came rushing into the office, his freckled face aghast. "Gosh! What—"

"Take that ape out of here!" Bill roared.

But Alphonso, with one frightened screech, had made for the door and disappeared outside. Sandy raced after him.

Bill stood in front of the baron. "I can't tell you how sorry I am," he said, awkwardly. "He didn't hurt you?"

Baron Hauss von Struben had regained his composure. He smoothed out his tie and touched his eyeglass.

"No—no. Quite all right. Strange, though, why he should attack me."

"We're going to have to do something about Alphonso," Bill said grimly. "He wasn't attacking you, von Struben. He was after your monocle. I don't know what's happened to him. Lately he's been going for anything glass. Been stealing goggles by the dozen and hiding them."

"Very odd," the baron said. He rose to his feet and held out his hand. "Well, I must be pushing off. I am indeed sorry we cannot work together, Barnes. Perhaps some other time, eh?"

Bill took his hand. "Some other time," he said.

Baron von Struben's Beechcraft was still visible in the western sky when the telephone in the office rang. It was Steve Drake. The government agent's voice sounded excited. He said, "To-night's the night. Land at 3 X B 4."

III—WAITING

3 X B 4 designated an old deserted yacht basin on the fringe of the Florida Everglades, six miles up the south fork of New River from Fort Lauderdale. The Caruthers Brothers had built it during the height of the Florida boom, for the summer storing of yachts and smaller craft. But, being too far from Fort Lauderdale



Richard Claymore

and the ocean, it had never been a commercial success and had finally been abandoned.

Once before, years ago, Bill and Steve Drake had used the Carruthers yacht basin for a secret meeting. And when Bill landed the Lancer on the amber waters of New River, just as twilight was blackening into night, it seemed to him that he was living his life over again.

A skiff probed out from the gloomy interior of the basin and pulled alongside the Lancer. Two men were in it. One was Steve Drake. The other was Kirk Graves, a secret-service operative.

There was no time wasted in conversation. The Lancer, her powerful Diesels silenced, was slowly worked into one of the slips that had been partially cleared of weeds. The three men labored with silent intensity. When they were through they were soaked with perspiration and tormented with swarms of mosquitoes.

A forty-foot schooner, patched and paintless, was tied up in the other slip. It wasn't until the three men had climbed under the mosquito netting of her cockpit that Drake spoke. His voice was sharp. "Were you followed?"

Bill shook his head. "Don't think so. I flew due east across the ocean. I made sure no one was on my tail

before I turned and headed for here. What's the excitement?"

Drake grunted. "Excitement enough," he said. "All your men are standing by?"

"Yes. And they're curious. So am I, for that matter."

The three men were seated in dilapidated wicker chairs. Drake pulled out his pipe and slowly packed it with tobacco. "Tell you in a minute." He got his pipe going and then said, "First I want to give you some money for expenses."

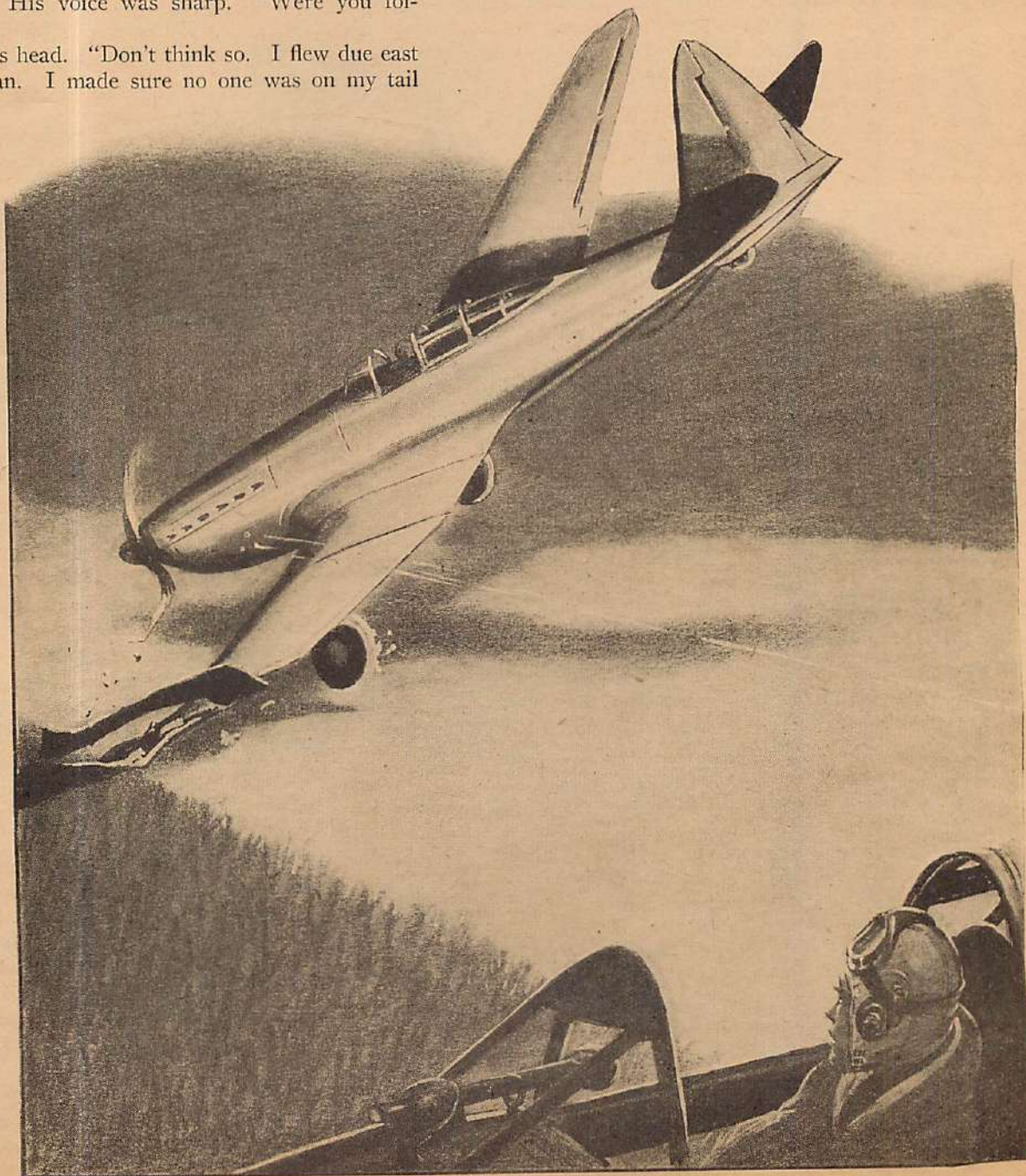
"Expenses for what?" Bill asked.

Drake didn't answer. He took a wallet from his pocket and removed a hundred-dollar bank note, a fifty, a twenty and a ten. He handed them to Bill. "A hundred and eighty dollars. Better count it. Here, use this flashlight."

Bill focused the light on the bills and leafed through them. "That's right. A hundred and eighty."

He noticed a look pass between Drake and Graves.

Bill aimed dead on the tire of the ship racing for the take-off—He saw the left tire blow out. One wing dipped, buried itself in the ground—



Drake said, "Sure you've counted right? Better look them over again."

Bill did. "Hundred and eighty," he said. "What's the gag?"

Drake shook his head wearily. "No gag, Bill. I was just trying you out. You didn't get wise. Nor would any other average person. Hell's fire, man, you've just accepted a hundred and eighty dollars' worth of counterfeit money."

"Counterfeit!" Bill said, startled. He inspected the notes again. "They look perfectly good to me."

"That's the trouble," Drake said. He took the flashlight from Bill and snapped it off. "It takes an expert to detect them. They've been passed into banks and been paid out by tellers as the genuine article. The country's flooded with them. I've seen plenty of counterfeit plates, but this is the slickest engraving job I've ever laid my eyes on."

"Have you any idea who's making the stuff?" Bill asked.

Drake's jaw tightened. "If we knew we wouldn't be here," he said abruptly.

"Don't be like that, Steve," Bill said. "I was just trying——"

"I'm sorry, Bill," Drake said. "The thing's got me down. I've scarcely had any sleep for weeks. If this case isn't broken soon why—— Listen to me. We've checked the records of all known engravers in this country and a lot of foreign ones, and drawn blanks. We've

had every available operative on the job for the past five months. Time after time we thought we had something. Then——" The agent hesitated, breathing hard.

Graves hitched himself forward in his chair. "Take it easy, chief," he said anxiously.

Drake didn't say anything more for a long minute. When he spoke again his words were measured. "This counterfeit ring operates as others have done. The money goes from the factory to jobbers, to retailers, to passers. Only in this case the system is highly organized. We've picked up plenty of the passers and some retailers. We've made them talk. But it was the same story in every case. They didn't know where the money came from originally.

"We finally got a break—and blew it. We grabbed an ex-con by the name of Levinski. He was mixed up in this thing. And—well, we made Levinski do a lot of talking. He tipped us off that a batch of the 'queer' was to be delivered by plane at a place on the Maine coast.

"We got a fast coast-guard airplane and installed an infra-red-ray detector on her—so the pilot could follow the counterfeiter's ship at night and not be observed. We hoped he might trail him back to his headquarters. Our plan went sour."

"What happened?" Bill asked.

"The counterfeiter swooped down about two o'clock in the morning and dropped his load. The crooks had a car waiting to pick up the dough. A couple of

agents and I were hidden near by. We had a radio.

As soon as the counterfeiter's plane high-tailed it we signaled our pilot. He took off. The detector worked fine. Our man was able to follow the other plane. But only for a while. That crook was flying what looked like a Morrow Meteor. Anyway, he had speed to burn. He just walked away from the coast-guard ship and vanished."

Bill said, "That's why you want the Lancer and——"

"Yes. We're going to try the same stunt again. We let Levinski go on his promise to stool for us. He's just reported that another delivery will be made by plane at a place in the Everglades five miles from here. It will be made some night soon. But this time we're going to be ready. Of course, Bill, you don't have——"

"Skip it," Bill said. "What's the dope? You or Graves coming with me?"



Drake snorted. "My superiors have decided that I'm too old for this sort of thing, Bill," he said. "Graves will go with you. You'll be under his orders. The two of you will hide out here. There's plenty of food and water aboard. I'll be stationed at Miami until I get definite word from Levinski. On the night they dump the stuff I'll be hidden near the contact place and I'll have a radio. You'll take off after the money's been dropped, so as not to arouse their suspicions. I'll tell you when. You know how that detector works?"

"The chap who installed it gave me the low-down," Bill said.

"Your black-light telescope ready?" Drake asked.

The infra-red-ray telescope was standard equipment on the Lancer. It permitted Bill to see through fog, clouds and darkness. More than once it had proved itself invaluable.

Bill said, "Yes."

"Good," Drake said. "That telescope's going to help us do the trick. You'll use the detector to pick up the counterfeiter's plane. Then, you'll follow it through your telescope. If you can find out where his base is—well, the rest will be up to you and Graves."

"I'll do my best," Bill said.

"You'll both have to do more than that," Drake said.

Drake stood up. "I'm going to leave now," he said. "I know you two will see it through. To smash this ring we've got to get the criminal mind back of it and get those counterfeit plates. Now sit tight, both of you. There's no telling when the take-off word will come. It might be to-night, to-morrow or two weeks from now. Levinski will let me know."

TEN DAYS LATER the ex-convict, Levinski, phoned Stephen Drake from the basement room of a house on LeRoy Street, New York City. He gave his identifying code word, then said, "They're going to dump it early to-morrow morning."

IV—THE WORD

AT FOUR O'CLOCK on the afternoon of the tenth day Bill heard Drake's voice through the head phones of the schooner's radio. "Pulling it to-night," the agent clipped out. "Be ready to get away at any time after midnight. I'm driving to the contact place now. I'll radio you from there."

At six o'clock he reported again. "We've got the car hidden at the side of the clearing where the stuff will be dumped. My men are spread around. Everything ready there?"

"Everything ready," Bill said laconically.

Yes, everything was ready—checked and rechecked a hundred times.

Bill was in the bucket seat of the Lancer's forward cockpit, helmet phones attached and the radio tuned in on Drake's wave length, when the agent called once again. It was eight o'clock.

"Nothing will happen until after midnight, Bill," he said. "But we can't be too sure. Keep on your toes."

Keep on your toes! As if Graves and he hadn't been keyed up for hours on end. Forgotten now was the procession of monotonous days they had spent aboard the schooner, doing nothing but eating and sleeping and—waiting.

Bill's gaze went to where Graves was squatted on the catwalk between the two slips, ready to guide the Lancer

from the shed when the word came. He was barely discernible in the darkness that had come. The man's extreme nervousness was obvious by the way he was smoking cigarettes.

Bill slipped up the flaps of his helmet and heard Graves' hoarse whisper. "Nothing?"

"Not yet," Bill said.

Nine o'clock and Drake said, "Stand by. All O. K. there?"

Bill said, "Except for the mosquitoes," and tried to laugh. He didn't make a very good job of it.

Again radio contact was broken and again Bill found himself running a practiced eye over ammunition counters and checking the pair of .50-caliber machine guns and the 37-mm. automatic cannon mounted in the V of the Lancer's cylinders. He lifted the infra-red-ray telescope from its recess in the instrument board and clicked it into position. Leaning forward, he switched on the mechanism and looked into the double eyepiece. The blackness ahead became clear as day, as the invisible beam of infra-red rays projected itself through the night.

Bill turned off the mechanism but left the instrument in position. He remained in the cockpit.

Ten o'clock passed—eleven.

Bill could now catch the tension in Drake's voice as he repeatedly made radio contact with the Lancer. He had nothing new to report, just, "Stand by."

The night was moonless and coal-black. Only the glow of his cigarette told Bill where Graves waited.

Bill switched on the instrument lights and eyed the face of the chronometer. Drake had said after midnight. It was now almost twelve.

Below the instrument board a new dial had been added, similar to an artificial horizon indicator. It was connected with the infra-red-ray detector that had been installed far out on the left wing. The detector was a bulky piece of apparatus, decidedly not streamlined, and would take its toll of the Lancer's speed. Yet the sacrifice was necessary if the counterfeiter's plane was to be contacted and followed.

Bill had familiarized himself with the operation of the detector. It was a parabolic reflector with a thermocouple at the focus capable of registering the heat waves coming from the counterfeiter's airplane engine. The two needles of the dial would give the vertical and lateral directional readings. The detector had been shielded against influence from the Lancer's own power plant.

Yes, the instrument was capable of putting him on the trail of the other plane. But supposing there was a flash of lightning and the man looked back. Or what if the telescope went sour or—

Suddenly Bill heard Graves' guarded voice. "Hey, Bill, it's after midnight. Any news?"

There wasn't.

It was the same at one o'clock and one thirty.

Then, at ten minutes to two in the morning, Drake's voice crackled through Bill's ear phones. "A sedan has just pulled up in the clearing. Two men have got out." There was a pause. Bill felt excitement shivering up his spine. "They've turned the car's spotlight on—aimed at the sky. Must be a signal for the plane. It'll probably be along any minute. Get ready."

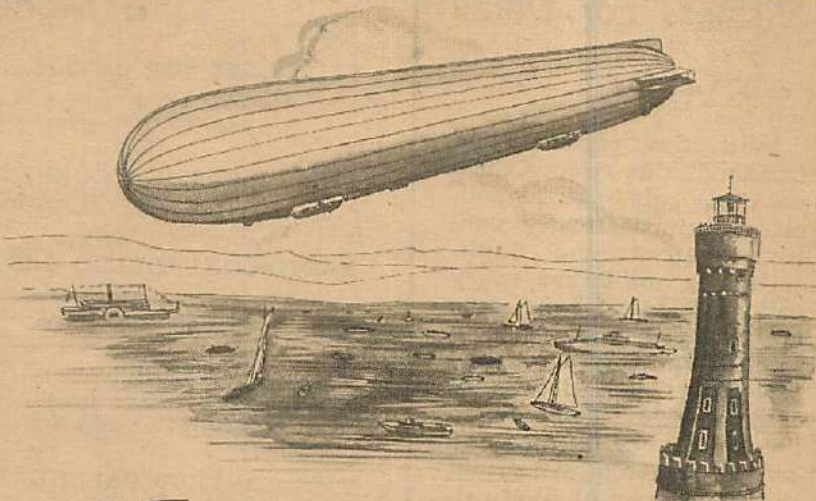
"Check," Bill said, and relayed the word to Graves.

Drake's voice came back. "I hear an airplane engine—far away. It's getting louder. The men here are blinking the light."

(Turn to page 61)

Pictorial History of Man in the Air

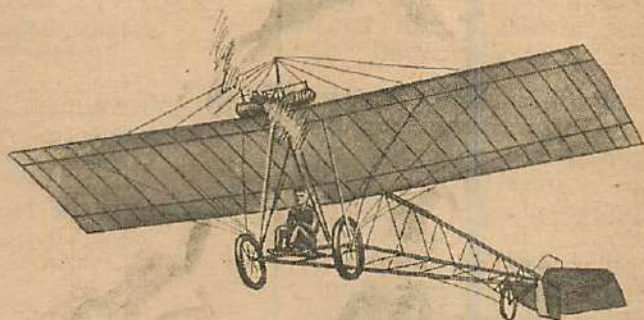
1909 - ON AUGUST 27th OF THIS YEAR COUNT ZEPPELIN'S GREAT RIGID DIRIGIBLE ROSE OVER LAKE CONSTANCE AND SAILED AWAY TO BERLIN, WHERE IT LANDED TWO DAYS LATER, SUCCESSFULLY DEMONSTRATING ITS PRACTICABILITY.



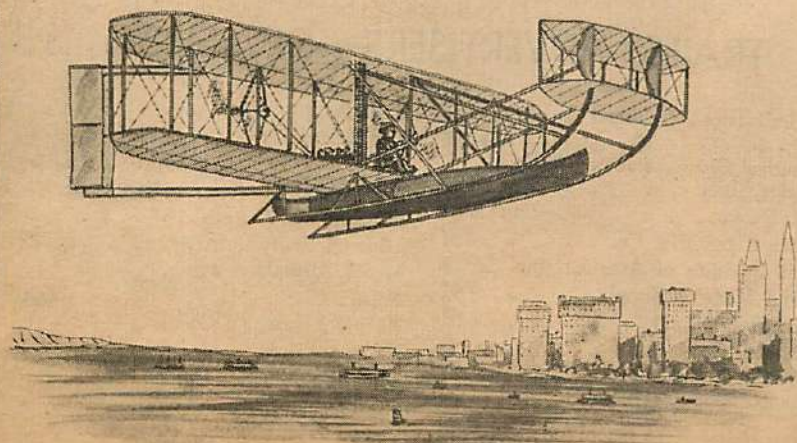
1909 - THIS YEAR ALSO SAW THE FIRST PIECE OF MAIL TO BE CARRIED IN THE AIR. TO HANS GRADE AND HIS TINY MONOPLANE, BUILT AND FLOWN BY HIMSELF, BELONGS THIS HONOR. HIS TINY SHIP WAS THE FIRST POWER-DRIVEN PLANE TO BE BUILT AND FLOWN IN GERMANY.



1909 - DURING THIS YEAR SANTOS-DUMONT AGAIN TOOK THE SPOTLIGHT WITH AN ASTONISHING FLIGHT OF FOUR AND THREE-QUARTER MILES IN FIVE MINUTES AT THE UNHEARD-OF SPEED OF FIFTY-FIVE MILES AN HOUR. THIS WAS IN HIS TINY 59 LB. MONOPLANE NAMED "DEMOISELLE".



1909 - AMERICA ALSO WAS REPRESENTED THIS YEAR FOR GREAT FLIGHTS, AMONG WHICH WAS WILBUR WRIGHT'S FAMOUS FLIGHT FROM GOVERNOR'S ISLAND TO GRANT'S TOMB AND BACK OVER THE HUDSON RIVER. HE CARRIED A CANOE ATTACHED TO HIS UNDERCARRIAGE IN CASE HE WAS FORCED DOWN INTO THE WATER BY VIOLENT AIR CURRENTS FROM THE TALL BUILDINGS OF LOWER NEW YORK CITY.



MODEL MAKING—

Air Trails Department of Practical Construction

Sticklers For Detail

By Gordon S. Light

With few contests and little publicity to spur them on, thousands of scale modelers enthusiastically continue their work of duplicating in miniature every new airplane. Like true craftsmen they work accurately. Painstakingly, they reproduce such details as cabin interiors complete to the upholstery buttons and control systems carried out to the extreme of duplicating the rubber hand-grip on the control stick.

Air Trails considers scale modeling to be one of the most interesting phases of the hobby and intends doing its part in bringing recruits into the ranks of the scale modelers. Accurately drawn plans of the latest airplanes will continue to be presented.

The present authoritative and informative replica projects are prepared by staff writers from factory-supplied plans and specifications. In response to popular demand, fully detailed, larger scale ships can be occasionally presented. From them scale modelers can learn every detail of an airplane.

Airfoil shapes, landing-gear construction, motor installation, and hundreds of other details are common knowledge among scale modelers. Their intimate knowledge of the details of a wide variety of airplanes rivals that of any aeronautical engineer. If you're interested in learning about airplanes—plus a pleasant way to spend leisure time—scale modeling is recommended. Try it. Then send us a letter telling what scale model plans you'd like to see in this department.

11 Model Building Items

STICKLERS FOR DETAIL.....	BY GORDON S. LIGHT	38
<i>The scale modeler's intimate knowledge of the details of a wide variety of airplanes rivals that of any aeronautical engineer.</i>		
THE DISCUSSION CORNER.....		39
<i>This month readers discuss "Outline Shapes."</i>		
RADIO-CONTROLLED GAS MODEL.....	BY CHESTER LANZO	40
<i>The greatest "scoop" in model history—the first practical, contest-winning, radio-controlled model.</i>		
MODEL MATTERS.....		44
<i>Club notes, model activities everywhere, news of recent contests, pictures. This is your page. Send in your notes, news, snaps.</i>		
THE CONTEST CALENDAR.....		46
<i>A schedule of competitive events which keeps Air Trails readers up to the minute.</i>		
THE BELLANCA SCOUT.....	BY MARTIN A. DICKINSON	47
<i>Another sensational first appearance of a secret ship—a three-view drawing.</i>		
WIND MASTER.....	BY ROGER HAMMER	48
<i>An intriguing model project—plans for a high-performance soarer in miniature, the Ross-Stephens sailplane.</i>		
PRACTICAL MODEL DESIGN.....	BY FRANK ZAIC	51
<i>Stability factors simplified—a timely discussion by the author of the Model Aeronautics Yearbook.</i>		
GULFHAWK.....	BY ALAN D. BOOTON	52
<i>Detailed plans for constructing a flying scale model of one of the most popular ships of the day—Al Williams' Grumman stunt ship.</i>		
BOMBER OR TRANSPORT.....	BY WILLIAM WINTER	57
<i>1/4" scale replica plans of a twin-motored plane—the Lockheed convertible bomber.</i>		
THE CANARD.....	BY LAWRENCE N. SMITHLINE	60
<i>An interesting pusher type model for the indoor fans.</i>		

AIR TRAILS ADVERTISERS—DECEMBER, 1937

Aero Industries Technical Institute, Inc.	Back Cover	S. J. Jorgensen	93
Aeronautical Chamber of Commerce of America, Inc.	93	Litwin Bros.	93
Aircraft	2nd Cover	McFarland Aircraft Corp.	91
American Flyer Mfg. Co.	87	Mechanix Universal Aviation Service	87
Aviation Institute of America, Inc.	3	Megow's	63
Cleveland Model & Supply Co.	91	Midwest Radio Corp.	3rd Cover
De Luxe Mfg. Co.	91	Model Airplane News	89
Gun Model Co.	91	Nelson Co.	87
Heath Model Airplane Co.	67	Newell Pharmacal Co.	87
Howard Engines & Mfg. Co.	93	Rapaport Bros.	75
Imperial Model Aero Supply	75	Scientific Model Airplane Co.	82 & 83
International Correspondence Schools	1 & 71	Skyway	91
Johnson Smith & Co.	96	State Model Co.	87
		Tyndal Products	93
		Universal Aircraft Co.	87

The Discussion CORNER

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

GOOD tip shapes on the wing and tail surfaces do materially increase performance, because such practice is in keeping with good streamlining. Likewise, models with graceful curves and pleasing appearance fly better because of the better streamlining.—**POWELL BUSH**, Dahlone, Georgia.

Model-airplane efficiency is dependent on wing and tail shapes. Curved tips are not only more efficient but are more pleasing to the eye. And too, the model with attractive lines is most always the better performer. This has been rather conclusively demonstrated by the increased number of victories turned in by the streamlined, elliptical-winged models in recent contests.—**PETER BOWERS**, Los Altos, California.

It doesn't matter whether or not the wing tips, rudder, and stabilizer are curved or square. The curved shape is more pleasing to the eye. A plane can look most attractive and still refuse to glide. The performance of a model is usually the result of design and construction. Pleasing appearance has little effect. Stick models are outstanding performers, and yet they are not particularly attractive models.—**FRANK SCHMAGL**, Milwaukee, Wisconsin.

Wing and tail tip design does not materially affect performance. Many times a model with square wings and tail surfaces carries away the honors in a contest. The things which really influence a model's performance are: airfoil, propeller size, power, and weight. A model with pleasing appearance does carry away honors on the ground, by attracting more attention than its homely brothers.—**THEODORE BOZECKI**, Wyandotte, Michigan.

Wing-tip shapes, together with rudder and stabilizer shapes, do influence a model's performance. It is especially important to design the stabilizer in correct proportion to the wing area. A "good-looking" model does not necessarily fly better. However, when people see a well-built, attractive model, they imagine it flies better.—**MILO KENSUR**, Wichita Falls, Texas.

Although an exceptional case will occur once in a while, the model with rounded wing, stabilizer, and rudder

tips will show the best performance. This type model usually has the most pleasing appearance. Good looks and performance go hand in hand.—**JAMES CRAIG**, St. Clair, Missouri.

In designing the outline shapes of wing tips, rudder, and stabilizers, care should be taken to see that they are rounded off gradually and evenly and that no blunt edges are exposed to the air stream. A model with attractive appearance, based on showy curves and flashy decorations, will not prove superior over the model which has been carefully built with tissue tightly stretched, airfoil uniform, and construction rugged and dependable.—**JOE BAHAMONDE**, Rahway, New Jersey.

This Month's Topic

Does designing the outline shapes of wing tips, rudders and stabilizers materially affect a model's performance? Does the model with a pleasing appearance show a noticeable superiority in performance?

While there is a considerable decrease in wing drag when a square tip is replaced by a rounded one, there is no appreciable difference in aerodynamic effect among circular, elliptical and negatively or positively raked tips. The effect of the tip form of any surface on the profile drag, and therefore the performance, depends far less on plan form than it does on careful smoothening or fairing of the tip edges and on keeping a good airfoil section out to the extreme end. Since long, smooth curving lines are both the most pleasing to the eye and of least resistance to the air flow, the most graceful model is usually among the best fliers.—**H. K. WEISS**, Lawrence, Massachusetts.

COMING UP are these topics:

For February—*In designing the outdoor model what fuselage cross section do you consider to offer the maximum efficiency?* Answers must reach us by November 15th.

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

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

RADIO-CONTROLLED GAS MODEL

PART I.

Detailed plans for duplicating the radio-controlled gas model winner of the National Contest. The 15th Air Trails championship-model presentation

By Chester Lanzo

In collaboration with Gordon S. Light



Chester Lanzo experimented for 4 years to solve the problems of practical radio control for model planes. The model above is a modification of the actual contest winner.

THE idea of a radio-controlled gas model is practically as old as the gas model itself. For the past five years gas models have been flying successfully. But it was not until this year that a successful radio-controlled gas model was demonstrated to the satisfaction of the modeling public. Chester Lanzo of Cleveland turned in this history-making flight at the National Model Meet last July in Detroit. The model and the radio apparatus are the result of his four years of experimenting. He was one of the first to conceive the idea of radio control and had the honor of being the first to carry it through to a successful conclusion.

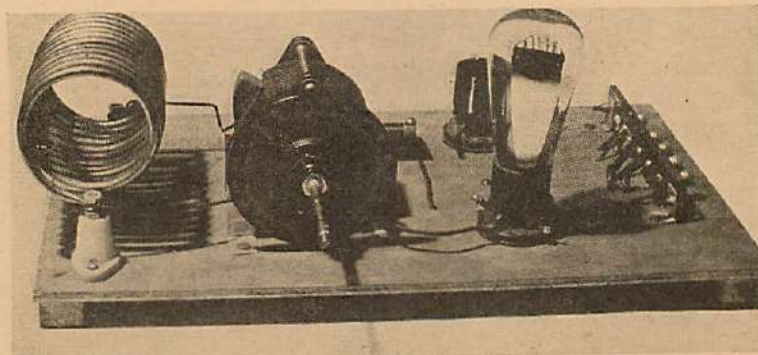
Lanzo's first idea on radio control was to operate all of the controls, that is, elevator, rudder, and ailerons. Early in his experiments he found this was impracticable. The weight of the receiving set was greatly increased by having three controls. And the size of the model necessary to lift the weight of the radio unit assumed such large proportions as to make it unhandy for flying. In addition the three-control radio unit became extremely complicated, increasing the possibility of failure at a critical time. To operate the elevator of a model a sure-fire positive-action radio apparatus is needed. A slight uncontrolled up or down motion of the elevator would have a disastrous effect on a model flying close to the ground. Lanzo's experiments further proved that aileron

control was not necessary to control a model's flight. In flight the model automatically banked itself in the proper direction when making a turn.

Consequently, he concluded that rudder control alone was the most practicable way of guiding a model's flight. It would give the ground operator complete control over the model and would greatly simplify the radio apparatus. He concentrated on developing a practical and simple apparatus that would do the job effectively and with little trouble.

The apparatus he demonstrated last July had these features. It was the simplest of any yet devised. The model can be flown either right or left with sufficient rudder movement to make tight turns. The climbing or diving attitude of the model is easily controlled. The model can be made to lose altitude by holding it in a tight bank. By moving the rudder into a neutral setting it will gain altitude, since the model is originally trimmed to climb at its most effective angle.

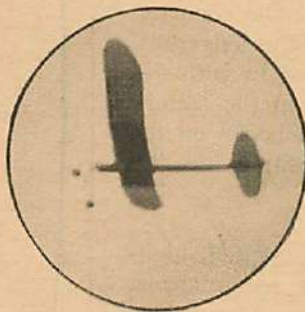
Many modelers, interested in radio control, are under the impression that the successful radio-controlled model should be capable of loops, spins, dives, and a full list of other aerobatics. This is not feasible with present equipment. Within a few years, however, any sort of maneuver will be possible. Up to now progress in radio control has been slow. But since successful flights have



The transmitting apparatus. Construction is detailed in text; explanatory diagrams in back of book.

LICENSING

The plans and text in these two installments will include all the necessary information for duplicating both the model and the radio apparatus. We're presenting the material in detail as it was prepared by Lanzo. Many of the terms and drawings will be staggering to a model



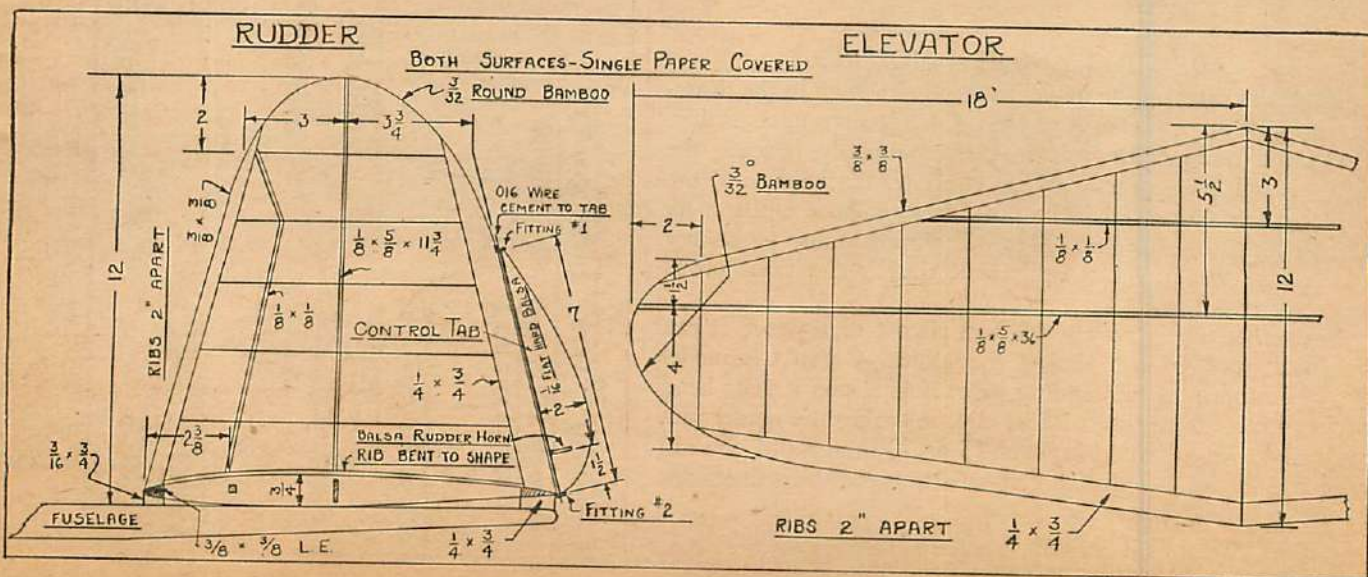
CONSTRUCTION OF THE MODEL

Two bass longerons $3\frac{3}{16} \times 1\frac{1}{4} \times 60"$ are used for the fuselage. The batteries and radio are mounted in the compartment between the longerons. These compartments

are easily reached for installation of apparatus and the necessary trouble shooting. The plans and sketches contain all the necessary information for duplicating the model.

DOUBLE PAPER COVERING

Both the wing and the rear of the fuselage are double-paper covered. First cover the wing with the grain of the tissue running lengthwise. Spray with water and



follow with two coats of clear dope. Now add another layer of tissue with the grain running crosswise. Spray again, and then apply two more coats of clear dope. This method provides a strong yet lightweight covering.

RUDDER TAB

The small movable tab on the rear of the rudder is actuated by the radio apparatus. The actual method of moving the rudder will be discussed in detail next month. However, at this time, mount the tab to the rudder, using a piece of .016 wire inserted through two aluminum fittings #1 and #2. The tab is slotted to accommodate the horn which is cut from $\frac{1}{16}$ " flat balsa. Mount the tab so it moves freely in both directions.

MOTOR INSTALLATION

A Baby Cyclone was used to power the model. It is mounted on $\frac{3}{8} \times \frac{3}{8}$ " bass-motor mounts fastened to the front of the fuselage. The coil, condenser, and other items in the ignition system are carried between the bass longerons directly to the rear of the motor. The motor is mounted with 3 degrees downthrust.

BATTERY AND RADIO COMPARTMENTS

The positions indicated as the battery and radio compartments are 3" wide and extend the depth of the longerons. The bottom of the radio compartment is filled in with $\frac{1}{16}$ " flat balsa. This procedure is not necessary in the battery compartment since rubber bands, fastened to hooks on the longerons, are used to hold the batteries in position.

WING AND TAIL

The wing section used in the wing is a low-speed, high-lift airfoil. A variety of airfoils will fill the requirements. The ribs are cut from $\frac{3}{32}$ " flat balsa. The wing is assembled in three separate sections—each 3 feet long. The three sections are joined, adding the 13" of dihedral to both tips.

The wing is mounted to the fuselage by means of a "saddle" built up of $\frac{1}{8}$ " and $\frac{1}{16}$ " steel wire and $\frac{3}{16} \times \frac{3}{8}$ " bass strips. The saddle is attached to the fuselage with rubber bands. Likewise, the wing is attached to the saddle with loops of $\frac{3}{16}$ " rubber crisscrossed across the top of the wing.

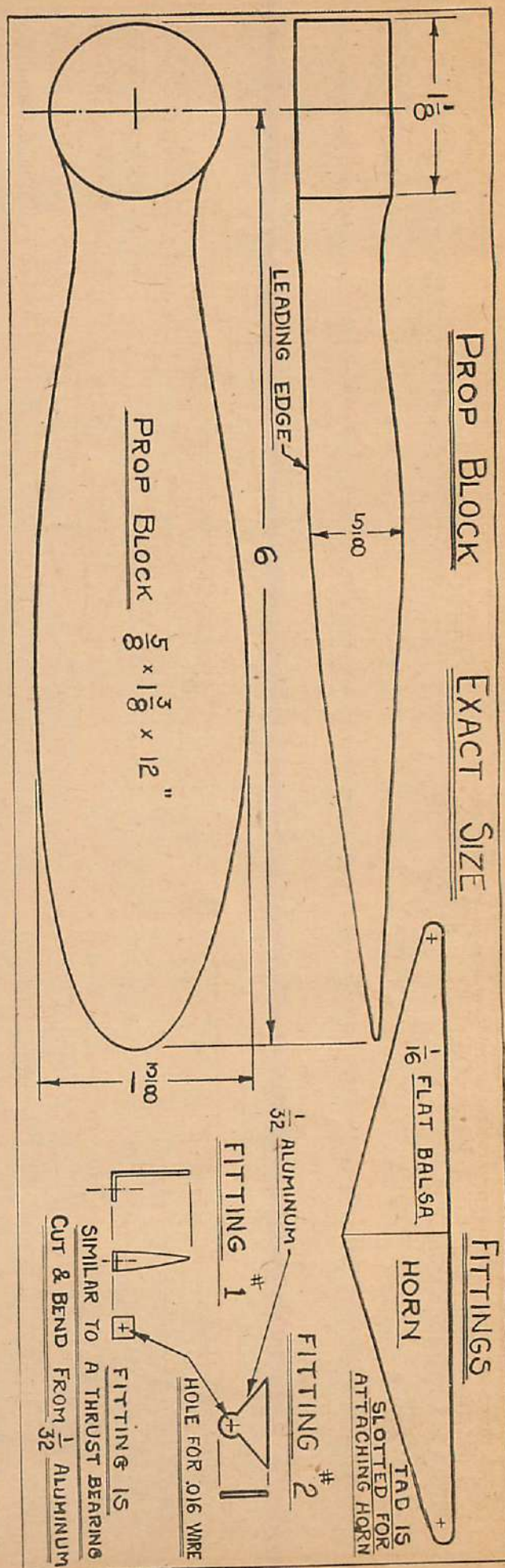
The rudder and elevator are built separately and then joined before covering. That is, the rudder is cemented rigidly atop the elevator. The tail is covered with a single layer of tissue. It is mounted to the top of the fuselage with 4 loops of $\frac{3}{16}$ " rubber.

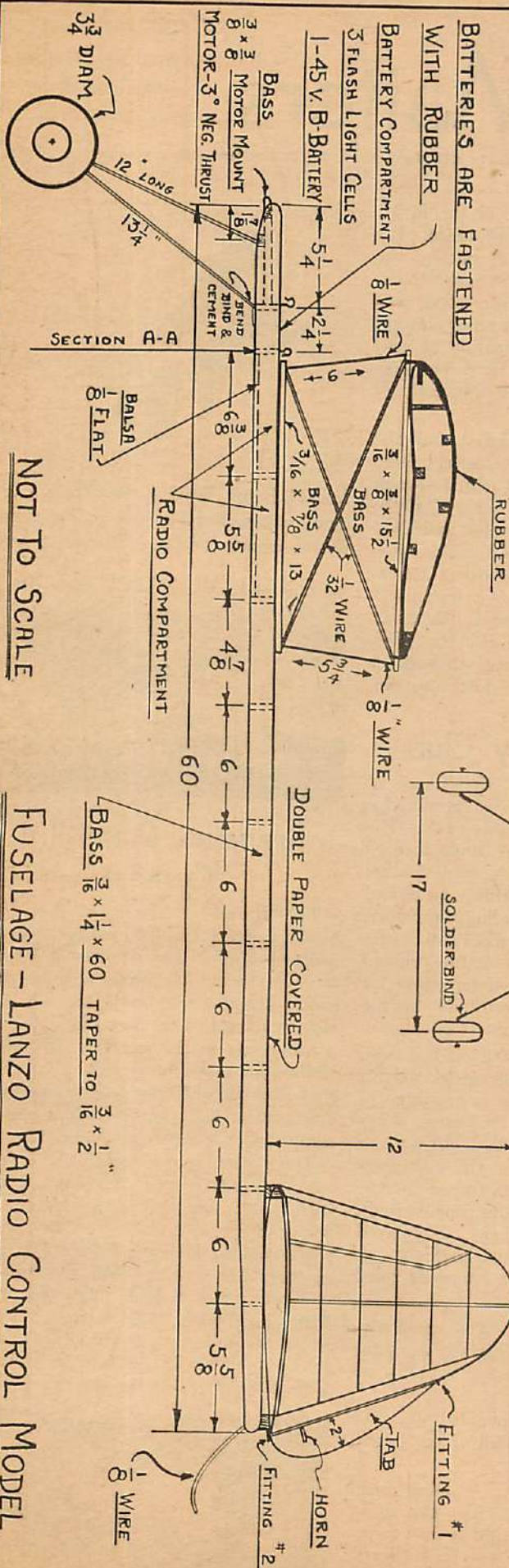
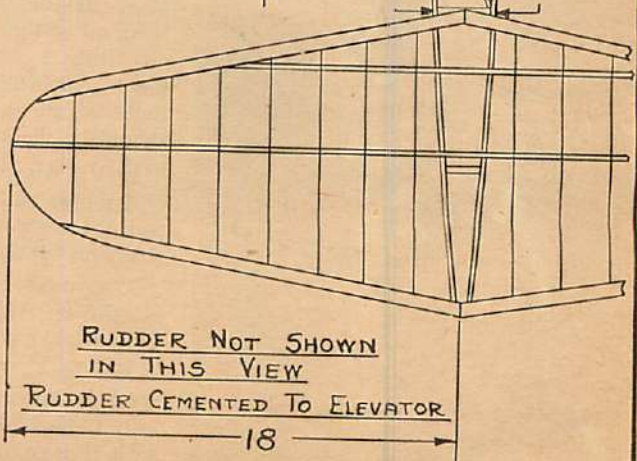
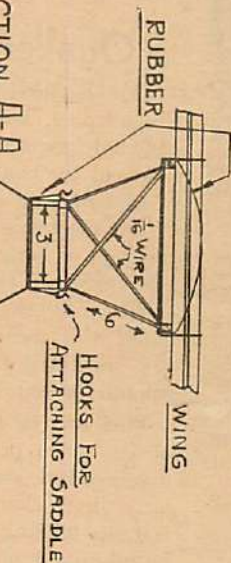
ADJUSTING AND TEST HOPPING

Place the wing on the model in position shown in the drawing. Make sure all parts of the model are mounted firmly. Since the radio equipment is carried directly beneath the wing, it will have practically no effect on the balance of the model. Therefore, it will be possible to balance and test-fly the model without radio. This will eliminate any possibility of damage to the radio equipment during the treacherous stages of test-flying.

Since the ship is very stable and almost crashproof, it can be hand-launched for testing the glide. Grasp the model firmly just behind the landing gear, hold it above your head and run into the wind at a fast clip, releasing the model in a very slight dive. Glide it about 15 or 20 times until you are sure the model is delivering the flattest possible glide with no stalling tendencies.

For a power flight, place a slight additional amount of downthrust in the motor mount than the 3 (Turn to page 94)





NOT TO SCALE

FUSELAGE - LANZO RADIO CONTROL MODEL

*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.)

Linden, N. J., Model Aircraft Club

The Linden Model Aircraft Club of Linden, New Jersey, is one of the most active model groups we've ever had the pleasure to contact. We've seen them in action at contests and have had considerable correspondence with them. They're a swell bunch of modelers, with enough enthusiasm and ability to carry them to the top.



Above: Al Williams, National Commander, and Mr. L. W. Grieve co-operated in boosting the Junior Aviator National Air Races held at Akron, Ohio. Below: Jerry Kolb, senior stick victor; time 41 min. Below, right: Winners of the original design event.



Recently the first issue of the L. M. A. C. *Gazette* made its appearance. It's a monthly publication put out by the club. We found the first issue to be eight pages of mighty interesting material. It contained club news and activities, along with information of general modeling interest. We'll look forward to receiving our monthly copy of the *Gazette*.

Following is the editorial staff of the *Gazette*: editor—Roy Messenger; rubber editor—Ralph Mann; gas editor—Frank Yuhasz; humor editor—Silvio Colletti; art editors—Eugene Matrejek and Robert Lange. They are particularly anxious to contact other modelers to exchange news of club activities and model information. Address the L. M. A. C. *Gazette*, Old City Hall, Linden, New Jersey. You'll find their enthusiasm stimulating and inspiring—just as we did.

Quaker City Club

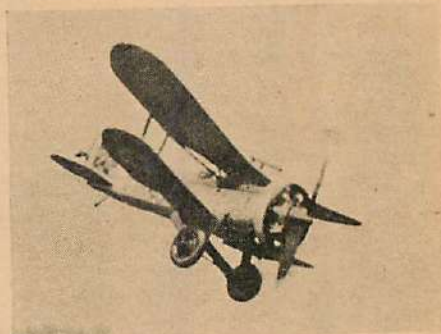
The Quaker City Gas Model Club of Philadelphia, Pennsylvania, sponsored a gas-model meet on September 11th. The hours of the contest were 10:00 to 6:00 p. m.—rain or shine. A novel feature of this meet was to distribute an official program of events, including the names, addresses, and type of model entered by each contestant. This feature should make the meet more interesting for the spectators and contribute to the smooth procedure of contest events.

Fuel was to be allotted on the ratio of $\frac{1}{16}$ ounce per pound model weight, unless wind conditions necessitated a last-minute change in this ruling. Contestants making an official flight were to be allowed 2 minutes on the main runway. If the timer was forced to rule them off at the end of this time it would constitute a delayed flight. 3 delayed flights constituted an official flight. A flight of 20 seconds or longer is ruled an official flight.

In the Timer-Flight Event, a 40-second motor run was allowed. A motor run of less than 20 or more than 40 was ruled no flight.

The meet was scheduled for the Northeast Airport, Red Lion Road, Philadelphia.

The Q. C. G. M. C. is doing much good gas-model work. Any one living near Philadelphia is urged to join forces with this group. Address W. S. Berry, Chairman Contest Committee, 3925 N. Broad Street, Philadelphia, Pennsylvania.



Jack H. Elwell, Beverly, East Yorks, England, constructed the flying model of the Bristol, above, and the Hawker, below.



Brandon, Manitoba Contest

The Brandon, Manitoba, Air-Meet Model Contest was held on Labor Day, September 6th. The air meet began at 10 a. m., when the model contest was held. The day was bright but not hot. Hot weather in this part of Canada is a rarity late in the summer. Modelers of Brandon make up in enthusiasm what they lack in numbers. This was their first contest and the result has been a considerable increase in model interest.

Three events were held: Ed Sengwoda winning the Junior Stick event with 1:10; Jim Johnston taking the Senior Stick with 1:01; and Ed Sengwoda winning his second victory of the meet in the Junior Stick event held under the new weight rules. He was flying his model, which took first place in a recent Winnipeg contest, turning in a flight of 49 seconds in a rain. Unfortunately, he wrecked his model



bringing it back to Brandon. Consequently, his poor time of :33 at this event.

Jim Johnston, of Brandon, who was kind enough to send us these contest results, is an enthusiastic modeler. We've frequently had letters from him telling of his progress in modeling. And it sure was pleasing to learn he had placed first in the contest.

New York Police

A model airplane builders' meet, sponsored by the Juvenile Aid Bureau of the New York City police department, 62 Precinct-Unit #6 has been set for Saturday, September 25th. In case of rain, arrangements had been made to postpone activities to the following day. Frank H. Campbell, Acting Lieutenant, Commanding Officer-Unit #6, has been in charge of the preparation for the meet.

Florida Contest

Bad model weather caused postponement of the Jacksonville Model Club Meet from August 29th to September 5th. But this week delay did not decrease the enthusiasm of the

W. L. Timpone, club director, directed this meet. He has been active in model activities in Florida for the past several years. He is largely responsible for the healthy upswing in model interest which Florida has been showing. Modelers in the vicinity of Jacksonville can keep posted on model developments by contacting W. L. Timpone, Director Jacksonville Model Club, 2048 Roselle St., Jacksonville, Florida.

Following is the tabulation of contest winners:

Junior Glider Event

1. Clifford Doyle, Jacksonville
2. Bruce McElroy, St. Augustine
3. Richard Paulus, St. Augustine



Line-up of models at the Jacksonville, Florida, gas-model contest.

Senior Glider Event

1. William McMinn, Jacksonville
2. John Aitken, Jacksonville
3. Lawrence Raley, Jacksonville

Junior Stick Event

1. Horace Smith, Jacksonville
2. Edward Herrmann, Jacksonville
3. Richard Paulus, St. Augustine

Senior Stick Event

1. William McMinn, Jacksonville
2. Gus Mangos, St. Augustine
3. Ed L. Smith, Jacksonville

Junior Fuselage Event

1. Horace Smith, Jacksonville
2. Edward Herrmann, Jacksonville
3. Richard Paulus, St. Augustine

Senior Fuselage Event

1. Gus Mangos, St. Augustine
2. John Williams, Jacksonville
3. Lawrence Raley, Jacksonville

Senior Gas Model Event

1. Milton Myers, Jacksonville
2. Lucius Herrmann, Jacksonville
3. Gus Mangos, St. Augustine

Open Gas Model Event

1. Frank W. McCormick

LINDEN, N. J., CONTEST RESULTS

Roy Messinger of Linden captured the Senior Championship by placing first in the two important events entered. By his double victory he replaced Richard Egles, winner for the past two years.

The contest was the third annual municipal meet, sponsored by the Linden Recreation Commission, and managed by the Linden Model Aircraft Club. The activities were conducted at the South Stiles Street Field on Saturday and Sunday, August 7th and 8th.

Recreation Superintendent, Frank Krysiak, an inspector of the N. A. A., supervised the running of the meet.



Leonard Fries of Philadelphia holding 2 of his flying scale models. Left: Romanian pursuit, right, French fighter.

Following are the results:

Senior Division, Open Fuselage

- | | |
|--------------------|--------|
| 1. Richard Egles | 1:42 |
| 2. Carl Frank | 1:06.4 |
| 3. Eugene Matrejek | :57.2 |

Junior Division, Fuselage

- | | |
|---------------------|-------|
| 1. Adolph Pribush | :50 |
| 2. Alex Pawlikowski | :48.4 |
| 3. Hampden Smith | :36.8 |

City Championship Fuselage Event

- | | |
|--------------------|--------|
| 1. Roy Messinger | 1:24.2 |
| 2. Silvio Colletti | 1:21.8 |
| 3. Richard Egles | :58 |

City Championship Stick Event

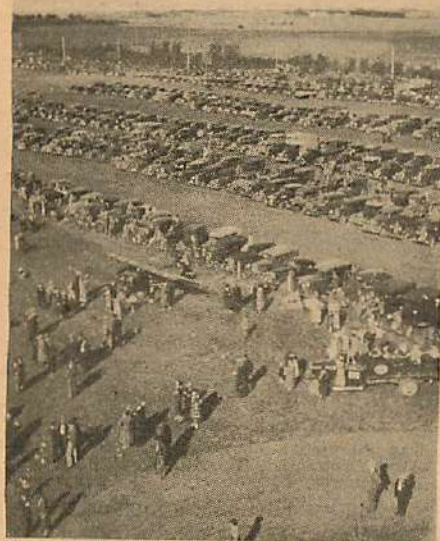
- | | |
|--------------------|--------|
| 1. Roy Messinger | 1:46 |
| 2. Richard Egles | 1:14.4 |
| 3. Eugene Matrejek | 1:00 |

Junior Glider Event

- | | |
|----------------------|-------|
| 1. John Gudalis | :40 |
| 2. Joseph Prsybylski | :38.2 |
| 3. Alex Pawlikowski | :28 |



Roy Messinger, left, and Alex Pawlikowski, right, senior and junior winners respectively of the Linden, New Jersey, city championship.



Scene at the Brandon, Manitoba, air meet, in conjunction with which model competitions were held.

Florida modelers. The meet was held at Paxton Field, Jacksonville, Florida, under N. A. A. rules, with a full list of outdoor events.

A silver trophy was presented by Eastern Air Lines to the Senior winner of the gas event. This trophy was competed for last year and the present holder has one leg on it. It must be won twice by the same competitor to hold it permanently. Other prizes were medals, trophies, model material, and magazine subscriptions.

Contest Calendar

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

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

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

Junior Stick Event

1. Alex Pawlikowski	1:01
2. Hampden Smith	:48.2
3. Joseph Prsbyliski	:38.2

Chicago Aeronauts

The Gas Model Aeronauts of Chicago announce the results of a recent club election: president, Miles J. Stone, Joliet, Ill.; vice president, Melvin Yates, Joliet, Ill.; secretary, Dr. G. Covington, Chicago; treasurer, Osborne Bergman, Chicago.

The G. M. A. have an active club of 52 members. One interesting club activity is a photo album, in which the club activities are preserved. The Chicago boys are a mighty active group. We'd sure like to look through this photo album and see the photographic record of the club's advancement.

Dr. Covington, newly elected secretary of the G. M. A., is a newcomer to models. He first started rubber-model construction a few years ago. At that time we had the pleasure of helping his progress by answering a few of his troublesome questions. But Covington's contest performance this year shows he no longer needs our help. He placed first at Milwaukee with a gas flight of 32:19, using only $5\frac{1}{16}$ oz. of fuel; fifth at the nationals with 47:00; first in the consistency contest of Midwest Contest at Harlem Airport in Chicago. Covington modestly dismisses this contest success as being pure luck. He says he doesn't take modeling seriously, considers it purely as a hobby. But we've found out that the model hobby continues to take more and more of your time, until it's difficult to find time for anything else.

Other members of the club include Barney Johnson, who holds the N. A. A. State record of 42 minutes; Carl Goldberg, who placed second at the last nationals; Sid Axelrod, who placed 7th in the senior division at the nationals; E. Konefes, who placed 5th in the same event, and Walter Addems, who is chief test pilot for United Airlines.

Canadian National Contest

The Canadian National Model Aircraft Contest was the best model event ever held in Canada. Frank Lucas, the new director, turned in a mighty fine job. All events were run off smoothly. And for the first time in Canadian model-contest history, free lunches were provided for the contestants. We certainly think this marks a milestone in the progress of Canadian modeling.

After the National meet in Detroit last July we accused John Dilly, of Galt, Ontario, that he was neglecting his modeling for more frivolous activities. John had visions of retiring from the model game after he made such a poor showing at Detroit. But he decided to have one more contest fling at the Canadian nationals in Toronto. If you look at the contest results you'll see what happens when John really does

concentrate on model building. He won the Adult Championship and was runner-up for the grand championship.

Bruno Marchi, of Boston, brought an interesting Wakefield-type model to the contest. It was a 4-motored job that proved more effective as a scientific curiosity than as a contest model.

A new ruling for the indoor flying-scale model contest required opaque covering. This ruling was designed to eliminate microfilm-covered models from the contest. However, Dilly wasn't discouraged by this ruling. He covered his job with red film that proved to be the sensation of the meet. Dilly recommends using red film to cover the rudders of indoor models. It serves as a convenient means of identification while flying your indoor models in a contest.

Following are the complete results of the contest. Due to the large number of winning contestants, it was possible to print only the first three winners in each event:

Outdoor Stick Junior

1. Fred Bower, Toronto	4:20
2. Kenneth Jay, Toronto	0:39
3. Jim Templeton, Toronto	0:36

Outdoor Stick, 16 and over

1. Ernest Barrie, Galt	4:20
2. Bert Norman, Vancouver	2:24
3. John T. Dilly, Galt	2:06

Wakefield—no age limits

1. Bob Milligan, Toronto	1:11
2. John T. Dilly, Galt	1:07
3. Clarence Dunn, Hamilton	0:59

Gas Models—no age limits

1. Don Jacobs, Toronto	8:53
2. Albert Pow, Toronto	8:17
3. Harold Johns, Toronto	6:55

Exhibition Scale Models

1. Frank DiSalvo, Hamilton	(Senior)
2. Roy Potter, Ottawa	(Junior)
3. Bill Doe, Vancouver	(Adult)

Indoor Stick—16 and over

1. Bert Norman, Vancouver	13:54
2. Thos. G. Harris, Toronto	13:17
3. Don McIntyre, Guelph	12:42

Indoor Stick—15 and over

1. Albert McGir, Toronto	9:01
2. Jim Templeton, Toronto	6:59

Indoor Fuselage Models—no age limits

1. Thos. G. Barrie, Toronto	11:35
2. James J. Haffey, Toronto	9:11
3. Bruno Marchi, Medford, Mass.	9:07

Semi-scale Models (Junior)

1. Jim Templeton, Toronto	235 points
2. Albert Cominsky, Toronto	193 points
3. Fred Bower, Toronto	181 points

Semi-scale Models (Senior)

1. Fred Thayer, Montreal	320 points
2. Paul Verdier, Montreal	289 points
3. James J. Haffey, Toronto	251 points

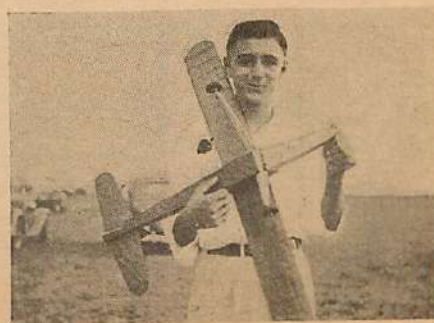
Semi-scale Models (Adult)

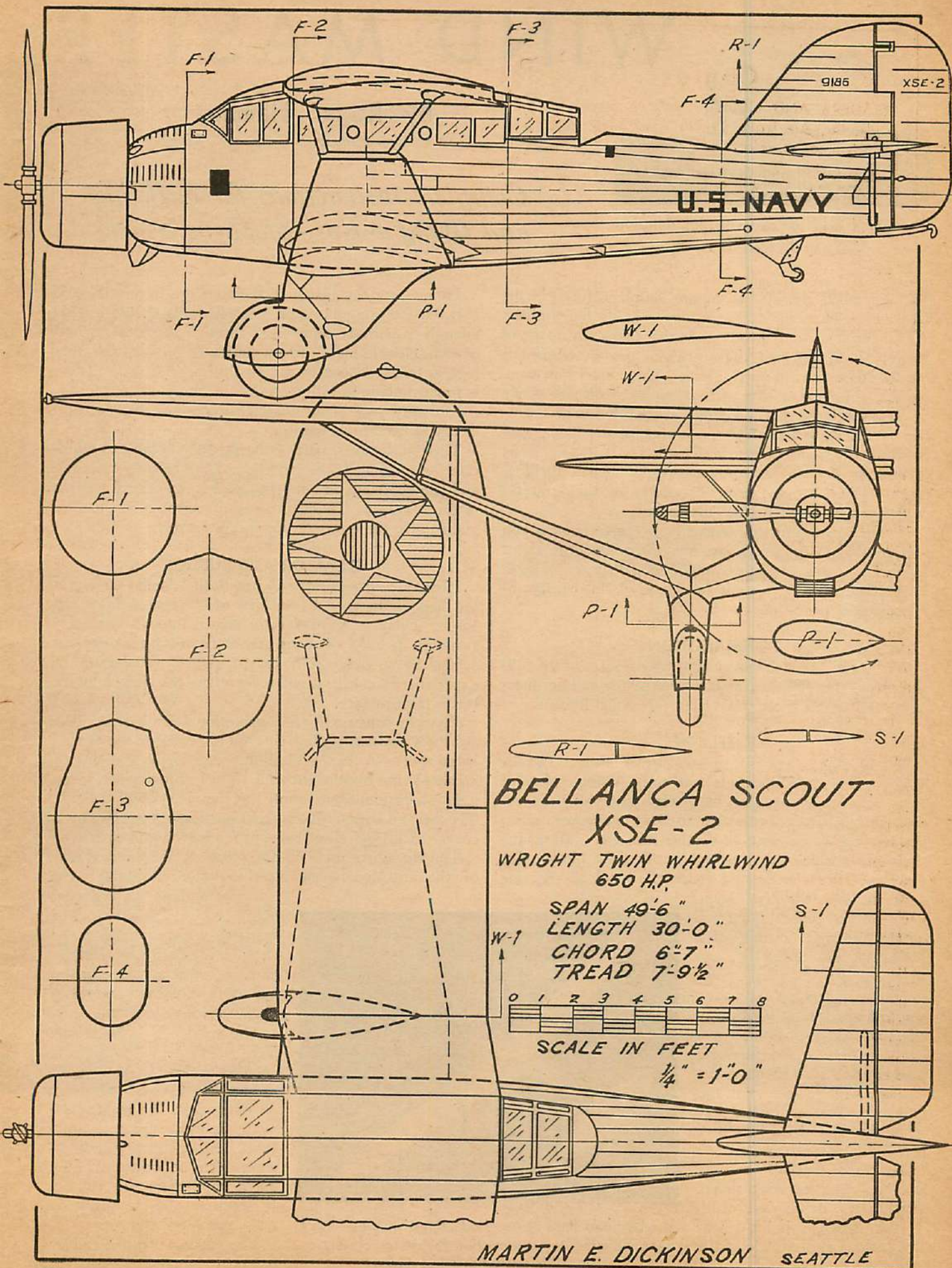
1. John T. Dilly, Galt	250 points
2. Thos. G. Barrie, Toronto	163 points

(Turn to page 87)



The Louisiana State Contest is the largest annual event in that part of the country. Above: E. O'Donnell, 2nd place winner endurance; left: R. Bassett, winner of the flying scale event; right: E. Gossen, endurance victor.







The model is of sufficient size for duration flying.

WIND MASTER

By Roger Hammer

In collaboration with Gordon S. Light

Complete instructions for building and flying a Ross-Stephens Soarer

THE MODEL of this famous sailplane turns in the same championship performance as its big brother.

It has a smooth, steady glide that takes advantage of every helpful current. The original model weighed 5 ounces and turned in good flights. This model was overweight, since extra care was taken to work out every detail of the large ship, with special attention to an extra-fine finish. The beautiful appearance of the model was worth the handicap of increased weight. It was not hard to realize why gliding and soaring is such a thrilling sport. Watching the effortless flight of this graceful soarer has made its pretty enthusiastic.

If you are interested primarily in performance, you will do well to reduce the weight of the model to about 3 ounces. A model of this weight should fly out of sight in no time at all. The performance of the heavier 5-ounce model proved this to be true.

CONSTRUCTION

The original model was built to $\frac{1}{10}$ the size of the full-size ship. This scale is convenient to follow and produces a model of a size most convenient for model flying.

FUSELAGE

The fuselage is cut from a solid balsa block $2\frac{1}{4} \times 4\frac{1}{8} \times 21\frac{5}{8}$ ". This block does not have to be a single piece of balsa but can be made up of several pieces of balsa cemented together. Templates are not necessary when shaping the cross section of the fuselage. Mark the shape of the side of the fuselage on the balsa block. Cut away the excess balsa and shape the block to the side view in the drawing. Next mark off the shape of the top of the fuselage on the balsa block. After cutting the top to shape, you'll have the desired fuselage shape except for the square corners. Cut away these corners to form the oval cross section of the fuselage. The cross-section shape of the fuselage which is shown in the front view of the drawing extends throughout the length of the fuselage. Take care to make your fuselage with a smooth, even-curved shape, keeping the depth and width of the fuselage indicated at the various stations along the length.

Hollow out the inside of the fuselage from station G backward to the tail. The fuselage walls should be thin enough to permit seeing light through them, when held over an electric bulb. From station G forward the fuselage is hollowed out to a wall thickness of $\frac{1}{4}$ ". There is no advantage in reducing the thickness of the walls in the forward part of the fuselage since the weight is necessary to balance the model.

The top, forward part of the fuselage is built to duplicate the cockpit of the large ship. The balsa is cut away and bamboo rings are substituted for the curved portion of the fuselage. These, in turn, are covered with celluloid to give the effect of the cockpit cover.

ELEVATOR AND RUDDER

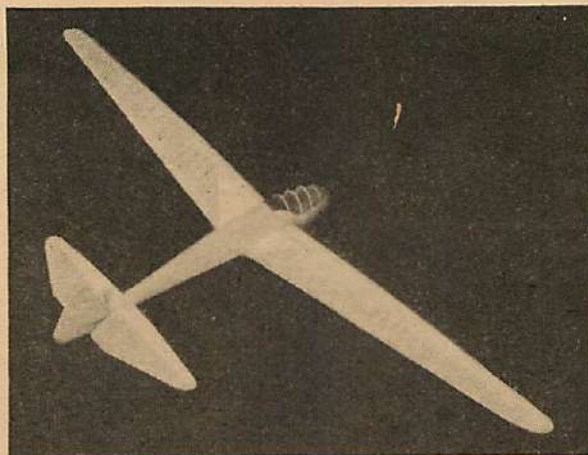
It was found necessary to practically double the elevator area of the model over that of the scaled-down elevator. This change in elevator area is the only necessary variation in scale. It does detract from the slick appearance of the model to some extent. But in the eyes of the experienced modeler it will seem attractive, since it means better performance.

Elevator construction is conventional throughout. The $\frac{3}{32}$ " sheet balsa streamline ribs are cemented to the $\frac{1}{8} \times \frac{1}{4}$ " balsa spar. A $\frac{1}{8} \times \frac{1}{8}$ " leading edge is inserted in the notches in the front of each rib. The trailing edge is triangular-shaped and butt-jointed to the rear tips of the ribs. The top and bottom of the front portion of the elevator is covered with $\frac{3}{32}$ " sheet balsa as far back as the spar.

The elevator is built in one piece. Cut away the rear of the fuselage when attaching the elevator. Any unsightly holes which you might carelessly cut in the fuselage when mounting the elevator are easily repaired by patching with scraps of balsa and cement with a follow-up treatment of sandpaper.

The rudder is built in one piece and cemented to the rear of the fuselage. A movable rudder serves no particular purpose other than making the model a more accurate scale job. All necessary adjustments can be conveniently made by warping the rudder. It shouldn't be necessary to make much adjustment.

The main spar of the rudder is $\frac{1}{8} \times \frac{1}{4}$ " tapered to $\frac{1}{8} \times \frac{1}{8}$ " at



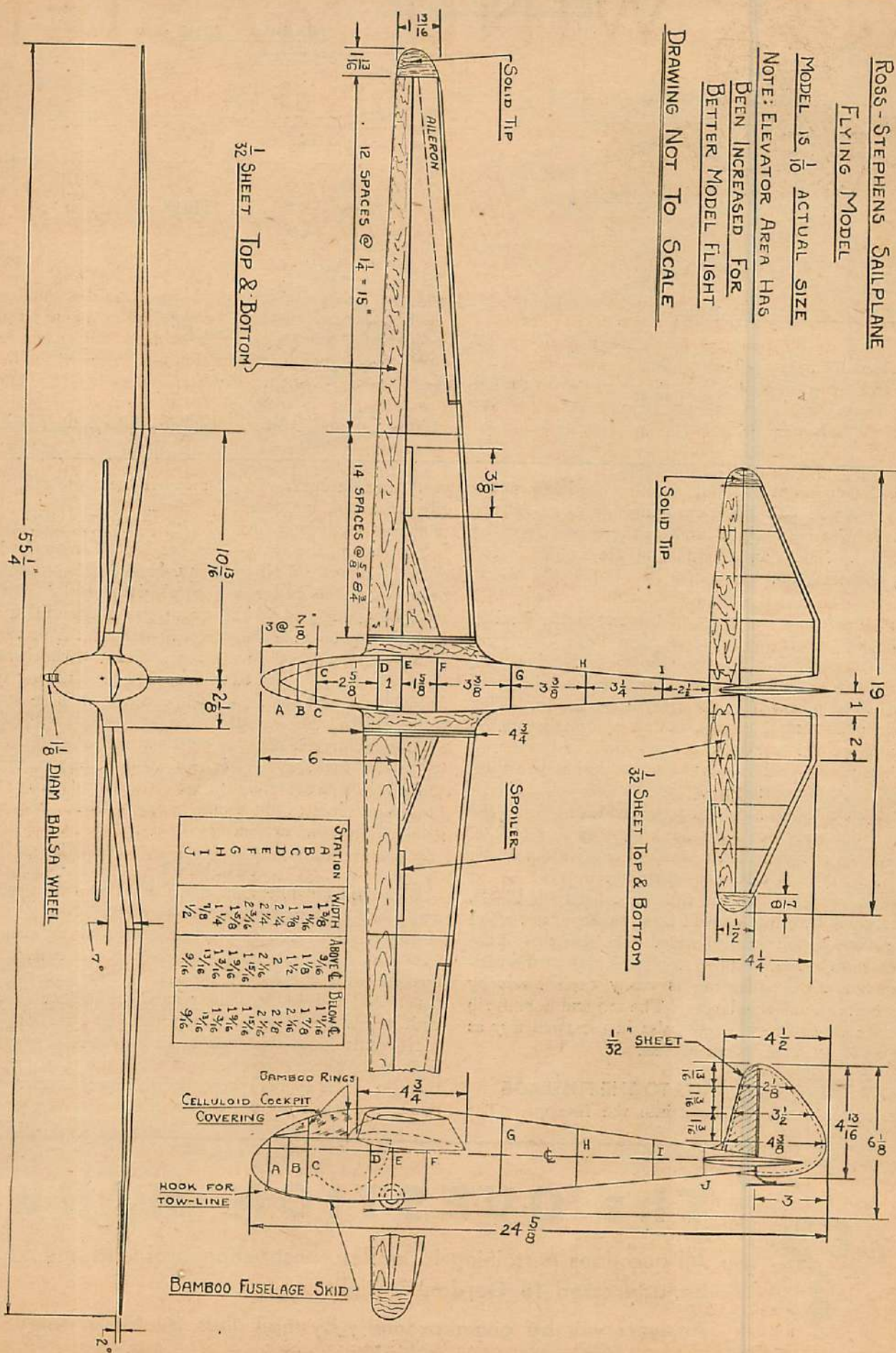
The beautiful lines of America's finest sailplane have been adhered to; construction follows as closely as possible that of the real ship.

ROSS-STEPHENS SAILPLANE FLYING MODEL

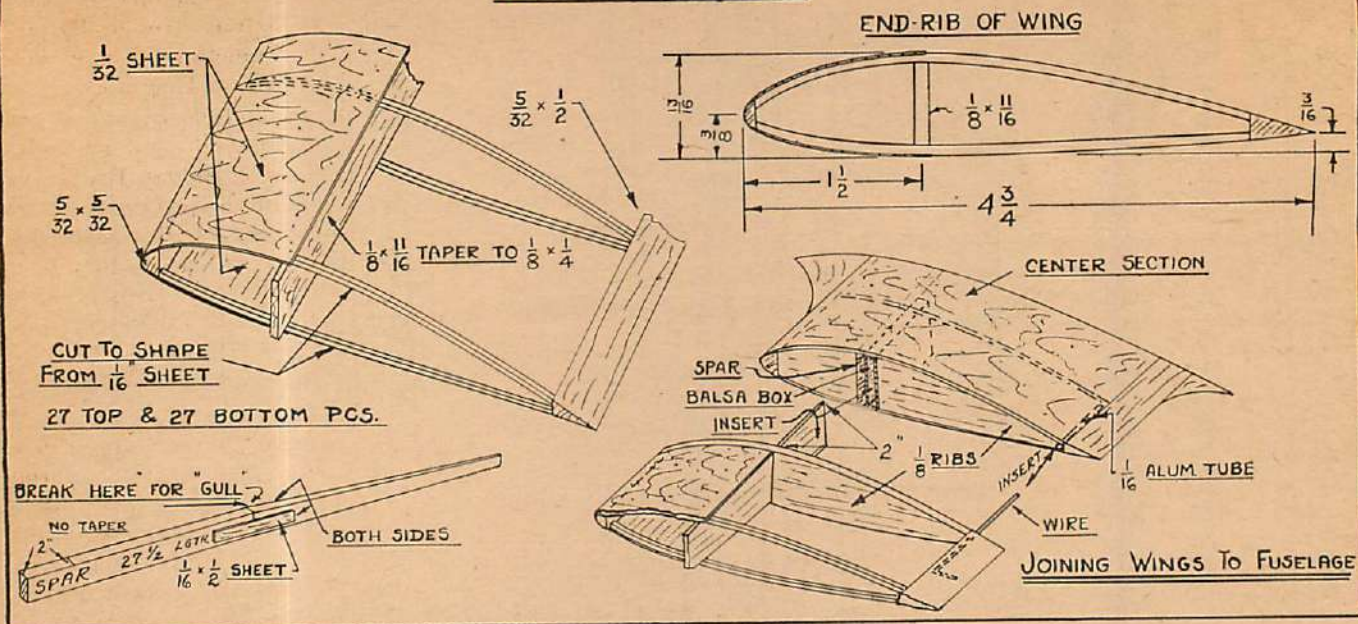
MODEL IS $\frac{1}{10}$ ACTUAL SIZE

NOTE: ELEVATOR AREA HAS
BEEN INCREASED FOR
BETTER MODEL FLIGHT

DRAWING NOT TO SCALE



WING CONSTRUCTION



the tip. The ribs are streamlined with a maximum thickness of $\frac{5}{16}$ " at the fuselage, changing to $\frac{3}{16}$ " at the tip. $\frac{1}{32}$ " sheet-balsa covering is used on the forward part of the rudder. The curved outline of the rudder is cut from $\frac{1}{8}$ " sheet balsa.

WING

The type of wing construction was first introduced to modeling by Roger Hammer of New York City. He has used it successfully on many models and did an outstanding job with this model. The sketch will show clearly the fundamentals of wing construction. This method is the ideal way to make an accurately tapered wing without the trouble, accompanying the usual way of tapered-wing construction, that necessitates cutting each rib to a different shape.

The top and bottom curved pieces which make up the shape of the wing are all cut from the same template. These pieces are cemented to the top and bottom of the spar. This spar is carefully tapered from $\frac{1}{8} \times \frac{11}{16}$ " at the center to $\frac{1}{8} \times \frac{1}{4}$ " at the tip. The length is $27\frac{1}{2}$ ". The accuracy of the taper will have an important effect on the shape of the finished wing. The rear tips of the rib pieces are cut to meet the required length at the various positions. Construction is easily carried out by working over a full-size layout. The top and bottom rib pieces are cut from $\frac{1}{16}$ " sheet balsa in the same way as in the construction of indoor models.

ATTACHING THE WINGS TO THE FUSELAGE

The center section is built into the fuselage. The

center-section spars extend through the fuselage. The ribs are solid, cut from $\frac{1}{16}$ " sheet balsa. The center section is completely covered with $\frac{1}{32}$ " sheet balsa.

The ends of the spars—2 inches beyond the end rib—of each half of the wing fit into balsa boxes which are cemented to the center section. This box spar is made by waxing the end of the main spar and building the box directly on it. The wax will prevent the box spar from "sticking" to the main spar. This method insures a perfect fit. $\frac{1}{16}$ " sheet balsa is used in the box spar with a double covering of tissue. The box spar is cemented to the finished center section.

An auxiliary fastening is used at the rear of the wing to prevent twisting. A piece of .040 wire is cemented to the inside of the trailing edge of the wing. This wire fits into a piece of aluminum tubing which is cemented inside the center section.

FINISHING

Wing and tail fillets are made with balsa dust mixed with dope or cement and followed with about 5 coats of wood filler. The fuselage is given several coats of wood filler before painting. Black paint was used on the fuselage with a rubdown of wet or dry carborundum paper, 360 and 400A. The wings and tail are covered with yellow tissue, doped with water and model dope.

No controls on this model were movable. The outlines of the ailerons has been shown if you want to paint them in. The spoilers were likewise ignored since they don't have much use in model work.



The QUESTION MARK

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

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

COUNTERFEIT WINGS

(Continued from page 36)

Graves was quickly throwing off the Lancer's mooring lines.

Bill's hand was on the starter, his body tense.

"Plane sounds right overhead," Drake said. "Yes. It's winked its navigation lights. Men here are answering. The engine is louder. The plane is coming down. You get this, Bill, you get this?"

"Check here," Bill said. "Safe to start my engines?"

"Not yet. Have to make sure. Plane's circling right overhead—a hundred feet by the sound. O. K. Start 'em! Quick!"

Bill did. The twin Diesels blasted into life, their thunder echoing and re-echoing through the large basin shed. He throttled down.

The lines had all been disengaged. The Lancer moved slowly out through the opening and into the river.

Drake's voice came again, vibrant with excitement: "The pilot's dropped the load. He's heading away. Get going. Take off!"

Bill's hand tightened on the controls. He shot a quick look back at Graves, who was now seated in the rear cockpit; then he rammed the throttles wide.

The Lancer, shivering with the vibration from the hammering Diesels, lunged ahead. Bill jammed his face against the eyepiece of the electron telescope and clicked on the mechanism. He saw the stretch of black water racing to meet him, the heavily wooded river banks rushing past. Then the stick came back and the Lancer was up and away.

Bill said into the microphone, "In the air. Climbing."

Drake replied quickly, "Plane heading dead south. Go get him. Luck!"

The Lancer's undercarriage had lifted into its retracted position and the silver machine bulleted higher into the black heavens. Bill swung her around on a southward course and held to his climb. At ten thousand he leveled off and switched on the intercockpit telephone.

"O. K., fella," he told Graves. "Here goes."

Graves' voice came back. "The detector working?"

It wasn't. The two needles were swinging around the dial aimlessly. Bill watched them in dismay. "Not yet. . . . There they go!" he said jubilantly.

The needles had suddenly seemed to sink their teeth into something. They had steadied. The detector was working. The reflector had picked up the heat waves from the counterfeiter's engine.

Bill watched the instrument eagerly. The dial showed that the other ship

was flying more to the left and lower. Bill corrected the Lancer's direction and nudged the stick forward. The two indicators crossed at dead center.

He put his eyes to the infra-red-ray telescope and peered through. It was as if a knife of white light had funneled into the night. At first he didn't see anything. Then his heart jumped.

Yes. There was a small speck—far, far ahead. It was growing larger. The Lancer was overtaking it. The speck sprouted wings.

The counterfeiter's plane!

V—PURSUIT

"GOT HIM!" Bill shouted into the microphone to Graves.

"You're sure?"

"Yes. See him plainly now. Looks like a Morrow Meteor."

"Are we gaining?"

"Yes—fast. I want to get close enough so I won't lose him. I'll throttle down then."

"Don't get too close," Graves said.

"I won't."

Bill flew by touch, his eyes never leaving the telescope. When its wing span had become three inches wide in the lens, Bill slowed the Lancer until both ships were flying at the same speed.

It was a Morrow Meteor all right. Bill was sure of it now—a slick mid-wing job, streamlined and plenty fast—one of the fastest commercial ships produced. No wonder the coast-guard plane had been outclassed.

Graves said, "How's it going?"

"Hunky-dory," Bill replied, with more lightness than he felt. "I'll stay this far away."

The agent had evidently been studying the instrument board in the rear cockpit. He said anxiously, "Say, he's veering into the southeast."

"That's right," Bill said. "May be heading for one of the Bahama group if he keeps this up."

The enemy pilot kept it up as the minutes piled rapidly into half an hour. The Florida peninsula had long since been left behind and they were over the ocean.

Twice Bill had momentarily torn his eyes away from the telescope to check on instruments and charts. His experienced brain made rapid calculations. They would soon be over Andros Island, the largest of the Bahamas, if the present course persisted.

Was the counterfeiter heading for the ring's secret base—the headquarters of that murderous gang? Was Drake's gamble going to succeed?

The same thoughts must have been flaring through Graves' mind. His

voice sounded in Bill's phones: "If you think he's going to land, shut off your engine pronto, so he won't hear us. Then try to set her down near by."

Where was the pilot of the Morrow Meteor heading?

A worried frown creased Bill's forehead. And the longer the flight progressed, the more he began to doubt the advisability of Drake's plan. Following the counterfeiter had proved easy, but the risk would come if and when he decided to land.

Bill suddenly pressed his forehead hard against the eyepiece of the telescope. "He's diving! He's going down!"

Bill could see the Meteor's abrupt maneuver plainly in the beam. He nudged the stick forward so that he could follow the downward plunge. Suddenly, a ball of light burst out below the Meteor.

"Dropping landing flares!" Bill shouted into the microphone.

Graves' voice was shrill. "There goes another!"

Bill closed the throttles. The thunder of the Diesels died.

"Must be planning to land where there aren't field lights," Bill whipped out. "Not likely his headquarters."

The Lancer was dipping down and Bill held it to a wide, circling course. Far ahead and below a succession of flares was cutting a swath of luminosity through the darkness. Bill didn't bother about his telescope now. In the reflected light he could see the enemy plane with his normal sight.

And then he saw something else. "There's an island down there!" he shouted to Graves. "See it?"

Graves did.

The island was very small, oval in shape. The light from the flares was making it discernible.

"He must be landing for refueling," Bill said. "We'll sit down on the water a good distance away and wait for him to take off again."

Graves said, "O. K."

The Lancer was low now. Bill brought her around and aimed the nose toward the island. He quickly looked into the telescope. He was just in time to catch a glimpse of the Morrow Meteor swinging in for a slow landing on a stretch of beach.

Then Bill was forced to circle away to keep his distance from the island. He banked around once again and aimed his telescope. And a gasp was wrung from his lips.

The Morrow Meteor had landed all right. It was there on the beach. But its nose was rammed into the ground and the fuselage was upended.

The counterfeiter had cracked up!

VI—LANDING

BILL snapped the news out to Graves.

The next move was one of necessity. The Lancer had to land. Bill put his eyes back to the telescope and eased the silver amphibian down on the calm waters of the ocean, to the windward side of the island.

Graves said, "Can you see from here?"

Bill looked through the telescope. "Yes. He sure piled her up."

The island was low-lying. Scrubby vegetation was scattered over its surface.

Bill said, "Let's sit here and wait and see what happens."

Nothing did. No light came from the island and Bill could see no movement.

Minutes passed, broken only by the lapping of the waves against the pontoons and the dipping of the big machine. Bill walked the rudder bar, keeping the Lancer lined up with the island.

The shore line was becoming more distinct through the telescope. There was an object lying near the wrecked ship. It was motionless. It might be a log; it might be the pilot.

Ten minutes more of drifting and Bill was sure. It was the prone figure of a man!

"We'll land and grab him!" Graves said, when Bill told him. "It must be the pilot."

Bill kept his eyes trained through the lens. "I don't like the set-up," he said slowly.

Graves was pretty excited. "Hell, we aren't doing any good here, Bill!" he said. "If this was the gang's headquarters, they'd have picked him up long ago. He must have come down to refuel, like you said. He isn't going to lead us any farther now. We'll grab him and see what he knows."

"If he's alive," Bill said.

"We can't lose," Graves went on. "Come on. Start the engines and let's go."

Bill said, "It'd be safer to let her drift in. The quieter we move—the better. There may be some one else there. I want to watch this thing a little longer."

It was done that way. The wind and current seemed to be allied with them. The Lancer moved sluggishly through the blackness. After a wait Bill said, "I can see the guy plainly, Graves. Seems to be the pilot all right."

Graves was eagerly planning for the landing.

"Can you beach the Lancer?" he asked.

Bill said, "Won't risk it. I'll drop the anchor some yards out. We'll wade in—or swim." He shot a glance back toward Graves. "Break out that swivel gun back there," he said. "Just in case."

"O. K.," Graves said. He swung the

rear cockpit's .30-caliber gun into position.

The Lancer was twenty yards off the narrow stretch of beach when Bill dropped anchor. Through the telescope he gave one last scrutiny of the wrecked Meteor and the figure of the pilot. Nothing had changed. With persistent doubts still clouding his mind, Bill directed his gaze to the portion of the island that came within the range of the lens.

Beyond the shore the coral formation gradually swung upward to a height of ten feet.

The Lancer was now swinging on her anchor chain, the nose pointing out to sea. Bill said, "Place looks deserted, Graves." He turned around and saw that the rear cockpit was empty.

Graves' voice came from below. "I'm going in. You stay there."

The agent had climbed down to the pontoon and had already slipped into the water. It came to his thighs.

Bill said anxiously, "You'd better let me go first."

But Graves was already wading to the beach.

Bill tugged off his helmet, released his parachute harness and swung over the coaming to the pontoon. Graves shouldn't go alone. There might be danger. Bill's hand went to his pocket and he took out his automatic.

The darkness was less dense and Bill was able to see that Graves had now reached the beach and was hurrying along it toward the Meteor and the figure of the pilot.

Bill stepped into the water and made for the beach.

Then—it happened.

Without a trace of warning, Bill saw the enemy pilot, who had been lying as motionless as a dead man, suddenly leap to his feet. The pilot's arm swung up straight at Graves.

And a crimson stab of flame blasted from it!

VII—RETREAT

THE THUNDER of the fired gun crashed through the stillness.

Bill heard Graves' choking cry, saw the agent stagger, fall.

A trap!

Bill's automatic jerked up. His finger squeezed. The gun smashed out once—twice—

Then he plowed madly through the shallow water and raced up on the beach. A scream was shuddering through the night. It wasn't Graves. No—the enemy pilot was down, writhing in agony. One of Bill's shots had connected.

Bill yelled, "Graves! Are you—"

But he never finished the sentence. Vague shapes had suddenly come up over the crest of the island. Men—one—two—three of them! They were

charging down on the beach and firing as they came.

A bullet slashed past Bill. The airman ducked low, whipped his automatic around, took snap aim and fired. He thought he saw one of the men fall. He didn't wait. He shot again.

Graves had come to his feet. One of the attackers charged recklessly at him. Another was racing toward Bill.

The airman stood his ground. He lined up his sight with deliberation and pulled the trigger.

His assailant was within five yards. The .45 slug took him in the middle of the forehead. He went down.

Graves was now in a hand-to-hand conflict with his attacker. Bill heard a smothered blast of gunfire. The agent reeled and fell to one knee. His enemy's gun came up again.

Bill saw it—and fired.

The man beside Graves darted away and vanished behind the wrecked Meteor.

Bill ran to Graves, grabbed him by the arm.

"I'm shot," the agent gasped, "twice. I think I can get back to the plane. Hold them off." He staggered past Bill.

The airman slowly backed after him, his gun ready, his eyes searching.

A finger of flame abruptly flashed from the wrecked airplane. Bill felt the slug fan his cheek. He leveled his gun, lined up the flash and pulled the trigger. The automatic clicked empty.

Bill whirled and plunged through the water for the amphibian. And now the blackness, which had enabled the enemy to spring their trap so successfully, was a godsend to Bill. Two more shots cracked from the island, but they were wide of their target.

Graves had reached the plane, had climbed up and half fallen into the rear cockpit by the time Bill got to the Lancer. The airman threw himself into the front seat, worked the starter. The Diesels boomed.

Bill jerked the anchor up and threw the throttles wide.

The Lancer lunged forward, water cascading from the pontoons. The big machine gathered speed and raced away from the island. A sprinkling of bullets zinged past.

When they were out of range, Bill throttled down. He stood up in his seat and leaned back in the rear cockpit. "Graves, are you badly hit?"

The agent was crumpled up. His eyes were like burned holes in a white sheet.

Bill said, "I'll get the first-aid kit. I'll fix—"

Graves' eyes came open again. "You can't do anything, Bill," he said. "Get the position—of the island. Tell Drake—I'm through—"

Bill said, "Stick it out, fella. I'll get you to a doctor." He turned back,

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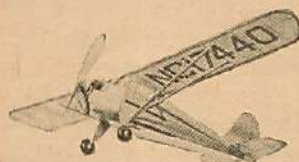
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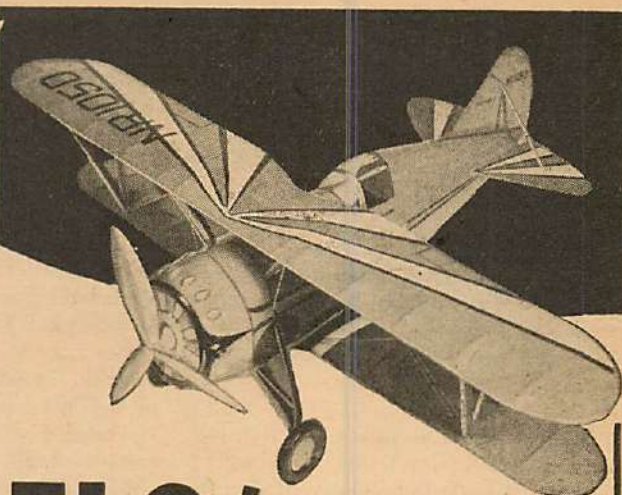
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seized the controls. He had charted the location of the island before landing.

Again the throttles were opened. The Lancer pounded across the smooth surface of the ocean. Bill's eyes looked once in the direction of the island and his lips tightened.

THE LIGHT of early morning was in the sky when Bill slapped the amphibian down for a quick landing at the Pan American base at Dinner Key, Miami. An ambulance was waiting, in response to his radio.

The unconscious Graves was loaded aboard. The ambulance fled, siren wailing.

White-faced, Bill stood near the ramp. The words of the doctor, who had superficially examined Graves, still rang in his ears. "Looks bad," the doctor had said. "But he may have a chance."

VIII—FIGHT

"RUPTURED INTESTINE," Stephen Drake told Bill. "A nerve center's been severed. May result in paralysis if—if he pulls through."

The two men were seated in a corner of the waiting room of Jackson Memorial Hospital, Miami, three hours after Bill had landed.

"He came through the operation all right," Drake went on. "He has a chance, they say. The danger now is peritonitis."

Bill looked up. "Blood transfusion?" "Given one already. They'll give another later."

"How about me?" Bill asked.

Drake shook his head. "That's been looked after. Now snap out of it, Bill. The doctors say he'd be dead right now if you hadn't got him here so fast. You weren't to blame for what happened."

Bill's eyes went back to the carpet. "No, I'm not to blame, Steve," he said, his voice edged with bitterness. "I just let him walk straight into that set-up."

Drake took him gently by the shoulder. "If any one's responsible, I am," he said. "I told you we'd found Levinski's body, didn't I?"

"You told me."

"He must have double-crossed me and talked—and got rubbed out by the ring. I was a fool to have trusted Levinski. I'm the one, Bill, not you."

"No, Steve," Bill said. "I've been through things like that before. I felt there was something wrong. I should have taken more precautions. If Graves dies, or if he's paralyzed for life, I'll hold myself responsible." He raised his head and his blue eyes were hard. "And I'm going to get the men who shot him down. I'm going to break that damn ring wide open, Steve."

"BREAK that damn ring wide open."

The words echoed hollowly in Bill's ears as he guided the Lancer northward toward his Long Island field the following day.

The previous afternoon he had flown Drake back to the island in the Bahamas. This time it had been completely deserted. The Morrow Meteor had disappeared. Even the gasoline drum had gone. Yes, the ring had staged their trap cleverly.

When Bill and Drake had returned to Miami, the government agent had said heavily, "That's that, Bill. You might as well get back to your field. I'll keep you posted about Graves. And if I need you—well, I'll let you know."

He hadn't said, "The ring knows you're mixed up with us. You can't do us any good now. Anyway, the trail's wiped clean."

Yes—clean as a whistle—without a clue left and the secret service baffled. And yet he, Bill, had said that he'd break the ring wide open. What a hope!

But he had to do it. Not only for the reasons Drake had given, but for what the ring had done to Graves.

And now, as the Lancer drilled farther into the north, Bill thought, "When I get home I'll be able to do some clear thinking. There must be an angle."

But when he did land at his field it was to find that the distance he had put between himself and Miami had only increased his concern over Graves' condition.

That night Bill slept fitfully and awoke exhausted. Routine business had piled up at the field during his absence and he went to the office early, prepared to try to lose himself in work.

He found Sandy waiting for him. The kid was unusually quiet and serious.

Bill sat down at his desk and said, "Well, peewee, how's it going?"

Sandy's freckled face didn't crack a smile. He stood with his hands behind his back. "I'm awfully worried about Alphonso, Bill," he said. "I can't stop him stealing things."

Bill focused his attention, with relief, on a minor worry. "Has he still got that yen for glass?"

Sandy nodded sadly. "Yes. While you were away he swiped two more pairs of goggles. And he stole the spectacles right off Dr. Humphries' nose. I can't find where he's hidden all the stuff. I've hunted high and low."

"I caught him stealing another pair of goggles from the Lancer's rear cockpit. I grabbed the goggles from him but he got away. Here."

Sandy brought his right hand from behind his back and placed a pair of amber-tinted goggles on the desk.

Bill looked at them. The strap was marked with dark stains. He could tell at a glance they weren't his.

"You found him taking them from the Lancer's rear pit?"

"Yes. Just a little while ago."

Bill's lips set. They were Graves' then.

Bill said, "Thanks for bringing them in. Now you'd better try to find where Alphonso's caching all his loot."

After Sandy had gone Bill's eyes went back to where the goggles lay. As if he needed any reminder of that night, he thought bitterly. But he left the goggles on the desk.

He had little chance for retrospection after that, as the press of business took his full attention.

And then, at mid-afternoon, to cap the climax, Baron Hauss von Struben again landed his Beechcraft.

Shorty came in with the news.

"Tell him I'm too busy," Bill said irritably, running his fingers through his blond hair. "Tell him— Oh, bring him in."

The sight of the baron, and especially the sight of the eyeglass stuck in his face, grated against Bill's nerves. He forced himself to be civil.

Baron Hauss von Struben sat down and said, "I have been endeavoring to contact you during your absence, Barnes. And I apologize for barging in on you now. I see you are very busy. But I wanted to discuss that Persian flight with you again."

Bill tapped a pencil against the side of the desk. "I'm sorry, von Struben. But my answer still goes."

The baron touched his eyeglass. "I realize that, Barnes," he said. "I was wondering whether I could hire one of your men for this flight—perhaps your Shorty Hassfurther."

The thought of hard-boiled little Shorty carrying perfume to Persia should've struck Bill as funny. At any other time it would have. But Bill said levelly, "Sorry. We're all busy on a job."

"So?" the baron said. "All?"

"All," Bill repeated. And then he thought, "Hey, I'm just being a dumb-bell. He's offering sixty thousand dollars net for this flight. Why couldn't Shorty make it—or Red or Bev or Cy? Why not?"

"Wait a minute, von Struben," he said. "I was a little hasty. Perhaps that can be arranged. When do you want it run off?"

"The day after to-morrow," he said. "If not then, the first of the week."

Bill looked out the window and mentally calculated. Shorty? No, it'd be better to keep the veteran around in case something broke. But why not Cy?

It was during Bill's momentary preoccupation that Alphonso, the monkey, stealthily entered the office through the open door. Bill didn't see him. Neither did von Struben, who was seated with

his back half turned toward the door. The monkey's little eyes were fixed on the segment of the baron's eyeglass that could be seen from the rear. He softly approached the foreigner, then, crouched down and leaped. He landed atop von Struben's shoulder.

Bill's gaze whipped back as he heard the baron's sharp cry of surprise. He was only in time to see the flash of a hairy arm, as Alphonso snatched the monocle from the foreigner's eye. Then the monkey had leaped to the floor and was scooting for the door triumphantly, clutching the eyeglass.

Bill threw himself around the desk as the monkey vanished into the corridor.

Baron von Struben had stumbled erect, his right hand clapped to the side of his face. He said something in German.

Bill yelled, "Sandy," as he reached the door. He saw the kid down by the guard room.

Sandy came on the run. Bill said, "Alphonso's stolen von Struben's monocle. He went that way. Now get it."

Sandy said, "Oh, gosh!" and ran.

Bill went back to the baron. The man was still standing, his face flushed with anger. But he forced a mirthless laugh. "It is of no consequence, Barnes," he said. "I should have been on my guard against the little fellow, eh?"

But the tone of his voice said, "Next time I'll kill that little beast."

"Sandy will get it," Bill told him after apologizing. "He'll be right back."

But when Sandy returned ten minutes later, one look at his crestfallen face told Bill the answer. "I finally caught him," Sandy said. "But he hadn't the monocle. He must've hidden it with all the other things."

The baron had thoroughly regained

his composure. "Quite all right, you know," he said. "But if you should locate it——"

Bill turned to Sandy. "Find it," he said coldly.

Sandy said, "Yes, sir," and backed out.

"Now, please—ah—do not worry, Barnes," the baron said. "You were considering my proposition?"

Bill said, "Yes. I'll have to check up on things, but I think Cy Hawkins will be able to do the job for you."

The baron raised his hand to where the eyeglass had been, before he remembered. He said, "Mr. Hawkins. That will be fine, Barnes. A good pilot, I know. Of course, I would rather have you, yourself. However——"

Bill said, merely to smooth things over, "I wish I could. And it's barely possible I might be able to."

"I would be very grateful," the baron said.

"I'll have to see how things stack up," Bill said. "I'll let you know definitely to-morrow. It will be one of us anyway. You are flying back to California to-day?"

"Yes. After a few business matters." The baron shook hands and bowed. "To-morrow then."

Right after he had left Shorty came in. He tossed four business cards down on the desk blotter. "These guys are waiting to see you," he said. He looked at the goggles lying on the desk. "Hey, you'd better glue those things down. Alphonso's liable to——"

"Let 'em stay," Bill said, as Shorty reached to pick them up. "And start parading those birds in."

The telephone rang sharply. It was Tony Lamport, the radio operator. He said, "Bill, Drake's calling on his private wave length. Want to take it?"

Bill's heart took a sickening flop.

Drake had radioed that noon and his report hadn't been cheering. And now? Bill said, "I'll plug in," and pronged the receiver. He yelled after Shorty, "Hold those fellows off a minute. I have a call."

When he had connected ear phones and microphone, Bill heard Drake's clear voice say, "Graves is still holding his own. Nothing more than that."

"No other leads?" Bill asked hopefully.

"Nothing," Drake said. Then added, "There was one strange thing that happened. Some one got into the hospital and stole all Graves' clothes."

"What for?" Bill asked in amazement.

He could almost see Drake shrug. "I don't know. Unless the ring wanted to see if he'd picked up anything on them. We're trying to track it down. And Bill, I'm leaving by plane to-night for New York. I'll be stationed there for a while."

Bill said, "O. K. Hope Graves holds up. See you soon, Steve," and signed off.

IX—THE PROWLER

AT FOUR O'CLOCK the next morning, the Barnes airport's general alarm went crashing into action.

Bill was out of his bed, automatic snatched from beneath his pillow, before his mind was fully clear. He jerked open the door of his bungalow and ran outside.

The landing field was ablaze with light.

As Bill raced toward it he saw Shorty and Red Gleason dive out from the pilots' building.

"What's wrong?" Shorty shouted.

"Don't know," Bill called back over his shoulder.

From ahead came the sharp spat of a high-powered rifle. There was one shot—no more.

When Bill reached the apron he saw two of the airport guards running toward a dark shape that was lying out on the landing field.

Before Bill had covered half the distance he could see that the shape was the body of a man.

The man was lying on his face, his arms outstretched. He didn't move.

One of the guards, who had been bending over him, straightened. "I told him to stop, sir—twice," he said to Bill. "He didn't. He stumbled just as I shot low. It took him through the back. I didn't mean to kill him."

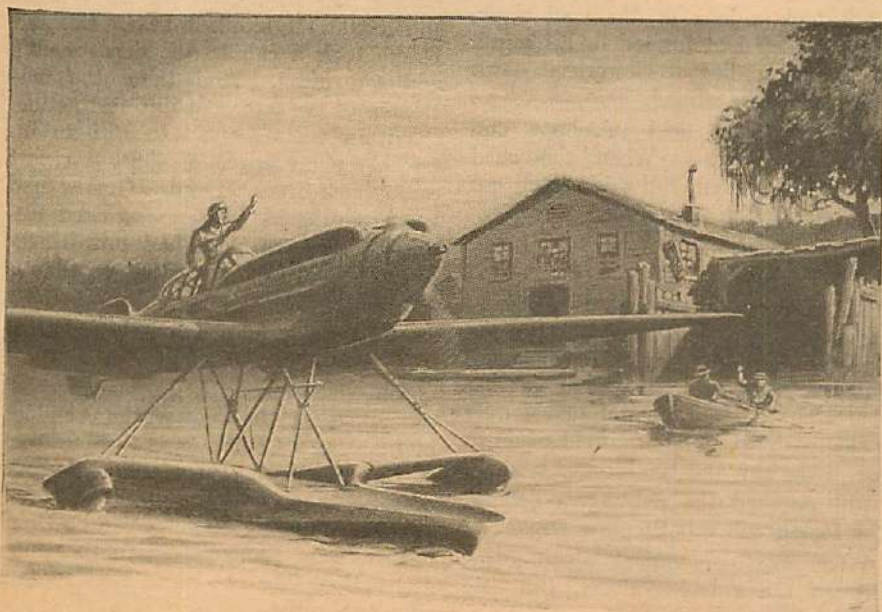
Bill asked sharply, "What was he doing?"

The other guard said, "Mr. Sanders saw him sneaking out of your office. He called us."

"How did he get into the field?"

"Don't know, sir, yet."

"Did he take anything?"



Bill landed on the amber waters—— A skiff probed out from the gloomy interior——

"Don't know, sir."

Bill said, "Search him."

"Not a blessed thing on him, Mr. Barnes," one of the guards said. "Not even a scrap of paper. We've turned out all his pockets. All we could find is this."

He handed Bill a pair of goggles.

The airman took them. He saw that the lens were amber-tinted, that the strap was stained with dried blood.

They were the goggles that had been in the Lancer's rear cockpit. Graves!

Half of the airport's personnel was by now crowding around; the others were racing to the spot.

Cy Hawkins said, "What's it all about, Bill?"

Bill was wondering the same thing. He didn't answer Cy but spoke to Shorty, "All right. Order the gang back to bed. Better keep a full guard on for the rest of the night. And check up on how this man got in. I'm going to the office. I don't want to be disturbed. I'll call the police."

It was after he had made the call that Bill thoroughly examined the office. Nothing had been disturbed that he could see. Only the goggles had been taken from the desk where he had left them.

It seemed obvious that the prowler's mission had been to get these goggles. But why? What would any one want with them? And who could have known that they were here in this office?

Then he thought of the stream of callers he had had that day. The goggles had been in full sight of all of them. To go down the list and pick out possible suspects would take time. No, the first thing was to figure out why they'd been taken.

Bill sat down heavily. And then, for the first time, he put the goggles to his eyes. He started in amazement. His vision had immediately blurred as he'd looked through the lens. Not his left eye, though. He could see through that side clearly. It was the right.

Hastily, he examined the lens. The left one seemed normal. But the right lens was thicker and threw everything out of focus.

These weren't ordinary goggles. They had been made especially for some one with a marked deficiency in one eye.

Graves hadn't sight like that!

Then—the goggles weren't his!

But they must be. He had them when he staggered back to the Lancer that night.

Unless—unless he'd got them on the island. He'd been in a hand-to-hand fight with his assailant. He might have grabbed them from him!

Bill was breathing fast. Suddenly, he remembered Drake's radioed words. Graves' clothes had been stolen. Had some one been trying to recover the goggles? And when they hadn't found

them among Graves' possessions had they figured that the goggles must be here at the field?

Yes! That must be the answer. Some one wanted them badly enough to send that prowler. But why?

The answer came in a flash. Stamped in gold on the inside of the strap was: "BLACK AND COULTER OPTICAL CO., NEW YORK." The company, Bill knew, specialized in manufacturing high-grade goggles and was equipped to grind corrective lenses.

The lenses of these goggles must have been made from an oculist's prescription. The prescription would be on file at Black and Coulter's. Once the goggles were presented to the company for inspection, the name and address of their owner could be learned.

That was the answer!

Bill felt the flaring of excitement. He had a clue—a definite lead now.

Knuckles suddenly rapped on the office door. Bill said, "Come in."

It was the guard who had shot the prowler. He said, "We found something else, sir—in the man's hatband. A hundred-dollar bill." He put the bank note down on the desk.

Bill picked it up, looked at it closely. He felt the note between his fingers. The bill was new and appeared to be all right. But now, with his suspicions aroused, there seemed something wrong with the paper. Was it a counterfeit?

He couldn't be sure. But if the bill was bogus it might be added proof that the dead man had been one of the ring.

Bill said to the guard, "Thanks." And when the man turned to go, the airman added, "When the police come, it'd be better if you didn't mention finding the goggles and this money. I'll tell them later. Spread the word around."

The guard said, "Yes, sir," and went out.

Bill took a look at the wall clock. A quick plan had formed in his mind. Drake was landing at Newark at dawn on a plane from Miami.

Bill lifted the field telephone and asked for Martin. When the chief mechanic answered, Bill said, "Run out the Lancer. I'm taking off."

X—THE CLUE

BILL had flown straight to the Newark airport and was waiting inside the air line's terminal building when the Douglas transport from Miami put her wheels on the runway and taxied over to the marquee. The first light of dawn was in the sky and the air was cold.

Bill watched the passengers debark. The fourth one was Stephen Drake.

When the government agent came through the swinging doors, Bill said quietly, "Steve."

Drake looked around sharply. He said, "Bill! What on earth—"

Bill took him by the arm. "I have to talk to you. Come on."

They went to a private office for which Bill had arranged. Once inside Bill closed the door and said, "I've got something red-hot. Listen—"

Drake's face remained expressionless as Bill talked rapidly.

When he was finished, the agent said, "Have you the goggles with you?"

Bill had and handed them over.

Drake examined them. He looked up and his gray eyes were sharp. "You've hit it, Bill," he said. "Black and Coulter. We'll have to drag one of their officials out of bed. Come on. We're heading for New York."

They went in the Lancer.

On the way, Drake said, "I'll have my Miami men check with Graves where he got these goggles. But I think your guess is right."

Bill asked anxiously, "Was Graves any better when you left?"

"About the same. Had another blood transfusion. He's fighting hard. It'll help him to know he's responsible for this clue. This may break the case, Bill."

Bill nodded. Yes, it might—if Black and Coulter had the prescription with the customer's name on file.

Yes, the goggles were an important clue.

Suddenly Bill remembered the hundred-dollar bill. He handed it back to Drake. "I forgot to tell you. It was found in the prowler's hatband. Looked bad to me. What do you think?"

The agent was silent for a minute. Then he said, "It's a counterfeit, all right. That ties your burglar in with the gang. We'll have to work fast, Bill. I only wish it were later in the day. Everybody's still in bed. May hold us up a little."

But there were no hitches. The Lancer was landed on the East River and left at the seaplane base. Bill and Drake took a cab to the department's midtown office. And there the machinery of the law went into fast action.

Within what seemed to Bill an incredibly short space of time, a report came back from Miami. Graves had been questioned. He remembered distinctly, now, that he had unwittingly torn the goggles from his assailant's head during the fight.

Then the goggles definitely belonged to a member of the ring!

And right after that, Drake received the news that Mr. Coulter, the president of Black and Coulter, was rushing from his apartment to his Madison Avenue office.

Drake and Bill, accompanied by three agents, went immediately to the same destination. The two cars arrived almost simultaneously.

Coulter was a large, thickset man in his late fifties. Marks of sleep were

still on his long face. He was confused and anxious.

"What's it all about?" he asked Drake.

Drake talked to him quietly.

Bill caught a snatch of Coulter's words as the business man and Drake walked across the sidewalk to the door. "—why, yes. A simple matter. I'll have to measure those lenses. After that I'll be able to find the prescription on file."

He had taken a small leather case from his pocket and inserted a key in the lock. Drake turned back and motioned to one of his men to remain outside, the other two to come in.

The door swung open. They followed Coulter into the gloomy interior. "Wait until I get the lights," he said. He found the switch and a row of overhead lamps blazed on.

Bill suddenly sniffed. "You smell smoke, Steve?"

Coulter was hurrying down the aisle ahead of the others. He said, his voice sharp with alarm, "Something's burning! My watchman should be around. McGregor! McGregor!" He called the name loudly.

They found the watchman in the business office at the rear of the store. He was lying on the floor, unconscious and bleeding from a head wound.

Across the room from him a large file cabinet had been tipped over. It rested on its side. The drawers were scattered around and empty.

And in the center of the office was a pile of fire-blackened papers still smoldering.

Coulter gasped, "My records! All my records!"

XI—ALARM

DRAKE looked at Bill. He didn't say anything.

He didn't have to, Bill realized bitterly. Words were useless now. The ring had anticipated their move and had struck quickly.

Bill kicked the charred mass aside. Only tiny bits of cards remained untouched by the flame.

Drake spoke again to Coulter, "If you analyzed the lenses, do you think you could possibly remember who bought these goggles?"

Coulter shook his head. "I don't think so. Those goggles are old—must have been bought some time ago. We do a big business."

Bill said, "But can you examine the goggles, Mr. Coulter, and tell us how the original prescription read?"

"Why, yes—approximately, anyway. It would take a little while."

Bill saw that Drake had caught his idea. The agent shot him a look of appreciation and then said to Coulter, "Do it, then—as fast as you can. Give us that prescription and we'll canvass

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every damn oculist in this country until we find the doctor who prescribed for this case."

Coulter took the goggles from Drake and hurried to a small workshop.

"We still have a chance, Bill," Drake said.

He went to a telephone and called his office. Bill heard his low voice giving crisp orders. "Get the names and addresses of all oculists in greater New York. Get their phone numbers, both office and home. Have a switchboard of fifty operators ready."

When he had hung up, the agent said to Bill, "I'll have fifty copies of that prescription made as soon as Coulter dopes it out. We'll canvass every eye

specialist in this area within fifteen minutes. If no one of them prescribed for this case, we'll spread out across the country."

It was a good scheme, the only one. Yet, it was a gamble. Bill said, "Practically all the doctors will be at home now. They'll have to rely on their memories. They won't have their records. The one who made the examination may not remember the case."

"We'll have to chance that," Drake said. "Our only hope is that the case is so unusual that he'll remember."

The case was unusual. Coulter said that when he came out of his workshop ten minutes later. He had a piece of paper in his hand.

"Left lens normal. All the patient's trouble must be in his right eye. He's suffering from marked astigmatism or nearsightedness. Yes, the man who examined him should remember this case."

"He has to!" Drake said.

IT WAS seven o'clock when Drake and Bill reached the department's office. The office force went into furious activity. By ten minutes after seven, fifty copies of the prescription had been made and rushed to the staff of telephone operators.

Drake sat down behind his desk. "We'll just have to wait," he said.

Would the scheme work? Would the oculist who had examined this mysterious man with the strange visual deformity remember the case when he heard the prescription read over the telephone? And if he did, would he be able to give the patient's name? Or would he have to go to his office and his files and thereby waste precious time—time for the ring to strike another paralyzing blow?

Every precaution and safeguard had been taken against that. Police radio cars throughout the whole district had been warned. Directly the oculist was contacted, patrolmen would rush to his home and his office.

Bill had been amazed by the speed and organization of Drake's force. A giant network had been thrown out at a moment's notice. Surely, they would win this time. But, the ring had twice acted with cruel precision.

Bill glanced across at Drake with concern. The agent looked haggard and worn.

Drake's gaze was fixed on a small easel photograph on his desk. It was a picture of the happy face of Tim McGovern—Tim who had gone to his death before the guns of the ring.

Bill said, as if to himself, "It's seven twenty."

But Drake didn't answer, didn't give any sign that he had heard.

Bill went to the window and looked down at the street with its sprinkling of early-morning traffic. Parked at the curb in front of the building was the long, low shape of a fast car. A government agent was at the wheel. The motor was running.

Directly across the street was another car. Men were standing in doorways. Everybody—everything was waiting—waiting for that phone call that would mean the doctor had been found.

The airman felt the increased acceleration of his heart as more minutes ticked away.

Drake looked across at Bill. His lips formed a tight smile of understanding. He said, softly, almost a whisper, "It's hard—waiting."

Bill said, "Yes." The one word came out harshly loud from his dry throat.

The strain was mounting. There was no noise in the office—no movement, only the slow, inevitable climb of that minute hand across the dial of the clock.

Surely by now all the phone calls had been made. Hadn't the doctor been found?

Then, softly, muffled—but to Bill as loud as a clanging siren—the telephone rang!

XII—THE CALL

BILL AND DRAKE had the receivers off their phones at the same time.

Drake said, "Yes?"

A voice said excitedly. "One of the operators has located a Dr. Brooke. He says he prescribed for the case. He's on the wire now."

Drake rapped out. "Send word to radio cars! Connect me with the doctor!"

There was a sharp click. Then, over the extension, Bill heard a sleepy, masculine voice say, "Dr. Brooke speaking. You want to know what—"

"Government business," Drake said. "Give me the name of the man you examined. Quick!"

There was a pause. "Why—I remember the case. But—who is this? It's unethical for—"

"This is government business! I'm Stephen Drake," the agent thundered. "A matter of life and death! For Heaven's sake, doctor, give me that name!"

"Well—I guess it's all right. The patient's name is—"

The doctor's voice suddenly broke off. Bill heard a sharp, explosive sound. It blasted through the receiver. A choking, human cry followed.

Then the line went dead!

Drake shouted, "Hello! Hello!" He was out of his chair, crouched over the desk, clicking the receiver.

The switchboard operator's voice rasped. "Line disconnected, sir. I'm ringing."

The color had left Bill's face.

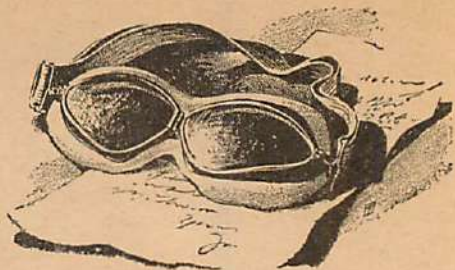
Drake shouted, "Where's Dr. Brooke's office?"

"He was talking from his apartment," the operator said. She gave an address on lower Park Avenue. "His office is in the same building. Alarm has been sent out."

Drake slammed the receiver down on its hook. He grabbed his hat and coat from a chair and made for the door. "Come on!" he said to Bill.

Their dash south on Park Avenue was made at reckless speed, with the police car's siren opening a swath through the traffic.

When they reached Dr. Brooke's apartment on the fourth floor of a large,



The Baron's fateful goggles.

modern building, they found it crowded with government agents and patrolmen. Roberts, one of Drake's men, met them and led the way into the bedroom.

Dr. Brooke, clad in pajamas, was lying half sprawled out of his bed. One outstretched hand seemed to be trying to reach the telephone. His pajama coat held a widening stain.

He was dead.

Drake took one look and turned slowly around.

"We're beaten, Bill," he said.

Roberts said quietly, "I've had news all round, chief. Dr. Brooke's office on the main floor has been ransacked. His records have been destroyed."

Drake stared across the room. Bill saw that the defeated look had come over his face again. He said finally, "Did they catch any one?"

Roberts shook his head. "They got away—a fast car. A police cruiser got here just as they were leaving the building. The gang opened fire. Both patrolmen are wounded. An alarm has been broadcast."

Drake said, "I see. Yes—ah—thank you, Roberts. Do what you can."

Bill said, "You'd better sit down a minute, Steve. You—"

Drake said, "Yes. Perhaps I'd better." He sank down on a chair and leaned back.

The airman said anxiously, "What's wrong, Steve?"

Drake said slowly, "Nothing, Bill. I'm just—I'm beaten. This was our last hope. I thought with your help I could win, Bill. But now—I guess I'm through. Maybe I'm too old. Maybe they should put a younger man in my place."

Bill said, and purposely made his voice harsh, "You mean you're quitting! That's not like you Steve."

Drake looked up. "I guess it does sound bad to you, Bill. Me—a quitter. But—" He straightened. Vigor returned to his voice. "All right. I'll stick with it."

The agent came to his feet. "Come on," he said.

Bill said, "Where to?"

"You're going to fly me to your field. I want a look at the body of that prowler. And I want to look at a list of every person who was in your office yesterday. Some one knew where to go for those goggles."

XIII—THE CACHE

SHORTY HASSFURTHER was waiting on the apron of the Long Island field when the Lancer taxied up. He said to Bill, as the airman swung to the ground, "The cops took the stiff to Huntsville. Haven't identified him. The dicks want you to phone them, Bill."

Bill said, "I will, later. First, we're going to eat. Tell Charley to bring two orders of breakfast to my office, will you, fella? Come on, Steve."

The hot breakfast tasted good to both of them. And while Bill sipped his third cup of coffee he began working on the list of his visitors of the day before. By nine o'clock it had grown to twenty-eight names.

"That's the works, Steve," Bill said, as he carefully checked them. He handed the list to the agent. "Look 'em over."

Drake took the piece of paper. Suddenly, the office door banged open and Sandy catapulted inside.

"I've found it!" he shouted.

"Found what?" Bill asked.

"Where Alphonso's been hiding all the stuff he swiped," Sandy said. "Guess where it was?"

Bill said, "Listen, peewee, Steve and I are very busy. I'll see you later about it."

"But I thought you were anxious for me to find the stuff," Sandy said indignantly. "It was hidden away at the end of the Eaglet's fuselage. Golly, I never would have thought of looking there if I hadn't been so desperate—"

"That's fine," Bill said. "Now—beat it!"

Sandy started to back toward the door. "Well, I wanted to let you know. You told me to keep looking until I found von Struben's monocle. I found it O. K."

He held up the monocle and then awkwardly stuck it in his right eye. "I say, how do I look really?"

"Terrible," Bill said.

"Hey, golly!" Sandy exclaimed. "How does that guy ever see out of this thing? Everything blurs!"

Bill started. "What's that? It blurs?"

"Yeah. I can't see—"

Bill got up. "Give it to me." His words were harsh.

Sandy handed the eyeglass to him. "Gosh, don't be sore, Bill. I didn't mean anything."

"I'm not sore, kid," Bill said. "I just thought of something."

He held the monocle up to his right eye and squinted through it. His vision instantly blurred.

He lowered the monocle and felt the width of the glass between his fingers. It was thick.

Bill said abruptly, "You got those goggles with you, Steve?"

Drake said, "Why—yes." He pulled them from his pocket. "Why?"

Bill took them. He didn't answer. He put the goggles to his eyes and looked through the right lens. His vision blurred.

Sandy said, "What're you doing, Bill?"

Bill said, "Keep out of this, kid." He quickly lowered the goggles and once again held the monocle to his right eye.

Drake came over, "Bill, you don't think for one minute—"

"Steve, I do! Take a look."

The agent did. "Hell's fire! They seem identical!" Drake exclaimed. "That means— Where'd you get this monocle?"

Bill told him about the baron's encounter with Alphonso.

"Von Struben was here yesterday—in this office?" Drake asked quickly.

"Yes. His name's on the list."

"He could have seen those goggles lying on your desk."

"He must have seen them!"

Drake was visibly excited. "Bill, I think we've got it! Does von Struben wear his monocle in his right eye?"

"Always."

"You remember what Coulter said. The man who owned these goggles must've been suffering from a visual deformity in his right eye!"

Bill remembered that distinctly. But he said, "Wait a minute, Steve. Not so fast. We're jumping at conclusions."

Von Struben of all people! Could the baron be the head of the ring or mixed up in it in any way? If he *was* the owner of the goggles, then he must have been on the island that night!

Drake said, "There's only one way to find out for sure. We'll go to New York and have Coulter analyze this monocle. If it matches with the right lens of the goggles—well—"

An hour later they found that it matched perfectly.

Bill and Drake were in Coulter's office when the man brought the conclusive report. "They're identical," he said. "Must have been made from the same prescription. That monocle was ground in our shop, has our mark on it."

Drake said, "You don't by any chance remember whom you made that monocle for?"

"Yes. At least I'm fairly sure. For years we've only had one customer for monocles. That's Baron Hauss von Struben. You know, he's the perfumer."

"We know," Drake said quietly, and looked at Bill as if to say, "Have you any doubts now?"

Bill hadn't. The evidence was too conclusive for that. The baron was mixed up with the counterfeiting ring in some way. But there was no telling whether he was the head man or just one of the links—

Drake had little doubts about that. He aired his views freely as they drove to the department's office after instructing Coulter not to talk and assigning two agents to guard him.

"Von Struben's the brains," Drake said definitely. "The more I think of it the more I'm convinced. He's got the perfect set-up: prominent in society and business, beyond the pale of suspicion. He's got that big place out in California, isolated from everything. He's got an airport and planes. Hell's fire, look at the way he spends money—right and left! He couldn't make all that out of perfume."

"Well—maybe you're right, Steve," Bill said. "But why did he come to me to make that flight to Persia? Do you think that ties in?"

"Yes, it ties in," Drake said. "He was afraid of you. He must have been wised up that you were going to work with us. That rat Levinski probably overheard something."

Bill nodded. That, too, made sense.

Drake was staring straight ahead, his face grim. He said, "I'm going to raid that damn place of his out in California. I'm going to get him and smash his organization to smithereens."

The car stopped in front of the department's building. Bill was silent as they rode the elevator to Drake's private office.

When they were seated, Bill said, "Steve, in order to break up this thing—you'll have to get the plates, won't you?"

"The plates and the engraver."

"All right. If you raid von Struben's place now, you may lose out all around. You've only got circumstantial evidence that he's even connected with the ring. You've no proof that he's the head man or that the money's made out there."

Drake looked at Bill quizzically. "Well—no. But I'm damn sure. I'll take a chance anyway."

"You'll take a chance on fumbling the whole business, you mean," Bill said evenly.

"What?"

"Now calm down," Bill said. "I have a plan. I'll go out there."

"You?"

"I told von Struben either Cy or I would make that Persian flight," Bill said. "I told him I'd let him know to-day. Well, I will. I'll phone and tell him that I'll do the job. I'll fly out to his place this afternoon to talk things over. I'll stay there all night. That'll give me a chance to snoop around. If the evidence is there, I'll get it. You'll have agents hidden in the vicinity of the valley. I'll radio you from the Lancer. Then you can make your raid."

Drake shook his head. "No, you can't do that. It's too dangerous."

But by eleven o'clock that night Bill

was seated in a guest suite of Baron Hauss von Struben's residence in Valle de Flores. He was alone.

XIV—THE ROLE

IT HAD taken long argument before Drake had been convinced of the advisability of Bill's plan. But he had finally said, "yes."

Bill had then returned to his Long Island airport and telephoned Baron Hauss von Struben. "I said I'd let you know about that flight," Bill told him. "I'll be able to do the job myself. I'll fly the Lancer to your place late today. O. K.?"

The baron said, with some hesitation, that that was excellent. Then he added, "I do not suppose you have located that eyeglass of mine, eh, Barnes?"

Bill lied and made a good job of it. "We've hunted everywhere," he said.

Immediately upon hanging up, Bill marshaled his forces and issued crisp orders. Tony Lamport, the chief radio operator, went to his shop to assemble a short-range radio, compact enough to be concealed in the bottom of a club bag.

Martin and mechanical technicians got to work on the Lancer. The locker in the fuselage back of the rear cockpit was cleared of its emergency equipment and enlarged and reinforced. An extension from the plane's radio was run back and microphone and ear phones installed. Food and drink were placed in the locker.

Bill talked earnestly to Sandy. When he finished, the kid dashed off to his quarters with, "Do it? I'll say I can!"

Then, at four o'clock in the afternoon, when everything was ready, Bill called his pilots into his office. He told them of the counterfeit ring, of Baron Hauss von Struben, of the plan.

"It's the old Trojan horse trick," Bill added. "When I land, the Lancer will be run into the baron's hangar and left there. Sandy will stay hidden in the plane's locker. He may be able to overhear some unguarded conversation. Anyway, he'll be in radio communication with Steve Drake and his men.

"I'll have Tony's small radio in my club bag. I'll be able to receive and send to Sandy. I hope von Struben won't be too suspicious of me. I'm gambling that I'll be able to do some snooping and get the goods on him. If I do, I'll radio Sandy to tell Drake to raid the place.

"All you fellows here will stand by. You'll be under Drake's orders. He may want to use you."

That had been the plan.

THE FIRST PART of it had gone off successfully.

It was eight o'clock when Bill landed at Valle de Flores. He was graciously

received by Baron Hauss von Struben, bemonocled and suave. Yet, under the suavity, Bill detected suspicion and wariness. And it was with decided misgivings that Bill casually walked away from the Lancer, leaving Sandy alone in the supposedly empty plane.

The baron had an excellent dinner served in the large dining room of the rambling house. There were four other men there. "Sportsman pilots," von Struben said after the introductions, "Week-end guests." Bill wondered about the "sportsman" part. Were they members of the ring?

After dinner the baron and Bill left the others and had cigars and coffee in von Struben's study. They inspected charts and maps of the proposed air route to Persia, and Bill realized that the man was in earnest about the flight. He had set the take-off for the following morning. Notices had been sent to the newspapers.

Every minute was a severe strain on Bill. He was acutely aware of the part he had to play—of lulling the baron's suspicions, of acting the rôle of Bill Barnes, the pilot.

Yet, Bill played his part well and he felt the baron was relaxing some of his vigilance. But, as the evening wore on, Bill became more and more anxious. He wanted to get to his room where his club bag was, to talk to Sandy over the radio. He tried to terminate the conference, but the baron, instead of leaving him, took him on a tour of the perfume factory. They walked down paths through fragrant flower gardens to the greenhouses, the laboratories, the bottling plant. Von Struben showed him everything almost with an air of, "See, my friend. There is nothing suspicious here."

No, there was nothing suspicious, Bill mentally agreed. Yet he hadn't forgotten the glimpse he had caught of a Cobbs Commander and a Booth Bullet in the hangar—two fast planes, not the type for an amateur aeronautical enthusiast to have around. But Bill was glad of the tour of the place. It gave him a knowledge of the territory. That might come in useful later.

Then, at last, at ten minutes to eleven, the baron escorted him down a long cloister to his suite in the east wing of the house.

"I must get to my other guests," Baron Hauss von Struben said. "They are leaving to-night by plane. I trust you will sleep well, Barnes. Good night."

Bill said, "Good night," and closed the door. He waited, listening to the sound of the baron's retreating footsteps down the cloister. Then he turned and ran across the living room to the bedroom, where his bags had been left.

The bedroom was in darkness save for the glow coming from the living-

room lamp. Rust-colored cretonne drapes were folded back on either side of the single bedroom window. Bill tugged the draw strings, pulling the drapes tightly together across the glass. Then, hastily, he unlocked and opened the club bag. He seized the top layer of shirts and clothing and tossed them on the bed. In the bottom of the bag was the compact radio set.

Bill picked up the ear phones and the small microphone. He flicked a switch on the miniature radio control panel, and set a dial. Then, with the phones held to his ears, he waited and watched a small glass square in the panel. When it lighted it would mean that Sandy had heard his signal and was answering.

Yes, the plan so far had worked, the preliminary part. The hard part, the dangerous part, lay ahead.

XV—THE SIGNAL

THE GUEST SUITE to which Bill had been assigned was at the extreme end of the east wing that had been added to the old rambling mission. The living room and bedroom had white plaster walls and heavily beamed ceilings, and were furnished in stout Monterey. Two large French doors in the living room opened onto the cloister.

One small table lamp now burned in the living room, shedding a rosy glow over the polished black floor with its scattering of colorful Navajo rugs. There was no noise save the steady hum of an electric fan in the bedroom.

Bill felt the cool blast of air sweep across him as the fan oscillated on its stand. And he was grateful for the slight noise. It would help to mask his voice when he talked to Sandy.

When!

His eyes were riveted on the glass square. Why didn't Sandy answer?

From somewhere in the silent house came the muffled sound of a clock striking eleven. Then—the square flashed a cherry red.

Bill pressed the phones close to his ears and heard a faint, scratchy voice say, "Is that you, Bill?"

It was Sandy.

Bill gripped the microphone. Instinctively, he bent over, cupping his hands around the instrument. He spoke into it, his voice so low that he could scarcely hear his own words above the whirring sound of the electric fan.

"Yes. Everything O. K.?"

Sandy's voice came back. "I couldn't answer before. Some men were standing right beside the Lancer. They've gone out. They've wheeled the Cobbs Commander outside." The kid paused. Bill caught the note of anxiety in his voice when he spoke again. "Bill, something awful has happened."

Bill's heart thudded. "What?"

"I know you'll blame me, but honest

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I didn't know. Alphonso's here in the Lancer."

"Alphonso!" Bill gasped.

"He must have been hiding all the time way back in the fuselage," Sandy said. "He didn't crawl up here to me until after the Lancer'd been run in the hangar. I don't know how he got in. Maybe he thought it was the Eaglet and he was going after the things he'd hidden away. Maybe—"

Bill cut in. "Never mind that. Keep him quiet. Your life depends on it."

"I'm keeping him quiet. He'll be all right, Bill," Sandy said. "Don't be too tough on him, Bill. Gee, if he hadn't swiped the monocle, you'd never—"

"Pipe down," Bill whispered fiercely. He was thoroughly alarmed. If it had been dangerous for Sandy before it was doubly so now, with Alphonso liable to make noises. Yet the situation had to be accepted. As Sandy had said, if it hadn't been for the little monkey—

Bill slipped one phone off an ear and listened for any noises near by that might mean that some one was listening to him. But there was nothing.

Then he said into the microphone, "Has Drake contacted you, kid?"

"Yes," Sandy said. "Three times. He's got his men all spread around. He's ready."

"O. K. Tell him to stand by. Have you been able to overhear anything?"

"Just hangar talk," Sandy said. His voice suddenly sharpened. "Wait a minute. The guys are coming back inside now."

Bill waited, tensely.

Then Sandy said, "They just passed me. I couldn't hear much. Something about the greenhouse and the plant. That's all I could catch. And Bill! They're loading some stuff into the plane out on the apron."

Bill started. Loading? It might be perfume. It might be counterfeit money.

And the words Sandy had overheard: the greenhouse, the plant. Did that mean that the stuff they were loading aboard the plane was coming from there? That must be it.

Bill whispered, "I'm signing off, pee-wee. I'm going to see if I can get out of here and do a little scouting. Keep ready for my signal—and act fast when it comes."

Sandy said, "Yes, Bill. Luck."

Quickly now, Bill disconnected the radio, put the microphone and ear phones into the bottom of the bag. He lifted the layer of clothes into the top and closed the bag.

He stood up, removed his automatic from its holster under his left armpit and put the weapon in his side pocket. Then he moved softly to the bedroom window. Pressing himself against the wall he carefully moved an edge of one

of the closed drapes so that he could see outside.

There was no moon, but a faint luminosity was in the sky. The cloister and the lawn beyond, as far as he could see, seemed deserted.

Had the baron put a guard out there? Was some one waiting in the blackness, watching?

Bill stood in the middle of the room and again listened. But only the whirring of the fan came to his straining ears. Then he made up his mind. He would have to gamble.

He switched on a bedside lamp, and, walking into the living room, extinguished the light there. To any watcher it might appear that he was preparing for bed. And the living room being in darkness would enable him to slip out through the doors to the cloister without being noticed—he hoped.

He softly crossed to the doors. His fingers gripped the handle and slowly turned it. Then, with the catch twisted back, he inched one of the doors open.

Every nerve taut, his heart racing, Bill widened the gap until there was space for his body to slip through. Outside he stood motionless. His eyes probed through the darkness. He listened. But he saw and heard nothing.

He carefully closed the door behind him and stepped into the deep shadows of the cloister. So far so good. But his right hand remained tightly closed on his pocketed automatic.

And now a mental picture of the valley, with the relative positions of the buildings, flashed across his mind. The airport lay to the north of the house.



Stevens was off balance— Bill's sudden onslaught did the rest—

The greenhouses, the laboratories lay to the south.

Bill walked noiselessly down the cloister and started out across the lawn to the south.

He had taken not more than a half dozen steps when from out of the darkness close at hand came a sharp cough.

Bill turned. He saw a man moving toward him. It was Baron Hauss von Struben.

The baron said, "A little stroll before bed, eh, Barnes? A capital idea. Will you join me in a cigarette?"

XVI—IN THE DARK

BILL SAID, "Oh, hello." He said it casually, or hoped he did. He wasn't sure. The shock of meeting the baron had routed his wits. Speedily, he gathered them to him.

Bill said, "A cigarette? Yes—thanks. I rarely smoke one. Perhaps it'll be good for my nerves."

The baron extended a silver cigarette case. "Nerves? You? Why, I always imagined you as a man of steel, Barnes."

Bill took a cigarette and ignited it. He took his time. "Yes, I know," Bill said. "People think I'm that way. But just before an important hop, I get plenty jumpy. I thought a walk might put some sand in my eyes."

Together they walked slowly down the length of the cloister.

They turned and came back; the baron talked politely, pleasantly. So did Bill. Yet the pilot knew neither of them was fooling the other.

When they reached the doors leading to his rooms, Bill stopped. He dropped his cigarette butt and carefully ground it out with his heel.

"Now I can turn in," he said. "You better have me called in good time, von Struben."

"You will be called at seven o'clock, Barnes," the baron said. "So, good night again. I trust this time you will find sleep."

Bill said, "I hope so," and opened the door and went inside.

And, once again, as he stood in the darkness of the living room, he heard the retreating footsteps of the baron. They faded into the distance.

The baron had gone, yes, but probably not far. Either he or some one else would continue the watch. He was making very sure that his guest didn't do any wandering. That meant he was afraid that Bill might see something he shouldn't.

And that was all the more reason for Bill to go looking.

Exit through the French doors of the living room was now out of the question. Some other way had to be found and found fast.

Ten minutes later Bill had decided what to do. There was a door in the north wall of the bedroom. Where it led, Bill had no idea. But from the construction of the house, he believed it must open into a small hallway from which other guest suites branched.

The door had been locked from the other side and the key was still in the lock. Probing with a hairpin, which Bill had found in a dresser drawer,

proved that. And it also gave Bill an idea.

The door fit its frame badly, leaving an inch gap between its bottom edge and the floor. The gap was wide enough for Bill to slide one of the small Navajo rugs part way through. Then, with the rug in place, he knelt down, bent the hairpin and inserted it in the lock. He twisted it around and felt it move the key. He worked with painstaking deliberation, trying to turn the key so that it lay straight in the lock and could be pushed out.

The hairpin broke and he had to hold up operations while he searched for another. He found three—and used them all. The next two broke in the lock. The tips of his fingers were sore as he worked the last pin. Then he felt the key turning. At last he was sure it was in the right position. He pushed against the end of it with the hairpin.

He heard a dull thud as the key dropped to the portion of the rug which lay beyond the door. Gingerly, he pulled the rug back into the room with the key riding on it.

He seized the key, inserted it in the lock and turned it. The bolt slipped back and Bill opened the door.

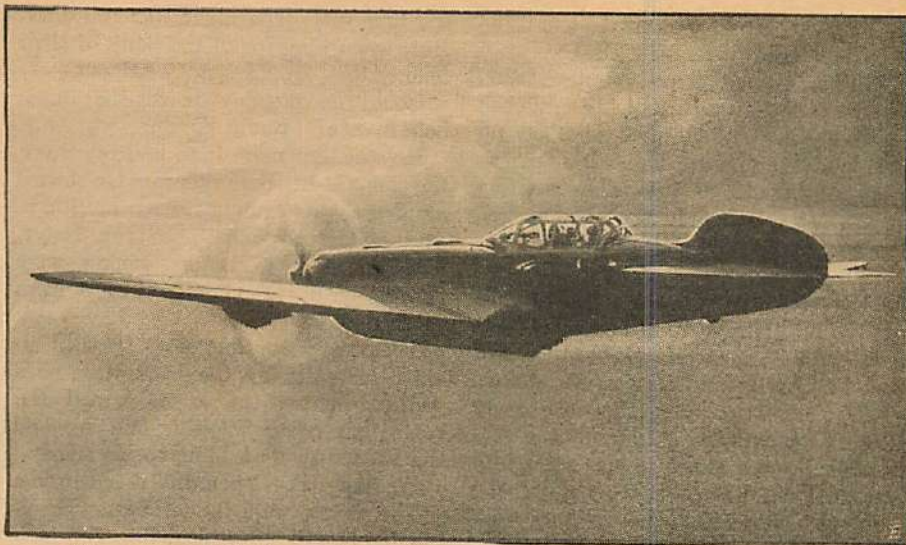
It was dark beyond. But by the reflection of the bedroom light he saw that the door opened into a small hallway from which several other doors led.

Bill went to the nearest door. It gave under his touch and he looked inside. Another suite, similar to his, was beyond. The French doors of its living room were on the north side of the building and opened onto a flagstoned terrace. He might be able to get out undetected this way. But first—

He went back to his own room. Working quickly, he turned down the covers on the bed and, using a rolled-up rug from the floor and cushions from the living-room couch, he formed a crude, elongated shape in the bed. When the sheet was pulled up it looked not unlike the body of a sleeping man. Bill took a flying helmet from his bag and stuffed a shirt into it to round it out. He made a hollow in a pillow, put the helmet in it and drew the sheet higher. That would act as the head.

He shot a critical glance at the arrangement, made some changes in the contour of the shape. Then he placed the electric fan on the floor, so that the draft of air coming from it played across the sheet at intervals, moving it slightly. He changed the position of the fan until the movement of the sheet was very slight—similar to the slow, regular breathing of a sleeping man.

That would have to do. There was no more time to waste. He extinguished the light and drew back the drapes from the window. A man preparing for a night's sleep would scarcely do otherwise. Now any one passing along the



Bill corrected the Lancer's position and nudged the stick forward—

cloister could look in through the window and make out the shape in the bed. It might stop any closer inspection. Bill hoped so, anyway.

Then, with one last glance over the room, he quickly stepped out into the hall and closed the door after him. His heart was beating faster as he entered the adjoining suite of rooms.

He had the French doors open and was looking out when he saw a man suddenly come into view at the east end of the house. The man stopped, turned and went back out of sight.

A sentinel. He must have reached the end of his patrol and was retracing his steps. Now was the time for Bill to leave the house.

He did. He bent low and, throwing caution to the four winds, ran across the flagstones to the blackness beyond.

He had his gun out. At any second he expected to hear a shout of discovery. But none came and he realized that he had, temporarily at least, made a getaway.

And now—the greenhouse.

Keeping his distance from the house, he took a circuitous route and finally reached the path to the greenhouse. But he hadn't gone ten yards along it when he made out the shapes of two men coming toward him.

With a surge of panic, Bill darted to the right and lay prone, face down, behind a row of jasmine bushes. His luck was in. The men hurried past without stopping. Bill heard one of them say, "—the biggest shipment the boss has ever sent out—"

He didn't hear any more. Shipment—shipment of what? Again it might be perfume—or counterfeit money.

The snatch of conversation spurred Bill on. He came to his feet, got back to the path and hurried. Each minute was tight with suspense.

Bill went slower, his gun ready, the safety slipped off. The greenhouse looked deserted.

Then, abruptly from behind him, he heard the sound of hurrying footsteps. Some one was walking rapidly down the path toward the greenhouse.

Bill acted by impulse. He hurried ahead, swerved off the path and, reaching the greenhouse, lay down against one of its walls.

He was barely in time. As he shot a look back he saw a man come into view. The fellow walked up the two concrete steps to the greenhouse door and went inside.

Bill raised himself on an elbow and found that he could see through the glass wall of the greenhouse. The only light came from a small blue bulb burning in a wall socket.

The man who had gone inside was standing just below the blue light. Bill saw him raise his right hand and pull down a small handle inset in the wall.

The steady hum of an electric motor sounded. Bill lay motionless, staring. He began to doubt his eyes. One whole section of the flowers inside seemed to be moving.

Yes, it was! It was sliding noiselessly to one side, leaving a hole. The gap widened. Light came up through it.

The section of flowers slid farther. Now Bill could get an oblique glance down the hole. There was a basement below. A metal ladder led to it.

The basement was brilliantly illuminated. Men were down there. Bill caught his breath. He saw something else. There was machinery—a small printing press. It was in operation.

And, even as Bill looked, he saw a line of green, oblong sections of paper slide out from beneath a roller.

One glance was enough. The paper was money—freshly printed counterfeit money!

XVII—THE WORD

THEN the baron *was* head of the ring! The money *was* being made here! The shock of the discovery sent Bill

to his feet. He had to get to the radio—to tell Sandy to signal Drake.

Bill half turned. Then, innate caution came to the fore. He quickly crouched down again. A man had climbed up the ladder and had handed a paper-wrapped bundle to the fellow waiting at the top. The man took the parcel, turned and headed out the door.

Bill waited. Now, more than ever, he had to be careful. It was vital to get the information to Drake. Let that man with the parcel go ahead. Bill would follow behind at a safe distance.

The man went along the path away from the greenhouse. Bill saw the section of flowers slowly slide back into place. Then he crept away from the building. He reached the concrete walk and started along it.

He turned and looked back at the greenhouse, wary of any one else coming from the place. It was in that brief moment, while his head was turned, that it must have happened. For when he looked ahead again his heart thudded. The man with the parcel had suddenly turned around and was coming back.

He was near, too near. There was no time to dive for cover. The man must have seen him. In the next second, Bill knew he had. The man called, "Hey, Gus. I forgot to tell you something."

Bill took a chance. He made his voice gruff and said, "What is it? Hurry up."

The man came closer. He said, "The boss told me to tell you that—" His voice suddenly choked off. "Say, you ain't—"

Bill didn't wait. He had his automatic clubbed. He leaped at the man. His arm came up. He had a flashing impression of the man's face. Then the butt of the gun slammed down.

But before it connected the man opened his mouth, yelled, "Help!"

Then Bill felt the jar in his arm from the impact. The man went limp and fell.

Had that one word been heard? Would some one come to investigate?

The answer came almost instantly. A light flashed on in the greenhouse.

Bill bent down, rolled the unconscious man off the walk. Then, scooping up the parcel that had been dropped, the airman started down the path, running hard.

Now the fat was in the fire. Men would come from the greenhouse to investigate. An alarm would be broadcast.

Bill put extra speed into his legs. He ran now without regard for concealment. There was no time for that—no time for anything but to get to the radio and warn Sandy.

He shot one quick look back. He saw two men dashing out from the greenhouse. They wouldn't be able to

see him yet. The night was too dark. But, when they found the body of their fellow, they would send word out.

Could he possibly reach the house before then? Radio Sandy?

He was now more than halfway down the length of the valley. He heard muffled shouts coming from behind him. And he forced himself to run faster. The house was ahead. Lights were flashing on in it. The alarm must have reached there.

There was no time now for Bill to enter his suite by the back way. He sprinted across the lawn, gained the protection of the cloister and reached the French doors leading to his suite.

He flung them open and dived inside. The rooms were in darkness. Gasping for breath, he rushed into the bed-



Sandy stayed hidden in the plane's locker—

room, yanked open the club bag. With trembling hands he grabbed up the microphone and ear phones. He snapped the switch over. He said into the microphone, "Sandy! Sandy!"

The signal light almost instantly sprung into life. He heard Sandy's voice say, "Bill!"

"Get this," Bill gasped out. "Tell Drake to raid! Raid! The baron is the—"

Suddenly a shaft of brilliant light knifed out from behind, focused on Bill. A blast of gunfire followed. Something smashed into the bag. The radio went dead.

Bill tried to turn, tried to get his gun up.

A hard voice said, "Make a move and the next one will be yours, Barnes."

And Bill found himself looking into the barrel of a gun held in the steady hand of Baron Hauss von Struben.

XVIII—ESCAPE

BILL WAS caught cold. He knew it and dropped his automatic. The baron advanced into the room. He held a strong flashlight in his left hand, the gun in his right. He turned on the bedroom light. The two men stared at each other for a long minute. Bill saw that the baron looked as composed as ever.

He said, "I heard what you said. Your friend Drake is going to raid my place, eh?"

Bill said, "Yes. You haven't a chance, von Struben. You might as well give up peacefully. It'll go easier with you."

The baron exchanged his gun to his left hand and adjusted his monocle with his right. "Thank you for the advice," he said, "but I have other plans. Kindly kick your gun out here."

Bill hesitated and then obeyed. There was nothing else to do.

The baron picked up the automatic and slipped it into his pocket. Then he moved over to the telephone. He lifted the instrument and said into it, "Get me Hans. Quickly."

There was a short wait. Then von Struben said, "Hans, we will soon be raided by Federal agents. Gather up your plates and hurry to the airport. We have to get away. . . . No, not the Commander. Phillips will fly that. We will go in a faster plane—Mr. Barnes' Lancer."

Bill's mind jumped to Sandy. He started forward. "You can't—"

The baron said, "Be careful." He jiggled the hook and said into the phone, "Get me the hangar."

The connection was made quickly. "Wheel out the Lancer," von Struben ordered. "And hurry."

He put the phone down.

"Barnes, your machine is going to come in handy," he said. "For a long time I have realized that some day my profitable business might be temporarily stopped and I should have to go away. Your machine will take me farther and faster than any of mine."

Bill said, "You'll never get away, von Struben. Drake and his men will be here at any minute now." But he knew that that wasn't so. It would probably take the raiding party precious time to sweep into the valley. And in the meantime the baron would get to the Lancer and Sandy.

"I have at least ten minutes before they can possibly reach here," the baron said calmly. "As the only roads leading to my place come from the other end of the valley, it will take Drake quite some time to get up here. And my guard will be ready for him."

Again he adjusted his monocle. "Yes. I will get away all right," the baron went on. "And in case any one should try to stop me, I will shoot and shoot to kill."

Bill heard the coldness of his voice and, with a shudder, he knew that the man meant every word of it.

Some one came in through the French doors. Bill saw that it was a tall, wide-shouldered man who was blinking his eyes sleepily.

"I heard your voice, boss," he said. "What's happening?"

The baron didn't look around. He said, "I am glad you came in here, Stevens. You have a gun?"

"Yeah," Stevens put his hand in a side pocket of his leather jacket and brought out a high-calibered revolver.

Von Struben said, "Excellent. I have to leave for a minute. You will stay here and point your gun at Mr. Barnes. And if he should get out of hand it will be perfectly all right to pull the trigger."

Stevens laughed. "You're a card, boss. I getcha."

The baron bowed to Bill. "I am sorry that the plans for the flight to Persia must be postponed indefinitely. And I really must congratulate you on what you have accomplished. I see that I should have taken you a trifle more seriously, Barnes."

He turned to go and then swung back. "One other item. I take it that you did find my monocle."

"We found it," Bill said.

Baron von Struben backed into the living room. "Ah, that was unfortunate," he said. "Unfortunate—for you."

He turned and went out through the French doors.

Bill thought wildly. He's going to the Lancer. If he finds the kid there, he'll kill him. He had to be stopped.

Bill said to Stevens, "The whole place is being raided. Your boss is making a get-away. He's leaving you holding the bag."

Stevens grunted. "Shut up," he said. But Bill saw his eyes flicker. "Let me out of here," Bill went on. "I'll see that you're treated right."

Stevens' grip tightened on his gun. "I said, shut up!"

Desperate now, Bill pressed on.

He said, "Government agents are closing in—a whole army of them. I just told them to raid the place."

"What the hell are you talking about?" Stevens demanded. "How could you tell them anything from here?"

"I radioed them. Look!" Bill leaned over and pointed to the club bag at his feet. "I used this set here. Look!"

Doubt now showed in Stevens' face. He took a step nearer and looked down.

Bill saw his chance. His hands were near the edge of the open bag. Then, with one quick movement, as the man leaned over to look inside, Bill seized the top of the club bag, jerked it off the floor and threw it full into Stevens' face.

The man was taken by surprise. He staggered back as the bag crashed against him. His gun exploded, but the muzzle was now upturned. And even as flame gushed from the muzzle, Bill threw himself at the man, his fists flailing.

Stevens was already off balance. Bill's sudden onslaught did the rest. The man

went down. Bill crashed his left fist against his jaw, his right just under the heart. The blows carried everything he had. The man's head hit the floor with a crash and he lay still.

Bill twisted the gun from Stevens' fingers and made for the living room without a backward glance. He reached the open French doors and dived through.

Would he ever get to the hangar in time—in time to catch the baron—in time to save Sandy?

XIX—ATTACK

HE LIVED an eternity in that mad sprint around the house.

Lights were flashing on inside. People were coming out the doors. But no one paid any attention to Bill as he dashed past. The reason for that was now apparent. From the far end of the valley came the sharp rattle of sub-machine-gun fire.

Drake and his men! They were storming the valley faster than the baron had expected.

But that didn't matter now to Bill. Von Struben was liable to escape—leaving Sandy's dead body behind. Bill was sure that the kid would open the panel in the locker and enter the Lancer's rear cockpit to try to stop the Austrian.

Ahead now, Bill saw the airport. The back of the hangar blocked his view of the apron and the landing field. But he could see that the floodlights were on.

Had the baron already reached there?

But no! Bill saw a running figure. It darted around the corner of the hangar and vanished from view.

It must be Baron Hauss von Struben!

Bill threw himself ahead even faster.

Two more minutes and Bill had reached the hangar. Two machines stood out there on the concrete, their noses pointing down the landing field. One was a Cobbs Commander. Her engine was running. A pilot was in the forward cockpit.

Beside her, Bill saw the sleek, glistening shape of the Silver Lancer.

Then he saw something else—and his blood ran cold.

The baron had already reached the side of the Lancer, was starting to climb up. Then, abruptly, Bill saw Sandy stick his head up from the rear cockpit.

From the distance the baron's inevitable start of surprise couldn't be seen. But his quick reaction was plainly visible. His right arm swung up. He had a gun in it. He was aiming it straight at Sandy.

Bill jerked up his revolver. His finger pressed on the trigger. But he didn't shoot—not then anyway.

Suddenly something flashed out of the rear cockpit—a small furry shape. It

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3/32x3/32, 30 for 5c	Mach. Cut Wina	1 1/2" dia. 15c	
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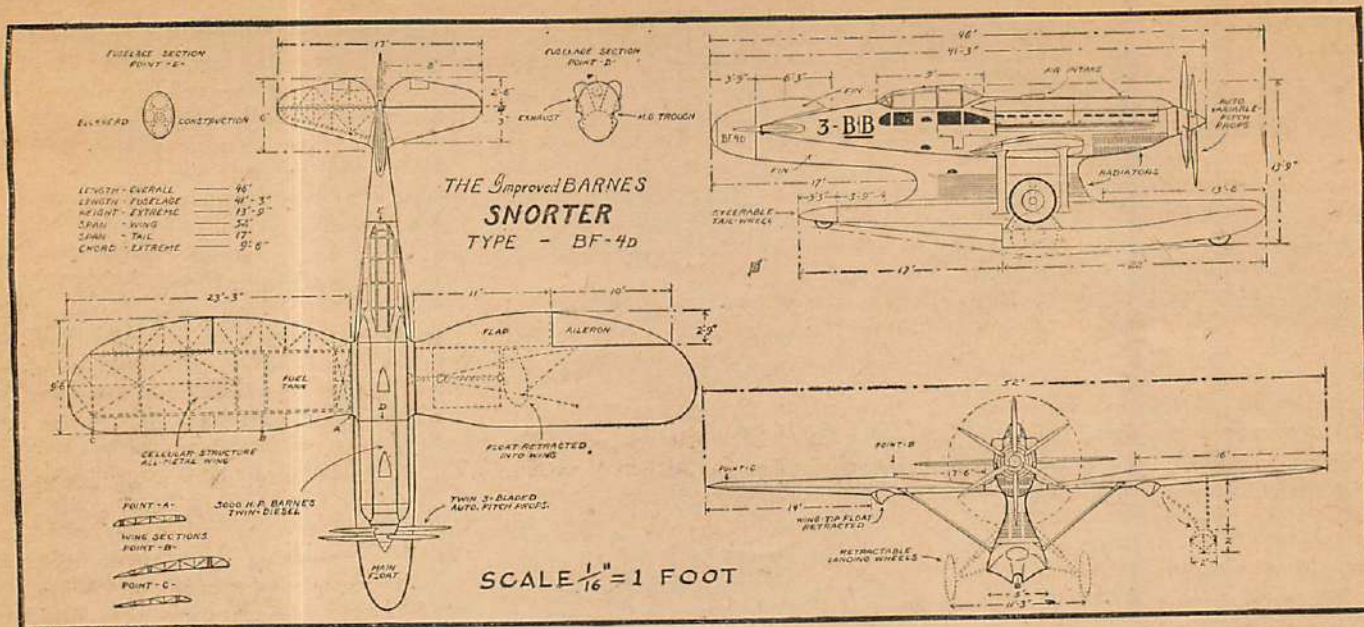
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landed against the baron's gun arm, threw the arm up.

"Alphonso!" Bill gasped.

The monkey had thrown himself against the Austrian. The baron's gun exploded, shooting almost straight up into the air.

Bill saw the baron leap down to the ground, saw him shake the clinging monkey away. Then, again von Struben's gun came up—aimed at Sandy.

But now Bill was nearer. He leveled his gun. He shot—once—twice—three times.

One of his shots must have connected. A sharp yelp of pain came from von Struben. He dropped his gun, grabbed at his right arm. He swung around and saw Bill coming.

Abruptly, the baron turned and ran toward the Cobbs Commander. Bill could hear him yelling something. A small man, carrying a suitcase, raced out from the hangar.

That would be Hans, the engraver, with the counterfeit plates.

The baron snatched the bag from the small man, knocked him roughly away, and threw himself up the side of the

Commander's fuselage and into the rear cockpit.

The Commander's engine crashed out as the pilot opened the throttles. The big machine lunged forward.

Bill was now racing across the concrete apron. He saw that Sandy was in the Lancer's front cockpit and had started the engines.

The Commander was rolling faster ahead. Bill forced his legs into one final spurt. He reached the Lancer, clawed his way up and into the rear cockpit.

The baron was escaping—escaping in the Commander!

Bill broke out the rear cockpit's gun. He spun it around on its track. He yelled at Sandy, "Swing her around."

The kid got what he meant. With a bellow from the engines, the amphibian slued around.

The Cobbs Commander's tail was up. Bill now had a clear range. His eyes glinted along the sights of his gun. He aimed dead on for the tire of the ship that was racing for a take-off. Then he pressed the trigger.

The gun yammered out its deadly

stream. Bill kept the trigger back. If this didn't work, the Commander would have to be pursued into the air.

But it worked.

Bill saw the left tire blow out. The racing machine suddenly spun around. One wing tip dipped, buried itself in the ground. The Commander abruptly ground-looped and came to a shuddering stop.

FEDERAL MEN were streaming across the landing field when Bill and Sandy ran to the wrecked Commander. There had been no spurt of fire. But the ship lay crushed.

The pilot, Phillips, had been thrown free and lay unconscious on the ground.

Baron Hauss von Struben was still in the rear cockpit. He was uninjured except for a lacerated right hand. With armed Federals grouped around, the baron slowly crawled from the plane.

Alphonso had raced after Sandy and was now clinging to his shoulder.

Von Struben's gaze went from Bill to the monkey. "A cunning little fellow, eh, Barnes?" he said.

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BEATING THE WEATHER DEVILS

(Continued from page 10)

with ice and choked the engines. Moreover, the devil of moisture, as if enraged at his failure to stop these daring invaders by blinding their eyes, proceeded to make use of certain laws of electricity to stop their ears and blot out the guiding radio beams.

The year 1937 is the first year in which it can be said that the patient scientists have devised armor and charms to foil all these latest attacks. Much progress had been made previously, but until recently a pilot could not be sure he was ready for the worst. He had to depend on interpreting weather reports so as to avoid certain dangerous atmospheric conditions.

Some of the dangers of ice formation have been known for a long time. Single-engined mail planes several years ago were forced down by ice on the wings, and more than one ship was lost before a device was worked out to solve this problem. Wing icing was the first problem solved. Experimental de-icers were in successful operation before single-engined mail planes left the airways completely to the big transports. By the time the famous Douglas planes came into use, in 1934, wing de-icers were ready, and similar devices were applied also to the tail surfaces.

But the problem was not yet solved. The wing and tail de-icers were rubber "overshoes" which were attached to the leading edges of wings and tail surfaces. Air was forced into these at regular intervals, blowing them up and cracking the ice which was then blown off in the wind. At previous cruising speeds they had been all right, but at the high speeds of the new Douglasses the cement used to attach the overshoes to the wings would not hold.

So the engineers of the B. F. Goodrich Co., which had developed the equipment in cooperation with the air corps and the major air lines, got to work on the problem of riveting them on. That wasn't easy, for no backing tool could be gotten inside the thin metal of the wing. They finally produced what they called the "rivnut," a hollow, threaded rivet which may be installed from the outside. This put wing de-icing well in hand; though improvements in air valves, and so on, continued.

In the spring of last year a Douglas DC-2, on a test flight with the new equipment, went out to find ice. It found plenty. It landed with a two-inch deposit on the nose and the windshield, but none on the wings except on the tips beyond the overshoes. The windshield had to be broken so that the pilot could see to land. But if he had had the equipment now in use he wouldn't have had to break the window.

A large flexible tube, which will remain in any position, is now used to shoot heated air against the windshield from the inside. (Secret: if a pilot gets chilly he sometimes sticks this tube down his neck or up a pants leg!)

With these victories chalked up against them, the weather devils, moisture and cold, became very subtle, and called in another ally, the wind.

It was only seven months ago, in March, that the devils ganged up to cooperate with diabolically cunning teamwork and wreak their vengeance on two pilots and their passengers as a big transport, Flight 15-A, came down through the clouds toward the Municipal Airport at Pittsburgh.

The pilots had been flying on instruments in the clouds, and had reported "moderate ice" a short time before. However, this was no matter of concern, as other planes had been landing with ice on their noses and wing tips where the de-icers didn't reach.

Flight 15-A got instructions to come in and land. Flight 6, which was coming in some distance behind the first plane, and under the clouds, caught up with Flight 15-A shortly after the latter came down out of the overcast. Flight 15-A was flying unusually slowly, with nose up. Then the pilots of Flight 6 saw one wing of Flight 15-A drop and recover sluggishly. This happened again. The third time the wing went on down and around, as the nose dropped and the big transport went into a spin.

This is what had happened: the leading edges of the slotted ailerons of that ship were protected when more or less in the neutral position. But the plane had encountered very turbulent air, so that the ailerons were used much more than usual. Each time the leading edge of the aileron came out into the air stream it collected a little ice. Finally the ice became so thick that the wind pressure on it made the ailerons so hard to move that the pilot was forced to slow down a little so that the pressure would be reduced to the point where he could turn the control wheel.

The mist swirled, and the cold froze it into ice. The wing and tail overshoes and the propeller de-icer worked perfectly. But the wind tossed the plane, and the ailerons kept collecting more ice, and the pilot was forced to go slower and slower, so he could move the wheel, until, at last, he was going so slowly that flying speed was lost and a final gust pushed him over into a spin.

But that will never happen again. Douglas Aircraft Co. engineers immediately pounced on the problem. Within a short time they were in the air with a new device, seeking the icing condi-

tions which can frequently be found along the crest of the high Sierras. They found ice, and they worked the ailerons, but no ice formed. Extensive tests proved that the metal flap they had used to close the gap over the aileron leading edge was adequate. Thus was stopped what may well prove to be the last chink in the armor against icing of airfoil and control surfaces.

The ice devil attacks other places as well. One of them is the propeller, and here the engineers use not armor but a charm. As the devils in the olden days could not stand garlic and rue, so the ice devil cannot stand a simple mixture of alcohol and glycerine. Oil will also do the trick.

During the early period of the battle against ice—that is from about 1932 to 1935—some success in combating propeller ice was obtained with large hub spinners, covered with sheet rubber painted with a special de-icing oil which would last about two and a half hours. But it was hard to get oil sticky enough not to be thrown off and not so sticky as to hold the ice. Something better was needed.

Engineers of the B. F. Goodrich Co., Transcontinental and Western Air, and the Bureau of Air Commerce got together. The result was the "slinger ring," which first proved its efficacy in the Goodrich refrigerated wind tunnel and then on TWA planes.

The slinger ring is a circular metal trough, twelve inches in diameter, shaped much like a tire. It is fastened to the back of the propeller at the hub. Discharge tubes run from the ring a short distance along the leading edge of each blade. When ice begins to form the pilot turns a valve and a mixture of alcohol and glycerine is fed into the rotating ring on the propeller. Centrifugal force slings it out through the tubes and onto the bare metal of the blades. This mixture will cause ice already formed to break off instantly, and will prevent further accumulation.

Until the past few months the particular icing problem which was perhaps the most serious and difficult of all remained without a satisfactory solution. This was the icing of carburetors. The significance of this hazard and the nature of the trouble was not fully understood until about three years ago, and it is now believed that a good many of the unexplained crashes of former days might have been caused by carburetor ice.

Ice on the outside of a plane can form only when the air is at freezing temperatures. But ice can form in carburetors and cut off the fuel supply when outside temperatures are as high as 60 degrees Fahrenheit. As you doubtless know, in a carburetor air is sucked by the engine through a Venturi tube, that is, a tube which is slightly smaller

in the middle than at the ends. At the small place in the tube strong suction exists, and it is here that the fuel discharge jets are located.

As the gasoline is sucked out of the jets some of it vaporizes immediately. This cools the inside of the carburetor, just as water evaporating cools your skin when you step out of a shower. Finally, the walls of the Venturi barrels, the butterfly valves and other metal parts, get below freezing temperatures. Then, if the airplane flies into a cloud or into any area where there is considerable moisture in the air, part of the water in the air sucked in will condense and freeze on the cold metal parts of the carburetor—just as ice forms on a cold windowpane.

Ice stops up the tube and stops the flow of air and fuel. Tests by the National Bureau of Standards have shown that enough ice can accumulate in two minutes to slow an engine down from 1,800 to 1,100 r.p.m. In actual practice an engine can be choked in a matter of seconds.

In the old days many pilots didn't know what had happened when the engine gradually died. Some sharper ones found out and discovered that sometimes the ice could be dislodged if they would cause the engine to backfire by pushing the mixture control to the extreme "lean" position. But obviously this was no solution to so dangerous a difficulty.

Search for a real solution has been going on for four years or more. In the meantime a makeshift was devised. Heat was applied to the carburetors by what became known as intensifier tubes. These are tubes which run from the open air, through the exhaust manifold, and then into the air intake of the carburetor. If the carburetor thermometer shows a dangerously low temperature a valve is opened which lets a larger proportion of the air in through the intensifier tubes, and less through the regular intake.

This device prevents ice, all right, and is still in wide use, though the chances are that as you read this sentence a good many mechanics are busy taking them off airliner engines for good. Intensifier tubes are costly to install; maintenance is difficult; they are heavy; and sometimes they cut down efficiency and even damage engines.

The search for a real solution of the carburetor icing problem was carried on by the air lines, by manufacturers, and by the Bureau of Air Commerce, working together. The Bendix Stromberg Carburetor Corp., which heretofore has made carburetors for almost every airplane engine manufactured in the United States, entered the race with a modification of its conventional model. If ice began forming in the carburetor it stopped a small hole in the side of the

Venturi barrel, and this automatically started a flow of alcohol into the Venturi ahead of the main discharge nozzles, thus dislodging the ice. Also, heated liquid was circulated around the center barrel where vaporization took place, and through the valves, and the carburetor design changed to prevent the fuel being heated too much before it reached the nozzles.

Then Dr. C. C. Callis, a chemical engineer, came forward with a chemical solution. Alcohol mixed with gasoline will prevent ice formation, but such a mixture is very unstable, since the alcohol causes it to absorb moisture. Dr. Callis provided a stabilizing ingredient which could be added to prevent the mixture losing its efficiency as a fuel. It was pointed out that many transports have a special tank of high octane-gasoline for use in take-offs, and that the de-icing fuel could easily be added to this and used only when necessary. The mixture, it was demonstrated in tests by the Bureau of Standards, could clear out a heavy deposit of ice in one minute.

Also, it was reported that Pratt & Whitney and the air corps had resumed experiments on direct injection of fuel into cylinders, but details were shrouded in military secrecy.

The real battle appeared to be between Stromberg's non-icing carburetor and a sensational and revolutionary entry by the Chandler-Groves Co. of Detroit. Mr. M. E. Chandler, Mr. W. B. Groves, and their engineer, Mr. M. J. Kittler, had brought forth something that even the venerable and firmly established Stromberg company needed to watch.

It was an entirely new and radically designed carburetor. The butterfly valve was no longer anything like a damper in a stovepipe. It formed one side of the Venturi tube. Vaporized fuel was snatched away so quickly that it had no time to draw heat out of the metal parts of the carburetor. It scarcely touched the metal of the new-type valves and barrels. In hundreds of hours of test operation, the new carburetor proved itself inherently ice-free.

The Wright Aeronautical Corp. began experimenting with it on their Cyclone engines. Navy engineers became interested, and then enthusiastic, for the new carburetor was not only ice free but offered a great military advantage. The old float-chamber arrangement had been eliminated, and, unlike carburetors in previous general use, the new carburetor would continue feeding fuel steadily to the engine through every kind of acrobatic maneuver, including inverted flying.

The non-icing and other advantages were undoubtedly great, but it remained to be seen whether the Chandler-Groves could stand up and deliver highly effi-

cient service as a carburetor, under all conditions.

TWA made extensive tests, and the verdict was in the affirmative. TWA announced recently that it would make a complete change to Chandler-Groves in the near future. Eastern Air Lines and others are following suit. The old intensifier-tube method of ice prevention is on the way out, and the industry is beating a path to the door of Messrs. Chandler and Groves. They have produced a much better mousetrap.

The victory over all forms of ice hazards is believed won for all time. But ice was not the only weapon the weather devils had in their arsenal. The new era of fast flying in the modern metal transports brought pilots a new difficulty. It blotted out the guiding hum from the radio range beacons. It was rain static.

Little was known until very recently about the nature of rain static. It was obvious, however, that it frequently occurred when the plane was passing through rain, snow, sleet, and other storm conditions, and made the long-wave radio-range receivers useless, often with the plane no more than ten miles from the radio station. It was also known that its presence depended on the speed of the planes, for it was rarely encountered in slower planes, could be diminished by flying more slowly, and practically never occurred on the ground.

By the summer of 1936 a body of theory on rain static had been built up. And Mr. J. G. Franklin, TWA radio engineer, had invented a device which did much to prevent it. According to the 1936 theory, each particle of rain, snow, or sleet striking the metal surface of the plane and the antenna carried an electric charge, either positive or negative, which was transferred to whatever part of the plane it hit, thus building up high potential charges in antennae and various other structures. Potentials of more than 25,000 volts were often built up, it was claimed, and St. Elmo's Fire was frequently observed on the wing tips and other projections. Miniature lightning flashes were even reported to have pierced rubber de-icers on wings and tail.

The static in the pilots' ear phones, it was thought, was produced by constant fluctuations of charges between positive and negative. Rain or other particles varied greatly in the nature of the charge, and their hitting the plane and ricocheting off caused the changes in "polarity" which caused the static.

Static leak arrangements, such as used on ordinary antennae were ineffective. But Mr. Franklin, and his assistants of TWA, devised what is now known as the "electrostatically shielded loop antenna." It looks like a large ring, and is mounted underneath the fuselage. It

is made of aluminum tubing, and the antenna wires are inside this shield. This loop was tried out last summer and adopted for general service by TWA in the fall. Pilots reported that they could often get radio range signals perfectly on the loop, when unable to hear anything but static on the regular antenna. (The TWA loop is also used as the antenna unit for a radio direction finder aboard the ship, but this is not the story of radio direction finding.)

United Air Lines was also busy trying to solve the rain-static problem. Last summer and fall they were experimenting with an eighteen-inch copper-shielded loop mounted on the nose of the plane. Then they took one of their Boeing transports out of service and made a flying laboratory out of it. Mr. Herbert M. Huckle, chief of United's communications laboratory, found it easy to enlist the assistance of a handful of scientists from various universities and manufacturing laboratories. Many experiments were carried out in numerous flights over the mountains of the Pacific Northwest. And a month ago, as this is written, they made some exceedingly interesting announcements, including a new theory of the cause of static, and a new and more certain cure.

Rain static, they said, is not caused by particles of rain or snow striking the antenna and other structures. It is caused by a continual discharge of static electricity from the trailing edges of the wings and other sharp edges of the plane in flight.

Various shielded loop antennae were tried, they reported. Under conditions of light static, reception over the loops was twenty times better than over ordinary antennae. In medium static the loops were seven times better. In really severe static, they were no better at all. Loops or no loops, reception was impossible.

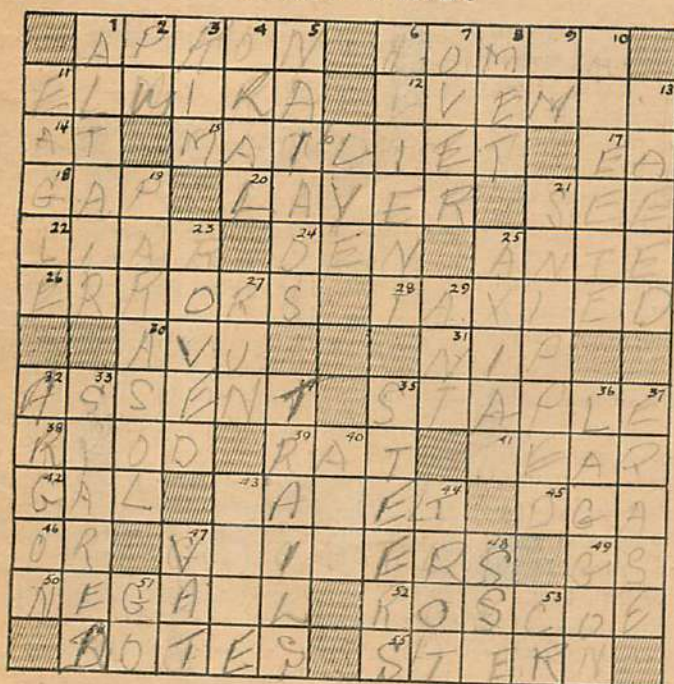
But the eight scientists dug out a solution. They found that the plane built up high charges of static electricity under various conditions, especially in storm clouds. And instead of letting it continue to discharge from wings and other sharp edges of the ship, they attached wires thirty or forty feet long to the trailing edges of the wings, thus affording the electricity a much sharper jumping-off place where it would go off gradually and more smoothly in smaller quantities. Suppressor resistors were connected into the wires so that the current could not flow back through the wire toward the plane. And the noises

in the receiving sets, even under the most severe static conditions, were eliminated. When the wires were reeled in, the static noises would block reception. When reeled out again, the noises would disappear. (It is expected that the trailing-edge wires will slow down a transport plane by not more than half a mile an hour.)

One minor problem is still being ironed out. It was found that a secondary static condition, not so serious as the other, was set up when ice formed on an exposed loop. Discharge of static from the ice-covered member to the loop itself, or to some other portion of the plane, occurred. So Mr. Huckle is busy experimenting with new shielded receivers, which may be entirely housed inside the round nose of the plane.

Research work goes on and on, but the scientists who have armed the airline pilots against the wiles of the weather devils might well stand on their laurels, a moment at least, in 1937. This fall and winter, for the first time, pilots will be completely armed against the dangers of ice formation and rain static. Passengers can feel a new confidence in the safety of America's already notably safe air lines.

CROSS WINDS



ACROSS

- 1—Hard-surfaced area in front of hangar
- 6—Make of Italian military planes
- 11—Soaring center of U. S.
- 12—In uninterrupted manner
- 14—Preposition of place

- 15—Make of French all-wood light plane
- 17—Enemy aircraft, as abbreviated in military usage
- 18—Vertical distance between wings in multi-plane aircraft
- 20—Stratum
- 21—Perceived visually

- 22—Untruthful person
- 24—Lair
- 25—Prefix meaning "before"
- 26—Mistakes
- 28—Moved an airplane on land or water by propeller power
- 30—Make of French light aero engine

- 31—Pinch
- 32—Agree
- 35—Double-pointed tack
- 38—Quarter of an acre
- 39—Rodent
- 41—Make of aircraft radio compass
- 42—Abbreviation of measure commonly applied to liquid fuel
- 43—Mark indicating an insertion in writing
- 45—Model designation of Ben Howard's commercial "Mr. Mulligan" plane
- 46—Alternative conjunction
- 47—British company making airplanes and war materials
- 49—Opening
- 50—Deny
- 52—First name of a well-known American flier
- 54—Cherishes foolishly
- 55—Tail portion of airship

DOWN

- 1—Type of Lockheed mail plane
- 2—Afternoon, abbreviated

Answers for November

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

- 3—Edge
- 4—Spoken
- 5—Water nymphs
- 6—Become lenient
- 7—Above
- 8—Encountered
- 9—Half of full-width measure of printing type
- 10—Salt of oily acid
- 11—Ten-dollar U.S. coin
- 13—Veered sideward from line of flight
- 16—Potassium carbonate solution
- 19—Type of monoplane in which wing is set above fuselage
- 21—Cut off with one clip of shears
- 23—Wandered
- 25—Concerning pivotal line
- 27—Hastened
- 29—Make of Russian planes that flew to U. S. via North Pole
- 32—Gas forming part of air
- 33—Attained altitude in gliding
- 34—Footprints
- 35—Directs
- 36—Lake
- 37—Rub out
- 40—Place of refuge
- 43—Quote
- 44—Jogging gait
- 47—Large tub
- 48—Compass point
- 51—Proceed
- 53—Chemical symbol of chromium

THE BRASS RING

(Continued from page 14)

"All right," Jed said. "They're your dice. Roll 'em."

"You got sense," De Rocco said, admiringly. "I want a parachute. When we get over the mountains here I'll put it on in the washroom and one of youse can open the big door for me and I'll do a Steve Brody over the side."

"That won't do you much good," Danny said. "We can telephone ahead and the cops will be there almost as soon as you make a landing."

"You ain't goin' to have no telephone," De Rocco snarled. "I know somethin' about these crates. Look!"

He reached down under the radio panel, after he had dropped the zipper bag on the deck, and began to rip out wires.

"Hey! Look out!" Jed shouted. "You'll rip out our ignition."

"They ain't got nothin' to do with your ignition and you know it, smart guy," De Rocco said. "Now we're alone. Are you goin' to play along with me or do I blow your heads off? I ain't much for arguing. See?"

"We'll play along," Danny said, and he threw the controls to Jed, got out of his seat and opened a locker. He pulled out a seat pack parachute and motioned to De Rocco to turn around. "I'll put it on you," he said.

"You ain't goin' to put nothin' on me," De Rocco said. "You gimme that pack an' I'll put it on myself in the wash room, like I said. And don't you guys get the idea I wouldn't just as soon shoot your face off as look at it. Mebbe I'd rather. See?"

"We see," Jed Macon said. "They're still your dice."

Young Danny Felton shook his head and gulped as De Rocco backed toward the door with Jed's automatic in his side coat pocket. For an instant he considered the advisability of making a flying dive at De Rocco's legs. The sight of De Rocco's right hand lying inside his coat and gripping the butt of a gun in a shoulder holster steadied him as much as Nancy's frightened eyes.

"You guys flip that curtain back now and act as though nothin' had happened," De Rocco ordered. "When I get this 'chute on, you come back and open the door for me." He pointed a finger at Danny.

"You go out and talk to the passengers," Jed Macon said to Nancy, after De Rocco had closed the door. "Don't let them know anything is wrong. Don't even tell them after he jumps, or they'll get jittery. After he bails out tell them he is one of our test pilots making a study of the air currents."

"That's almost as funny as getting a

gun stuck under your nose at five thousand feet," Danny said.

"There's nothin' funny about any of it!" Jed snapped. "What the hell are you doing?"

"I'm getting out a parachute," Danny said calmly. "I'm going after that baby and pin his ears back. He's wanted for murder."

"Listen, kid," Jed said. "He'll be wanted for two murders if you don't mind your own business. Your job is to help me take this ship to Chicago."

"Cleveland will give you another copilot, Jed," Danny said, as he slipped into the parachute harness.

For an instant their eyes clashed and held. Then Jed Macon shrugged his shoulders. There was something more than admiration written on his face as he shifted his gaze.

"A guy that plops a 'chute has got to know how," he said. "He'll shoot hell out of you, kid. You don't have a chance."

"I don't like that bird," Danny said. "I'll wait a few seconds and follow him. Kick the tail over when I jump."

"O. K.," Jed said softly. And added beneath his breath: "And I told 'em last night I didn't know if the kid had any guts. I ought to stop him but I won't."

Danny stood looking down the aisle of the big ship until he saw De Rocco come out of the wash room and motion to him. He wondered if De Rocco would notice the parachute harness strapped to him. And even more he wondered if Nancy would notice it. If she did she would probably realize what he was going to try to do and try to stop him.

But he didn't hesitate. He walked down the aisle nodding and smiling to the passengers, knowing that would keep their thoughts off his harness.

"All right, cluck," De Rocco snarled at him. "Work fast!"

Danny nodded, threw the safety catches on the door and eased it open. He watched De Rocco's twitching face as he stepped to the edge and gazed out into space. For an instant Danny thought he was going to turn back.

Then he threw a last twisted snarl in Danny's direction and dived head-first off into space. Danny saw the speeding tail of the ship miss him by a fraction of an inch. Then he disappeared from sight. He looked down the runway and saw that Jed Macon was half turned in his seat and watching him. He nodded his head and made a motion with his finger toward the white-faced Nancy. As she came toward him her eyes widened and she clapped her hands over her mouth to stifle a scream that leaped to her lips.

Danny tore his eyes away from her and flipped a hand at Jed Macon. The

next instant he hurled his body after De Rocco.

No one will ever know, not even Jed Macon, why, instead of kicking the tail off to starboard he kicked it around so that the edge of the port balanced elevator struck Danny a terrific blow on the side of the head.

For an instant Danny caught a glimpse of De Rocco's 'chute as it flowered out behind him. The next instant he was unconscious and hurtling toward the ground below at a sickening rate of speed.

Nancy Herrill's blood froze in her body as she saw Danny's body thrown high and clear and begin its sickening plunge downward. She wanted to scream as her knees nearly buckled beneath her. But she managed to close the metal door and turn a smiling face toward the passengers before she went down the runway to the pilot's compartment.

"The tail clipped Danny on the head," she said to Jed Macon.

Macon's face turned as white as her own as his breath hissed through his clenched teeth.

"Has—has he opened his 'chute?" Nancy asked him.

Jed shook his head.

"I tried to tell him. I——" he said, and stopped as he saw the pain in Nancy's eyes. "I'll spiral down——"

"What about the passengers?" Nancy asked.

"To hell with the passengers!" Jed said as he took the controls again.

Danny Felton had realized for one horrible instant that the tail of the ship was going to clip him, and in that instant he died a hundred deaths. The next moment he was plummeting downward unconscious, with a deep gash high on his cheek bone.

Down, down, down he plunged, constantly gaining momentum during the first thousand feet until he was falling at a speed of nearly one hundred twenty miles an hour.

He went by the slow-floating De Rocco like an express train passing a freight. It was only his speed that saved his life, as De Rocco pulled the gun out of his shoulder holster and fired three shots at him.

Jed Macon saw flame leap from De Rocco's hand three times, as he stood with his nose flattened against the glass of the pilot's compartment. That was when he leaped back to the controls and began to spiral the big ship downward. He was trying to think of some way to kill De Rocco without injuring his ship or the passengers. As Jed stuck the nose of the transport directly at De Rocco, he saw that De Rocco was slipping his 'chute off to the right to make a landing in a large flat field.

"All right, punk," Jed said, as he

worked the crank handle to lower his landing wheels. "One more shot from you and I'll tear your head off with the landing gear."

As Danny Felton's body plunged from the lessened resistance of the rarefied atmosphere closer and closer to the ground, the increased air pressure slowed up the speed of his fall and he began to regain consciousness. Just as a drowning man's hand will clutch at anything that is solid, Danny instinctively began to grope for the ring of his rip cord.

But in his half-conscious thoughts he was not groping for the ring that would actuate his parachute. He was trying with all that perseverance and determination his father had spoken about years before to get the brass ring on a merry-go-round.

He imagined that he was riding on a wooden horse that kept going up and down and around and around and each time he came around to the far side he clutched with all his strength at the metal arm that stuck out from an imaginary post to get the brass ring.

"If I don't get it this time," he mumbled to himself, "I've got to go home and pull some more weeds. I've got to get it. I've got to get it. I've got to get it!"

He could hear the far-away *rum-tum-tum* of the mechanical organ in the center of the carrousel. It was playing over and over, "Oh, the Merry-go-round Broke Down."

He tried to sing with it, to show that he didn't care whether he got the brass ring or not. But he knew in his jumbled thoughts that he did care. He wanted to get that brass ring more than he wanted anything else in life.

He was almost around on the far side and he leaned far out on his horse to get at the ring again.

"If I don't get it this time," he thought, "I'll go over and hit that man who puts the rings in that arm. He knows I'm trying to get it and he's holding out on me."

He was only eight hundred feet from the ground now and Jed Macon and Nancy Herrill and all the passengers aboard the big transport were watching his hurtling body with eyes that were sick with horror.

Jed had taken the transport down to circle De Rocco and had passed him so close that he had to bank the big ship steeply to keep from cutting him in two with a wing tip.

De Rocco's answer had been two shots from the gun in his right hand. One of them had punctured the metal skin of the ship and embedded itself in the face of the instrument panel. Jed had cursed until he ran out of words, but he knew he couldn't deliberately kill De Rocco when he was dangling almost helpless from the end of a parachute.

But he was determined that after he marked the spot where Danny crashed into the ground he would land his ship as close to De Rocco as he could and go get him, gun or no gun.

Danny's blood-smeared face worked convulsively as his imaginary carrousel organ gave off a short series of *rum-tum-tums* to indicate that it was going to stop. He saw the man who worked the metal arm that held the rings start to swing it back as Danny was almost around to it. He roared at the man at the top of his lungs as he lunged forward with his forefinger crooked.

It caught in the ring of his rip cord when he was only a few hundred feet from the ground. The pilot's chute floated out behind him and then his main chute opened.

Only one and three fifths seconds elapsed between the time he caught the ring until his chute opened. But it was one of the happiest moments in young Danny Felton's life.

"I got it! I got it! I got it!" he screamed to himself.

Then, as all of his weight was thrown against his leg straps, he screamed again. But this time it was with pain.

He looked up and saw the huge saucer of white silk above him, heard a noise like the sound of a peanut-machine whistle, as the air sang through the vent in the top. The earth swayed back and forth beneath him and the muscles in his stomach tightened and froze. He saw an enormous airplane circling around into the wind for a landing and he saw another form floating to earth above him. But none of them made any sense to him. He looked at the ring he still held in his hand like a six-month-old baby might look at its toes. He ran his hand across his face and stared at the blood on his palm as he took it away.

He tried to collect his thoughts as he landed on his back and was dragged along the ground by a twenty-mile wind. By getting a tight hold on the shrouds he managed to throw himself over on his stomach and collapse his chest buckle and then the leg straps as though he had never seen them before. Everything was confused in his mind. Nothing made any sense. He pulled himself free of the tangled harness and staggered to his feet, as De Rocco floated down for a landing a hundred feet away.

Danny stared at him for a moment and something whispered to him that he was chasing the man who had the zipper bag in one hand and a gun in the other. Only he didn't think of him as De Rocco, the gangster. He was the man who put the rings in the metal arm on the merry-go-round and he had been fixing it so that Danny never got the brass ring.

Anger worse than any Danny had ever known surged within him. He started toward De Rocco as he began to unfasten his harness.

De Rocco called to him when he was only thirty feet away.

"Don't come any closer, smart guy!" he snarled. He threw off the harness and started to run across the field.

Danny sucked air into his lungs and started after him, as Jed Macon brought the transport down for a landing. Danny's whole body ached unmercifully and his legs were so heavy he could hardly lift them. But he picked up a few feet on De Rocco. His breath was coming in hot gasps as De Rocco swung around and pointed the gun at him.

But he didn't stop. The single bullet that was left in De Rocco's gun fanned his cheek. He tried to put more drive into his legs as De Rocco threw the gun at his head and turned to run again.

Danny caught up to him in a dozen more strides. He left his feet in a perfectly timed flying tackle, when he was sure he couldn't miss. They crashed to the ground together. But De Rocco was the first one to recover. He began to beat Danny on the top of the head with the bag he held in his right hand.

But Danny held on while Jed Macon came tearing across the field with Nancy Herrill running a close second. Jed arrived just as De Rocco managed to pull out of Danny's grasp. He arrived with a right fist that was swinging from the ground when he closed in. It exploded on the side of De Rocco's chin like an explosive bullet. His feet left the ground as he collapsed beside Danny like a punctured balloon.

Tears were streaming down Nancy's face as she gathered Danny's head into her lap and tried to stop the flow of blood. Danny's eyes flickered open to stare at her. Then he grinned.

"Look, kid," he said. "I got it!" He tried to lift his right hand, but he was too weak. He compromised by opening his fingers. Nancy stared down at his empty, blood-smeared palm.

"You got what, Danny?" she asked.

"The brass ring!" Danny said. "That cluck has been trying to keep it away from me for years. But I fooled him this time."

"What did he say?" Jed Macon puffed.

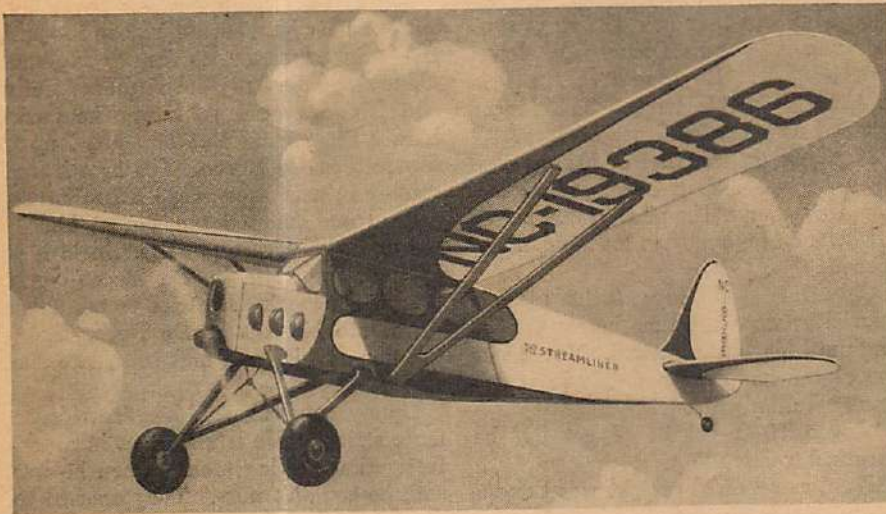
"He's delirious," Nancy said. "He thinks he got the brass ring on a merry-go-round."

"It isn't brass, fellah," Jed said. "It's gold. There is a twenty-five-hundred-dollar reward offered for that guy's capture. Besides that you get the new leg to Nashville with your own ship."

Danny grinned and tried to sing, "Oh, the merry-go-round broke down," as the passengers from the transport arrived to help them.

SCIENTIFIC SCOOPS THE FIELD

WITH THIS NEW, LOW COST GAS MODEL



THE STREAMLINER
WINGSPAN 6 ft. LENGTH 43 in.

WEIGHT (less motor) 2 1/4 lbs.

COMPLETE KIT INCLUDING ALL ITEMS LISTED BELOW

Kit includes printed balsa wood; selected strip balsa cut to correct lengths; liberal quantities of nuts, bolts, hook-up wire, tough landing gear wire, washers, electrical connections, miniature wood screws; gas model cement; bamboo paper and colored tissue; celluloid; rubber—everything required to complete the model.

READY MADE BALSA RIBS WITH NOTCHES FOR SPARS. Metal sides with die-cut vents stamped in place; formed and die-cut metal cowl front; shaped metal hatch with brass hinges; metal wing strut fittings; special hard wood for landing gear and parts needing added strength; do-not balsa tail wheel; all required insignia; numerals, and lettering; drilled propeller blank; large full size detailed plans giving every bit of information needed for building and flying The "Streamliner", with photographs, diagrams, and instructions for installing any type gasoline engine. An exceptional value in a gas model kit at this popular price.

Send today for your "Streamliner" or ask your dealer to show you this remarkable kit.

\$4.95
Less Motor and Wheels

POSTPAID OR AT YOUR DEALER

KIT INCLUDES READY-MADE BALSA RIBS WITH NOTCHES READY CUT FOR SPARS.

Designed by America's Gas Model Champion

MAXWELL BASSETT

AFTER many months of hard work, we have developed this new type scale gas model that is remarkably true to big-plane scale and still retains "Contest Model Performance". This model flies and does a real job of it! It has proven itself in numerous flights. The "Streamliner" is correct in aero-dynamic design and perfect in structure. Super-construction makes the "Streamliner" practically crashproof. Designed by America's Gas Model Champion and developed under his personal supervision.

WITH THE FOLLOWING SPECIAL FEATURES

HIGH WING STABILITY

High wing mounting and correct dihedral give this model unusual stability—as much as 60% more than the average model. Beautifully designed and decorated in red and white with black trim. High set dihedral wing with struts add grace and beauty. Nose of model completely cowed, with big-plane lines and appearance through use of air vents stamped in metal sides and ventilating ports at front.

CRASHPROOF LANDING GEAR

Landing gear is attached to fuselage with small bolts which allow it to pivot. Should landing gear become twisted in an exceptionally hard landing, it can easily be straightened out again as all parts are movable.

FLEXIBLE WING MOUNTING

Should wing tips hit any obstacle in landing, the entire wing has sufficient "give" through the use of shear-off pins on the struts to withstand all shocks.

STAMPED METAL NOSE COWLING

Includes sides, front, and hatch; air vents stamped in sides and brass hinges for hatch. Gives your model that big-plane appearance and beautiful lines.

ADDITIONAL FEATURES include Detachable Wing, Adjustable Rudder Control, and Easy Access to Motor through Cowl Hatch.

PICK YOUR XMAS PRESENT FROM THESE COMPLETE GAS MODEL KITS



REP ZEPHYR
America's Finest Popular Priced Gas Model! Easy and Inexpensive to Build and A Consistent Contest Winner!
Wing Span 6 ft. Length 56 in.

This model holds the Championship of France and on September 11, 1937 won 2 events at the Quaker City Gas Model Meet. The most complete, perfect flying and easy to build gas model ever offered at this amazing low price. Full shock-absorbing landing gear with brackets, vibration absorbing motor mount. Kit includes 3 1/2 in. Pneumatic Rubber Wheels, finished Hardwood Propeller, new type SCIENTIFIC Landing Gear Brackets. Also completely printed wood including ribs, bulkheads, wing tips, rudder section, etc. Bamboo covering paper, colored tissue for decoration, and all bolts, nuts, wire, electrical connections, landing gear wire, etc. Full assortment of supplies and 2 large full size plans showing every detail so you can complete this model quickly and successfully. Anyone can build this model because of its simple construction and detailed instructions. Ask your dealer or send your order direct. Satisfaction Guaranteed. Complete kit only.

\$6.95
Postpaid Less Motor



Miss AMERICA
Wing Span 7 ft. Length 54 in.

A reliable, consistent performer, won First Prize in the 40-second limited event at Hadley Field, May, 1937. Also First Prize Winner at Metropolitan Gas Model Meet, 1937. Kit is complete with every item required, including 3 1/2 in. Pneumatic Rubber Wheels and finished hardwood gas model propeller. If you want a reliable flyer for general sport or contest flying, ask your dealer to show you this MISS AMERICA Model. Complete Kit

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Postpaid Less Motor

An Exact Duplicate of MAXWELL BASSETT'S Detroit "NATIONALS" 1st Prize Winning Gas Model!
—The FAMOUS



MISS PHILADELPHIA
Wing Span 8 ft. Length 57 in.

This is a duplicate of Maxwell Bassett's famous Contest Winning Model. Kit contains everything required, including 3 1/2 Pneumatic Rubber Wheels, finished hardwood 14 in. propeller, ready-shaped leading and trailing edges with notches ready cut, also finished balsa ribs with notches for spars. Complete plans and detailed instructions explaining entire construction. This Model has won every major Gas Model Contest in recent years. Ask your dealer to show you MISS PHILADELPHIA or send your order direct. Complete Kit

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JIM CLARK'S "FLEA" MAKES 10,000 ft. FLIGHT FOR WORLD RECORD!

We always knew this remarkable model was an exceptional flyer, but are glad to publish the following letter from a satisfied model builder.



Akron, Ohio

Dear Sirs:
Your advertisement was all wrong about The Flea model flying 1/2 mile or 2,500 ft. because my Flea model flew for a distance of 2 miles or about 10,000 ft. I had launched the model after using a winder and it climbed like an elevator, nosing up steeply but without stalling for a single second.
I thought the model would never come down, but it did eventually and after much running, I managed to be on hand when it landed.
A perfect flight if there ever was one. My models from now on will always be Scientific Flyers. I am enclosing a photo of my Flea model on another flight it made. To date I have flown my Flea model over 50 times without any damage or repair except for new rubber.

A Scientific Customer.
(Signed) James Clark



GAS TYPE
Rubber Powered
AIRPLANE

COMPLETE KIT ONLY

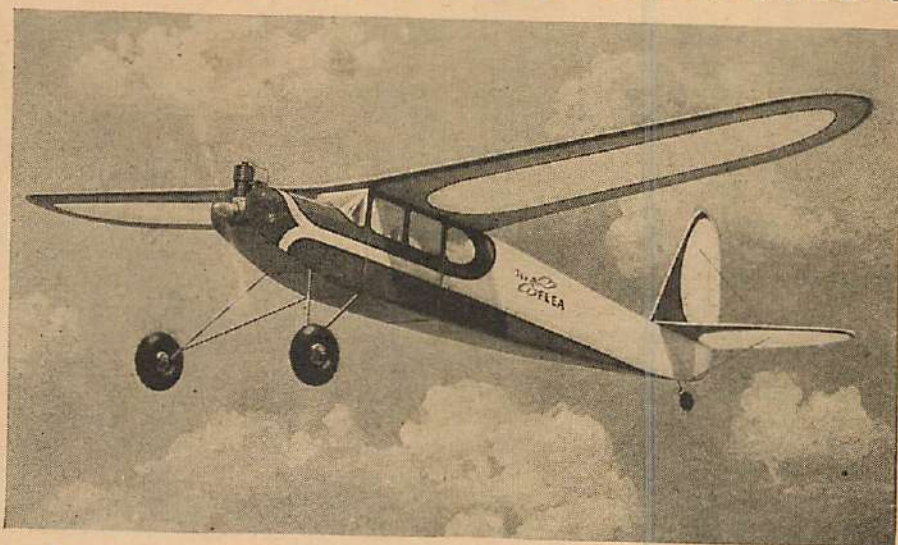
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With
M & M
PNEUMATIC

RUBBER WHEELS

POSTPAID OR
AT YOUR DEALER

Looks like a Gas Model!
Sounds like a Gas Model!
Flies like a Gas Model!



WINGSPAN 36 in.

WEIGHT 4 oz.

LENGTH 28 in.

MOVABLE CONTROL SURFACES ON RUDDER AND ELEVATOR

SHOCKPROOF GAS MODEL TYPE LANDING GEAR WITH PNEUMATIC M & M RUBBER WHEELS

NEW TYPE BALL BEARING PROPELLER WASHER BROWN CONTEST RUBBER ADJUSTABLE WING WITH NEW TYPE WING CLIPS

This is one of the most remarkable models ever produced. A brilliant performing flyer for you model builders who have always wanted a gas model but have been handicapped by the expense involved. Now you can make a gas type rubber powered model that will give you all the thrills of building and flying a real gas job—at a fraction of the cost. Read the contents of the kit and note its completeness. Also includes a novel feature never before attempted in a kit—this is the "Ratchet"—a device that creates a continuous and loud sound resembling the hum of a real gas model. When you see and hear this model in flight, you cannot tell it from a real gas model! The "Flea" has an adjustable wing, movable forward or backward to adjust the balance. It is held in place on the fuselage with new type clips built into the under side of wing to hold rubber strands which stretch around fuselage.

The "Flea" is just the model for those desiring to gain experience before tackling a real gas job. Send now for your Kit and build this fast climbing, high altitude flyer that will give you remarkable duration.

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Super NEW
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MIGHTY MIDGET is the motor sensation of the year. A speedy, lightweight engine that will give remarkable performance in any medium sized model. Assembled and block tested. Postpaid \$14.00

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GWIN AERO Engine equipped with hi-dome piston. Assembled and block tested. Postpaid \$18.25



NEW SYNCRO ACE
Deleco-Remy Coil
Oilite Bearings
Champion Spark Plug
Ray-day Alum. Piston
This is a low price streamlined motor with plenty of power. Runs at 500 to 10,000 R.P.M. Approved type timing superior to any motor because it is placed above grime and wire interference. Factory tested, complete ready to run including coil and condenser, mounted on metal skids. We urge you to order \$15.00 now. Postpaid

Use this coil for new pen and power in your \$2.50 engine. Each.

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Real TRU-PITCH Prop. (Value \$1.50). Your choice of 13-14-15 or 16 in. size, given absolutely FREE with every order for \$3.00 or more in Supplies. Take advantage of this BIG FREE offer NOW and get \$1.50 value for only \$3.00. (Order \$4.00 in Supplies. Instead of \$3.00 and we will prepay postage charges and include FREE Propeller).



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For years the standby of all model airplane engines. Equipped with all steel piston. Factory tested and ready to run. Postpaid \$21.50

THE NEW MODEL "C" BROWN JR. ENGINE
An entirely new engine just introduced. The new 1938 Model "C" with alum. piston and 2 special piston rings. Also newly developed needle valve giving perfect gas mixture control. Delivered unmounted ready for installation in your own plane mount—ing. Postpaid \$17.00

OHLSSON ENGINE
The many outstanding features of this powerful engine make it a favorite with many model flyers. Rated at 1/3 H.P. Complete ready to run—Postpaid \$18.50

TRU-PITCH GAS MODEL PROPS
Accurately carved with hole drilled. Made of clear hard wood in 13 and 14 in. sizes. Look for the name SCIENTIFIC TRU-PITCH stamped on every prop. Each

99c

SCIENTIFIC GAS MODEL FINISHES



The finish on a gas model does a great deal in making a successful model. Don't take chances with inferior low-priced finishes. Buy the best.

Clear Nitrate Dope
Colored Nitrate Dope
Nitrate Thinner
Gas Model Cement
Regular Cement
Bamboo Paper Cement
Banana Oil
3 oz. bottle.....\$2.25
1/2 pt. can......50
1 pt. can......75
1 qt. can.....1.40



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1/16"x214
1/16"x316
1/8"x218
1/8"x320
3/16"x222
3/16"x324
1/2"x226
1/2"x328
3/4"x230
3/4"x332

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GLIDING AND SOARING

(Continued from page 21)

Newark *Sunday Call*, over the Labor Day week-end and enormous crowds attended. Among the features were a spot-landing contest, bomb dropping, duration flights and a glider stunting exhibition by Don Lawrence, president of the association, in his Cadet. Emil Lehecka also stunted in a Continental-powered Taylorcraft. Participants included Henry Wightman with his duPont utility, Robert Eikenberry with the University of Michigan Franklin, the Aero Club Albatross with a Scheurer utility and a Franklin, Herbert Sargent with the small Schweitzer all-metal SGU-2, Warren Merboth and Carlton Schaub of the North Jersey Soaring Association with Warren's long wing Franklin, and the Y Flying Club with their Waco secondary.

Ben Levene, of the Philadelphia Soaring Society, has purchased Ted Bellak's utility and will enter it in next year's Elmira meet. Ben writes that he has designed an advanced-type primary which could be manufactured cheaply and whose performance is equal to a secondary's.

Elery Clark, head of the Clark Glider School of Hartford, Connecticut, has bought a Cadet to supplement his over-worked Mead Challenger.

Alfred Pepin, also of Hartford, is building an Albatross sailplane.

Art Schultz, of Detroit, is making available plans for his A.B.C. sailplane, which won first prize this year in the Mrs. Warren Eaton design contest, at a cost of \$35.

The Mid-West Annual Soaring Meet was held from September 4th to 12th at the Sleeping Bear Sand Dunes, at Empire, Michigan, with R. E. Franklin, designer and builder of the Franklin utility, in charge of the events. In every respect this meet was a grand success. One of the notable achievements was contributed by Eliot Noyes of Boston, who made his five-hour requirement for the Silver "C" license on his third soaring flight after only three days of intensive gliding training prior to his departure for Michigan, and after never having had the controls of an aircraft in his hands before.

Following is a list of statistics for the leading half dozen pilots, these figures being based on the points-award system, counting only points won for the pilot's best flight:

Name	Total time	Pts. for best performance
1. Elmer Zook	22 hrs. 35 min.	40 pts.
2. Dick Randolph	13 hrs. 42 min.	40 pts.
3. Udo Fisher	25 hrs. 35 min.	38 pts.
4. Randall Chapman	10 hrs. 21 min.	38 pts.
5. W. R. Skinner	14 hrs. 13 min.	36 pts.
6. Don Alexander	9 hrs. 49 min.	32 pts.

Francis W. Marsters sends word from East Sandwich, Massachusetts, that he put in two and a half hours of total

soaring in his primary over the sand dunes of Cape Cod.

The Skid Busters Club of Lethbridge, Alberta, Canada, report that they have finished building their Hütter H-17 glider, based on Austrian-bought plans. The club has been in existence since 1929, but was not really active until 1931, when they constructed a secondary designed by one of their members, A. Larsen. With this ship flights attaining 1,000 feet of altitude have been made.

The Skid Busters use a rather unusual launching method. The ship is pulled into the air by means of 3,000 feet of Manila rope which runs through a pulley on the towing car, one end being fastened to a stake in the ground and the other, of course, to the glider. In this way a speed of only 15 m.p.h. is required from the car to give the ship a speed of 30 m.p.h.

The Skid Busters, incidentally, boast the only girl glider pilot in Canada: Miss E. Fletcher.

A new organization to promote gliding and soaring in America has been formed. Called the Elmira Soaring Corporation, it will seek to obtain the international meet for Elmira and plans to start a gliding school. Richard C. duPont is president, with William L. McGrath and Mrs. Warren Eaton the vice presidents, and Oscar Monrad the secretary-treasurer. Directors include Dr. Karl Lange, Lewin B. Barringer, and Youston Sekella.

In this connection Dr. Karl Lange sailed for Europe several months ago to confer with glider officials over there on the subject of bringing the international contest to the U. S. A.

G. E. Dale, of Whangarei, New Zealand, reports that the gliding club of which he is a member is looking forward to the proposed establishment of an airport in his town, since this will provide new facilities and further general interest in local gliding. The Whangarei club was formed eighteen months ago, and quickly got off to a nice start by raising £25 (approximately \$100) through benefits and dances. That sum, incidentally, is enough to buy a new primary training ship in Mr. Dale's part of the world. Any one wishing to learn about gliding there is invited to correspond with him at 11 Portland Road, Whangarei, New Zealand.

The Metropolitan Soaring Association of New York is holding a series of meets over holiday week-ends for the balance of the year. The pilot accumulating the greatest number of points at the Columbus Day meet will be declared the Metropolitan champion. Efforts are being made to secure a trophy for that championship, as well as a fund for the

point-award system. Emil Lehecka, Chet Decker, Lewin Barringer and other leading soaring pilots will compete with their sailplanes.

From Lewin Barringer comes this statement as to the need for contributions to the Soaring Society of America:

"The Soaring Society of America was organized eight years ago by a group of men unselfishly interested in the promotion of gliding and soaring in the United States, and is an entirely nonprofit organization. It has had a great responsibility to shoulder and has had a difficult time to carry on its ever-increasing activities without government aid of any kind, such as that given to similar movements in practically all of the European countries. The work of the Soaring Society of America has been made possible through private donations of interested people.

"In order to facilitate the raising of money to carry on this very worthwhile work, the Society has recently been able to get a ruling from the Treasury Department in Washington which reads as follows:

Contributions made to you by individual donors are deductible by such individuals when arriving at their taxable net income in the manner and to the extent in the Section 23 (o) of the Revenue Act of 1936 and the corresponding sections



Henry Wightman's duPont utility at the Labor Day meet in New Jersey.

of prior revenue acts. The deductibility of contributions of corporations is governed by Section 23 (q) of the Revenue Act of 1936.

"This ruling should be a real inducement to publicly minded and philanthropic individuals to contribute to the cause which offers the only possible way for the vast majority of youth in this country to get into the air.

"The Soaring Society will greatly appreciate any effort made to help raise funds to carry on its work so that America may soon pull out of its position of being far behind a number of other nations in the development of motorless flight.

"LEWIN B. BARRINGER,
General Manager.

"The Soaring Society of America, Inc."

AIR ADVENTURERS

(Continued from page 29)

(trolley) car body which contains an office, waiting room and weighing-in room for the passengers!

Many thanks for all the news, Holder, but keep in touch with us. We want plenty of members like you.

Ivan Kington of Hamilton, Ontario, sends us a grand picture of a British Hawker Osprey which landed in Hamilton Harbor recently and took part in a general sports day. Ivan claims it flew in from a British aircraft carrier. The Osprey, you know, is a navy version of the Hawker Hart fitted with sea-plane floats and is listed as a two-seater Fleet fighter.

Fred C. Wilson, of Miami, has rushed in his membership coupon and states that he holds a 95-hour ground course certificate and has flown as an observer at the Marine Reserve Base at Miami. There's the sort of member we want. Fred said he had Air Adventurers brought to his attention by a friend and he leaped at the chance to join up with such a live-wire organization. Let's know more about those days with the Marine Reserve, Fred. There must be tons of interesting news there.

"Allow me to take this opportunity of saying that your publication is a credit to aviation and most instructive to the many readers all over the world," says Randolph J. Daintolo of Washington, D. C. Randolph included his membership coupon with his praise and we have another swell member who is interested in model building. We want to see you go far in Air Adventurers, Randolph.

Rolf Gray, who got a mention in this department some time ago, has moved from Tyler to Hot Springs, Arkansas, and sends us in two grand prints of a Douglas O-43-A observation ship. Gray used a 616 Brownie, a panchromatic film and got a splendid negative out of it. He claims he has designed something unusual in a model plane and hopes to have a blue print on it within a short time.

Kay Goff, a real live-wire member, is hot and bothered about Sandy having to put up with nothing better than the Eaglet all this time. We knew that kid would grab all the following one of these days. Bill Barnes will have to do something about it, too, or we'll have a young revolution on our hands. Any-

way, Goff has designed a new plane just for Sandy and it's a pippin! It apparently has a long water-cooled Macchi-type engine with two props, turning in opposite directions, a single racing-type pontoon and wheels that retract up into the float. "I'll bet there's a lot of kids who would like to draw plans for a new plane for Sandy," Kay said. Well, there you are, Mr. Editor, maybe you can make something out of that.

Sterner Horace Wilkinson, of Detroit, has joined up with Air Adventurers and thinks Air Trails is the best air magazine in the world. He particularly likes the lesson pictures, illustrations and Clyde Pangborn's question and answer column.

Jerry Baer, of Madison, Wisconsin, comes into Air Adventurers after being a reader since 1935. "I used to see the club news," Jerry writes, "but I figured that it was 'just another club' until I began to get the idea of the craftsman's awards. Then I realized that you had something, so here's my dime and the coupon." Jerry went heavy for the story, "The Devil's Plaything." He particularly likes Frank Tinsley's art work (and who doesn't?) and promises to buy that yearbook if we ever put it out. By the way, we want to hear more about that yearbook from you members. What about it; do we go through with it or not?

We have captured a real French-Canadian this month. Marcel Marcier of Montreal is a member of the Royal Canadian Air Force and is training to be an instrument technician. Marcel is a real worker. He has sent for the full list of members in Montreal and plans to round the whole lot up into one big squadron. He's a scrapbook hound, too. So far he has collected only 1,278 pages of aviation pictures which are bound into eight volumes. We certainly are glad to have you, Marcel.

Peter Felbarth, of Detroit, is out for a berth in aviation and wants to get out to the Aero Industries Technical Institute in Los Angeles, but can't see how he can get out there. We appreciate Peter's position, but there are hundreds more like him and that's why we are glad he can join Air Adventurers. Keep with us and remember the Creed, Peter. Things do not drop in your lap

like that. Aviation is a profession, not just a job. You have to work for skilled training. We want to help you and advise you in these matters. Stay with us, keep on trying, and the first thing you know, something will break—it always does. Look at Rudy Kling, who won the Thompson Trophy race recently at Cleveland. A short time ago he was just an ordinary grease-ball. Now he's the country's leading racing pilot.

Edmund Eagle—and what a swell name for an Air Adventurer—writes to us from Tyler, Texas, and tells us about his trip to the Boy Scout Jamboree in Washington. He also includes an interesting story about the Tyler Airport, which is one of the bases of the Delta Airlines. The bureau of air commerce



Goodyear blimp "Enterprise," snapped by Warren Holland of Union, N. J.

recently allotted fifteen thousand dollars for the construction of a new radio-range station for use in connection with the Tyler Airport.

Douglas C. Atkins, who was at Camp Passumpsic, in Vermont, when he wrote us, has passed his Photographer's Grade with a swell picture of one of the new Boeing "Flying Fortress" ships taken at Bolling Field, Washington, D. C. Atkins got the shot under adverse conditions, using a one-twenty-fifth-second exposure during a slight rainfall. He used Verichrome film in a Kodak folding Cartridge-Premo, 3-A.

Mark Blanck, of Oakland, California, has not missed an issue of Air Trails since October 1935.

W. Dolan, of Athens, Pennsylvania, is all for the Yearly Pictorial and believes it will be a big help to those who collect aviation information and keep scrapbooks. He says what he thinks, too, about members who are too lazy to write in and keep the editor posted as to their likes and dislikes. Don't forget, when you are members of the Air Adventurers you have some obligations to fulfill.

WATCH FOR NEW PLANS OF THE CHAMPIONSHIP MODELS!

TEXACO — DU PONT — BLOOMINGDALE — STOUT, (INDOOR AND OUT) — MULVIHILL AND MANY OTHERS

THE CANARD

(Continued from page 60)

the Class "C" Tractor described in the January 1937 issue of Air Trails. You can save yourself considerable time if you still have the drawing of the wing. If not, you will have to take time out to make a new drawing.

The wing is built up in three sections. The spars are made of light balsa $\frac{5}{32} \times \frac{1}{16}$ tapered to $\frac{1}{16}$ square at the tips. Round all the corners; sand them smooth with #10-0 sandpaper; pin them to the drawing and wet them with water. Cut out the ribs from $\frac{1}{32}$ "C" stock balsa. ("C" stock balsa has a speckled appearance. It is very stiff but light.) After the water put on the spars has evaporated, cement in the ribs. As you work out toward the tip it will be necessary to shorten the ribs. Do this by cutting off one third the excess length from the front end and two thirds the excess from the rear. This will tend to keep a more uniform wing section. Make a cardboard template of the tip and bend two strips of $\frac{1}{32}$ square balsa, soaked in water, around it. After they have dried, cement them to the tip sections. Cover the three sections separately with microfilm and then cement the sections together with $1\frac{1}{2}$ " of dihedral under each tip. Make wire clips to fit the fuselage and cement them to balsa stilts each two inches long. The pusher wing should have no angle of incidence, so after the stilts have been cemented to the wing make sure that

they have dried pin them to a drawing of the tail shape, cut ribs from $\frac{1}{32}$ "C" stock and cement them in place in the same manner as the wing ribs were installed. Put a drop of cement at the joint of both bent strips. Use no more cement than is absolutely necessary to hold them together.

Make a template of the fin shape and bend a strip of $\frac{1}{32}$ square balsa around it in the same manner as the tail. Cement the rib in place and cover both tail and fin. After the tail is covered put in the proper amount of dihedral by cracking the cement joint at the center, raising the tips and recementing it. After the cement has dried, heat-treat the film at the dihedral in order to remove any wrinkles in the film. Heat-treating is merely passing a hot wire under the film at a distance of about $\frac{1}{2}$ ". Wrinkles can be seen to dissolve with the application of heat.

MOTOR STICK AND BOOM

The motor stick and boom for a pusher are made in exactly the same way as that of tractor. However, the pusher boom is somewhat shorter than the tractor boom. Make a motor stick former of hard balsa $\frac{5}{32} \times \frac{3}{8}$ at the center, tapered to $\frac{3}{32} \times \frac{1}{4}$ at the ends and 15" long. Round the corners and smooth the former. The blank is made of $\frac{1}{32}$ sheet $1\frac{1}{8}$ " at the center, tapered to $\frac{3}{4}$ " at the ends and 15" long. (The wood should be light but as stiff as possible.) Soak the blank in hot water, bend it around the former, and bind it with $\frac{1}{2}$ " wide bandage. Allow the water to dry

PROPELLER

The propeller of the pusher is left-handed, as explained previously, for the convenience of winding. It is carved from a block of 4-lb. balsa $1\frac{3}{4} \times 1\frac{1}{2} \times 16$ ", or from a semicarved 16" propeller of pitch-diameter ratio 1.6. Finishing a semicarved propeller will save you about two hours, as well as give you a more perfect pitch propeller. In both cases carve the concave sides first and completely finish them before proceeding to the convex sides. Smooth the blades with #10-0 sandpaper. Make a template of the blade shape and cut the blades to fit. Make a shaft of .016 wire and insert it into the propeller in what would ordinarily be backward for a tractor. Coat the hub with cement.

ADJUSTING AND FLYING

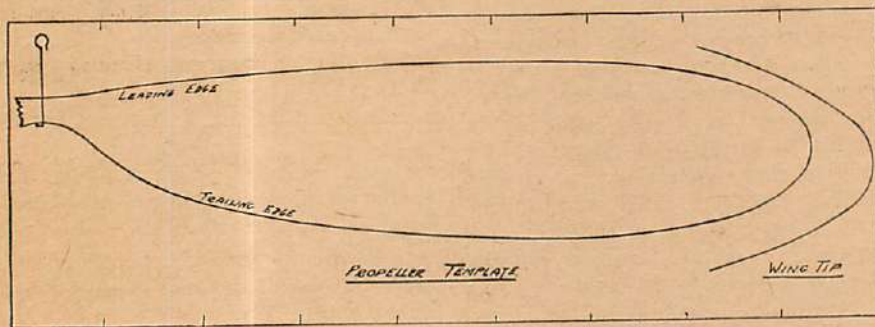
Cement the fin onto the boom in the position indicated in the drawing and then cement the tail in place. Put the wing on the motor stick, remembering that the wing goes on in reverse from the ordinary way; that is, with the trailing edge toward the propeller. Insert the propeller shaft into the thrust bearing and put a loop of $\frac{7}{64} \times 1\frac{1}{30} \times 17$ " brown rubber in place. Glide the model. If it stalls, move the wing forward; if it dives, move it backward. Note that you do the opposite to a pusher to correct dives and stalls, but the same treatment is used for both pushers and tractors in cases of washing in or out.

After a good glide has been obtained, wind the motor about 500 turns.

The method of launching pushers is somewhat different from tractors. It is done as follows: Hold the model with one hand only. Grasp the propeller hub and thrust bearing with your thumb and index finger. The middle finger supports the motor stick. Raise the model to eye level and holding it at a slightly positive angle, thrust the model forward at approximately flying speed, and release it. The model should fly in circles about 40 feet in diameter. If the model tends to dive or stall, correct it as explained previously. More full winding may tend to dive the plane. Correct this by moving the wing forward. The model under full winds and good conditions should break 20 minutes. To date, the highest time known to be done with pushers is 16 minutes. Let's see what you can do about it.

WEIGHTS

Wing	.028 oz.
Propeller	.018 "
Tail and Fin	.0035 "
Boom	.003 "
Motor Stick	.018 "
TOTAL	.0705 oz.



For full size template complete cross lines and double the space sizes.

the distance from the lower edge of the wire clips to the front and rear spars are the same. This completely finishes the wing.

TAIL AND FIN

The tail of a pusher is built in the same way as that of a tractor, except that the two halves of the tail are cemented together only lightly before covering, in order that the dihedral angle might be put in later. Make a template of one half the tail from cardboard, bend two $\frac{1}{32}$ square soft strips which have been soaked in water around the template and allow them to dry. After

out, remove the bandage, and then sand it with #10-0 sandpaper. Then you may cement the seam, caps thrust bearing, and rear hook in place, after you have taken the formed blank off the former.

Make the boom former of hard balsa, $\frac{3}{32} \times \frac{1}{16}$ tapered to $\frac{1}{16} \times \frac{3}{32}$ and 9" long. Round the edges and smooth the stick. Make a blank of $\frac{1}{64}$ light sheet balsa $\frac{5}{8}$ tapered to $\frac{3}{8} \times 9$ " long. Proceed with it as was done with the motor stick—soak, bind, sand, and cement the seam. After it is finished cement it to the motor stick with the front end raised $\frac{3}{16}$ ".

MODEL MATTERS

(Continued from page 46)

Junior Aviators

Records are in danger when the Junior Aviators of America hold a national model contest. And this year's contest—Akron, August 30th to September 2nd—resulted in 4 new records. Substantial cash awards, trophies, and air-line trips were the prizes posted by the Scripps-Howard Newspapers for the fourth annual meet. Several hundred model enthusiasts assembled at the spacious Akron Airport for the 4-day session. They came from all parts of the United States and Canada. The contest was under the direction of the hard-working veteran—H. M. Jellison, of Akron. Major Al Williams, national commander of the Junior Aviators, unfortunately was unable to attend because of a knee injury suffered the previous week. (No, it wasn't in an airplane accident but in a Pullman car!) Junior Aviators showed their appreciation of their commander's work in behalf of model aviation by giving him a silver plaque. It was presented at the National Air Races in Cleveland. We had the thrill of watching the presentation of the plaque. It was a mighty fine gesture on the part of the Junior Aviators.

One outstanding feature of the J. A. A. contest is the selection of an "All America Junior Aviator." Clement Turansky, representing the Pittsburgh press, was given this honor. Clem is eligible for this award. He's a modeler from start to finish. He handles gas models expertly. Yet he's no slouch with indoor models. We think he's good. Congratulations and best of luck to him. This honor carried with it the American Airlines trophy, along with \$25 and an air-line tour of Boston and New York.

Three new records were turned in by Clevelanders. Jerry Kolk won the United Airlines trophy contest with a new record of 41:15 for stick models. Harry Walker took the Firestone open-class stick contest with 36:38.4. George Reich won the Peerless Model Airplane trophy with a fuselage-model flight of 13:02.5.

Wesley Peters of Akron won the Junior Outdoor fuselage contest and the Vincent Bendix Trophy, with a new mark of 16:42.

The J. A. A. contest is the only national model meet that includes a speed event. This feature is probably the most thrilling of all events. Richard Korda, of Cleveland, was the speed king. His red streamline racer was clocked at 70.85 m.p.h. for the 88-foot course. The electric timing device clocked the model at .9 seconds.

The day following the close of the meet the contestants traveled to Cleveland, where they were guests of honor of the Famous Fliers Club. Trophies were presented to the winners by C. R. Smith, president of American Airlines. After the luncheon the modelers went to Cleveland Airport for the opening performance of the National Air Races.

Junior Aviators are to be congratulated on the splendid work they've been doing for modeling. They foster all types of models with a well-rounded program of events. And too, they followed the N. A. A. rules and regulations governing model flying. This is an intelligent move, as it helps standardize modeling in this country. Short-sighted model organizations that persist in setting up their own contest rules merely confuse the contestant and accomplish nothing. With leaders such as Al Williams, Ed Clarke, and H. M. Jellison, the Junior Aviators are continuing their model program, which has proved constructive and helpful to the model hobby.

Following are the contest results (due to the size of the meet only the first 3 places in each event could be printed):

Junior Outdoor Fuselage Event

- | | |
|--------------------------------------|---------|
| 1. Wesley Peters, Akron, Ohio | 16:42.4 |
| 2. Robert Lambacher, Barberton, Ohio | 5:27 |
| 3. Jack Swartz, Akron, Ohio | 5:17 |

Senior Fuselage Event

- | | |
|----------------------------------|-------|
| 1. George Reich, Cleveland, Ohio | 13:25 |
| 2. John Kuharski, Akron, Ohio | 6:30 |
| 3. Toful Petratus, Akron, Ohio | 4:15 |

Open Fuselage Event

- | | |
|--------------------------------------|--------|
| 1. John Wulschlager, Cleveland, Ohio | 2:54 |
| 2. Richard Korda, Cleveland, Ohio | 2:18.4 |
| 3. Herbert Fish, Akron, Ohio | 2:04 |

Outdoor Speed Event

- | | |
|-----------------------------------|--------------|
| 1. Richard Korda, Cleveland, Ohio | 70.83 m.p.h. |
| 2. Mike Karlak, Cleveland, Ohio | 66.66 m.p.h. |
| 3. Donald Buchele, Toledo, Ohio | 66.66 m.p.h. |

Junior Outdoor Stick

- | | |
|-----------------------------------|--------|
| 1. Henry Falkowski | 3:41 |
| 2. Charles Baker, Ontario, Canada | 3:25 |
| 3. Wesley Peters, Akron, Ohio | 3:20.1 |

Senior Outdoor Stick

- | | |
|---------------------------------|---------|
| 1. Jerry Kolk, Cleveland, Ohio | 41:15 |
| 2. Albert Broz, Cleveland, Ohio | 31:55.2 |
| 3. Mike Karlak, Cleveland, Ohio | 24:10 |

Senior Gas Event

- | | |
|---------------------------------|---------|
| 1. Don Orman, Akron, Ohio | 16:31.4 |
| 2. Donald Buchele, Toledo, Ohio | 11:47.6 |
| 3. Carroll Krupp, Akron, Ohio | 11:31 |

Open Gas Event

- | | |
|--|---------|
| 1. William Bernstein, Youngstown, Ohio | 22:30.4 |
| 2. Richard Staab, Akron, Ohio | 21:23 |
| 3. Bernarr Anderson, Akron, Ohio | 20:11 |

Original Design Contest

- | | |
|--|--|
| 1. Albert Broz, Cleveland, Ohio | |
| 2. Hilary Kosicki, Cleveland, Ohio | |
| 3. William Gusky, Pittsburgh, Pennsylvania | |

Exhibition Scale Event

- | | |
|-----------------------------------|---------------|
| 1. Max Sokol, Hamtramck, Michigan | Stinson |
| 2. Harry Walker, Cleveland, Ohio | Boeing F4B4 |
| 3. Peter Zaleski, Cleveland, Ohio | Macon Fighter |

Baby Stick Event

- | | |
|--------------------------------------|---------|
| 1. Dick Rouse, Cuyahoga Falls, Ohio | 10:30.4 |
| 2. Richard Falkowski, New York, N.Y. | 5:31 |
| 3. Samuel Seuro, Pittsburgh, Pa. | 2:30 |

Open Stick Event

- | | |
|----------------------------------|---------|
| 1. Harry Walker, Cleveland, Ohio | 36:38.4 |
| 2. George Gell, Cleveland, Ohio | 5:44.5 |
| 3. S. H. Macrum, Pittsburgh, Pa. | 4:32.5 |

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7 1/2" Boeing F4B-4	\$2.05	7 1/2" Albatross	\$1.60
6 3/4" Boeing P-26A	2.05	7 1/2" Fokker D.7	1.80
7 1/2" Grumman	2.05	6 3/4" Spad	1.80
8 1/2" Beechcraft	2.25	6 3/4" S. E. 5	1.80
16" Monocoupe	7.50	11" Camel	7.50

JOE MACKEY

(Continued from page 26)

All this time the motor cowl was beating Joe over the head and bashing his skull. And the old man with the scythe was grinning.

Somehow—and Joe says he doesn't know how or why—he regained his senses just enough to kill his speed and waltz the Waco in for a landing. When the dust had cleared away, Joe was slumped down in the cockpit, out cold.

Then—three years before that—in 1932, with the flying business going to pieces in a hand basket, Joe was laid off at Curtiss-Wright. So he went back to his home town and formed the Lancaster Flying Club and taught its members to fly. Joe bought a Cirrus Great Lakes and one day took it up and started kicking her around.

He was doing a long tail spin of about ten turns. But when he decided to pull the plunging ship out of it—no go. She just kept a-goin'. Joe tried everything—gunning the motor, changing the stabilizer. When nothing happened, Joe said, "Uh-huh. This is it." He wore no parachute.

At the last minute, he suddenly remembered that the ship was very tail heavy. So with the crate spinning down like a crazy top, Joe climbed from the rear cockpit into the front. He fought the controls. And again the Mackey luck—or magic touch—was in. The ship straightened out.

One day he flew up to Cleveland to meet a buyer. By the time his business was over it was late in the afternoon. Joe knew he couldn't make his home port before sundown, but he took off anyway in a ship that had no landing lights.

About halfway down from Cleveland, it got dark. That didn't worry Joe particularly. The worry came later, for five miles out of Lancaster his engine quit cold.

As Joe himself said, "I just turned it over to God. I didn't have a thing to do with that landing."

But land the ship did—without a scratch. A little later Joe worked up quite a sweat when he found out that he'd come in over tall trees, a house and a barn without seeing them—and better still, without touching them.

Your Air Trails reporter met Joe Mackey during the 1935 All-American Air Maneuvers at Miami. We talked to him, squatted down in the shade of his trim maroon Waco Taperwing. And we watched him put that Waco through its paces up there in the Florida sky.

For three afternoons he thrilled the big crowd with sensational aerobatics and skywriting. Joe was right! Just how right we believe you'll realize when we tell you that at the same show were

two other ace stuntmen—Captain Alexander Papan of the Rumanian Royal Air Corps and Captain Lem Povey of the Cuban air force. Every afternoon those three dare-devils tried to outdo each other.

But, when it was all over, the Freddie Lund Trophy for precision aerobatics was awarded to Joe Mackey.

Lieutenant Joseph Creighton Mackey doesn't do much talking. We had to get hold of his announcer, Bill Sweet, to give us the full story.

It's a success story. Joe was twelve when the grease monkeys at Norton Field, Columbus, used to let him do a little work around airplane engines. The kid was a born mechanic. Every once in a while the army pilots took Joe for short hops.

Joe had been bitten by the flying bug ever since he'd seen Lincoln "Daredevil" Beechy fly once at the Ohio State Fair. Mackey's history is just one long string of steady steps up the aviation ladder. Between 1927 and 1930, he made exhibition parachute jumps—35 in all. But one Sunday when he hurt his legs badly, his mother called a stop. Since then he's used his expert 'chute knowledge to train Earl Stein, the ace delayed-parachute jumper, who is a member of his Linco Flying Aces.

In 1928 Joe took three hours of instruction from Cliff March and soloed. And in 1930 he got a job as co-pilot on a run from Cleveland to Detroit. Then he went with Curtiss-Wright.

It was at this time that Joe received the honor, or however you want to take it, of being grounded by the president of the United States. It was this way. The boys from the Curtiss-Wright base at Columbus were engaged in shooting pictures of the Warren G. Harding Memorial at Marion, Ohio. They were flying within the department of commerce regulations, but it seems they attracted too much attention and President Hoover said to trim their wings.

When Joe left Curtiss-Wright he went on carrying passengers and giving instruction. In 1933 he was commissioned a lieutenant in Uncle Sam's reserve air corps at Port Columbus—the 308th Observation Squadron.

All this time Joe was playing around with the idea of sometime having his own organization, of putting on air shows and doing aerial advertising. The going was tough, but he kept at it. He perfected an inverted fuel system and began teaching himself aerobatics. He experimented with skywriting and spent more than \$4,000.

To-day, Joe's dream has come true. He has his own airport; six modern airplanes; a remodeled Laird supersolution racing plane with a top speed of 290, used for high-speed aerobatics; a Waco Taperwing, top speed 205, which he uses for his sensational low-inverted

aerobatics and skywriting; a Travel Air Speedwing flown by Gordon Mougey, Jr., the mid-West stunt flying champ; a Laird powered by a Wright 575 h.p. motor, used for speed dashes and skywriting; another Waco; a Curtiss Fledgling, equipped with a neon advertising sign.

And, listen to this one. Joe and Gordon Mougey were putting on a two-ship writing event over Mansfield, Ohio, one fine day. The message to be written was LINCO GAS OIL. Joe had just started to write when a smoke oil line from the booster pump to the exhaust manifold broke, spraying the specially tested oil over the white hot exhaust. A sheet of flame whipped up.

Mougey, who was working some distance away on the same sky sign, saw the fire. He zoomed his ship and started to write across the city's roof, OH, JOE!

Meanwhile, Joe was preparing to bail out when, once again, the Mackey luck turned. He switched off the oil and the fire miraculously went out.

The same thing happened to him while he was skywriting over Paris, France, in 1936. It was the last day of the great International Air Games and the officials asked Mackey to do something typically American. So Joe blasted his ship up to 20,000 feet and wrote: "O. K. PARIS." The French went wild with joy.

But just as Joe finished writing, his ship caught on fire. His hair and helmet were badly burned and he was all set to hit the silk when once again the flames died out.

Joe told us that the only thought he had at the time was he hated to leave \$15,000 worth of sweet flying equipment alone up there in the sky with no one to look after it.

Being elected to represent the United States at the International Air Games is about tops in honors for any flier. Joe and Milo Burchman of Hollywood, California, were the two Americans selected. With over 300,000 people witnessing the three-day meet, the two Yanks stole the show.

Joe and Burchman had to be good. They were up against such brilliant airmen as Michel Detroyat, the winner of the '36 Thompson and Greve National air races events; Louis Massotte; Marcel Doret; Adrienne Bolland; Maryse Hilsz, and the rest.

When Joe sailed for home aboard the S. S. *Washington*, a flight of France's foremost aces gave him an aerial escort for five miles out to sea. Then, one by one, the tiny French ships peeled out of formation and dived down to sweep across the liner's deck in salute to Joe. The pilot of the last plane threw three roses on the deck. A note was attached which read:

You are a grand pilot. Hurry back.

AIR PROGRESS

(Continued from page 7)

Air France has ordered several new Farmans fitted with four 800 h.p. Gnome Rhone radials. Some of the new Junkers Jumo 210 engines originally designed as Diesels have been rebuilt for direct gasoline-injection systems. These and the 900 h.p. Daimler-Benz inverted Vee engines have been tried out on certain German military craft.

The new Armstrong-Whitworth *Ensign* airliner, designed for trans-Atlantic work, is said to cost \$270,000. The first one is now nearing completion at the company's Hamble factory. A Danish transport firm has purchased the American Barkley-Grow monoplane, which resembles the Lockheed Electra, except that it has a fixed undercarriage.

The Everal Propeller Co., of Lancaster, Pa., has received an approved certificate from the Bureau of Air Commerce on their single-blade propeller, and will begin high production at once. The firm claims to have hundreds of orders for their propeller, which they, in turn, claim offers better take-off, climb, more miles per gallon and freedom from any form of vibration.

A land-plane version of the large German four-engined Hamburger sea-plane designed for trans-Atlantic service is to be built using B.M.W.-132 engines.

AIR FORCES

During the first five weeks of the "undeclared war" between China and Japan, 61 Japanese planes were shot down, according to claims made by the Chinese. This included 29 heavy bombers, 5 high-speed pursuit planes, and 3 seaplanes. Eighty-one bodies of Japanese aviators were recovered and buried; 56 could not be found, and 11 Japanese pilots were captured alive and sent to Nanking. Further details indicate that these planes were shot down by 43 Chinese pilots and that First Lieutenant Lo Yi-chin and Lieutenant Tsui-kang each had 5 planes to their credit.

A new and secret Seversky two-seater, with a range of 4,000 miles, has been built for export purposes. It is understood that China and Russia will place orders for a large number of these ships. Boeing has received an order for 13 more YB-17 bombers, which will use 4 of the latest Wright Cyclone engines rated at 1,100 h.p. There has been no news as yet concerning the result of the test flights with the larger version which uses the 1,500 h.p. engines.

The Dutch Air Force will soon place an order for a large number of Fokker T.VI heavy bombers, which use the British Pegasus engine. Sixty-five new-

type Hawker Hartebeests, now being manufactured by the South African Union Defense Force, have all successfully passed their flying tests at Pretoria.

The British Air Ministry has now decided to use camouflage on its fighters. Machines which normally operate by day will be painted blue on their lower surfaces and green-gray on the upper. Night fighters will adopt the dazzle-shadow effect recently ordered on all night bombers.

It has been reliably reported that the German Air Force will soon add 500 Messerschmitt-109 single-seater fighters to their service. Along with this note came the news that a captive barrage balloon, one of those now being used as a form of anti-aircraft defense around London, broke away recently and traveled nearly fifty miles, until its cables became entangled in a tree near Bury St. Edmunds.

One of the most amazing accidents was recently reported from Shoreham, England, when a Royal Air Force plane, carrying 2 officers, collided with an 11,000-volt high-tension cable and landed without injury.

The Chinese Air Force is made up of the following types of planes: Italian: Breda-25, Breda-27, Caproni-III, Fiat-C.R.32, Fiat BR-3, and the Savoia-Marchetti S-72; American: Consolidated Fleet Type-5, Curtiss Hawk, Douglas O-38, Douglas O.2Mc.4, Vultee attack, Northrop bomber, and Vought Corsair; French: Breguet 27/3.

The Japanese Air Services use the Nakajima-91, Kawasaki-92, Mitsubishi-92, Mitsubishi-91 bomber, Kawasaki-93 bomber. The Naval forces use the Aichi AB-4 flying boat, Kawanisi K.F.L.92, the Kawanisi-94, and the Ishikawajima R-5.

MISCELLANEOUS

At this writing, European radio operators claim that they continue to pick up fragmentary radio messages coming through on the wave length allotted to Levanovsky, the Russian flier, who is still lost with his companions in the arctic.

A Soviet parachutist, K. F. Kaitanoff, claims to have jumped from a height of 32,000 feet, which, if confirmed, would constitute a world's record.

Rudy Kling, a former grease monkey and now the owner of an automobile garage, won the Thompson Trophy Race at Cleveland, on Labor Day, with a speed of 256.91 miles per hour. Roscoe Turner, who was in the lead early in the race, was blinded by the sun and a greasy windshield and almost missed a pylon. Believing he had cut inside it, Turner turned back and went around again and lost much valuable ground.

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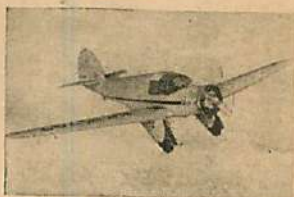
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ZEPHYR

(Continued from page 23)

outstripped the rest of the world in motorless flight. Realizing that the modern military pilot requires a far more thorough and comprehensive training than was necessary during the World War, the skeletonized army of the then German Republic jumped in with both feet and gave powerful backing to the soaring movement. They discovered that gliders were inexpensive to build, cheap to maintain and provided an unusually safe vehicle for training purposes. To-day Germany is drawing dividends from that investment. Graduates of those "sporting" glider schools of the early 1920s form the backbone of the present efficient air force of the Third Reich.

Quick to profit by German example, England, France, Italy, Japan and Russia have adopted the motorless training system. They encourage youths to build model airplanes, bringing them into contact with glider operations by holding model contests in conjunction with soaring meets. When they are old enough to start actual flying, plans and training are provided to enable the boys to build and fly their own machines. Having passed the primary gliding tests, the boys enter local gliding clubs where they obtain advanced training from more experienced members. Following this method, Russia alone is said to be turning out more than 10,000 glider pilots a year—young men who know more about practical meteorology than many of our best-trained military pilots.

Ever on the alert to advance American aviation in all its ramifications, Air Trails has taken its position shoulder to shoulder with the Soaring Society of America in the fight to encourage more and better glider pilots in this country. The United States has a greater wealth of potential pilots than any country on earth. We have more varied and suitable terrain, more and better thermal currents. This is no cheap flag waving—it is a plain statement of fact. With proper organization and backing there is no question that between us all, we can place America in the forefront of soaring. The knowledge of materials and structures gained in glider development is bound to have an increasingly greater influence on powered-airplane design.

Noteworthy among the encouraging signs observed at the last annual soaring contest at Elmira was the appearance of several new American sailplane designs of unusual merit. Up to the present time there has been a tendency among our better soaring pilots to import their ships from Germany. This is perfectly understandable. The best possible equipment is needed to do a good

pilot justice in hard-fought competition. And we must admit that in the unbiased opinion of many of our Silver "C" pilots, the German-built Rhonsperbers, Condors and Minimoas have been miles ahead of most of our native products. In an attempt to speed up the development of soaring in the United States, Air Trails Magazine has presented a handsome trophy to be awarded annually to the pilot making the most notable flight in gaining his "C" certificate.

The winner of the 1937 Air Trails Trophy is Harland C. Ross, designer of the beautiful new Ross-Stephens sail-



The Ross-Stephens sailplane.

plane. This ship, an extraordinarily graceful mid-wing, high-performance craft, was the outstanding sensation of the meet. Taking off early in the competition, Ross soared a distance of fifty miles, not only winning the trophy, but also the coveted international Silver "C" rating as well.

Not content with this demonstration, the California designer took off again on July 8th, the eleventh day of the meet. Towed aloft by airplane from Harris Hill, Ross cut loose at 1,900 feet. His



Harvey Stephens at the controls.

watch read 11:50 a. m. After encountering several thermal currents in the vicinity of Elmira, the ship climbed to an altitude of 3,500 feet above the point of release. A glance at the map showed the airways radio beam to be parallel to the wind direction, so Ross headed in the direction of New York—185 miles distant. On the way he saw several other contestants wheeling in and out of cumulus clouds, but soon lost sight of them. As evening approached Ross found himself over Hawley, New York. The clouds had dissolved and all up-

currents ceased. His altimeter read 3,600 feet and straight ahead of him lay a belt of solid forest. He realized that in order to win he would have to take the chance of flying over this very dangerous terrain. Setting his ship at her best gliding angle, he coasted down the long hill of atmosphere, covering 16 miles before arriving low over a small clearing. Fortunately, the ground was free of stumps and Ross brought his brown and white craft in for a smooth, slow landing after being in the air for five hours and forty minutes. He found that he had come down just five miles from Milford, Pennsylvania, a distance of 121 miles from the starting point. This was the longest flight made by any "C" pilot during the course of the meet.

The performance of the Ross-Stephens sailplane impressed every one who saw the ship in action. It was generally agreed that she was easily the equal, if not the superior of any foreign ship built. Emil Lehecka, holder of the Silver "C" rating, outstanding glider pilot and instructor of the Airhoppers Club of Long Island City, showed especial interest in this new American sailplane. He is said to be considering the acquisition of a Ross-Stephens to replace the brand-new Rhonsperber that he imported especially for this meet.

The Ross-Stephens follows the latest practice in high-performance sailplane design. It is constructed of plywood and fabric throughout. The gull-type wings have a very high-aspect ratio and are fitted with spoilers to permit landing in small areas. A single cantilever spar supports the wing structure. The leading edge is covered with a stressed skin of plywood back as far as the spar. The remainder of the wings, as well as the ailerons, are covered with doped fabric. A transparent hatch covers the cockpit and forms a particularly well-streamlined nose for the fuselage. The ship is equipped with the usual single landing wheel set at a point beneath the pilot's seat. The RS-1 has a span of 46 feet, is 20.5 feet long and has a wing area of 125 square feet. The aspect ratio of the cantilever wing is 1:17. The plane has an empty weight of 280 pounds, and weighs 470 pounds fully loaded. Its sinking speed is 2.5 feet per second and its gliding angle is 1:23.

The deserved triumph of the California plane proves that American talent exists and is ready to produce as fine soaring craft as any in the world. With Ross, Stephens, Bowlus, Franklyn, Buxton and others like them, building our motorless aircraft and pilots of the caliber of DuPont, O'Meara, Barringer, Lehecka and the rest of the Silver "Cs" flying them, America seems about due to take her proper place in the cloud-land of soaring. Let you and I take a firm hold on the shock cord and help get her launched.

MODEL DESIGN

(Continued from page 51)

Because of the fact that standard wings have air-tight covering, there is no interchange of air from lower to upper through the wing proper; so we obtain the full benefit of the wing section. The moment we do interchange air—that is puncture the wing full of holes—the efficiency drops very low as the pressure differentials are equalized. We have this exchange of pressure at the tip. It is natural for the compressed air to try to roll around the tip into the rarefied upper portion. There is very little we can do about it except try to make this loss as small as possible. We could sort of fence the areas by tip fins, but they bring in so many other problems that it was found best to forget them and concentrate in shaping the tips so as to cause minimum loss.

It can readily be seen that if the wing was spanned way out into the Milky Way with a very gradual taper, we would have an almost perfect wing. However, under the circumstances, the best we can do is to taper the wing to a fairly small section at the tip, so that the pressure differentials will be small and consequently have a lower tip loss. Designers don't mind very much the lift they lose by having square tips, as they only need to add a few extra square feet to compensate. What they do resent and object to very strongly is the immense disturbance square tips produce. The square tip allows the lower compressed air to whirl around the tip in a big mass into the upper portion. This mass movement naturally messes up the air in the surrounding area, with the result that the ailerons are in shifting air flow, while the power used to pull the airfoil is wasted in churning the air.

There is no reason why square tips should be used on models. Besides having poor aerodynamical efficiency, the structure is also weakened. A rounded tip gives a good base for covering and strengthens the structure. Start to round the tip about two tip chord lengths from the tip. It is hoped that you notice the mention of air-tight covering used on power ships. Be sure to follow suit on models when doping. If the framework is too weak to take regular dope, try to plasticize it with castor oil.

Coming back to the airfoil forces, last month's diagrams showed how the lift was concentrated at the leading edge at high angles and at the trailing edge at low angles. If we were to find the center of all these forces, the place of this point would be as shown on Drawing 4 for different angles. Notice how it moves. The center of these lift forces is known as center of pressure (C.P.).

The airfoils that have considerable C.P. movement are known as unstable sections.

The so-called unstable sections are usually those that have flat or undercambered bottom portion; the greater the undercamber, the greater is the C.P. travel. This can be easily explained by the fact that the downward droop of the trailing edge still produces lift, while the front portion is way below the zero angle.

The stable sections are those whose trailing edges have an upward swing, such as the M-6. Such airfoils are noted for zero lift at zero, or slightly negative angle of attack, as they present a streamlined form to the air flow. The modern airliners use such airfoils because of low drag. However, it is to be remembered that when they land, the flaps down produce a highly undercambered airfoil with resultant tremendous lift.

For model work, the so-called unstable airfoils are best because of their high lift characteristics. This unstable situation is easily remedied by using large stabilizers, which keep the wing within a fixed angle border.

Before the action of the stabilizer is detailed, we must bring in another force which the stabilizer takes care of to a certain extent. To obtain lift, the wing is forced through the air. Consequently, we get an opposition to this forward motion. This is technically known as drag. This drag is overcome by forward pull or thrust of the prop. Although the drag is thus equalized, it still has to be controlled or it will upset the ship. If the prop thrust was right through its center we would have no reason for worry, but since such alignment is rare we must make adjustments to counteract it. A force diagram showing this new addition is shown in Figure 5. Note how the rotation direction changes when wing positions are rearranged.

Combining the drag and lift forces we now have a force diagram as shown in Figure 6. The degree of these forces naturally changes with angles of attack. The diagonal shows the direction of the motion. Although the airfoil does not move into this direction, we can assume the forces take this road and that the direction of the wing would move if it were suddenly cut loose from the ship. This direction is very important to keep in mind, as the whole longitudinal stability treatise depends on knowing just where it is in respect to the center of gravity—C.G. from now on.

With the direction of the force line settled we can see what happens when the angle of attack changes the C.P. (such as in changing incidence). In a normal flight, with no load on the stabilizer, the line projects right through the C.G. as shown. Note how

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1/16x1/16 100, 5c	Superdine, wh. 5c	2" pr. 12c	1 1/2" pr. 12c
1/16x3/32 35 for 5c	WHEELS per pr.	3" pr. 15c	2" pr. 15c
1/16x1/16 15 for 5c	Brah Balsa Celu	4" pr. 18c	3" pr. 18c
1/16x1/2 5 for 5c	1/2 01 . 03	5" pr. 20c	4" pr. 20c
3/32x3/32 30, 5c	1/4 02 . 04 . 05	6" pr. 22c	5" pr. 22c
1/4x1/4 30 for 5c	1/8 04 . 08 . 10	7" pr. 24c	6" pr. 24c
1/4x3/16 12 for 5c	1/16 07 . 10 . 18	8" pr. 26c	7" pr. 26c
1/4x1/2 10 for 5c	3/16 15 . 30	9" pr. 28c	8" pr. 28c
3/16x3/16 8, 5c	1/2 Balsa Planks	10" pr. 30c	9" pr. 30c
1/2x1/2 6 for 5c	1x1 1 for 4c	11" pr. 32c	10" pr. 32c
3/4x1/2 3 for 5c	1x2 1 for 5c	12" pr. 34c	11" pr. 34c
1x1/2 2 for 5c	2x2 1 for 15c	13" pr. 36c	12" pr. 36c
18" Balsa Sheets	2x3 1 for 25c	14" pr. 38c	13" pr. 38c
1/32x2 5 for 5c	2x4 1 for 35c	15" pr. 40c	14" pr. 40c
1/16x2 5 for 5c	PROPELLER BLOCKS	16" pr. 42c	15" pr. 42c
3/32x2 4 for 5c	1x2 1/2 x 3 8-5c	17" pr. 44c	16" pr. 44c
1/2x2 4 for 5c	1x2 1/2 x 4 8-5c	18" pr. 46c	17" pr. 46c
3/16x2 4 for 5c	1x2 1/2 x 5 8-5c	19" pr. 48c	18" pr. 48c
1/2x2 2 for 5c	1x2 1/2 x 6 8-5c	20" pr. 50c	19" pr. 50c
1x2 1 for 5c	1x2 1/2 x 7 8-5c	21" pr. 52c	20" pr. 52c
3" sheets or 36"	1x2 1/2 x 8 8-5c	22" pr. 54c	21" pr. 54c
lengths, double	1x2 1/2 x 9 8-5c	23" pr. 56c	22" pr. 56c
above prices; add	1x2 1/2 x 10 8-5c	24" pr. 58c	23" pr. 58c
10¢ packing	1x2 1/2 x 11 8-5c	25" pr. 60c	24" pr. 60c
charge for 35"	1x2 1/2 x 12 8-5c	26" pr. 62c	25" pr. 62c
lengths.	1x2 1/2 x 13 8-5c	27" pr. 64c	26" pr. 64c
NOSE BLOCKS	1x2 1/2 x 14 8-5c	28" pr. 66c	27" pr. 66c
1x2x1 1c	1x2 1/2 x 15 8-5c	29" pr. 68c	28" pr. 68c
2x2x1 2c	1x2 1/2 x 16 8-5c	30" pr. 70c	29" pr. 70c
3x2x1 3c	1x2 1/2 x 17 8-5c	31" pr. 72c	30" pr. 72c
4x2x1 4c	1x2 1/2 x 18 8-5c	32" pr. 74c	31" pr. 74c
5x2x1 5c	1x2 1/2 x 19 8-5c	33" pr. 76c	32" pr. 76c
6x2x1 6c	1x2 1/2 x 20 8-5c	34" pr. 78c	33" pr. 78c
7x2x1 7c	1x2 1/2 x 21 8-5c	35" pr. 80c	34" pr. 80c
8x2x1 8c	1x2 1/2 x 22 8-5c	36" pr. 82c	35" pr. 82c
9x2x1 9c	1x2 1/2 x 23 8-5c	37" pr. 84c	36" pr. 84c
10x2x1 10c	1x2 1/2 x 24 8-5c	38" pr. 86c	37" pr. 86c
Alum. Tubing	1x2 1/2 x 25 8-5c	39" pr. 88c	38" pr. 88c
1/16", 3/16"	1x2 1/2 x 26 8-5c	40" pr. 90c	39" pr. 90c
1/8" 10¢ ft.	1x2 1/2 x 27 8-5c	41" pr. 92c	40" pr. 92c
Rubber Motors	1x2 1/2 x 28 8-5c	42" pr. 94c	41" pr. 94c
1/16 sq. 20 ft. 5c	1x2 1/2 x 29 8-5c	43" pr. 96c	42" pr. 96c
3/4 flat 20 ft. 5c	1x2 1/2 x 30 8-5c	44" pr. 98c	43" pr. 98c
Sheet Aluminum	1x2 1/2 x 31 8-5c	45" pr. 1.00	44" pr. 1.00
.003 sq. ft. 10¢	1x2 1/2 x 32 8-5c	46" pr. 1.02	45" pr. 1.02
TISSUE, AA	1x2 1/2 x 33 8-5c	47" pr. 1.04	46" pr. 1.04
1/16", 1/16"	1x2 1/2 x 34 8-5c	48" pr. 1.06	47" pr. 1.06
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this line passes through the C.G., even though C.P. is actually behind the C.G. if the perpendicular line were taken as a criterion. Sketched are several wing positions in relation to the C.G. while the model is trimmed for flight. Now the moment we change the angle this diagonal line is affected. Again referring to sketches you will note what happens with different combinations. Since most models are of the high-wing type (anything that has the wing above the C.G.), the description will only deal with this type.

The moment the C.P. line shifts to the front of the C.G. the lift force has a leverage, which tends to rotate the nose up. This upward swing would continue if no counteracting force is applied, since the C.P. would keep on shifting forward with every increase of angle of attack, until the stall is reached. When the stall is reached, the lift is zero and the C.P. line disappears. However, on a well-designed model or plane the wing is not allowed to approach the stalling point. What happens is that the moment the angle is increased, the heretofore inactive stabilizer, because it is set at zero angle of attack, will suddenly get a positive air flow. However, no matter how small the lift may be, the fact that the stabilizer is way back in the tail provides it with a large leverage.

Now, in case of a sudden dive, the C.P. gets behind the C.G. and tends to increase the dive, but here again the stabilizer comes into play. In this case the air flow is negative on the tail,

which tends to pull the rear portion of the model down. The diagram shows the two forces.

From the above we can now estimate just how the tail-surface area is computed. The chord of the wing determines the C.P. travel. The wing area determines the power of the lifting force; and the distance of the wing above the C.G. determines the leverage moment arm of the C.P. A formula for determining stabilizer area is as follows:

$$\frac{\text{Average Wing Chord X Wing Area}}{\text{Tail Moment Arm (C.G. To Tail C.P.)}} = \text{Stabilizer area}$$

The stabilizer area should be increased about 10 per cent if a high wing is used. Otherwise this is a safe formula to use as long as the C.G. is fairly close to C.P. The moment we separate these two, we must change the stabilizer area. The area may be decreased if the C.P. is behind the C.G. and increased if the C.P. is in front of C.G.

It is next to impossible to give an exact formula for stabilizer area. The current practice of using 35 per cent to 40 per cent of the wing area for the tail is on the safe side and it should make almost every model stable.

The main thing to remember from the above is that the C.P. is not in a perpendicular line, as we usually assumed. This should destroy our fallacy of placing the C.G. one third behind the leading edge and say that it now is under the C.P. Your past lessons of seeing your ships stall under such settings should convince you of the importance of knowing about this diagonal line.

This line can be computed by taking the L/D as shown by charts. However, since L/D for a model is small you can assume a diagonal of ten lift and one drag.

So far we assumed a stabilizer which only brings the wing back to its normal position after it is disturbed. We have another type of stabilizer which also contributes a portion of lift. The diagram of this combination is shown. Note how the weight of the model is divided between the wing and tail. Although at the first glance one would think that 40 per cent stabilizer set way back would lift about 80 per cent of the load. However, the tail is set at zero angle and it depends only on the upper camber lift to provide the needed balancing lift. Therefore, the moment the model is upset the positive air flow on the stabilizer will provide the corrective force. If we try to place too much load on a lifting stabilizer we will find that when the model dives it is very difficult to straighten it, as this stabilizer has lift at a negative angle.

So, with the C.P. of the wing moved back and lift on the tail, you can easily imagine why full-size airplanes do not use this combination.

The thrust line has something to do with it while the model is under power, but in the glide as well as in flight the circumstances are as presented. Just remember that the purpose of the stabilizer is to keep the wing within certain limits, and that its long distance from the C.G. makes it possible to control erratic changes in wing positions.

GULFHAWK

(Continued from page 52)

rods are broom straws, ignition ring $\frac{1}{16}$ " aluminum tube and the wires thread. After all detail has been added, cement the motor into the cowl. A removable nose plug shaped like the crankcase is then added.

LANDING GEAR

A serviceable landing gear, closely resembling scale, can be made from aluminum tube pinned together, or a less pretentious one of music wire will do. The one on the original model is automatically released, but is too complicated for the average builder to tackle without cussing.

WINGS

Build the wing frames on the drawings laid on a flat surface. Before removing the top frame, crack the frames at the second $\frac{1}{16}$ " ribs, raise the tips $\frac{1}{2}$ " with blocks and cement the cracked

members. Carve a pair of fillet blocks with which to attach the lower wings to the fuselage.

TAIL SURFACES

Assemble the tail surfaces with plain unshaped stock as designated on each member. Then sand to the required streamline shape.

PROPELLERS

Both scale- and flying-propeller designs are included on the drawing. Cement three blocks together, with the center lines 120 degrees apart. Then blank and carve in the usual manner.

FINISHING

Cover the wing and tail frames with orange tissue and attach them to the fuselage. Attach the top wing first by using a $\frac{1}{8}$ " sheet block shaped like the space between the fuselage and the center section. Pin the block to the fuselage and then the wing to the block. In this manner the center struts can be accurately fitted so the wing will have zero incidence. With the top wing in

place, it is an easy job to fit the N struts and the bamboo rigging wires. Spray the tissue lightly with water and when dry, apply thin model dope.

FLYING THE MODEL

Power the model with 3 loops of $\frac{1}{8}$ " flat lubricated rubber. Make the first flight tests in tall grass until a fully wound flight has been made. Stretching and winding the motor will give improved endurance.

LIST OF MATERIALS

Blocks	Miscellaneous
2 $1\frac{1}{2} \times 3 \times 18$ "	1 oz. cement
3 $\frac{3}{4} \times 1 \times 3$ "	2 oz. clear dope
1 $\frac{1}{2} \times 2 \times 18$ "	1 oz. orange lacquer
1 $\frac{1}{4} \times 2 \times 6$ "	2 dm. blue lacquer
1 $\frac{1}{8} \times 2 \times 9$ "	4 dm. white lacquer
1 $\frac{1}{4} \times 2 \times 2$ "	1 sheet orange tissue
	3x4" sheet celluloid
	12x $\frac{1}{16}$ " alum. tube
	6x $\frac{1}{8}$ " alum. tube
1 $\frac{1}{16} \times 3 \times 10$ "	1 $\frac{1}{16} \times 1 \times 10$ " bamboo
2 $\frac{1}{16} \times 1 \times 18$ "	12" #12 music wire
1 $\frac{3}{32} \times 3 \times 18$ "	60" $\frac{1}{8}$ " flat rubber
2 $\frac{1}{8} \times 1 \times 18$ "	

FLYING CLUBS

(Continued from page 17)

the fact that it was announced only ten days before the event was to take place. Some Flivver pilots also rebelled against the \$5 entry fee and the necessity of securing a sporting license, both requirements for any contest sanctioned by the National Aeronautical Association as the American representative body of the Federation Aeronautique Internationale.

Thus, there were but 17 planes entered, including two girl pilots—both of whom incidentally finished "in the money"—Miss Abbie Dill of Lakewood, Ohio, and Miss Ione Coppedge of Dayton, Ohio. Miss Dill, who finished sixth, received a special trophy from the Women's Flying Club of Maryland. Johnny Jones of Los Angeles flew the longest distance to enter, but there was true national representation in pilots from Alabama, Michigan, Indiana, and Kentucky, in addition to those states already mentioned. In types of Flivvers, Aeroneas and Taylor "Cubs" were equally divided—four each—while Taylor-Youngs were represented by nine. Most were true amateurs, holding only amateur and private pilots' licenses. One entry had as his credentials only a Department of Commerce letter of authority to fly, pending formal issuance of a license.

Ralph J. Hall, Texaco representative in Chicago, who refereed the race as the National Air Race representative, pronounced the event perfect. Not a single protest of any sort was heard. Considering the event as a new experiment, it would appear that C. G. Taylor has evolved a new ideal of sportsmanship which will characterize most flying derbies of the future. Flivver pilots have shown the way!

HOME-BUILT AIRPLANES

Can I build an airplane at home? How much will it cost? Can I fly it without restriction when finished? How should I go about flying it?

Summed up in these questions is the paramount problem of many an air-minded enthusiast. Considered collectively, they reveal his determination to fly. For, to him, conditions of the past have offered little encouragement. That he could not buy an airplane was obvious. The immediate future promising no solution, his zeal to fly—to do something constructive—forced him to clutch at straws. The one possibility, and that a vague one, was to build his own plane. The cost and attendant difficulties of such a project were seldom realized. It is surprising to note that, even in this day of booming light plane production, thousands are confronted with the same old problem. If the light plane has made flying possible for many,

it has also been a lodestone for countless others.

Contrary to the impression held by many, the construction of a home-made airplane is a complex affair. Many factors must be considered before the decision can be made to start actual construction. To attempt planning and building without being aware of important laws, regulations and requirements, will certainly result in disappointment.

For instance, many states have outlawed the flying of unlicensed, home-built craft. To be licensed, the plane must meet with a number of rigid requirements of the Department of Air Commerce. Certain technical data, including stress analysis, must be submitted for examination. This information is checked by experts to ascertain whether or not the ship in question has the required strength in structure, and if standard engineering practices have been adhered to. Informatory booklets are available from the Department of Air Commerce, Washington, D. C.

Assuming that the would-be builder had the mathematical and design knowledge to meet these requirements, or if he knew some one who could perform the task for him, he would still be faced with other troubles.

The aerodynamic design of an airplane is an involved engineering job and should not be attempted by any one not too familiar with the ramifications of the subject. Suppose that licensing restrictions were removed, granting free rein to amateur construction. How could a safe ship be possibly designed, if essential principles were disregarded unknowingly by the builder? The plane must not only be longitudinally stable, but laterally so, and also must incorporate safety design features too numerous to be mentioned.

Aerodynamics are only part of the design problem. Structural design is equally difficult. The selection of materials and their required cross-sectional sizes, motor installations and such things as fittings and general fabrication is an art not to be trifled with.

Should the builder be capable of designing and then building a craft conforming to Department of Commerce licensing requirements, he must surmount other obstacles. The cost of building a small plane is not, as many queries have suggested, a matter of \$25, \$100, or even more. If motor, wheels and propeller were to be listed as necessary purchases, the sum will have surpassed a few hundred dollars. The cost of the Continental motor is approximately \$400. True, conversions of Ford and other engines may be used, but rulings of the Department of Commerce are also in force governing motors and propellers. Therefore, an improved conversion must be used. Running the gamut of constructional items, materials to be

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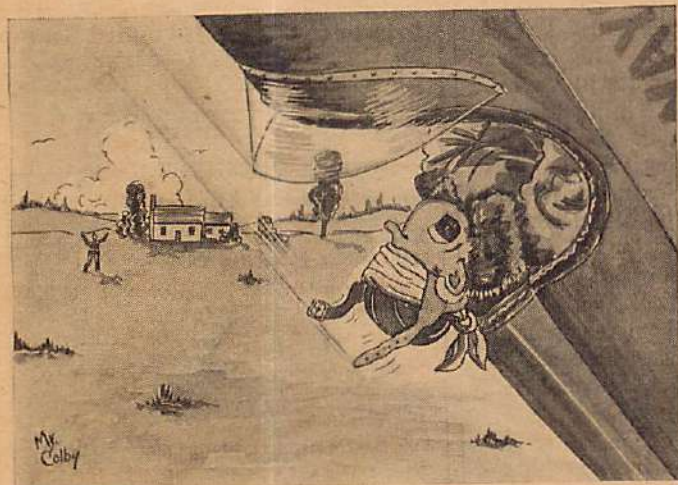
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used, and other expensive details, additional outlay will be encountered. Disregarding the labor involved, the cost is likely to be prohibitive.

Kits have been obtainable from time to time for the construction of ships whose designs had been approved. The average kit sold for four hundred dollars or more. They contained necessary materials, selected for quality and conformity to design specifications. Once purchased, the task remained of building and assembling the parts. The degree of capability of the workman quite conceivably could result in the refusal of the license application.

it be known that the rigged ship conformed to plan specifications? The Department of Commerce would check all these things before granting a license. Regardless of licensing, one's neck would be risked in flying a job in which some joint or fitting was inferior.

The current appearance of many midget planes with spectacular performances should not be permitted to influence the issue. Such planes are usually the work of a man or men versed in aviation shop practices. Working as aircraft mechanics and technicians, they are qualified for assured success.



"This blind flying is harder than I thought!"

Design, licensing and costs considered surmountable, the builder must prove equal to the actual construction. To create successfully his own plane he must possess knowledge of materials and tools and their use. Much metal work in the form of cowlings, fittings, etc., demands familiarity in that phase of the work. Perhaps welding must be done, or some other equally forbidding step. If the plane is being constructed to save money, this work cannot be brought to an outsider. Even the simplest of planes incorporating wood construction makes imperative experience with the material being worked. Without knowledge of jigs and assembly methods, how would

As gloomy as the picture appears to those of us who feel the purchase of a light plane to be beyond our immediate means, a hope does exist. Although it is not our intention in this article to promote light plane sales programs, it should be stated that the combination of the modern finance plan and mass production has done much to lower the cost objection. Considering that the one-third-down payment often amounts to less than \$500, the list price of the light plane may not be much greater than the ultimate cost of the home-built ship as is commonly supposed, and much safer to fly. Everything considered, the home-built craft offers few advantages.

CLUB NOTES

Harold Brown of Red Bank, New Jersey, writes in telling us of his experiences practicing soaring and gliding with a light plane. One day, just before a thunderstorm, he got in a good thermal at a height of about 1,000 feet. By keeping in this thermal he was able to rise to 2,500 feet, keeping his motor throttled to idling speed all the while.

The practical advantages derived from these experiments are twofold. In the first place, gliders could find out more about gliding conditions, relying on the added power of a motor if necessary, and light plane fliers could make good use of a knowledge of thermals if their fuel was running low.

Norman Silva of 412 S. Street, Sacramento, California, writes in wanting to know if there are any Negro flying clubs. While the editor cannot answer this question himself, he would very much appreciate it if any readers who are able to would either write to Mr. Silva or to the department.

Curtis Plumly would like to know whether there are any light plane clubs in San Antonio, Texas.

Much interest has been shown by our readers in the Payne biplane with the 15' wing span, illustrated in the September issue. It is manufactured by the Payne Aircraft Company in Chicago, Illinois. In the near future we will have an article discussing these small planes.

News reaches us that the Nicaraguan army has purchased a "Cub" plane to be used as a primary training ship. This raises the question as to whether or not other countries might not begin training their pilots in this more economical way.

Lt. Homer Taylor writes in telling us of the recent organization of the Zephyr Aero Club, Inc., in Englewood, Colorado. They are using a Porterfield Zephyr cabin plane and at the same time are acting as distributors for the Porterfield planes. This ought to open up a new line of thought in the minds of some of those who are about to form clubs.

RADIO-CONTROLLED GAS MODEL

(Continued from page 42)

degrees called for in the plans. Also, move the wing back about 2 inches from the glide adjustment. Start the motor with sufficient gas for about 10 seconds. Push the model gently. The tail should rise as the model taxis across the field. On the next flight move the wing up to the glide position and the model will "hedge hop" as it moves across the field. Now reduce the downthrust until the model climbs in a gentle steady flight.

Now the model is ready for the radio installation. After some good, hard work in the theory and practice of radio ap-

paratus, we'll be ready for the big thrill—a radio-controlled gas-model flight.

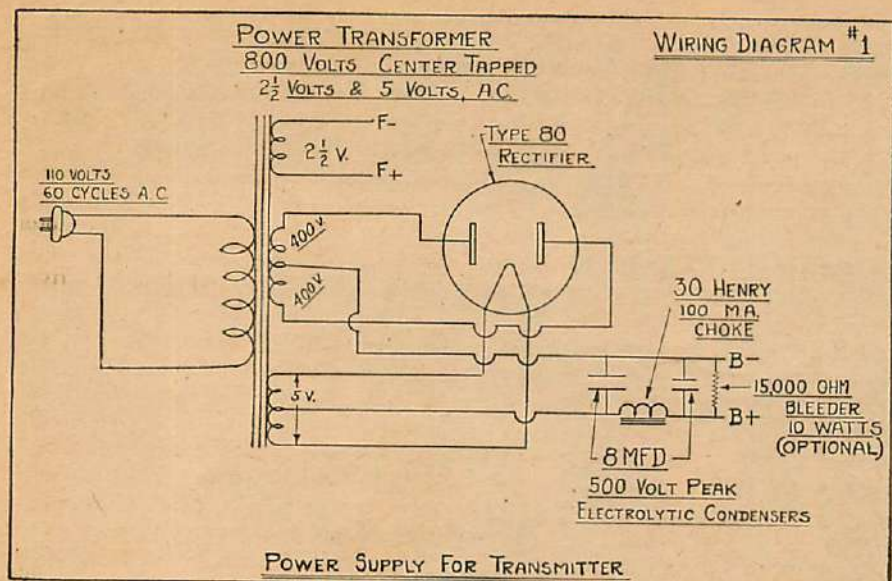
FUNDAMENTALS OF THE RADIO APPARATUS

All the parts are of conventional make and can be easily obtained from any local radio amateur supply dealer. The cost of the receiver used in the model will not exceed \$5.00, without headphones and batteries. The batteries used in the receiver are a special lightweight variety weighing only 2 ounces

per 45-volt unit. This type battery is recommended for flying, but the larger and more substantial 45-volt "B" batteries are used when experimenting and testing the circuit on the ground.

Take a deep breath and we'll briefly tell you the fundamentals of the radio apparatus. The radio receiver circuit is a time-tested one. It consists of a regenerative triode detection with capacity control of regeneration, plus two stages of transformer coupled with audio-frequency amplification.

A signal of radio frequency is radiated by the antenna of the transmitting apparatus. This signal in turn is picked up by the antenna of the receiving set. Tuning is accomplished by means of the



variable condensers shunted across the grid coil. The signal is then impressed upon the grid of the tube through the grid leak condenser combination. The components have the proper value to automatically bias the tube for proper detection action. The rectified plate current passes through the ticklers winding, which is employed to feed back a portion of the radio-frequency current flowing in the plate circuit to the grid circuit. The feed back is controlled by the variable condenser. The oscillation which results beats with the incoming signal and produces an audio-frequency signal which, in turn, passes through the audio-frequency transformers and is amplified by the two following stages.

These two tubes have an excessive grid bias which is the secret of successfully operating a relay in the plate circuit of a vacuum tube audio amplifier. The bias is raised to such a point that the incoming signal will give a sharply defined increase in plate current. The excessive grid bias also limits the plate current to a very low value, thus preserving the life of the small "B" batteries to a great extent. This increase in the plate current passes through a sensitive half-mill relay which closes a contact in the exterior circuit, which controls the train of gears operating the rudder tab.

THE TRANSMITTER

The transmitter is easy to build and operate and the cost is low. Yet it is a highly efficient apparatus. The following description, together with the two wiring diagrams included in the article, should give you the necessary information.

The large power transformer steps up the alternating current to 800 volts. This is rectified by the 80 tube and therefore is changed to pulsating direct current, the choke and condensers smoothing this out to direct current. This current then goes into the transmitter where it is converted into radio-



Chester Lanzo.

frequency energy. This energy is then radiated by the antenna and is then picked up by the receiving set. The circuit is the tuned-grid, tuned-plate arrangement. The capacity between the grid and the plate of the tube causes oscillation.

A single wire untuned feeder connects the plate circuit to the antenna. The antenna is tuned to the desired transmission frequency by cutting it to a predetermined length.

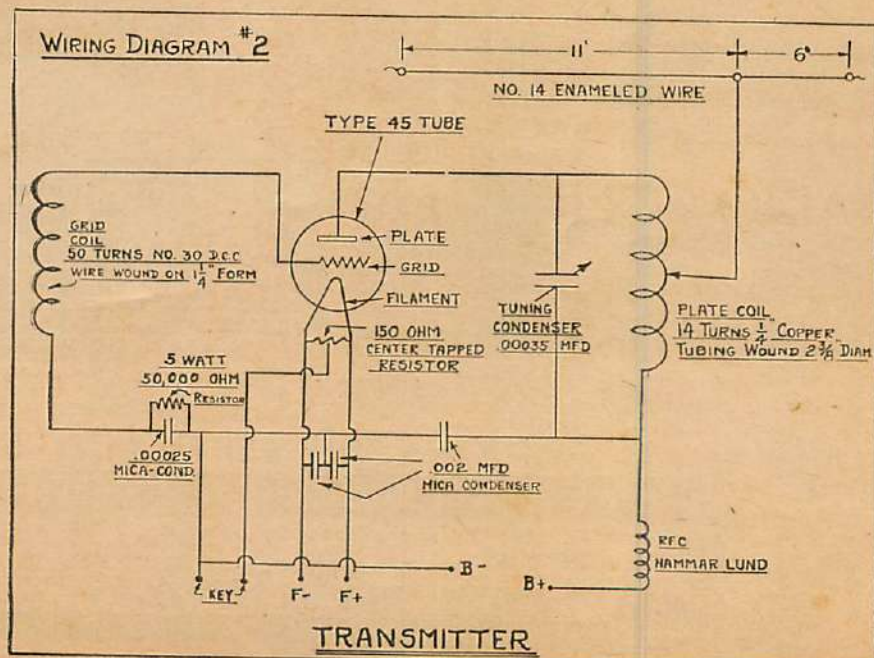
CONSTRUCTING THE SET

There should be no difficulty found when constructing this set. The transmitter is mounted on a board 12" long and 7" wide. The grid coils are wound with #30 double cotton-covered wire on regular coil forms. After winding they should be given a coat of dope so they will retain their characteristics. Wind the coil around a dry cell 2⅜" in diameter. Flatten the ends and drill them to fit over the machine screws on the stand-off insulators. The stand-offs should be mounted 5" apart. Connections to the plate of the tube and the tank connections are made of very heavy wire to carry the high current. The power supply is mounted on a board 12x9".

Once the transmitter is wired, cut the antenna to the required length, plug the earphones into the receiver and tune in the 80-meter band. Then press the key on the transmitter. A whistle should be heard in the earphones signifying that the set is operating satisfactorily. Then clip the antenna onto the plate coil nine turns from the plate end. Always keep the note of the transmitter a pure D. C.

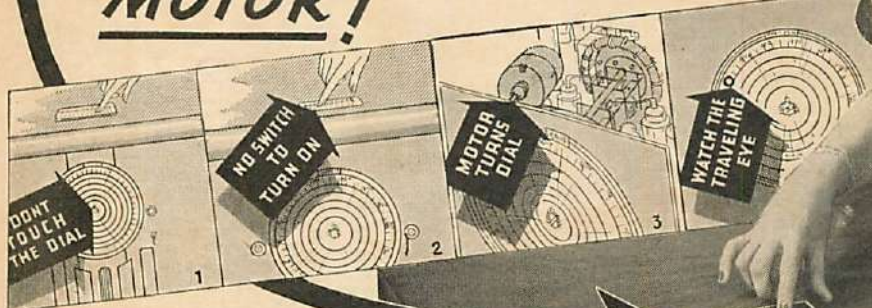
Next month we'll include instructions for making the receiver, method of actuating the rudder, installation of receiver in the model, radio-control flying, together with hints for trouble shooting and other information that will help complete your radio-controlled model.

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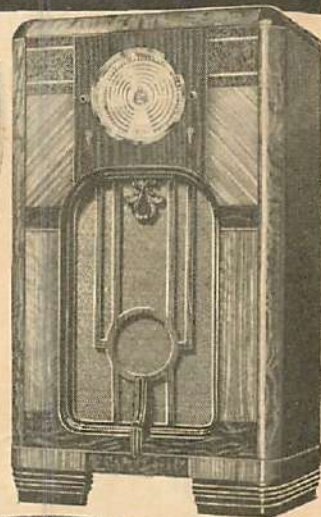
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