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Control-Line News

What About Rules?

BY LARRY EISINGER

Jim Walker flying his Fireball inverted. Not speed flying but much more fun.

CONTROL-LINE flying has zoomed and twisted its way into the workshop of practically every gas modeler in the country and in doing so has proven to be one of the greatest developments in the field of model aëronautics. Control-line events are now considered a major part of every large gas model meet; clubs solely devoted to this new phase of modeling are springing up like California towns during the gold rush, and more individual modelers are taking to this type flying because of the many advantages it has over free-flying gas models.

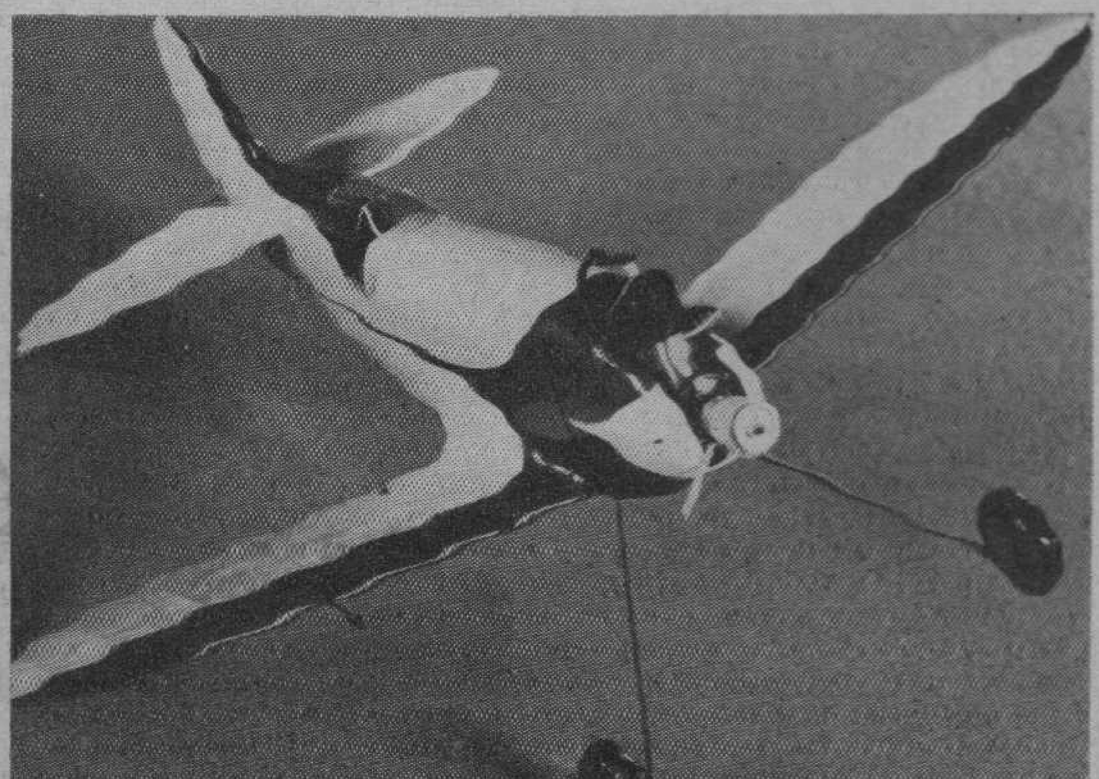
Why, then, don't we have rules? The answer is that thinking people believe these aërial spin-dizzies are heading for a collective spiral dive as far as contest flying is concerned, unless some originality is used in arranging events other than the speed kind. Stunt flying, marathon and precision events, balloon busting, dive bombing, dog fights and other novelties that place some premium on flying skill—the natural strong point of this kind of flying—are among the more obvious possibilities. But speed alone displays an amazing lack of thought that belies the traditional ingenuity of the American modeler.

For the same reason that race cars failed to catch hold, some leaders think control-line contest flying is heading for a fall if something is not done soon. Speed events are unfair, they say. Expensive engines or suped-up power plants determine the winners. The average fellow doesn't stand a chance. Four-pound ninety-mile-an-hour thunderbolts are not exactly safe. We've heard of several that have broken loose. Fortunately, they headed for the moon and not for the innocent bystanders.

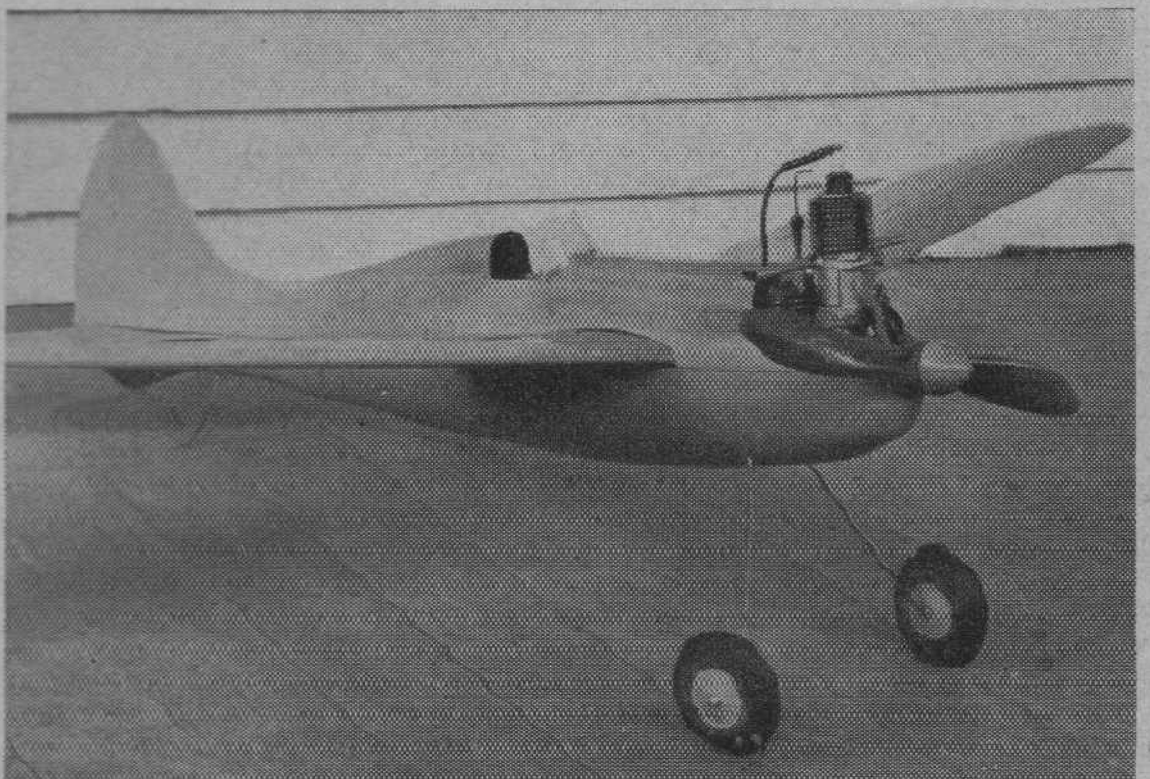
We must have immediate restrictions on minimum wing and power loadings. In our opinion the trend to cut wing area and to use a power plant big enough to power a plane triple the size indicates a collective fascination on the part of tether adherents to commit collective suicide—remember, we are talking of contest flying. We quote from a letter of Dick Korda's: "Since the rules do not specify take-off, most of the new ships have no landing gears at all but are hand-launched—Melvin Orr's, weighing four and one quarter pounds, has gotten off in less than fifteen feet each time I saw it fly, which will give you an idea of the power these Hornets have." (The Hornet engine which holds a race-car record of 110 m. p. h. Dick's letter follows after "Take My Experiences."—Ed.) While these conditions reflect the design skill of the Cleveland gang, the national trend as a whole will put control-line contest flying behind the eight ball, just as the stupid no-weight rules wrecked indoor flying by making it a game for the privileged few, the superscientific fan with the feathery touch, instead of the average guy. We don't want anything like that to happen to the cleverest and most thrilling way of flying a model that has been devised to date.

Rules are needed now, rules that will force other events to let us all have some fun, rules that will place a premium on flying skill (the first time thermals and luck won't make a winner), rules that give *(Turn to page 48)*

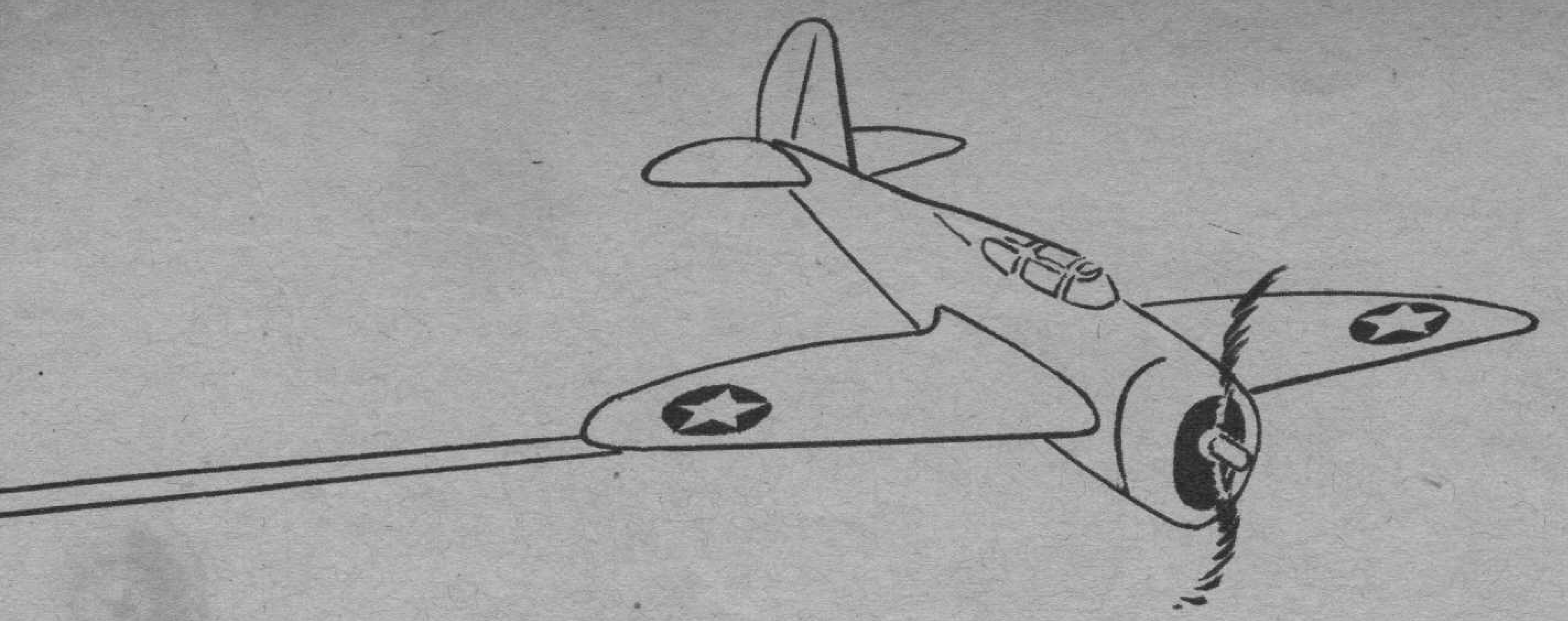
Richard Haysen, Chicago, holding his 36" control-line job of original design. Condor Kopper-King "60."



Victor Stanzel's Baby Shark is one of the hottest G-line models. Takes any Class A or B engine.



George Matthaei's American Junior Fireball boasts a super paint job besides all-around flying characteristics.



Take My Experiences

BY N. L. KOCH

N. L. Koch and his North American Mustang which has over 1,000 flights to its credit without a serious crack-up—and still going strong!

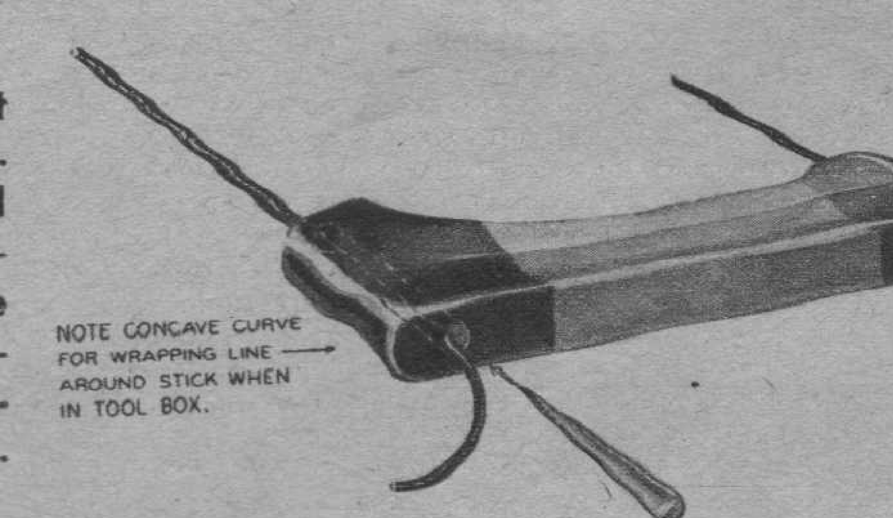
LIKE all new fields, the building and flying of control-line models offers a much different problem from free-flying jobs, and consequently modelers must adapt themselves as best they know how upon entering this field. Since this type of flying is more or less new and not too much has been written on the subject, I would like to offer a few points which might prove beneficial to the cause. Although we do not consider ourselves authorities on model building and flying, what little I and my friend know about control-line models has been learned mostly the hard way.

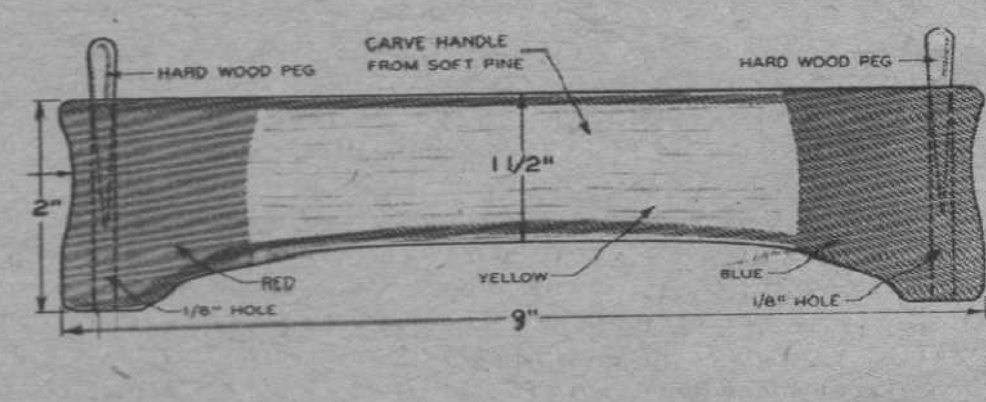
My good friend Mr. A. H. Requarth and I were initiated into this field by building a Class C powered North American Mustang, the plans of which were made by enlarging the drawing published in a back issue of Air Trails. Credit for the plans goes to the writer while Mr. Requarth takes the bow for building the ship. The general idea of construction follows closely that used in some of the free-flying contest gas models.

An inner box or frame is made first from 1/4" square balsa, a hardwood socket being built up in the front to receive the firewall and motor mounts. This has several advantages, namely, easy access to batteries, coil and wiring, ease of construction and strength. The control assembly is made and installed before the ship is covered. The final adjustment should give about 3/8" up and 5/8" down motion at the trailing edge of the elevator. The control arm must be installed so that the tips of the arm touch the inner sides of the body at the same time or, in other words, for maximum swing. It is very important that the control assembly works absolutely free. Slight play in the hinges and rod may be disregarded. We do not feel it necessary to use any method of damping or neutralizing the control arm. In fact, we have found this to be a disadvantage to smooth control. The amount of left rudder depends on length of line, type of motor and weight of ship. We find 1/2" at trailing edge to be correct for a 75-foot-radius, 4 1/2-pound ship powered by an Ohlsson 60, using a 13-inch prop and 8-inch pitch. The important thing is to *(Turn to page 51)*

Richard Haysen's job has a wing loading of slightly over 26 ounces per square foot. Use of Davis airfoil is said to cut down landing speed.

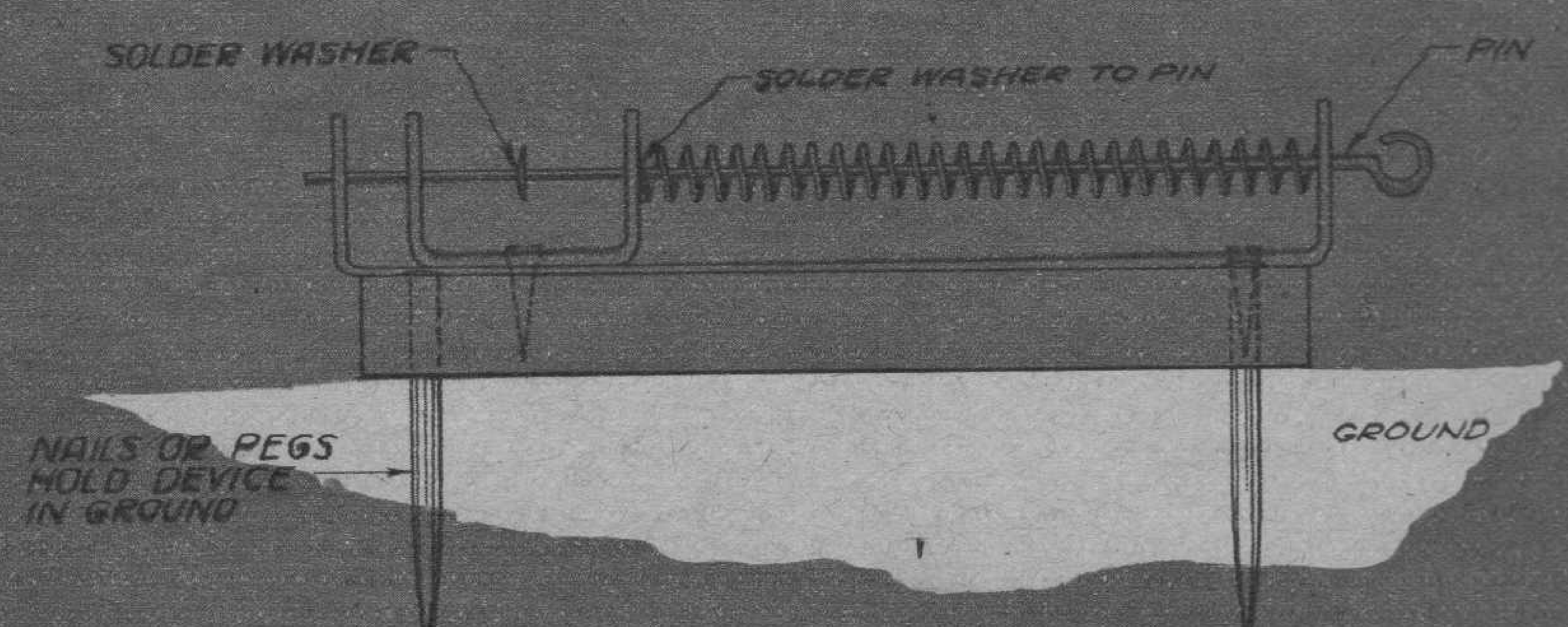
A simple, efficient control handle by N. L. Koch. Color-coded ends eliminate possibility of pulling the wrong line while flying. Pegs used to adjust length of line.

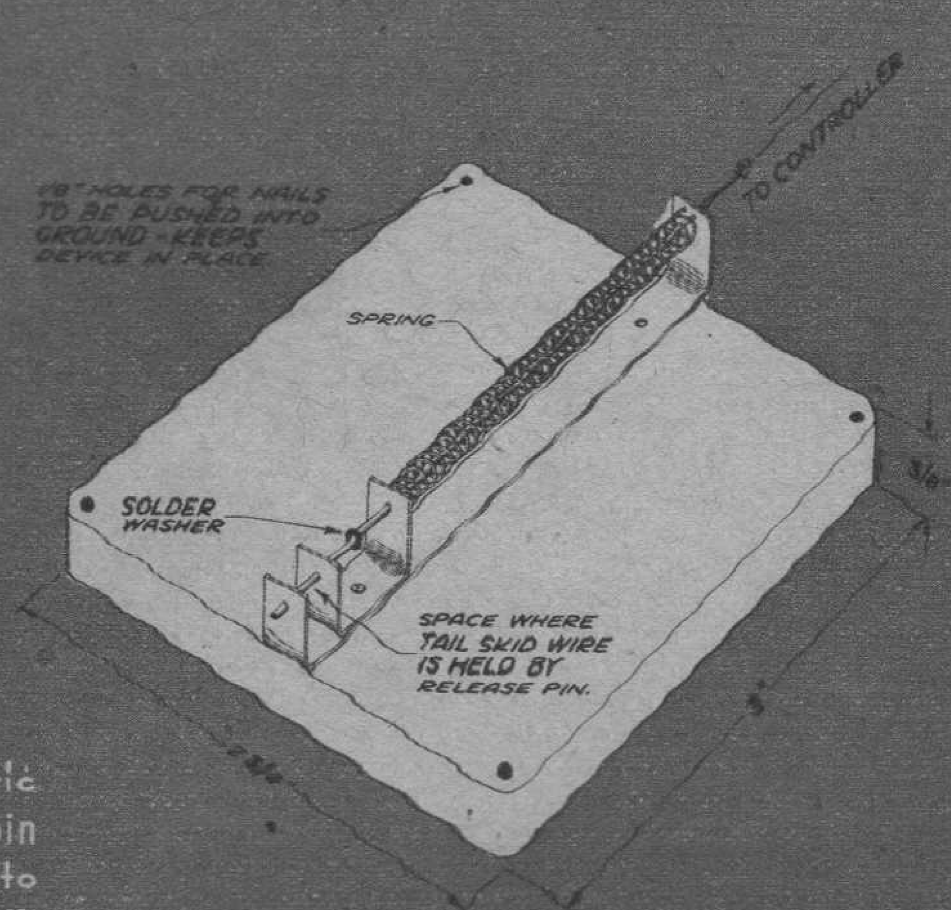




Automatic Stooge

BY LESTER McBRAYER & H. SEWARD DION





Control-line flying is strictly a two-man job—pilot and launcher—but now, with the aid of Automatic Stooge, the launcher is eliminated. Stooge is anchored to ground at edge of flying circle. Release pin through tail skid holds model secure, making it possible for pilot to start engine and then run to center of circle to grab control handle. Pilot then pulls release line, freeing model for take-off.

"Sure, I Remember the Nationals!"

BY GORDON S. LIGHT

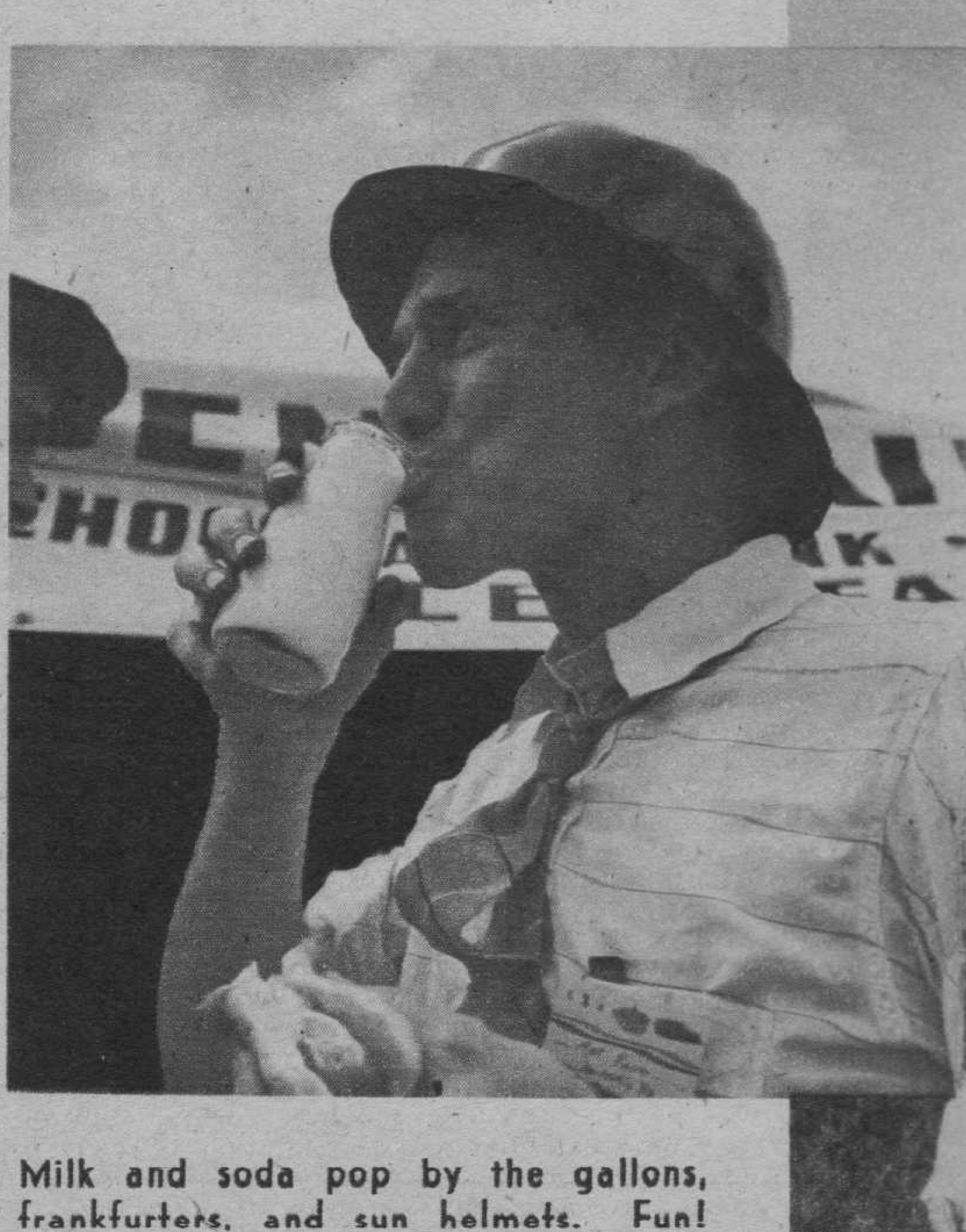
For the first time since 1928 the Nationals have been canceled. Looking back to the days of twin pushers, paper-covered indoor models, first gas models, we are reminded of colorful personalities, boys now in aviation.

YES, I remember the Nationals—and the hundreds of little incidents that made them so colorful. For example, one modeler spent all night building a model for next day's flying in Detroit's Olympia. He was tired and sleepy when he finished sanding, carving and covering. It was early morning when he literally fell asleep on the job. Thoughtlessly, he had put the finished crate on the bed and didn't remove it before piling in for a few hours of well-earned sleep. Equally distressing was the experience of another night-owl builder. After an all-night session he thought he'd catch a little sleep before going to the field. He barely got there in time for an official flight—it was late in the afternoon after the thermals and good flying weather had disappeared.

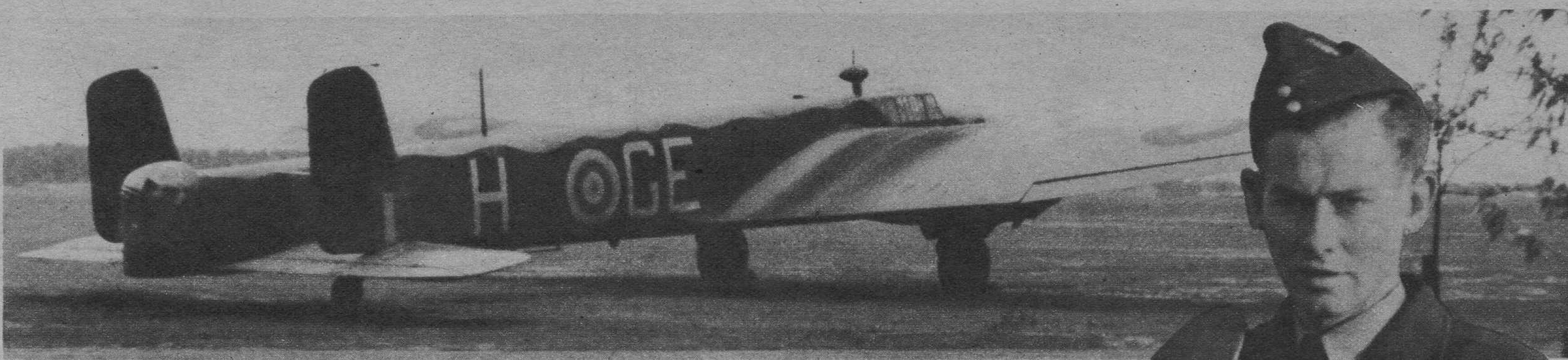
Model contests aren't all heartaches and tough luck. Contest fliers are a rugged lot, and the breed has grown better and better during the last fourteen national meets. Cancellation of the 1942 Nationals ended a custom that was started back in 1928 when the Airplane Model League of America sponsored by the *American Boy Magazine* conducted the first national meet in Detroit. A helpful series of articles in the *American Boy*, high-powered aviation interest following Lindbergh's flight in 1927, and booming business conditions provided a mighty elaborate setting for the first Nationals. The city of Detroit and the *American Boy* provided liberal cash prizes, trips to Europe for the *(Turn to page 38)*

Above—And always there was Tent City, with birds and dust and stuff.

Below—Twin pushers were the rage in 1931. The same year the first gas model entered, at Dayton. First Nationals in 1928 at Detroit, winners went to Europe.

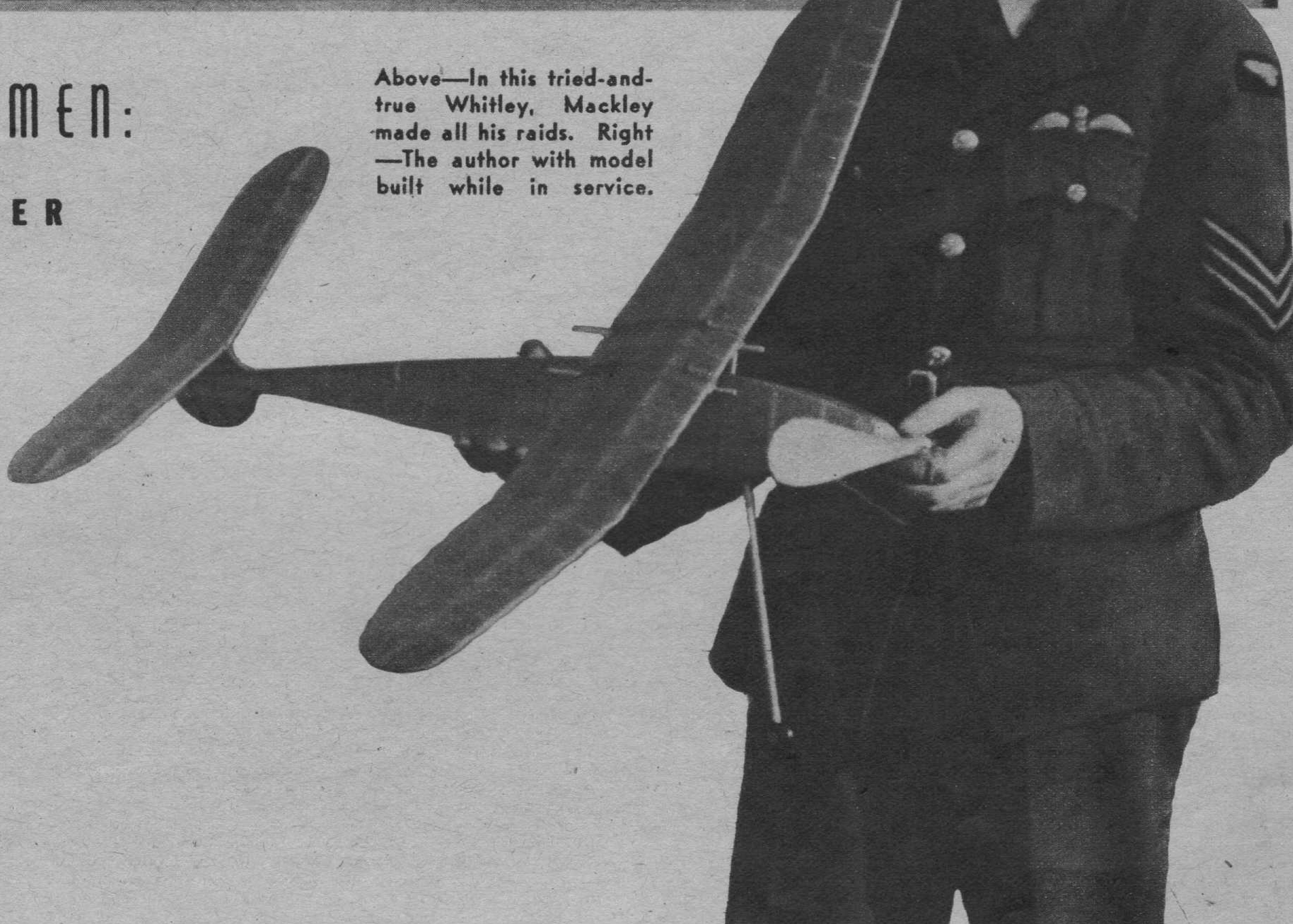


Milk and soda pop by the gallons, frankfurters, and sun helmets. Fun!



MODEL CAREER MEN:

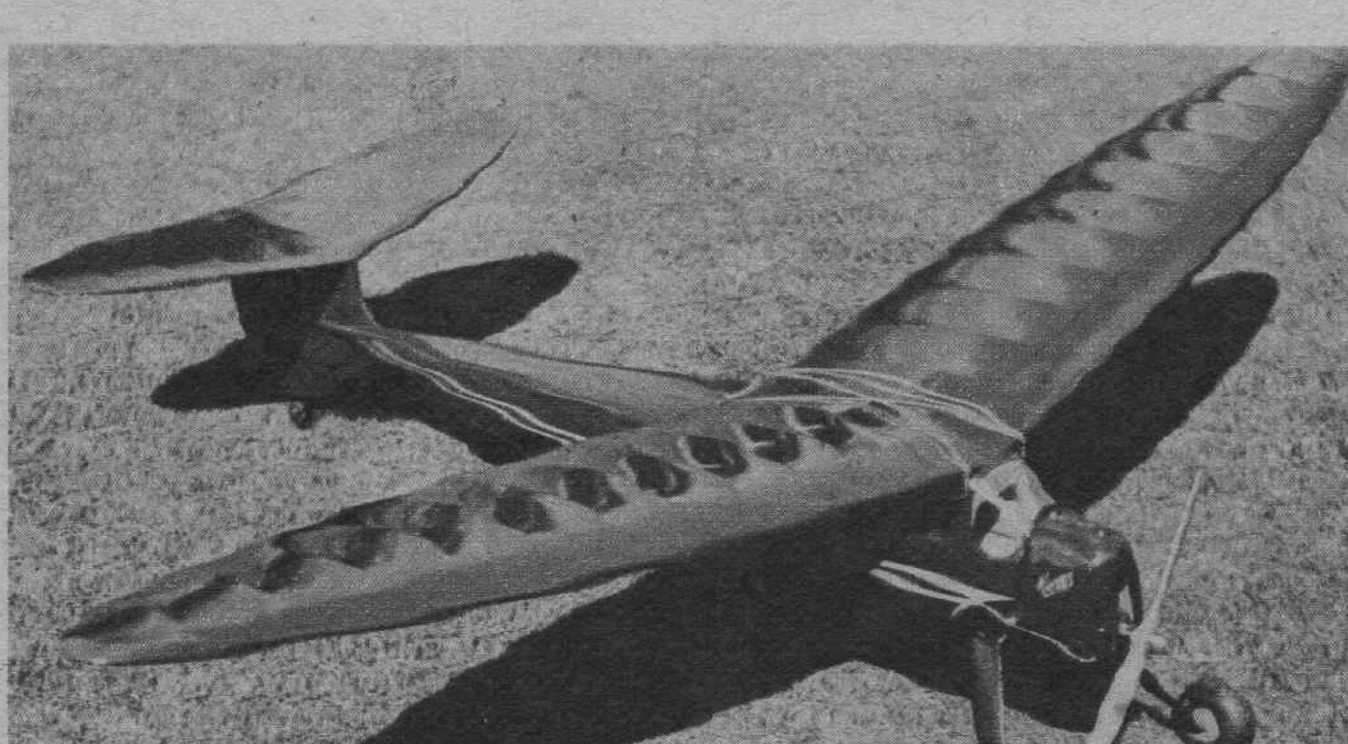
BY WILLIAM WINTER



Above—In this tried-and-true Whitley, Mackley made all his raids. Right—The author with model built while in service.

Flying Officer Mackley

The U. S. has no monopoly on good design and workmanship, as indicated by Mackley's two nifty gas buggies, above and below.



Ex-Wakefield and Moffett entrant from New Zealand, Bill Mackley was awarded the DFC after some thirty raids.

THE clipping simply states: "Auckland Pilot Decorated—Distinguished Flying Cross." It carries no date line; the paper is unidentified, except, of course, that it is New Zealand. But what this clipping goes on to say about an old and mutual friend of ours makes an outstanding story, even if we are limited to reading between the lines. It's the story of what just another model builder is doing to win this war for the Allies. We'll tell all that the circumstances permit us to say about Pilot Officer Winston Mackley, of the Royal New Zealand Air Force, the same Bill Mackley who used to send his Moffett and Wakefield models to compete each year at the Nationals.

In the typically plain, unadorned words of a citation, this newspaper account from Down Under goes on to say: "Official advice has been received by air headquarters that the Distinguished Flying Cross has been awarded to Pilot Officer Winston Brooke Mackley. The official citation accompanying the award to Pilot Officer Mackley states: 'Pilot Officer Mackley has completed 178 operational flying hours and 27 sorties. He has shown constant devotion to duty and consistent flying skill. His attacks on heavily defended targets have been carried out with courage and determination. On two occasions he has executed excellent landings when very short of petrol—one when cloud was at 200 feet and visibility only 500 feet. He has displayed unfailing gallantry. Objectives attacked by him include targets at Hamburg, Berlin, Bremen, Brest, Kiel, and Dusseldorf.' "

Bill is a bomber pilot. A Whitley pilot, to be exact. Or perhaps we should say *was,* since he is now a flight instructor in Canada. Flying a bomber proved a more monotonous than exciting job for Mackley. His particular flight put in six months of active service *(Turn to page 58)*

"Sure, I Remember the Nationals!"

(*Continued from page 36*)

winners, trophies, and medals. There were no gas models, no microfilm, and few rules. Mulvihill Trophy for outdoor stick models and the Stout Indoor were the only two familiar trophies. The scale model event was a big part of this contest, as it has been in every Nationals since then.

AMLA and Detroit repeated the contest in 1929 and 1930. The Stout Outdoor Fuselage Trophy was put into competition in 1930. There were more trips to Europe, big cash prizes, and a country-wide entry. Tie-ins with newspapers and service clubs made this possible. A Honolulu newspaper sent the winner of their local contest to Detroit.

A slack in business in the early '30s influenced the national contest as it did almost everything else. AMLA was still active but Detroit dropped the idea of a national meet. In 1931 Dayton was host to the boys with the George D. Wanner Co. as sponsor. Instead of trips to Europe the winners were flown to Washington to meet President Hoover. Cash awards fell off. Unfortunately the big cash prizes had fostered a small group of professionals. The $1,500 in cash seemed like small potatoes after three years of peak prosperity. Cash disappeared entirely in 1932 and following years. Recently it has come back—but in small innocent amounts.

Joe Ehrhardt of St. Louis was the outstanding flier during the first few Nationals. In 1930 he won the Mulvihill, Stout, and Wakefield Trophies. He repeated his Wakefield victory in 1931. Competition had become plenty tough by this time.

The army always co-operated with the national contest effort. In Detroit it was Selfridge Field. In Dayton it was Wright Field. Army men served as timers and officials and manned the motorcycles for retrieving. Lt. Col. H. H. Arnold, now chief of the army air forces, was chief of the materiel division at Wright Field in 1931. His answer to our letter of appreciation following the meet has a prominent page in our scrapbook.

Dayton Nationals were a milestone in the evolution of contest rules. For the first time the weight rule of 1 ounce per 50 square inches was effective for stick models. Models were weighed before and after flights. For the first time in model history modelers added chunks of lead to their ships, all the while mumbling, "It was heavy enough back home on my scales." It took about ten years to clear up this discrepancy between contest scales and workshop balances. But at last the habit of adding weight has virtually disappeared. Weight rules cured the obnoxious habit of using lightweight indoor type models in outdoor events when the weather was calm. For example, in the 1929 Mulvihill contest, Don Burnham won the trophy with a 19" stick tractor powered with two strands of $1/8 \times 1/32''$ rubber. His flight was 10½ minutes out of sight. The weight rules didn't cut down flights as much as everyone had expected. Steve Klazura did 5:40 in winning the Mulvihill with a twin pusher. Fuselage models were not subject to weight rule and flew correspondingly long. Emanuel Feinberg of Detroit won the Stout Fuselage Trophy with 29½. Six boys were about the 7½-minute mark. No one was surprised when next year's rules put the fuselage jobs in the one-ounce-to-fifty class.

Most of the early indoor models were tissue-covered. A few used aluminum foil. In 1929 Joe Culver of Oakland, Calif., won the Detroit indoor event with 8:33. It was a 23" tractor, 14" propeller, kite-shaped tail with a teardrop fin extended in the rear. The wing had curved dihedral and clipped to the bottom of the built-up motor stick. A single pusher flown by Al Mott took second with 7½ minutes—one of the few times the single-tractor design has ever been challenged indoors. Lack of flying facilities in Dayton ruled out an indoor contest—the only time during the fourteen Nationals. There was a considerable discussion about indoor design, especially a new covering called microfilm. Great things were predicted for this covering that weighed one tenth the weight of tissue and half the weight of aluminum foil. It sounded good even to conservative builders. But they certainly didn't believe that indoor models would soon be flying 20 minutes or more. In 1932 indoor models were still paper-covered, but the flights soared to 13 minutes. At the 1933 Nationals in New York City the indoor boys got their long pants. They made the most of spacious Kingsbridge Armory. Not only had they solved the problem of making and handling microfilm but Carl Goldberg came within 26 seconds of the 20 minutes mentioned wildly only two years before.

We saw a gas model for the first time at the Dayton Nationals in 1931. Its flight was short but hardly sweet for the two builders who retired with pieces after a few hectic seconds of take-off, stall, and dive. Like many of the breed who followed them, they turned the engine over many more times by hand than with gasoline. Rubber builders weren't very impressed. Rubber was still king. They couldn't even take the hint in 1932 when Maxwell Bassett put on a good show at the Atlantic City Airport. He did 2:55 officially for fourth in the Wakefield contest. An unofficial flight after the contest was lost after 13 minutes. Bassett spent most of the day making repairs, adjusting his model, and carving props. His clocklike performances were to begin in 1933.

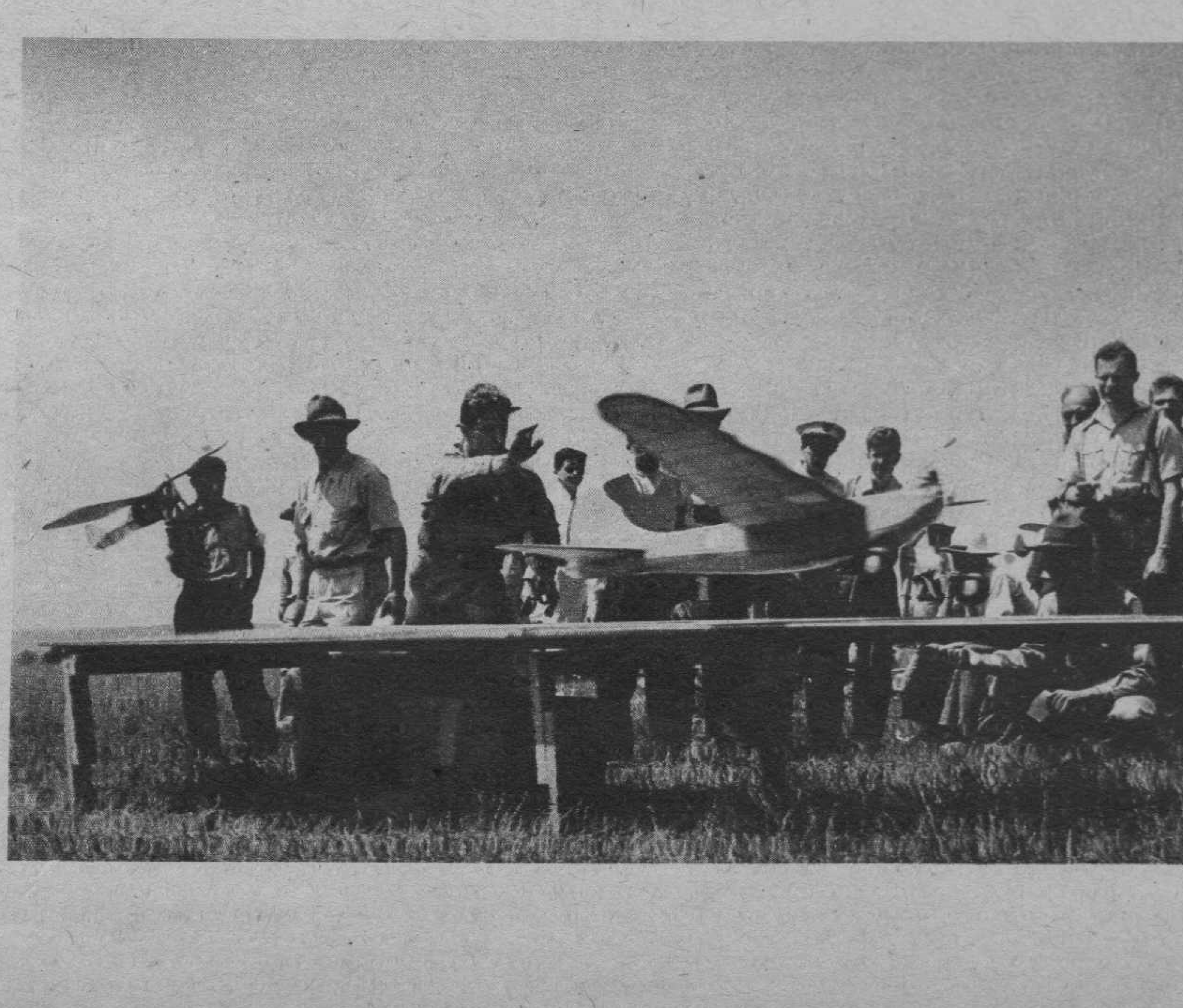
At Roosevelt Field in 1933 outdoor contestants watched the interesting phenomena of one entrant winning all events. There should have been separate events for gas and rubber. Bassett won the Stout and Mulvihill and two new trophies—International Moffett for cabin fuselage and Texaco for gas. Joe Kovel and Charles Grant entered the only other gas model, but engine trouble grounded them. (This was the forerunner of the famous K-G gas model design which did championship flying in the following years.) The hot June sun wasn't the only reason that contestants perspired freely. They were slightly hot under the collar when they saw a gas model walk away with the trophies. It was a brutal but convincing way to prove that rubber was no match for gas.

Next year, 1934, at Akron, Ohio, the seventh Annual Nationals brought out nineteen gas contestants —the largest number ever entered in one contest. Some of the boys had more than one model so the total number of gas jobs was boosted to twenty-six. The boys groaned, grunted, cranked and patched, but when the bell sounded only eight models had made official flights. Max Bassett won the Texaco Trophy with 21:57 and Joe Kovel was second with 14:02. The NAA had formulated the famous fuel-allowance rule for this contest and Bassett's *Miss Philadelphia* carried 1⅝ ounces. There were two young fellows from the West coast entered in this meet, Bill Atwood and Irwin Ohlsson from Los Angeles. Both have done plenty of good since then. But the best that day was Ohlsson's sixth place with 36 seconds.

Looking back, it seems that up until 1932 everyone was building rubber models. A few were dabbling with gas without result. Then all of a sudden came Bassett with a good performance at Atlantic City and in New York in 1933 and *pffftt!*—it seemed everyone was building gas models, even little kids. This isn't the case. A few boys learned the knack of making them perform on schedule but the rank-and-file builder found them pretty much of a mystery.

In St. Louis in 1935 the boys were still far from red-hot. The winners racked up good time. Leo Weiss won the Texaco with 64:12. Bruno Marchi was second with 41:55, and Bassett was third with 36:49. Kovel did 31:05 for fourth. Dropping down to twelfth place, the time was :24.6, and last place (seventeenth) was :11.6.

In 1936 the national contest was again in Detroit. Francis J. Tlush won the Texaco with 45:34.5 flying a planked, circular-cross-section, taper-wing model of original design powered by an engine of his own design. Fuel allowance was one quarter ounce per pound. Even though the Texaco event was limited to boys twenty-one and younger, the first twenty-two winners flew more than 11 minutes. Maxwell Bassett wasn't at Detroit in 1936 but he bounced back the following year with a flight of 70:02 to win the Open Event. Carl Goldberg won second with 52:45 flying a beautifully streamlined and clean-looking Valkyrie. This was Carl's first big effort in a gas contest. Indoor flying had been his specialty since the first Nationals in 1928. His record for consistent performance indoors has never been equaled. Second in the Stout Indoor in 1930; third in 1932 and 1933. Bad breaks always pushed Carl out of first place and denied him the Stout Indoor Trophy. His luck changed when he became twenty-one and was no longer eligible for the Stout. Started flying in the open class in 1934 and won the Springfield Trophy with a new world record of 22:59.4. Did it again in 1935 with 23:29.4. The same story in 1936 with 19:26. Second in 1937. First again in '38. From this time on, Carl was too busy with gas models to fly indoors. His gas designs—Clipper, Zipper Sailplane, and Interceptor—proved exceptional and were widely accepted by contestants.



Fiske Hanley of Fort Worth won the 1936 Texaco Trophy with 50:29. Great numbers of long flights proved to the model fraternity they were getting pretty good, and one-eighth ounce per pound was too much gas. The rules were streamlined for the 1938 contest in Detroit. That year the boys struggled under the handicap of a thirty-second engine run and a minimum weight of eight ounces. Timers were limited to a 200-foot radius from the take-off spot. No longer were models checked and weighed—this red tape now assumed the classy name of "processing." Gas contestants appeared in such volume the event was expanded into two full days of flying. Half of the entrants flew each day. But the second day's

(*Turn to page 40*)

"Sure, I Remember the Nationals!"

(Continued from page 38)

weather was better—much to the disgust of the boys who flew first. Bob Toft of Minneapolis was leading after the first day but was pushed back into third by longer flights in better air made the next day.

This trouble was cured the following year. Models were classified according to engine displacement and the same event was never extended more than a day. Gas contests in Detroit had always been held at Wayne County Airport. In 1937 and '38 the only handicap had been the ransoming of models which drifted on an adjoining farm. The fee ranged from twenty-five cents to one dollar, depending on the farmer's estimate of the damage to his crops. In '39 there was a new menace. Airport officials herded the boys to the far end of the field and ruled out the use of the runways for take-off. For a while the boys battled the high grass, but finally reverted to the old habit of hand launching and thereby eliminated the possibility of establishing a new national record.

Chicago was well prepared for its first invasion in July, 1940. Preparation was made on a big-league scale. Capably trained Park District personnel were able to time as many flights as the 1,100 contestants were able to turn in. Modelers were king of the hill with no air traffic to worry them. For the first time a national meet was not held on an airport. This convenience backfired in 1942—one of the reasons for canceling the Nationals was the construction of a munitions plant alongside the outdoor flying field.

The Buzzard Gas Model Club of Chicago prepared for the 1940 meet by all building the same design. Joe Konefes flew his Class C Buzzard for a three-flight total of more than 59 minutes. (Both gas and rubber rules called for a three-flight average.) The club put on a mass flight of Buzzards—about fifteen of them, some towing sky signs. Usually the only buzzards at model contests are the youngsters who collect fragments of broken models. They lurk near the take-off boards and pounce on the debris after the crack-up. Sometimes they expedite matters by getting in your way and helping create debris.

More and more extracurricular activities were included on each national contest program. In 1940 the Model Industry Association met and completed its organization. Since 1937 the Academy's annual battle on rules had become a regular feature. The Academy itself started at a national meet—St. Louis in 1935. H. W. Alden proposed the idea. Purpose of the AMA as discussed that hot June evening in St. Louis was to provide a council to direct and supervise contest and research activities of the many expert model builders. Victor Fritz, Bert Pond, John Young, H. T. Sommers, Carl Goldberg, Jesse Bieberman, H. M. Jellison, Frank Zaic, Lawrence Smithline, John Young and several others who are still interested modelers.

After this powwow the AMA slowly gathered some steam. It was a rocky road that wasn't made any smoother when Lieut. H. W. Alden stepped out of the model picture after the 1936 Nationals. As a member of the NAA he had helped the Academy gain prestige. He had done the lion's share of organizing and planning the Nationals from 1932 to 1936. He shared the modeler's viewpoint and believed all contests should be directed to his welfare rather than merely publicity and free advertising for the sponsor. Alden has never taken any further interest in the AMA or national contests.

Nineteen forty-one in Chicago was a field day for more than 1,200 contestants who turned in 30,000 flights. Defense jobs and military service kept many of the older boys away—the hobby was doing its job as a number-one reservoir of the air force and aircraft industry.

Canadian participation in our national events is almost as old as the event itself. Gordon McKinney of Toronto brought a delegation to one of the first Detroit contests. Another colorful visitor was John Dilly of Galt, Ontario. Before defense work cut down his vacation time he always hitchhiked. Turned up in Akron, St. Louis, New York, Detroit, and Chicago. Roy Nelder of Toronto is one of Canada's best. He won the Moffett International in 1938 and did it again in 1940. Roy was barely able to get to this contest. But he made the most of the two-day leave from his job in an aircraft plant.

Our international efforts have hit highs and lows. In 1930, 1931, 1935, 1938, and 1939 the Wakefield was in this country. In nine Moffett International events we've lost the trophy three times. A low spot in our international ranking was 1936. Not only did we lose our grip on the Wakefield but the Moffett as well. Bert Pond of Indiana was the rascal who did so well as a proxy flier with 44:14 that Vernon Gray of New Zealand held the trophy for a year. In 1936 the English weren't content to do things by proxy. Their team of six visited the Detroit Nationals and flew in many of the events in addition to the Wakefield.

France sent an entry to the 1936 Wakefield. André Vincre placed eighth. He couldn't speak English. Larry Smithline met his boat in New York. As soon as they got together on the French and English equivalents of the words in the model jargon, conversation moved right along. Larry made the most of his two years of high-school French.

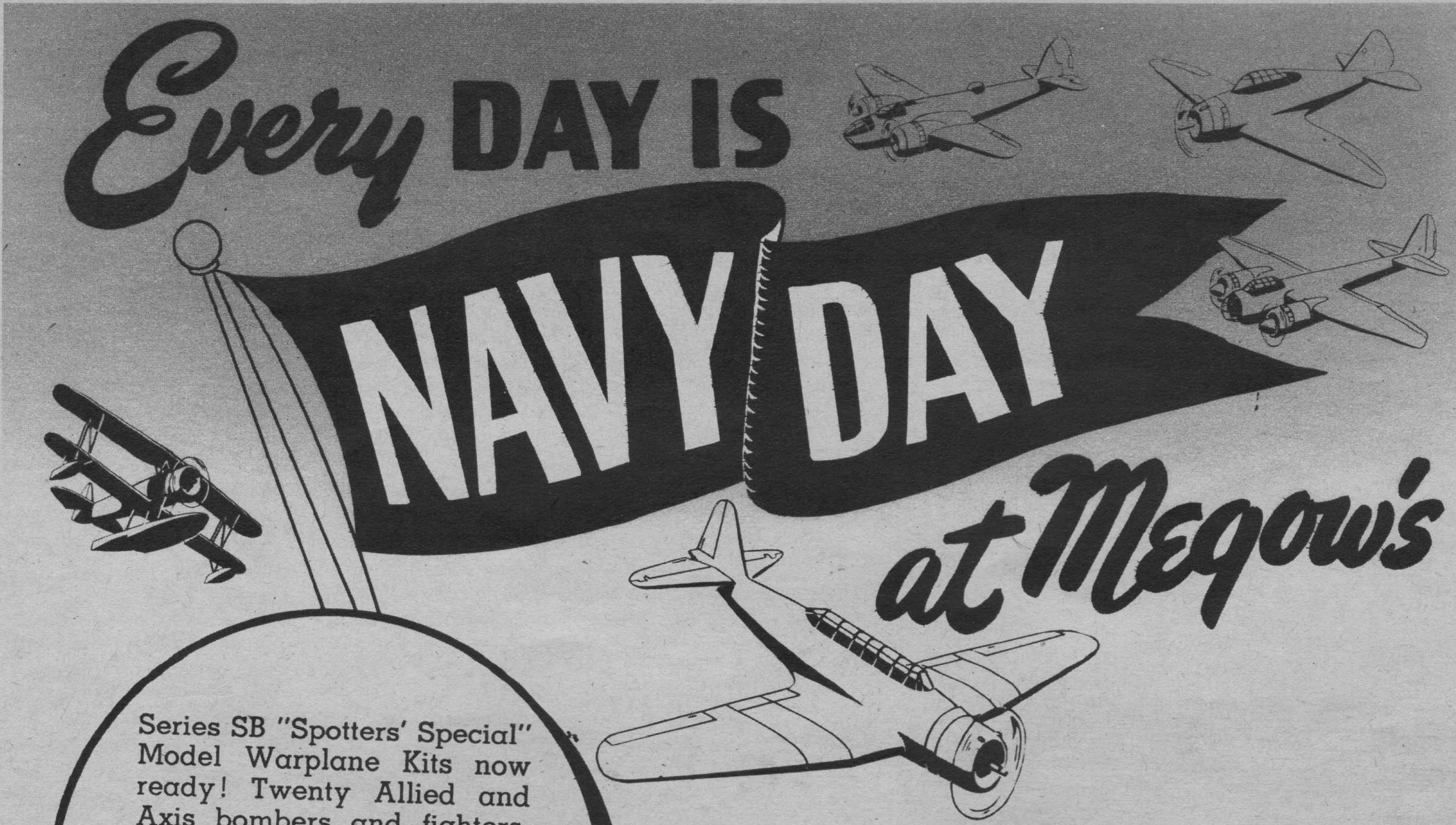
At this same contest Col. Ralph Royce was among the army fliers from Selfridge Field who attended the contest and talked with the boys. Now the rank is brigadier general and the flying field is somewhere in Australia. Another brigadier general who has helped model builders is Doolittle. In 1935 at St. Louis he attended the contest. He was manager of Shell's aviation department. Shell distributed an attractive souvenir program with autographed photos of Doolittle and Jimmy Haizlip.

A trophy for radio-controlled gas models was put into competition a year before any models arrived to win it. This was in Detroit in 1936. The trophy went back into the packing case until next year when Chester Lanzo of Cleveland turned in a controlled flight. He was barely able to qualify but even so was far ahead of the five other r. c. models. Walter Good improved the r. c. in 1938 when he demonstrated his model on the ground in snappy fashion. He cracked up trying to fly in a stiff wind. All the other models were land-bound. Walt would have done well if the flying conditions had been reasonable. He proved it in 1939 when Brother Bill joined him. Together they flew their model through a series of 8-turns, spirals, dives, and zooms and landed dead-stick one hundred feet from the take-off spot. In 1940 the Goods' technique was even better and they won the trophy for the third time. In the spring of 1941 both Walter and Bill graduated with doctor's degrees and were off to important research work that didn't give them time for contests. They did make a fast trip to Chicago over July 4th and watched Jim Walker of Portland, Oregon, win the r. c. contest. This event should show considerable progress when competition is resumed. By far it should become the most interesting event in the entire national-contest program.

The 1942 Nationals would have been the fifteenth. Some modelers probably object to this numbering, since efforts had been made prior to 1928 in conducting nation-wide contests. In 1923 the first Mulvihill Trophy contest was held in St. Louis as a part of the National Air Races. The 1924 contest was in Dayton; 1925, in New York. In 1926 it was a part of the National Air Races at Philadelphia's sesquicentennial.

The Playground and Recreation Association of America sponsored model work about 1927. The first National Miniature Aircraft Tournament was held in Memphis in 1927, sponsored by the PRAA. In 1928 the contest was held in Atlantic City. Noteworthy performance at this contest was the 12:30 ROW flight made by Tudor Morris flying a twin pusher equipped with three small floats. The model weighed 2.91, had a 30" span and a 42" V frame

Mentioning all the championship model builders who have participated in the fourteen national events would call for a list of thousands of names. Whether they finished first or last, they were still champions—they won and lost with equal grace. The builders take flying seriously. Yet they have the stuff to take crack-ups in their stride. "Wait until next year" is the password. Model flying itself is interesting. Yet it's pretty dull stuff compared to the colorful personalities of the boys who fly them. And that's what we remember about the Nationals.



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SB-5	Lockheed P-38E	.35
SB-6	Martin B-26C	.50
SB-7	Republic P-43	.20
SB-8	Consolidated B-24D	2.00
SB-9	Lockheed Lodestar	.50
SB-10	Messerschmitt ME 110	.20
SB-11	Junkers JU 87B	.35
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SA-4	Vought-Sikorsky OS2U-1	.35
SA-5	Douglas Devastator TBD-1	.35
SA-6	Consolidated PBY-5	1.00
SA-7	Consolidated PB2Y-3	3.00
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SA-9	Curtiss P40E	.20
SA-10	Northrop A-17A	.35
SA-11	Douglas A-20A	.50
SA-12	Boeing B-17E	1.00
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SA-15	Heinkel HE-3	1.00
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Write today for catalog and special information on the new Megow warplanes and gas models.

Megow

PHILA., PA.

Substitutes for Radio Control

(Continued from page 31)

first coil, flux lines produced by this current extend from the immediate vicinity of the coil to a considerable distance out in space. They are strongest near the coil, of course, and diminish with distance. If at any point in this magnetic field another coil is placed, as shown, the flux lines link with the turns of the second coil and set up a minute current flow in this coil. The two coils are then said to be inductively coupled, and the

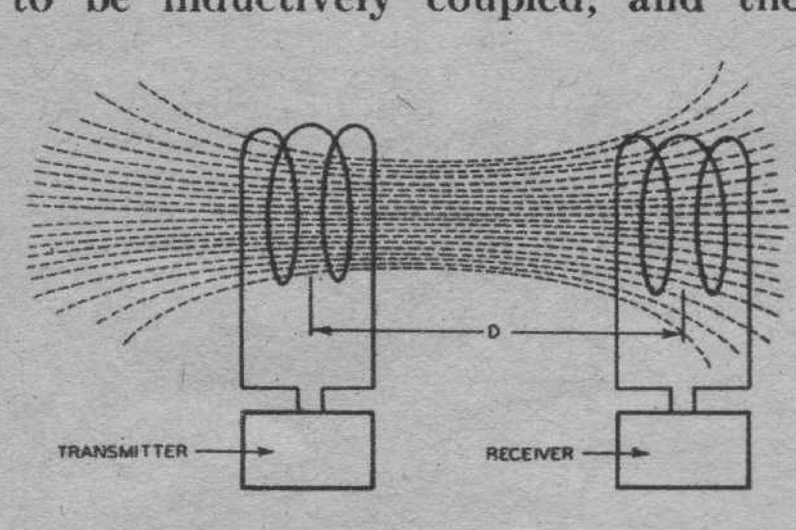

FIG. 2. INDUCTION FIELD REMOTE CONTROL. Input to receiver is proportional to the following: $\frac{1}{d^3}$, number of turns in either coil, area of either coil and current in the transmitting coil. The field must not exceed 15 uv./meter when $d=\frac{\lambda}{2\pi}$.

coupling medium is the electromagnetic field. The combination is known as a transformer.

We can use this transformer at anything from power or audio frequencies (sixty to 15,000 cycles per second) up through the low radio frequencies below the broadcast band. R. f. induction, you know, is the principle on which the Philco "Mystery Control," wireless record players, wireless juke boxes and the like are operated.

Without going into elaborate technical detail, it may be said that there is a sharp dividing line between such "wireless" inductive devices and the true "wireless" of radio communication. According to regulations of the Federal Communications Commission, this line occurs when the field strength is fifteen microvolts per meter at a distance equal to

$$\frac{\lambda}{2\pi} \text{ meters or } \frac{157{,}000}{freq_{KC}} \text{ feet or } \frac{30}{freq_{KC}} \text{ miles.}$$

As a rough guide, this is something like the maximum sensitivity of an ordinary superheterodyne receiver. The maximum range, therefore, is a matter of the wave length or frequency used.

The "Mystery Control" and the radio record players use relatively high frequencies in the broadcast band or just below. Since operation is usually confined to the limits of a house or small building, only limited range is required.

When these devices were first authorized by the FCC a few years ago a number of us pricked up our ears. At first glance it seemed like an ideal basis on which to build a system for remote control of models, as well. Maybe it occurred to you, too, and you grabbed the old pencil and started figuring. It came as a rude shock to realize that at five meters the permissible control distance is only about three feet. Even at 500 kilocycles the maximum distance under the magic formula works out to only about 314 feet. Hardly enough to control a free-flying model. And that with a fifteen-microvolt field at the edge, requiring a receiver with as many tubes as an ordinary broadcast set. Most of us stopped right there.

The present restrictions have caused us to take another look at the problem, however, and it now looks as though this induction business holds some promise after all.

Suppose we forget about the more common radio frequencies and go down the scale a bit. At sixty kc. the range is something like half a mile. At thirty kc. it becomes a mile. It can be seen that with suitable choice of frequencies we can begin talking about substantial ranges

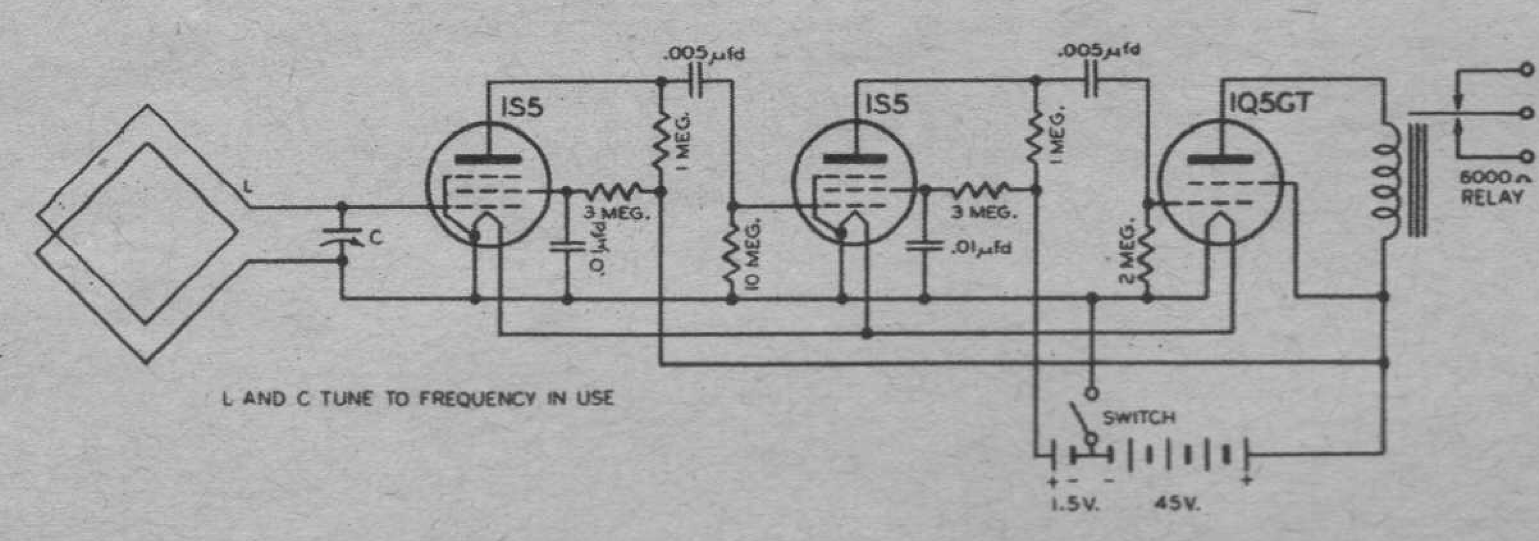

FIG. 3. A. F. INDUCTION RECEIVER. Total weight (less relay and batteries) 3 ounces. Overall dimensions: 1½" x 3" x 3½".

instead of a few hundred feet. This begins to look worth while! The question then arises: Can suitable equipment for use on such low frequencies be built and applied to small models?

Well, indications are that it can. Take a look at Table I at the end of this article. Without going into the technicalities behind the figures, this table summarizes design data for inductive systems for various frequencies and ranges. The type of equipment contemplated is shown in Fig. 4A and 4B.

The figures in the table are based on the use of triangular receiving loops of the type shown in Fig. 3, for ships of typical wing span. The six-and-a-fourth-square-foot-area loop can be used with a ship of five-foot span, for example. The nine-square-foot loop fits a ship of six-foot span, and the biggest loop is on the larger ships of seven and a half or eight-foot span. For the sake of simplicity, transmitting loop current is shown in the same table; actually the two loops need not be the same size, of course.

It will be noted that, as the area goes up, the effective induced voltage in the receiving loop goes up, while the current required for rated output from the transmitting loop goes down. The bigger the loop the better the performance, therefore.

The receiving loop is wound as a self-supporting flat ribbon, mounted in the plane of flight to minimize drag. It can be made by assembling a triangular wooden jig, with slots the thickness of the wire sawed in the ends of the supporting rods. Care must be taken to keep the wire equally taut on each side. After winding, the cotton-covered wire should be heavily doped with coil dope or shellac until the coil becomes self-supporting. The slotted rod ends can be cut off the jig and left on the winding to serve as mounting supports.

Yes, such a coil is a rather cumbersome and awkward gadget to hang on a model. But a good-sized loop is necessary for performance in an inductive control system, and if the job is done with a little care it should work out fairly well.

The receiver proper is simply a straight-forward r. f. amplifier using tuned impedance coupling, as shown in Fig. 4B. R. f. chokes are used as the plate-circuit inductances because they are lightweight and readily available. There's plenty of room for individual experimentation in this department. You'll need plenty of gain, of course, but the amplifier must be stable, too. Some selectivity is necessary to avoid interference from long-wave commercial stations; it's surprising how much you can pick up in that part of the spectrum when you don't particularly want to!

The transmitter is, of course, a simple oscillator. The loop current is adjusted to rated value by moving the tap up and down. A storage-battery-powered vibrapack is ample power supply; a regular 300-volt a. c. supply can be used, too, of course.

Just what frequency should you use? Well, that's a problem you'll have to decide for yourself, since it's pretty much of a compromise. The equipment is simpler and lighter at

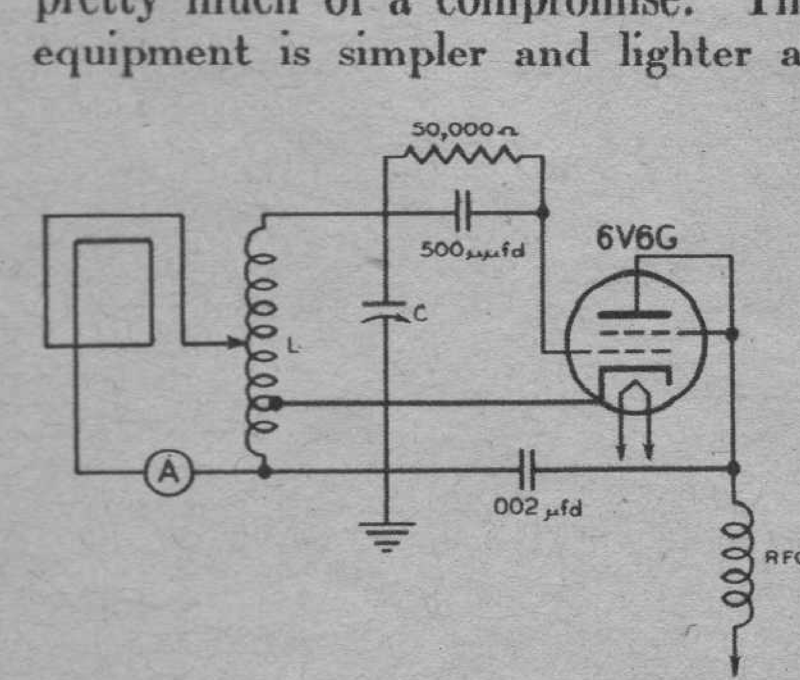

FIG. 4A. R. F. INDUCTION FIELD TRANSFORMER. L and C tune to frequency in use. For loop data see Table I. A is thermo galvanometer (0-0.5 amperes for high frequencies, 0-2.5 amperes for low frequencies).

the higher frequencies, generally speaking, but the maximum range and performance are to be found with the lower frequencies.

As was said a little earlier, the lower we go in frequency the greater the control range—that is to say, the farther we are permitted to work un-

(Turn to page 44)


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CLEVELAND MASTER MODELS
"THE MODELS THE MEN IN THE AIR FORCES BUILD"

Substitutes for Radio Control

(Continued from page 42)

der the FCC regulations. There's no telling, just now, where the practical limits may lie. Actually, if we have access to enough wire and the other required equipment, the frequencies down into the audio region look to be worth trying.

One of the advantages of working there is that the radiation problem no longer is important, and we can push about as much power into the transmitting coil as we can get, without fear of having the FCC lightning strike for violation of the regulations. Of course, it does require big equipment for maximum performance.

Just to let you in on a little secret, here is the system we're hoping to get working ourselves. We're trying to figure out a way to make a huge single-turn loop by stringing a wire all around the outer edge of the field where we fly. When we get it up we'll feed it with a thirty-watt audio amplifier driven by a variable-frequency audio oscillator as shown in drawing at head of this article.

The receiver is to be a straightforward two-stage audio amplifier using miniature battery-portable tubes (Fig. 3) feeding a relay tube, which in turn drives an orthodox rotary selector switch and control drives.

It'll be something of a problem to find enough wire for the transmitting loop, but probably by piecing together odds and ends we'll be able to make it. It'll have to be fairly heavy wire—around about No. 14 or so—to handle the current, of course. It would be nice if there were a wire fence on wooden posts around the field; we'd look it over for shorts or grounds, and then it would just about fill the bill. The iron wire would waste a little power in heat, of course, but that wouldn't be too bad. For that matter, it might be easier to secure a proper match to the output of the amplifier than with a corresponding length of copper wire. We'd be using a low-impedance voice-coil output transformer, naturally, to match the low effective impedance of our loop.

However, that's only daydreaming, because we don't have the fence. But we are going to rig up the loop, if we possibly can, and then we're going to find out just what can be done with the audio frequencies in inductive control systems.

relay pulses back via the two "G-string" wires to operate a fast-acting electrical control system installed in the plane. Stabilizer control alone would provide plenty of sport; add throttle control, so that take-offs could be made from a standing start with power zooms and dives and glide landings, and you'd really have

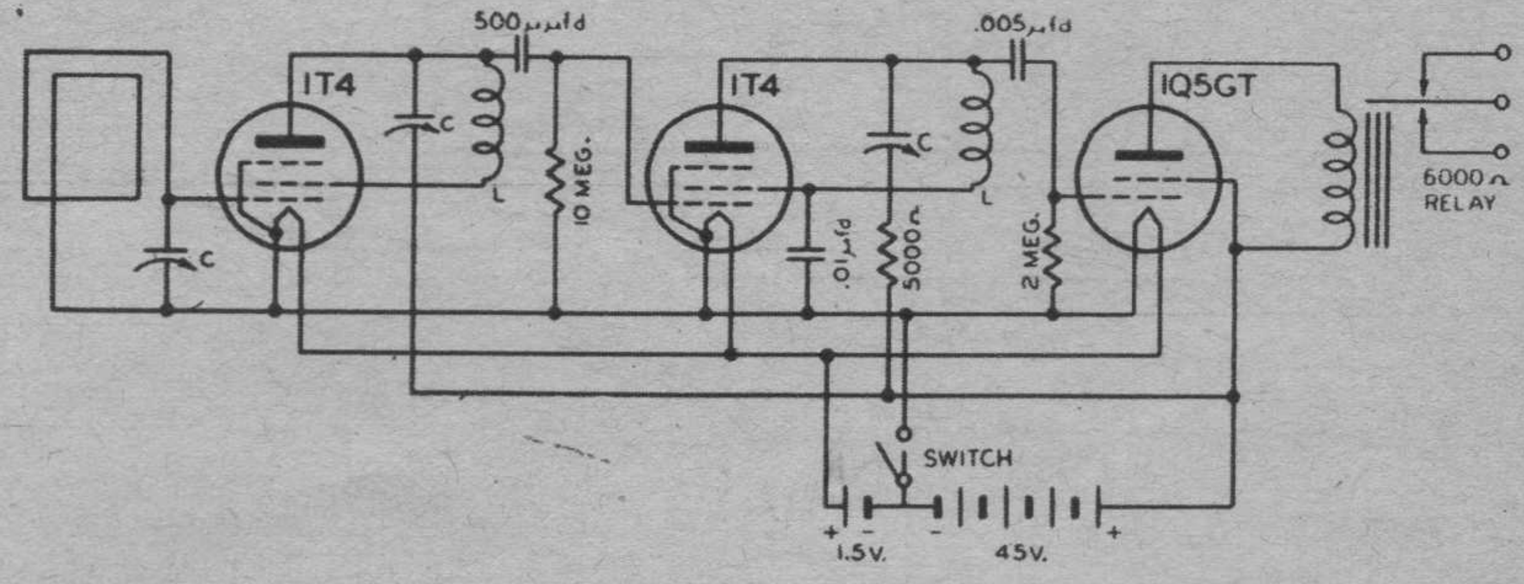

FIG. 4B. R. F. INDUCTION FIELD RECEIVER. C—25-100 μμfd mica trimmers. L—Inductances for frequency in use: 150 KC, 10 millihenries; 100 KC, 25 millihenries; 60 KC, 85 millihenries; 30 KC, 250 millihenries. For loop data see Table I.

And if any of you happen to get around to trying it out before we do, we hope you'll let us know how you fare. Because we might think of something else to try in the meantime. Actually, there are a number of intriguing fields for experimentation along these lines. Light beams, for instance; the business of having an automatic-landing model flying itself down a beam of light from a sharply focused searchlight is a fascinating thought. There are a lot of "invisible control wires" we might learn to use.

Nor do the control wires necessarily have to be invisible. There's an interesting prospect in the development of the U-control principle, too, with electrical control drives operated by pulses transmitted over the tethering wire. Ships of the sort ordinarily flown in this way are usually capable of carrying considerable weight because their high speed permits high-wing loading, and there's no reason why a push button or two on the handle should not be used to something!

All in all, there's a wide range of possibilities. We may be *off* the air, but that doesn't mean we can't get *in* the air this summer with a remote-control model—war or no war.

TABLE I

Frequency (kc.)	Area (sq. ft.)[1]	Turns[2]	μv. in Rec. Loop[3]	Current in Trans. Loop[4]
150	6.25	60	1.7	150
	9.0	55	2.1	125
	14.0	50	2.8	75
100	6.25	110	2.1	300
	9.0	100	2.5	225
	14.0	85	3.4	150
60	6.25	200	2.3	800
	9.0	180	2.7	600
	14.0	150	3.5	400
	14.0	170	4.0	350
30	14.0	200[5]	2.3	2400
	14.0	265[6]	3.1	1750

[1]Computed on basis of square and triangular figures, but applies approximately to other shapes as well.

[2]Based on No. 30 d. c. c. wire, close-wound.

[3]Induced voltage in receiving loop at distance $\lambda/2\pi$, with 15 μv. transmitting field. Actual voltage at grid of first amplifier tube is value shown multiplied by Q of tuned circuit.

[4]Safe maximum permissible to conform with FCC regulations. Read on thermoammeter shown in Fig. 4A. Values shown are in ma.

[5]No. 32 d. c. c.

[6]Two-layer winding.

Fire Goes to Work

(Continued from page 6)

normalizing, in which they are heated up to 1700° F. in huge automatic furnaces and then quenched in a bath of oil. Not only is this infinitely faster, since it takes only about an hour, but it is far more exact.

Since heating and quenching tend to harden steel, it is necessary to soften it again by a process called annealing, which consists of heating again to 1200° F. for one hour and then allowing it to cool slowly in the air. (The temperatures given here are for high-grade nickel steel, and vary somewhat for other materials.)

The part is now soft enough to be machined easily, and as a result of the accurate temperature control possesses the desired toughness to withstand the loads placed upon it in service. Toughness, however, is only one property desired, and in many cases it is necessary to have certain surfaces very hard in order to resist wear, while retaining the toughness of the interior to obtain the strength, for if the part were to be hardened all the way through, it would also be very brittle. To achieve this result, the part is first subjected to a treatment called carburizing.

This may be done in several ways, the most common being to pack the parts in iron boxes with a large quantity of material rich in carbon, such as charcoal, charred leather scraps, and crushed bone. The boxes are then placed in a furnace and heated to about 1700° for several hours, the length of time varying with the depth of the hard skin, or "case," as it is called, desired. After remaining in the furnace for the proper time, the boxes are removed and allowed to cool before the parts are removed. In the aircraft-engine industry particularly, a process called "gas carburizing" is now being widely used, and instead of the parts being packed in boxes with the carbon, a slow process at best, they are placed in containers and a special oil is allowed to drip onto them. As this oil burns it produces large quantities of carbon, but when the parts are removed after cooling, they are quite clean instead of being covered with a thick coat of soot, as in the former process. Whichever method is used, the result is the same, and a large quantity of carbon is absorbed into the surface of the steel. It is this carbon which enables the steel to be hardened. Almost any depth of case can be obtained by simply varying the length of time, but

(Turn to page 46)

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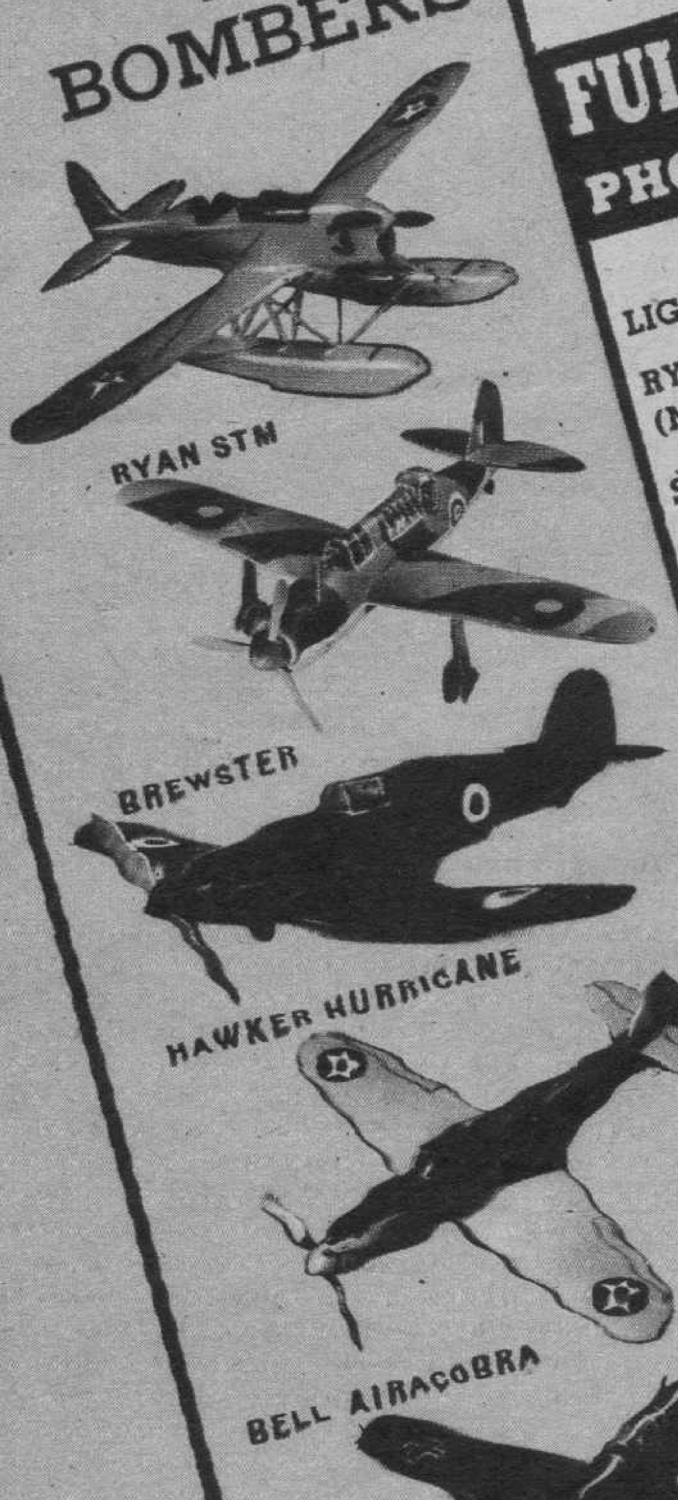

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GLOSTER GAUNTLET	16⅜"	HAWKER HURRICANE	18¼"
AIRCOBRA BELL XP39	18¼"	MESSERSCHMITT BF 109	16¼"
CURTISS HAWK	17¼"	NORTH AMERICAN	20½"
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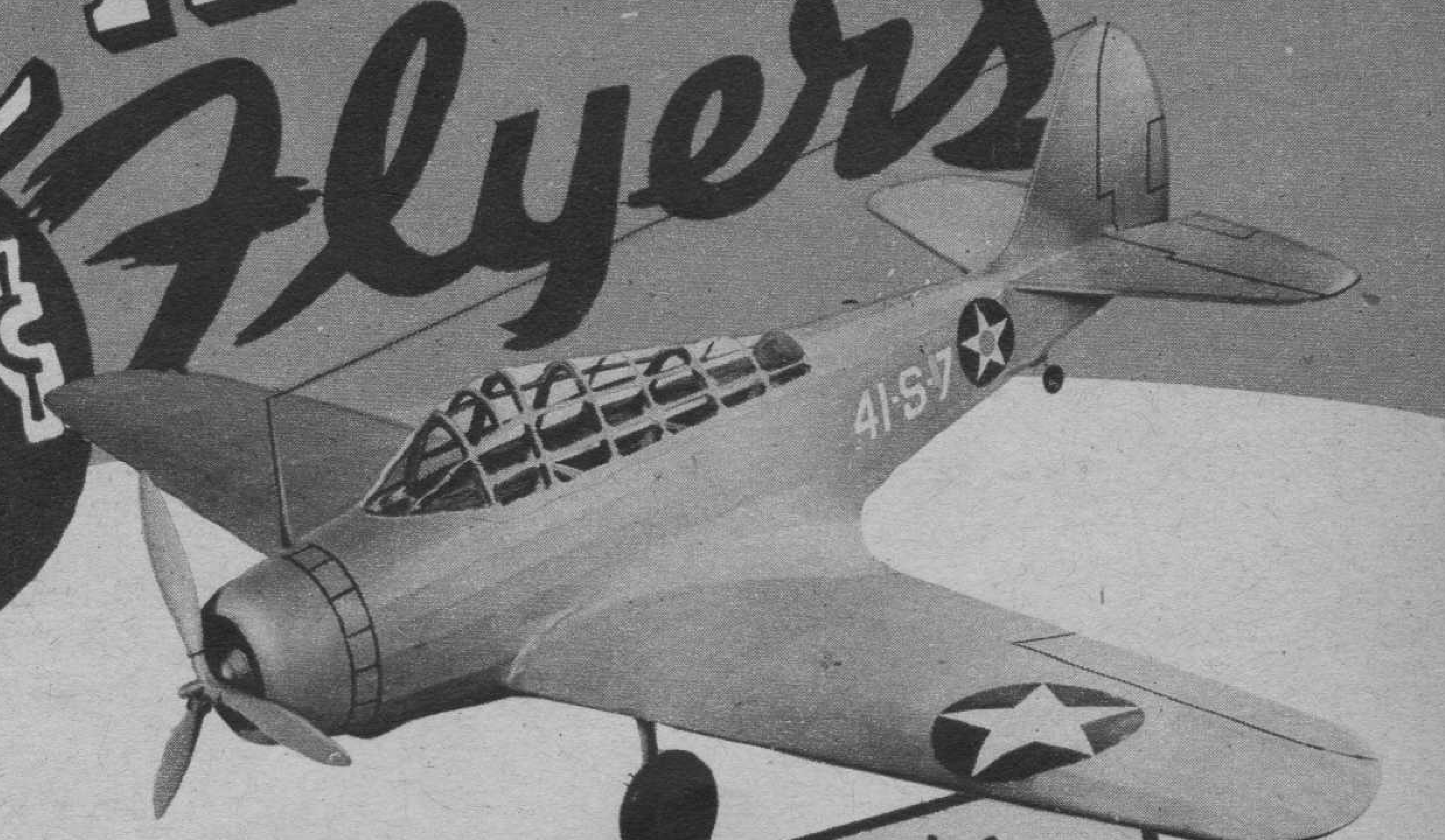

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Fire Goes to Work

(Continued from page 44)

for most purposes the usual depth is about one thirty-second inch and requires four hours.

The carburizing treatment has prepared the steel for hardening, and this step is performed by again heating the parts to about 1500° F. for a quarter of an hour and then quickly plunging them in a bath of oil. This operation is usually performed in large automatic furnaces. A serious drawback in the hardening process is that the presence of air in the furnace will produce a scale on the parts, and this can be removed only by grinding, a costly process and one which, moreover, removes a considerable amount of the valuable case. Again, however, science comes to the rescue, and modern furnaces are so arranged that air is excluded either by means of a curtain of flaming gas or, even better, by filling the furnace with an inert gas such as nitrogen. This prevents the formation of scale and produces better and more accurate work.

When the parts leave the oil-quenching bath, the surface is extremely hard, so hard indeed that it is brittle, and for most purposes useless. A final operation known as "drawing" or "tempering" must therefore be performed. This is similar to the annealing process, and consists of heating the parts to 250° F. for four hours and then allowing them to cool slowly. This reduces the brittleness of the case and brings it to the exact degree of hardness required. The temperature is very carefully controlled, and may be varied to obtain different hardnesses on different parts.

This carburizing and hardening treatment is also commonly known as "case hardening," or "pack hardening."

It does not often happen that a part is required to be carburized and hardened all over; usually this is needed only on certain surfaces, and some way had to be found to confine it to just those particular areas. One way is to machine the part so as to leave an excess amount of metal on those surfaces which are to remain soft. The part is then carburized all over, but before going to the hardening furnace the excess metal is machined off. This removes the carbon, and these surfaces will therefore not be affected by the hardening process. It is usually necessary to anneal the part before this machining is done, and this operation, plus the extra machining, makes the operation somewhat too slow and expensive for general use. The most common method is to give the part a thin coating of copper plate about 0.0005 inch thick, and then to remove this from surfaces to be hardened, either by turning or grinding. This takes very little time, as only a light skimming cut is required. The part is then carburized and hardened in the usual way, but such is the peculiar property of copper plate that the carbon will not pass through it to be absorbed by the steel, and the surfaces protected will therefore not be hardened. When the hardening operation is complete, the parts are placed in a chemical bath to remove the remaining copper, or if desired, this may be done before hardening.

On parts such as gears, frequently the only surfaces to be hardened are the working surfaces of the teeth. In this case the teeth are cut after the copper plating has been done, and their working faces are thus the only parts exposed to the carburizing action.

Certain parts of an engine which are subjected to a great deal of wear require a much higher degree of hardness than can be obtained by carburizing. Chief among these are the cylinder barrels. A special steel known as "nitralloy" is used here, and a special hardening process called "nitriding." To limit this process to the inside cylinder walls, the barrels are first given a coat of tin plate all over, and then this is removed from the inside. The parts are now placed in containers in an electric furnace and heated to 1000° F. The containers are sealed and ammonia gas is fed into them. At this high temperature the ammonia breaks down chemically and liberates nitrogen, and such is the composition of the steel that this gas is absorbed into the metal and renders it extremely hard; so hard, in fact, that it will cut glass in the same manner as a diamond. Just as copper plate stops the carburizing action, so the tin plate stops the nitriding action, and as a result only the interior walls, from which the plate has been removed, are affected by the nitriding action. The process is somewhat slow, requiring thirty hours to produce a "case" thickness of .022 inch, plus an additional ten hours for cooling while still sealed in the containers, but it is well worth the time and trouble, since it is the hardest surface ever commercially produced and is practically immune to wear. After nitriding, it is usual to finish the surface by grinding to remove the top three thousandths of an inch which is slightly spongy, and thus to expose the hardest portion.

For different materials and different purposes, different processes are used. Thus, tool steel is hardened all through by heating and quenching, aluminum and magnesium are toughened by heating in huge ovens and cooling slowly in air, but whatever the process, heat, controlled heat, does the job, and every day skilled metallurgists are developing new ideas to produce stronger and harder steels.

Junior Air Reserve

(Continued from page 25)

command operates on a city-wide basis with the active co-operation of the American Legion, Rotary Club, Women's Club and, of course, the Lodwick Academy.

For the outset, JAR officials have decided, after much conferring and head nodding and so on, that the official Reserve uniform will consist of a cadet cap. Cadets will be encouraged to complete their uniforms with khaki shirts and trousers, or slacks, or coveralls. The official cap is a good-looking khaki affair available in three sizes and bearing the emblem of the Reserve in blue and gold.

You'll be interested in knowing that Reserve headquarters has prepared a series of training bulletins, or directives, as the army designates such materials. We like to consider them "work sheets." The idea is to provide inexpensive, authentic material on model-plane building and flying, along with related matter on aerodynamics and aviation in general.

CREED OF THE JUNIOR AIRMAN

By Gill Robb Wilson, President, National Aeronautic Association

I believe in aviation for myself, for my country and for humanity.

I believe the opportunities in aviation will offer me a career, the power of aviation will protect my nation, and the facilities of aviation will provide a way for better understanding among the people of the earth.

As evidence of my faith and to achieve these objectives, I pledge myself as a member of the Junior Air Reserves of the National Aeronautic Association of the United States of America to develop in myself the qualities which have been proven to be necessary to an airman.

JUDGMENT is the FIRST requirement of the airman. I will think before I speak, and plan before I act.

KNOWLEDGE is the SECOND requirement of the airman. I will be intrusted with the lives of others, so I shall feel a moral responsibility to know all that is within my power to learn.

DISCIPLINE is the THIRD requirement of the airman. I will develop in myself the ability to respond instantly to a proper order and to disdain excuses.

CONCENTRATION is the FOURTH requirement of the airman. I will practice self-control until I have learned to shut out fear, temper, indecision and carelessness.

CO-ORDINATION is the FIFTH requirement of the airman. I will practice those exercises which teach my body to instantly obey the decisions of my mind.

HEALTH is the SIXTH requirement of the airman. I will seek to develop a sound mind in a tough body.

HUMILITY is the SEVENTH requirement of the airman. I will keep an open mind, always eager to learn and to appreciate the experience of others.

Ask Balsa Butch

Model builders' questions answered here or by mail; inclose stamp to insure reply.

C. W. M., Columbus Junction, Ia.—Thanks to the Answer Man and my friend, Bill Winter, I have been asked to solve your riddle. Well, Clarence, that has caused more controversy than any question I have ever heard. For example ninety percent of fin jobs (including the Pacer, which is a fin job in outline) turn right under power. The Pacer is perhaps the right-turningest ship in the country in this respect. Zipper designs usually fly straight with a slight right turn. It is believed that the length of nose moment has some effect—witness the fact that nearly all replica (looking like big plane) models turn left under power and have a relatively long nose moment. Sal Taibi found that his Pacer turned less to the right with a longer nose moment. That would indicate that the CLA had moved farther front. In other words, if the CLA is about on the thrust line and one third the chord behind the trailing edge (as on the Pacer) the ship will turn right. The question has never been answered satisfactorily and we've even asked the model and aëronautic experts. Sorry, fella.

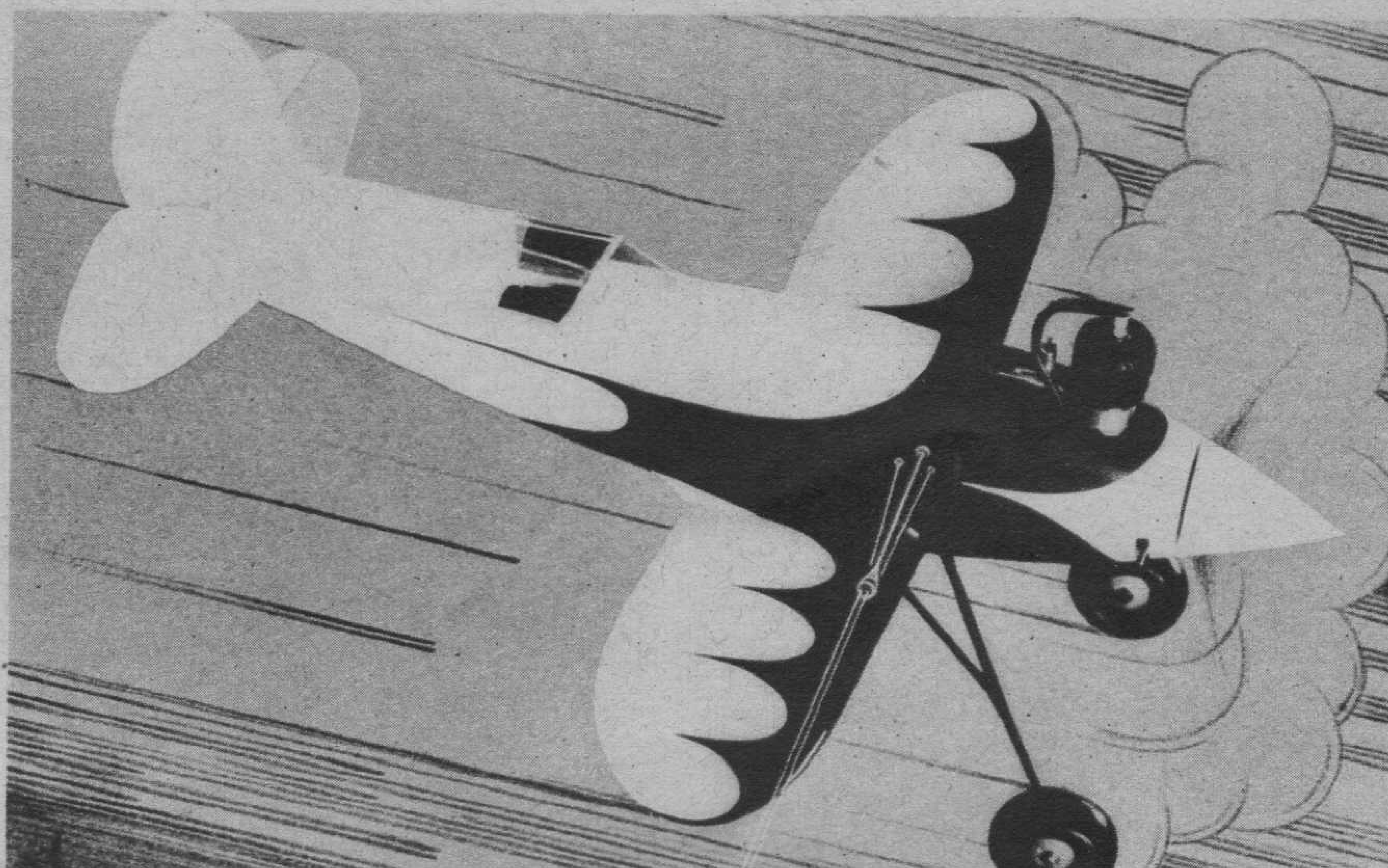
Frank Gothaf, Newton Falls, Ohio.—The plane you saw in Air Trails (the amphibian) was built from kit and plans published by Burkard Model Engineering Co., Larchmont, N. Y. We suggest you write them for details.

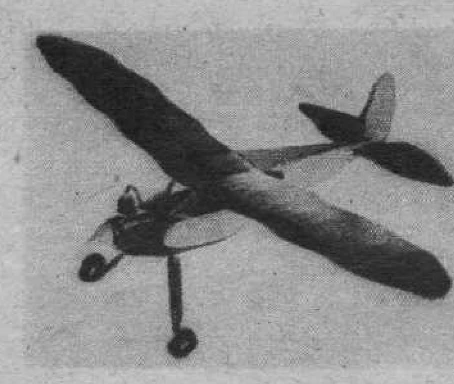
Tom Berg, Leetonia, Ohio.—The Cleveland Viking is not particularly hard to build if you have built several rubber-powered models previously. Cleveland plans are always especially clean and explanatory, and if you take your time and read instructions carefully you shouldn't have much trouble.

Ralph Dykstra, Detroit, Mich.—The size of twin rudders is still largely a matter of experiment. We would advise making each rudder one third the area of the original single rudder. A few tries and you should find the answer.

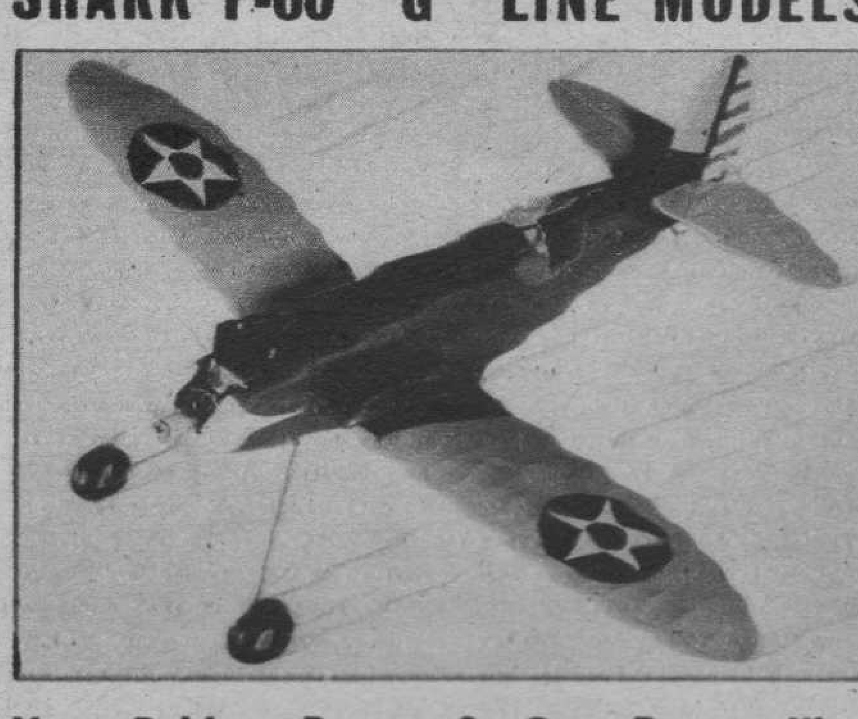
Ralph Moll, Wamego, Kans.—The Nomad is a Class C gas model, the Request a Class A or B gas model, the Sportster a Class C or B gas model. Write to Megow for plans of the Class C Super Zombie. The best piston for a Brown motor is a cast-iron lapped piston. Electroplating of a steel piston has been done, but not with great success. Usually the job doesn't last very long, either. One of the best ways of "suping" up a Brown is to send it to Junior Motors, Inc., Philadelphia, Pa., and have it put in A-1 condition, specifying that you want either a lapped cast-iron or steel piston. They do a swell job, and their results are guaranteed.

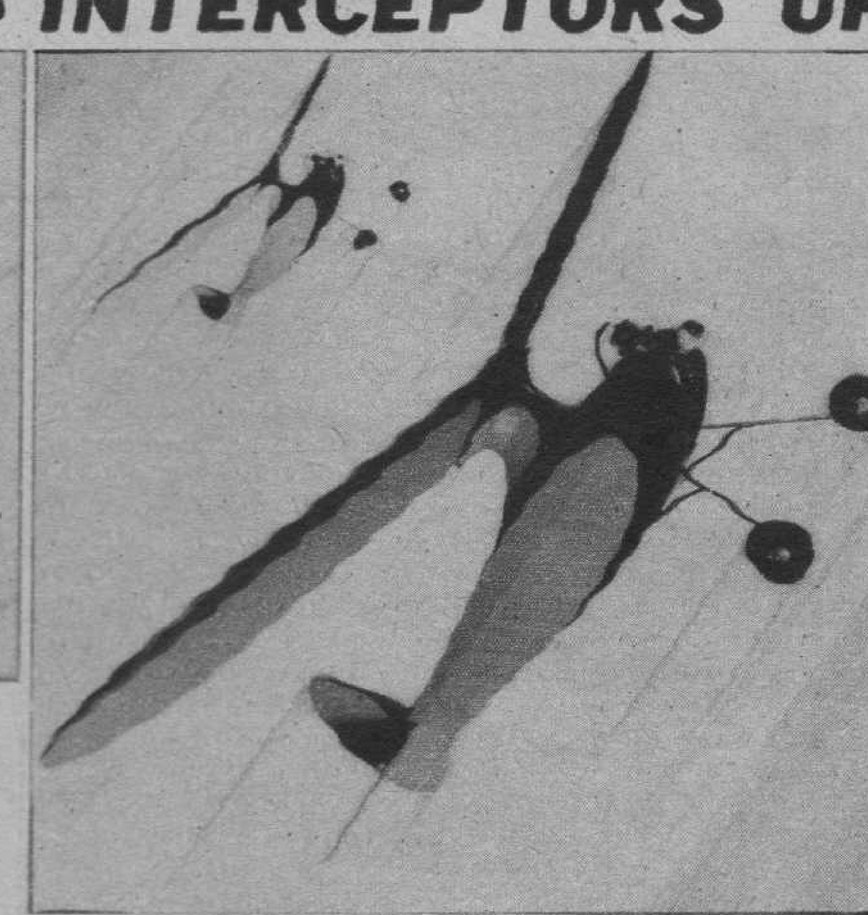
J. H., Inkster, Mich.—Whoosh, John, you're about the most ambitious question asker we've met yet. However, we'll try to answer your questions as briefly and as completely as possible. 1. The ignition system of a model motor can best be learned by consulting almost any gas-model plan published in Air Trails. For the sake of simplicity we might describe it thusly: the points of the motor are connected to one side of the coil; the other side of the coil goes to the flight timer; the other side of the flight timer to one battery connection. The other battery connection goes to the ground, which is the crankcase of the motor. A condenser goes from the motor points to the ground. The high-tension lead goes to the spark plug. 2. After a model is covered, spray it with water and place it in a dry place. When thoroughly dry, apply dope with a good-quality camel's hair brush, preferably one about one half or three quarter inches wide. This first coat should be rather thin. After drying, use very fine (10/0) sandpaper and sand any rough spots. Dope again and resand. Then color dope may be applied. 3. Sand your all-balsa covered model very carefully, then dope as described above. A finish coat of clear lacquer would give added high finish. 4. The P-30 is an excellent motor. We've used one and we know. 5. A model motor is usually started on external batteries, which are most always two dry cells. The booster plug enables the flier to connect the boosters for starting, then disconnect them and use the inside batteries for flying. 6. How to start a motor? In theory the process is this: connect the booster batteries, open the needle valve about three turns, place a finger over the intake (venturi) behind the motor, and flip the propeller sharply counterclockwise (to the left). Close the needle valve (turn it to the right) until it is only about two turns open. Then flip the motor sharply until it fires. If it doesn't fire, rechoke it, flip it until it does. When it starts, gradually close the needle valve until it is running smoothly. Then advance the spark until maximum power is obtained. 7. The ignition system (complete) consists of a spark coil, condenser, flight timer, battery box, batteries and booster connections. 8. The pitch of a propeller is an indication of the distance forward the propeller would travel in one revolution if the propeller were revolving in a solid medium. A high-pitch propeller theoretically gets more thrust for each revolution. Some modelers use low-pitch propellers because they wish their motor to reach its maximum r. p. m. and greatest efficiency, which it could not do with a high-pitch prop. 9. Most any model house can sell a "large supply" of wood. We might suggest





Class "A" & "B"	
Ohlsson "19"	$14.50
Ohlsson "23"	$16.50
Super Atom	$15.50
Class "C"	
Ohlsson "60" Special	$18.50
Bunch Tiger Aero	$18.50
Rogers "35"	$14.50





any concern among our advertisers. They are all reliable. 10. Do you mean model motor cars or model planes? If the latter, we suggest you contact American Junior Aircraft Co., Portland, Ore., or Victor Stanzel & Co., Schulenburg, Tex. 11. Consult any model dealer for questions concerning the dope supply. Also for model air wheels. 12. Gas tanks have been successfully made of celluloid. We never have heard of a plywood tank and can't see any advantage in one. 13. Consult your dealer for sizes of wood, or read our advertisers. 14. We believe the Baby Shark kit contains all information and all essentials for flying the model.

R. F., Massilon, Ohio—You bet the moisture will affect the dope and general modeling. We had the same trouble only last week and finally took our projects to the semidry air of the living room and finished them there. You see, model dopes absorb moisture as they dry, which causes "blush" and makes covering sag. Better move all your materials to drier ground. Once balsawood is wet it has a tendency to warp. For glider polish we suggest you write to Cleveland Model & Supply Co. The Davis airfoils worked out swell on models, although have you noticed how much some of them resembled the NACA 6409? We used a Davis foil on a Simplex and it improved the glide a great deal over the specified Clark Y wing.

J. B., Manhasset, N. Y.—For info on radio control write Radio Control Headquarters, P. O. Box 214, Deal, N. J. Their new bulletin costs 25 cents. Most model motors work best on 70 octane gas. That includes Ohlssons.

M. T., Anniston, Ala.—Peerless Models used to put out a Waco model, but we haven't seen this concern listed for some time. Otherwise, we don't know where you could get the ship.

A. F., Newport, R. I.—You may obtain the 1942 issues of Air Trails and possibly the 1941 issue of *Air Progress* by writing to the Circulation Department, Street & Smith Publications, 79 Seventh Avenue, New York, inclosing the original magazine price for each one. A majority of the planes you note are experimental models or models built for overseas shipment. The P-41 and P-44 were Republic designs. The P-48 was the Vultee made for export to England. Since general data is restricted on these ships, we can't help you much.

R. A., Scarsdale, N. Y.—There's a better formula for lift, Dick, which is more generally applicable to model foils.

$$L = (.002)\ \frac{3Hu \text{ plus } Hb}{4C}\ A.V.^2\ \frac{3 \text{ plus } I}{6}$$

where Hu is the maximum height of the upper surface curve; Hb is the maximum height of the lower surface relative to the chord line; C is the chord of the section and A is the area of the wing in square inches, V the velocity through the air in miles per hour, and I the angle of incidence of the wing. L then equals the lift of the wing in ounces. If the numerical value of the camber factor is known it may be substituted for the quantity: $\frac{3Hu \text{ plus } Hb}{4C}$ The other formula is a trifle tough to use, especially at model speeds. You may obtain airfoil coefficient charts by writing to NACA, Langley Field, Hampton Roads, Va. A good rubber lube may be made of equal parts of tincture of green soap and glycerin. Did you read Dick Korda's article on rubber in the June issue?

W. B., New York City.—Sorry, Walt, the plans for the Eaglet were exhausted years ago. It was a sweet little ship, though, and we don't blame you for wanting to make a model of it.

E. C. B., San Antonio, Tex.—Pilots tell us that the curved tube is used when air speeds are high and the curve effectually breaks the pressure and makes the air-speed indicator more accurate. Too much speed would increase the pressure (using a straight tube) and be hard to calibrate. Balloon busting with a G-line model is more or less of a stunt, and the method varies with the designer. Usually they use a pin on the wing tip to break the balloon.

W. R., Jr., Lawton, Mich.—Our experts strongly advise using .018 wire for control lines. However, judging by the size of your 7½-foot Luscombe, we strongly advise having some substantial citizen hold you down while flying. The 52'6" circle is arbitrary and you could increase it without harm. However, remember the larger the circle the greater the centrifugal force. Berkeley Models, Inc., 230 Steuben Street, Brooklyn, N. Y., sells control line. We strongly advise joining AMA. The organization can give you much information on forming a club if you wish it.

J. S., Worcester, Mass.—One of the best books on models generally, and one which contains much data on controls, is "The Model Aircraft Handbook," by William Winter, published by T. Y. Crowell Co., 432 Fifth Avenue, New York City.

P. F., Jr., Forest City, Ark.—Thanks for your interesting letter, Paul. Those scaled-down jobs should work swell. We had a seventy-five-percent Buzzard with an OK 49 which was a fine performer. We realize that things have "slowed up" since the war started, but a good modeler never lets a little thing like a war get him down. As for the plane that spins in—that isn't anything new. Many times a wing will shift, or adjustments will be lost due to a stray puff of wind. Even "Shulman the Mighty" had that trouble with his Zombie, but on a succeeding flight it didn't happen. One of the best ways to avoid it is to put keys on the wings to keep wings and tails in place and to prevent adjustments from coming out. If incidences are used, cement them in place.

J. C. S., Summit, N. J.—Usually you make a single-blade prop about the same size as a two-blader. Theory is that it delivers more thrust than a two-blade because one blade revolves in less-disturbed air. A single-blade prop is easier to make, folds easier, and the folded blade offers less drag. On that Neptune you'd better use a 10" prop with a large blade area—such as a Modelcraft. Three-bladers are usually inefficient and complicated to make.

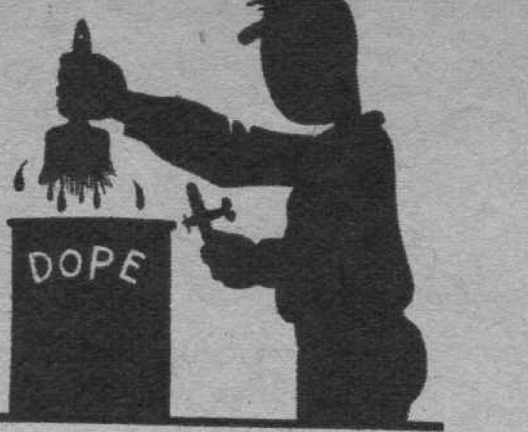
B. B., Toledo, Ohio.—The Marvin should be just about right for the Class A Buzzard or a Baby Playboy. It would meet AMA requirements, which are based upon motor used and not upon the size of the ship. Your rubber job would be rather small and might take an Atom—in which case it would be a Class A ship.

What About Rules?

(Continued from page 34)

the average fellow a chance to win. Of course, speed within reason is O. K. Wing and power-loading restrictions come first. After that a handicap based on displacement would be a pleasant novelty; would frustrate the powerhouse boys. There must be dozens of other worth-while possibilities. It has never been the policy of this magazine to lobby for its idea of rules, but we do hope the future of control-line flying will be safeguarded before it is too late. The Academy of Model Aeronautics, quite justly, has ducked the issue to date. Speed rules alone are not enough. We suggest that every interested reader who wants to see rules for control-line flying write the Academy of Model Aeronautics, 718 Jackson Place, Washington, D. C., NOW! Be sure to include any constructive suggestions from your own experience.

Next Month—Flying scale gas model of Monocoupe 90-AF



The Dope Can

BY GORDON S. LIGHT

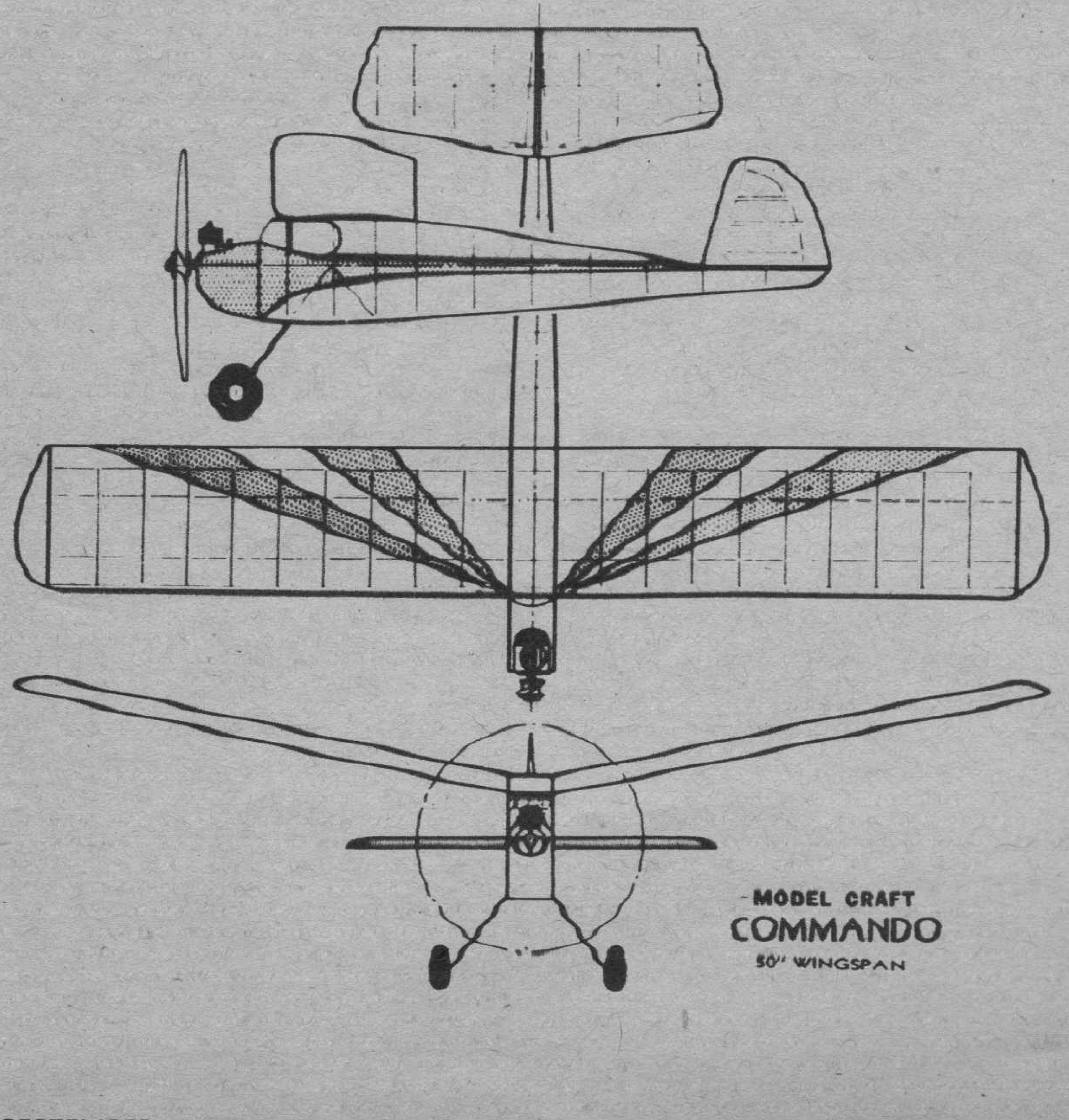
THE Scripps-Howard Junior National Air Races have joined our 15th Annual Nationals and the Canadian Nationals as casualties of war-time restrictions. The event had been scheduled for September 5th, 6th and 7th in Pittsburgh. Since 1934, this had been a regular event, attracting a field of top-notch builders.

Bob Sommers is in the navy as Lt. (J. G.) serving as naval flight instructor at Corpus Christi, Texas. Bob has attended most of the Nationals—bringing the St. Louis delegation with him. He's director of the Stix, Baer & Fuller model airplane club and buyer in the toy department. He's largely responsible for the success of the Mississippi Valley Meet—one of late summer's big sectional meets held in St. Louis.

Henry Cole, Jr., of Tacoma, Wash., built a stick model with a carefully plotted and accurately built Davis No. 4 airfoil. After one short test hop the motor was wound to near maximum for an official flight in a Northwest AMA-sanctioned meet. The model climbed quite high and soared out of sight to place first in the stick event and set a new AMA Northwest record. Now the problem is whether the Davis airfoil is extremely hot stuff or did Cole just happen to stumble into a lucky current which the other models couldn't hit?

The Third Annual Fresno West Coast Championship was held May 31st—sponsored by the Fresno Exchange Club and the Fresno Gas Model Association. Identical prizes were offered in each of the three events, Class A, B, and C. First place a $50 bond, second a $25 bond, and third, $10 in cash, in addition to trophies and merchandise to about the first twenty-five places in each event. Weather conditions were good, the field was rough and many ships cracked up during take-off or landing. The worst was the dive-bomber type crash of Grace Robison (East Bay Aeroneers) which buried the motor eight inches in the ground. Ted Gillette of Los Angeles took Class A with 1060 seconds, and Class B with 986 seconds; Dick Diel of Oakland did 2433 in winning Class C. (Last year's AMA rules were used, and the flight times are the total of three official flights.) Edward Marbut of Fresno won a trophy for the longest single flight of 1580 seconds. Much of the credit for a smooth-running meet goes to Major J. C. Doherty of Hammer Field and his staff of technical sergeants who served as timers. The boys pooled their cars and managed to get to the meet from all parts of the State. The East Bay Aeroneers of Oakland turned out practically one hundred percent. Most of them were flying Westerners—which should give Designer Don Foote a great deal of satisfaction. They've developed a dethermalizer that releases a small parachute from the middle of the ship which is fastened to the tail and lifts it about eight degrees to snap the model out of a thermal. Arle Armstrong managed the meet, Dr. Earl Coleman of Fresno State College was head timer, and Dick Wood of Bakersfield was contest director. And most important were the ladies. Frances Gruenwald, Miriam Winter, Hazel Randall, Ruth Armstrong, Mrs. James, Patricia Gruenwald and Gwen Randall were hot and exhausted by the end of the day—but come time for the next meet, the ladies will be right in there again.

Robert Dunham was high-point



MODEL CRAFT
COMMANDO
50" WINGSPAN

winner at the Third Tulsa (Oklahoma) Contest last May. He won Class C gas, second in senior stick, third in Class B gas and senior fuselage. Dunham is from Tulsa, and that didn't please the Kansas City (Missouri) boys. For some while these two cities have been feuding in a model sort of way. Results of the Tulsa contest still left the issue in doubt as to ability—both Tulsa and the K. C. boys interpreted the results as a victory for their side. Prior to the meet, K. C. boys bragged that gas was their specialty. Tulsans favored rubber. Neither did very much good in their favorite events. Frank Lilly of the Winged Motors Club (K. C.) can't explain why they didn't win any more gas awards. They used all their luck in the rubber events. Tulsa doesn't think much of the excuse that WMC lost sixty percent of their club members—"what city hasn't?" was Dunham's reply.

Baltimore Model Airplane Association Fifth Annual Gas Model Meet was held during July. AMA rules were used. Prizes hit a new high of $350. Entry fee was thirty-five cents for each event. Flying was done at Modelhaven—a very attractive spot twelve miles outside the city devoted exclusively to model flying.

H. Parnell Schoenky of Kirkwood, Missouri, tells the sad story of Dick Siever's (Kirkwood Thermaleers Model Club) Stout Trophy Winner built from March, 1941, Air Trails plans. The ship performed well indeed, considering its short life of one day. Dick finished it just in time for last year's summer rubber meet. After testing the ship all afternoon, he finally turned in three official flights totaling 4:56 (all after six o'clock) and won first place. The sad part begins with the landing after the third flight. The ship came down smack-dab in the middle of a hog farm. Before Dick could rescue it, the porkers were at it. There was munching and crunching of balsa and tissue. Dick waded bravely into the churning mass of piggery and after much kicking and pummeling of the pigs, emerged with hands full of rubber and a few scraps of orange tissue. He was practically inconsolable. The near-hysterical laughter on the part of the boys watching him didn't help either.

High School Air Force

(Continued from page 22)

"It will be up to each individual school to decide whether it wishes to become an ATCA squadron. If it elects to join ATCA, as many of its preflight students as wish will be uniformed, and the prescribed military program begun."

The ATCA is working in close cooperation with the Civil Aeronautics Administration, the Office of Education and the army. In fact, Col. S. J. Donovan, AAF, has been assigned to work with the ATCA on all its problems.

Experience in England and Canada has shown that such a training program is saving the best part of a year in preparing airmen for duty. Also, it has materially reduced training accidents.

The government's sanction is best expressed by an extract from a letter by Robert A. Lovett, assistant secretary of war for air: "The army air forces have long been of the opinion that preflight training must become a part of our national system of education. . . . We will give the enterprise all the assistance we can."

The ATCA is not just a project. Active, uniformed groups are already getting training in selected schools, with many more units in the process of being formed. Everyone interested—and that should mean every civic group—may write to Air Training Corps of America, 285 Madison Avenue, New York, N. Y.

The real objectives of the ATCA—and, in fact, of all agencies interested in the preaviation cadet training programs—has been well expressed by Dr. Ben Wood, the director of collegiate educational research in Columbia College:

"It has become increasingly evident that this country is sorely in need of young, well-trained men to man the 185,000 airplanes which will have come off our assembly lines by the end of next year and which will continue to be produced in ever-increasing numbers before this war is won. That these men must be young already has been proven by the experience of Germany and England. It is clear that it is the sacred duty of our military authorities and us educators to make sure that these young men are well trained. Fliers so well trained through early education that they can operate planes instinctively—as you would run a motorcar or ride a bicycle—are fliers who will help maintain democratic ideals and come through the ordeal with the best chances of being unharmed.

"If the war is prolonged, these boys of today will be the men in the final victories. Should the war not last as long as many of us fear, then these ATCA boys will have a valuable training in one of peace time's most important industries—aviation.

"Thousands of patriotic young men are volunteers daily for our air forces. We are not confronted with any problem in obtaining personnel, but we must see to it that the training required is thorough enough and started at an early age in justice to those boys facing an uncertain future."

Boomerang

(Continued from page 26)

time saver as well as the best way to get the two sides alike. When they are dry remove from the plan and insert the crosspieces in their proper places; it is best to cement the joints well before bringing the top longerons together. The plywood bulkhead is now added. Bend the landing to shape and bolt in place. The motor bearers are now cemented to the lower longerons. To this add the cowl blocks, which are cemented to the ship lightly till shaped to the way shown on the plan and then removed and hollowed out to 3/8" wall thickness and then cemented back in shape securely to the motor bearers and the bulkhead. The fuselage is now planked and the formers added to the bottom of the ship, after which the stringers can be cemented to them. Add the ignition to the ship and don't do a poor job on the wiring or you will have a handful of trouble in getting the motor running the way you like. The door for the second timer which works the timer is installed and the timer is located as shown on the plan. Add the rest for the stabilizer and the sub-rudder. The whole ship is then sanded in order to remove any rough spots that may be there.

Start the wing by cutting out the number of ribs that are required, together with the spars and the tapered trailing edges. Lay down the spars along with the trailing edges and cement in the ribs. Add the tips and when dry remove and add the gussets. This is how the panels are joined together. This ship is capable of flying any motor up to .30, but the leading edge of the wing should be sheeted when sizes after .23 are used. Sand the whole wing so as to get a smooth covering, but after this is done the whole wing should be recemented in order to prevent it from warping when the wing covering is being doped.

The stabilizer is made as most stabilizers except that the top tip portions are built separate from the rest—that is, the top section. Lay out the spars and assemble in the usual manner and after this add the tip parts. They can be cemented to the main portion of the stabilizer and after that they can be cut off; in this way they will fit perfectly. Add the tubing that the wire slides through. The rudders can now be hinged to the stabilizer; this is done with the wire-and-tube method. The eyelets are now cemented to the tips.

The rudder is made in the same way as any other. It is cemented to the stabilizer after the stabilizer is covered. Be sure that the rudder is cemented straight, as this is important.

The ship can now be covered with whatever you like to use. Water-dope the ship to tighten the covering, and after that dope with clear dope. The ship can be trimmed with colored dope.

Flying the ship is the best part of the whole job, and yet the ship can be wrecked if good judgment is not used. When flying a new ship it is best to test in calm weather. Set the inner timer about a minute longer than the flight timer, as this will bring the ship heading back into the wind. Now the ship is apt to make large circles before the rudders go into effect, for if the circles are too sharp the ship will still turn in the glide, unless the wind is real strong. After a few test flights the ship will be like its namesake. So here you are, a Boomerang designed to give good flights and still not get lost. It is of no value in a dead calm, as it will glide straight and that's bad, so if you want a real stay-at-home ship, well, throw in a pair of spoilers for the calm days. (I never had the luck to fly in that kind of weather.)

Take My Experiences

(Continued from page 35)

use enough to start with and decrease until ideal amount is found.

We do not warp wings as we do not find it necessary. However, we do feel that tether ships perform better if flown in a right circle, or clockwise, because the torque works for you instead of against you. Several degrees of left thrust may be used but this is not absolutely necessary.

The wing fairing is built up solid of soft balsa pieces and sanded to shape. Our ship is covered with silk, but paper, of course, could be used equally well. Since weight is not of vital importance in this kind of flying, we suggest plenty of dope be used to produce a fine finish. We use about two coats of clear and three of color.

Landing gears, to be practical, cannot be to scale. The ones shown are highly satisfactory and we strongly advise them. Note the forward position of the wheels. This helps eliminate nose-overs on sloppy landings or rough ground.

It is, of course, possible to use lighter wood in many places in this ship, but the fact must be considered that this type of ship presents different problems, inasmuch as it is adapted for this type of flying. It will roll on the ground for ten to twenty feet before taking off, and when the power cuts, it naturally comes in fast, even though it is very easy to make perfect landings consistently. Since crashes are practically eliminated in this kind of flying, the stronger you can build the longer you can fly. If you build a ship from undersized wood it simply will not stand up for long. We have tried this and know it to be true. If a ship of this type is flown at a weight of four pounds it will naturally be much more stable than if the weight was three pounds.

We do not believe in hand launching. We feel that ROG is safer and far more thrilling. The touch of flying this type of ship can be gained only through constant practice and careful thought. I have never seen anyone who could learn it in a day. Maintaining level flight ten feet off the ground should be thoroughly

Photo Credit List

The following list shows the sources from which credited photos were obtained. Abbreviations: Bot., bottom; T., top; U.L., upper left; U.R., upper right; L.C., left center, R.C., right center; L.L., lower left; L.R., lower right; Cen., center; T.C., top center; B.C., bottom center.

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mastered before any attempt is made at acrobatics.

The line carrier should extend about one half inch forward from the leading edge of the wing. The position indicated on the drawing is correct. Slots must be built into the side of the fuselage so that the steel or bronze cables clear them completely. No drag or friction can be permitted. Cables, of course, must clear the upper surface of the wing between the line carrier and the fuselage. We strongly advise using small fishing-leader snaps, tied to the ends of the control line. They can readily be connected to the loops in the steel fishing leaders. The fishing leaders must be long enough to pass well through the line carrier.

The control line we use is simply an inexpensive enameled cotton fly line, fourteen-pound test. This kind of line has very little stretch and we highly advise its use. We much prefer it to steel wire for several reasons. It does not kink and break and is easier to handle in every way.

Our control stick is simplicity itself. The line passes through the holes and is secured by the pegs. The line is wound around stick lengthwise when in tool box. When flying, the stick is always placed on the ground with blue end to the tail of the ship. When stick is picked up, the blue end is always to the sky or on top. This simple arrangement eliminates all danger of mistakes in handling the stick. Lines are adjusted for length so that stick is vertical when elevator is at zero.

It is important to locate center or base bolt of control arm at balance point of ship and on the center of gravity. Ship should balance at point indicated on drawing.

The spinner is secured to the crankshaft by using a prop not long enough to extend one quarter inch beyond the end of the crankshaft when pulled down against prop. A ¼" x 27 bolt of proper length passes through spinner and is secured into end of prop nut. Spinner can be shimmed up as is needed with one-quarter-inch washers. This method works very well but it does require the use of a special long prop nut. The Bunch Tiger Aero prop nut can be used. The plug in the end of the spinner, of course, hides the end of the spinner bolt.

I might add in conclusion that the speed of this ship is about 70 m. p. h. Its flying characteristics are very fine and for stability I have never seen its equal. Spot landings are easy and we have done nearly everything in the way of maneuvers without a single serious crash. It is a conservative estimate that a ship like this could be flown hundreds of times without any damage whatsoever. Naturally, a perfect flying field must be available. Our model is nearing the 1,000-flight mark.

Mr. Requarth and I are so sold on control-line flying that we would never consider building any free-flying models again. We feel that control-line flying is the coming thing and once the technique is mastered interest in free flying will vanish.

(The following letter received from Dick Korda may interest control-line fans.—Editor.)

"I've been so busy finishing my Hornet-powered U-control that I forgot about that last contest.

"Class C U-control was won by Melvin Orr, of Saginaw, Michigan, with 85 3/10 m. p. h., using a Tiger Shark powered by a Hornet. These are the same engines that hold the race-car record of 110 m. p. h. I'll bet the boys beat that time with their planes by the end of summer. These engines will do over 17,000 r. p. m. with a flywheel.

"Melvin Orr's plane weighed 4¼ lbs., had less than 24" span and went like blazes—I saw it in Findlay, Ohio, when he took first with 81 m. p. h.

"Bob Reich won Class B with 59½ m. p. h., nosing out his brother George who got second—57¾. But George's time was the first flight of a brand-new ship and was a little erratic. He should do over 60. This was the American Airlines contest, so you probably heard the results from them.

"The Hornet-powered ships take quite a beating and the fellows are turning to almost complete plywood ships in order to stand the gaff. They use .010 piano wire to fly up to Class B and .015 for Hornets, 52½-ft.-radius circle up to Class B and 78¾-ft. radius on Hornets. There's only one way to appreciate the way these ships go with Hornets and that's to watch a contest.

"When we say 85 m. p. h., it's within—or a *couple* of miles—not the 85 or 90 that some fellows are *doing* with '23'-powered Fireballs. We time the ships over a certain diameter circle with *three* judges (robbers) checking each flight, and average the three for the time. Since the rules do not specify taking off, most of the new ships have no landing gear at all—Melvin Orr's, weighing 4¼ lbs., has gotten off in less than fifteen feet each time I saw it fly, which will give you an idea of the power these Hornets have—but are hand-launched."

Weather, Front and Center!

(Continued from page 24)

All right, then, let's go on.

The earth is receiving heat continuously, even though unevenly, from the sun. Now it can't keep all that heat, otherwise the climates everywhere would be increasing all the time, and we know that isn't true. So it gives up just as much heat as it receives, and the study of this process is known as the "heat balance of the atmosphere."

But here's the point. The atmosphere surrounding the earth lets the sun's radiated heat pass through to the earth without accepting any of it—at least, not enough to worry about. Yet, when the earth starts to give back the heat that it has received from the sun, a change has taken place. By some process the character of the radiation from the earth has changed, and the atmosphere doesn't let it pass through, but instead absorbs it. And that's why the temperature of the air, as well as that of the earth, is warmest at the equator and coldest at the poles. Furthermore, since the atmosphere gets nearly all its heat by absorbing the radiation from the earth, the degree of heat, as measured by temperature, is highest close to the ground and lowers steadily as the distance from the ground is increased.

Now we have some very basic facts with regard to temperature, so next we are going to consider the effect of temperature on the weight of the air. Without investigating why, hot air is light, and cold air is heavy. Ever been at a country fair and seen a hot-air balloon ascension? (Or is that too age-revealing?) Anyway, hot air, if surrounded by cold air, will rise through the cold air and allow the latter to take over the spot which is vacated. Thus a circulation, or wind, is established, blowing into the spot where the hot air rose.

In the same way, the hot air over the equator tends to rise, with the colder air to the north blowing into the vacated area. However, it isn't as simple as all that, because the way the earth spins around its axis, giving us our day and night, also has an effect on this attempted circulation.

Certain parts of the tropical zone near the equator will get more heat than others, and certain parts of the colder areas to the north will also receive an uneven amount of heat as compared with other areas at approximately the same latitude. So, we not only have a tendency for air to blow from pole to equator, but also, since there is uneven heating even at the same latitudes, there will be currents of air attempting to equalize this inequality. Then, finally there is the peculiar fact that as soon as air tries to blow from one of the areas of more dense air into the area of less density, the rotation of the earth deflects it. This deflection takes place in such a manner that no matter in what direction the air may start to blow, in the northern hemisphere it will be deflected to the right. Thus, the air blows spirally outward from the high pressure, or high-density areas, and spirally inward toward the low-pressure areas.

With all of these influences acting upon the air as it starts to move, the result is an irregular pattern of flow in which some of the air blows as it should, from colder to warmer areas, but there is a belt around the earth where the flow of air is apparently opposed to a normal type of action. If we could get off somewhere in space and look at the circulation of air around the earth, its general pattern in the northern hemisphere

would look something like the drawing at the head of this article.

Notice that about a third of the way down from the pole there is an area where a current from the south meets a current from the north. That current from the south wouldn't be there if it weren't for the rotation of the earth, so it is what we call a "forced circulation" and is very irregular. It varies in strength, sometimes overpowering the current from the north, and at other times giving in to it, and the result is an oscillation of the meeting area between the two currents, sometimes going pretty far south as it does in winter, and at other times getting pretty far north, as in summer.

At any rate, we have now come to the point in question. Here we have two opposing currents of air, one warm and one cold. What happens in that area where they meet? That is a front, and when the cold current from the north is strongest, it pushes south as a "cold front," and when the warm current is strongest, it forces its way north as a "warm front."

Now do you get the idea of a front? Not yet? Well, let's go a little further, then. Here is where the water tank becomes very useful.

We have established an area of cold air around the poles, and an area of warm air to the south. Through the effect of the earth's rotation we find a flow of air such that the cold and warm masses are brought together. When this happens, they do not mix with each other. No, sir. The cold air stays to itself, and so does the warm air. Even though they have the same gaseous content approximately, they act as if they've never met. The cold air, being very heavy and dense, keeps its place close to the ground, and if it has a strong enough wind behind it forces itself underneath the warm air. The warm air promptly rises to the occasion and rides up over the dome of the cold air.

Look at the series of events which takes place in the water tank. By adding salt to the water colored blue, it has been rendered more dense than the light, red-colored water. A watertight boundary is placed between the two types of water. In effect, then, we have two masses of incompressible fluid, with different densities, and an artificial boundary between them.

We remove the boundary. With little or no tendency to mix, the heavier liquid immediately starts to underrun the lighter fluid. Although there is no boundary between them, *they establish their own boundary, and each mass of fluid moves along that boundary without passing through it.*

This action is very similar to the action which results when cold, heavy air encounters light, warm air. The warm air rides up over the cold air with practically no mixing, and if new factors weren't introduced, eventually the warm air would lie on top of the cold air, just as in the final picture in the series the light fluid lies on top of the heavy liquid. However, in the atmosphere, the continuous nature of the heating and its irregularity very seldom allows the entire process to be completed. Usually some new source of heat comes in and rejuvenates the whole process.

Thus, visually, we have demonstrated that when warm air encounters cold air, it rides up over the latter and a boundary, or front, is established between the air masses.

To conclude the explanation, we need only to consider two additional well-known physical facts, and then it will be apparent why fronts are so rough and have so much rain. First, there is the fact that water vapor, which is invisible, is present in the air all the time, but the amount which the air can hold is higher when the temperature is higher. If we lower the temperature of any given sample of air far enough, the moisture will condense out of it. The common example of this is the "sweating" of a glass of cold water. The air around the glass comes in contact with the cold surface, is cooled, and some of the vapor in the air condenses out and deposits on the outside of the glass.

The second fact is that when a gas expands, its temperature drops unless some means of keeping it up is available. In the atmosphere there isn't any way of keeping the temperature up if the air expands, and so its temperature drops when it expands.

In summary, then, unequal heating of the atmosphere sets up a circulation which brings cold air in contact with warm air. The warm air rides up over the cold air. As it does so, it enters areas of ever-decreasing pressure, which allows the expansion process to take place. The temperature of the rising warm air lowers until it no longer can hold all of its water vapor, and some of it condenses out. This forms clouds. As the rising current continues, some of the cloud droplets collect together, and then begin to fall through. This is rain. The turbulence is caused partly by the rising of the warm air over the cold air, but even more strongly, it sometimes happens that the rising warm current doesn't have the same temperature as the surrounding air, and should it happen to be warmer than the air through which it is rising, why, it actually goes up even faster than the cold air is trying to raise it, and this becomes a very violent vertical current of air. These currents are very common in fronts, and they cause all the terrific turbulence that is present.

Next time there is a storm out your way, watch it. As it passes on, note whether the wind, which shifted, stays in the new direction; whether the temperature, which dropped, stays down; whether the refreshing coolness which accompanied the storm remains after it has passed on. If all this happens, turn knowingly to your companions and say, "That was a cold front." If, however, the wind following the storm goes back to the direction it had before, and the temperature begins to rise again to its original value, and little change has occurred now that the storm has passed on, just observe casually: "That was a local storm. Very severe within it, but couldn't have extended any great distance."

How does it feel to be a meteorologist?

Down the Runway

BY AL LEWIS
EXECUTIVE DIRECTOR, AMA

Latest roundup of aeromodeling news as compiled by the AMA, official headquarters of American model aviation.

A PERSON able to travel around much would find that a surprisingly large number of folks have never heard of your Academy of Model Aeronautics. On the surface that sounds bad, but actually the reverse is what bothers us. Although we regret that some aeromodelers and club leaders haven't yet become familiar with the AMA, plenty of other people have.

Some of these people include book publishers, question-and-answer services, would-be school teachers, eight-year-old youngsters with a yen to get into the army air forces, applicants for civil-service positions, applicants for this, that and the other. It all works out to headquarters spending a lot of time on the phone saying something like this: "Yes, they fly. No, not *balsam*—balsa. That's right, real gasoline engines. No, ma'am, all of these modelers are quite nice. Yes, there are more than two million model aeronauts. Yes, that's right, the engine stops at the end of a specified time, fifteen seconds." And so far on into the night.

But there are plenty of bright spots. Every now and then somebody sets a record or brings out a new design model. In the record business, Tom Greenfield of Butte, Montana, did pretty good recently. Unofficial, of course, but still pretty good. In a city-wide meet to decide who should represent Butte in the State championships, young Greenfield flew a Class C Playboy, powered by a Brown D. On a 20-second motor run, the model cleared the Continental Divide by a goodly margin, being clocked at 11,000 feet by an experienced pilot in a Stinson.

The flight started on one side of the Rocky Mountains and ended up about five miles on the other side. Tom wanted to know if AMA headquarters had any statistics on record altitude flights with gas models and whether or not he had established a new mark. We were sorry to report that no events had ever been set up for altitude flights because of the difficulties of calibrating same. Tom runs a model shop at 1924 Aberdeen St., Butte. He says his Playboy had been patched up so often due to landings in the brush that it resembled a patchwork quilt. Maybe that's all that needs to be done to our models to make 'em fly.

The competition rules are still evoking plenty of comment from various quarters. But before discussing those, we'd like to report on how contest activity is holding up these days. A lot of questions have been asked about this. Although a dozen or so large-scale regional or State meets have been called off because of transportation difficulties, there is a marked swing to more local and interclub competition. A very healthy sign indeed, if you will permit us to editorialize.

Control model flying, also known as tether flying, U-control, G-line and so on, is coming in for more recognition as materials and motors become less plentiful. There has been much demand for the Academy to recognize this with standard regulations. It's up to the members of the AMA contest board. This much we can say—E. N. Angus, the board's chairman, has been running control events in conjunction with his regular sanctioned meets, and is well acquainted with that type of modeling. So that's a good sign. Other members of the board haven't expressed themselves in detail on the subject. Maybe they already have it under consideration.

Incidentally, you might like to know those contest-board men. The members are Paul B. MacCready, Sr., New Haven, Conn.; Gunnar Munnick, Boston, Mass.; Chairman Angus, Oaklyn, N. J.; Charles H. Grant, New York City; Richard Korda, Cleveland, Ohio; Philip Zecchitella, Philadelphia, Pa.; Charles A. Hulcher, Hampton, Va.; Russell Nichols, Washington, D. C.; Jacque Houser, Auburn, Ala.; William T. Thomas, Daytona Beach, Fla.; James Cahill, Connersville, Ind.; Stephen Meuris, Chicago, Ill.; James Custin, Milwaukee, Wis.; Curtis D. Janke, Sheboygan, Wis.; C. L. Bristol, Cheyenne, Wyo.; Jack Moradez, Lincoln, Neb.; Peter Bowers, Alameda, Calif.; John Drobshoff, San Francisco, Calif.; Benjamin H. Malkson, Portland, Ore.; and Carl P. Van Court, Yakima, Wash.

Now back to those rules. When the war-time flying regulations were released calling for voluntary reduction of official flight times to not more than 4 minutes (with an additional 2-minute leeway if total flight time was under 6 minutes) the immediate reaction of a lot of folks was: "Hey, what are they trying to do, telling me to cut down on the length of flights? And how do they expect me to keep within the four-minute limit?" And so on.

Some clubs and localities got the idea immediately. Fewer motors or less materials available for competition flying . . . must save what we have . . . limit flights as much as possible . . . win a meet without losing a model.

But the battle still rages, and we, for one (that's the editorial "we") are glad to see the rumpus being kicked up. Shows there's a lot of life left in the aeromodelers, and that they're ready to fight for their con-

victions. We have even suggested that those who don't like the war-time rules petition the members of the contest board—in regular parliamentary fashion, of course.

Speaking of parliament, we predict here that you may soon find some changes in the structure of your Academy, if present plans of Carl Goldberg are carried to completion. Carl is asking for revamping and "modernization" of the old AMA to permit, among other things, licensed modelers electing members of the contest board. All sounds good to us. Carl has been asked to suggest members for a committee to review AMA progress to date and consider any necessary changes in the set-up.

About the priorities problem and materials situation as far as the model-airplane industry is concerned, we have some news, although it's necessarily meager at the time of writing.

After spending a full day shuttling around in the headquarters offices of the army air forces, we see some relief in sight for the aeromodeling manufacturers. Maybe even official requests by the army and navy that this very essential activity continue by being given necessary materials. It gladdened our heart to hear one high-ranking army air officer describe the continuance of model-plane building and flying as plain "good business" as far as the flying services are concerned.

But a warning—any allotments of supplies, materials for motors, rubber for power, and the like will be made probably for educational purposes only, and that means schools and related activity. The Civil Aeronautics Administration, as well as the military services, indicate that they are not concerned at this time with the "recreational" or expert competition aspects of our hobby-sport. They're interested in seeing that ample materials are provided for the educational side of America's "air conditioning" program.

So you'd better treasure that motor, chum!

What's Your Question?

S. H., Mill Valley, Calif.—A rotary engine is radial in shape. In it the cylinders rotate around the crankshaft, the crankshaft being stationary. Present-day radial engines are stationary—the cylinders do not rotate, while the crankshaft does. The F9C-2 was built by the Curtiss Aeroplane Co.

G. L., St. Louis, Mo.—All publications mentioned in your letter can be obtained only in England. The magazine *Sailplane* has been discontinued for the duration of war.

D. H., South Pasadena, Calif.—Sorry, no official information on the F4U-1 has been released as yet. Presumably the ship will operate from aircraft-carrier decks. For pictures of British war planes, write to Airpix, Box 195, Toronto, Canada.

J. M., Kingsville, Tex.—The North American O47-A has a wing span of 46 ft. 4 in.; length, 33 ft. 2⅞ in.; weighs, fully loaded, 7,700 lbs. The top speed is 244 m. p. h.; cruising speed, 212. It is powered by an 850 h. p. Wright Cyclone engine. The Karigane has a span of 39 ft. 6 in.; the overall length is 27 ft. 11 in. Gross weight is 5,060 lbs., top speed is 310 m. p. h., cruising speed 230 m. p. h., range 1,500 miles. We have no information regarding the Italian Nard FN-500.

T. W. F., Chicago, Ill.—Sorry, we cannot answer your questions because we are not on the engineering staff of the manufacturers of planes listed in your letter. All the features mentioned by you are incorporated in the planes in order to get the best possible results as far as speed, maneuverability and fire power are concerned. Some of the Japanese planes are equipped with in-line engines.

R. C., Brooklyn, N. Y.—The Aeronca has a span of 36 ft. Overall length is 20 ft. 8 in. The gross weight is 1,060 lbs.

J. M., Los Angeles, Calif.—As far as we know, the Bell YSM-1 is not in production. Neither is the navy adaptation of the Airacobra, known as the Airabonita, in the service.

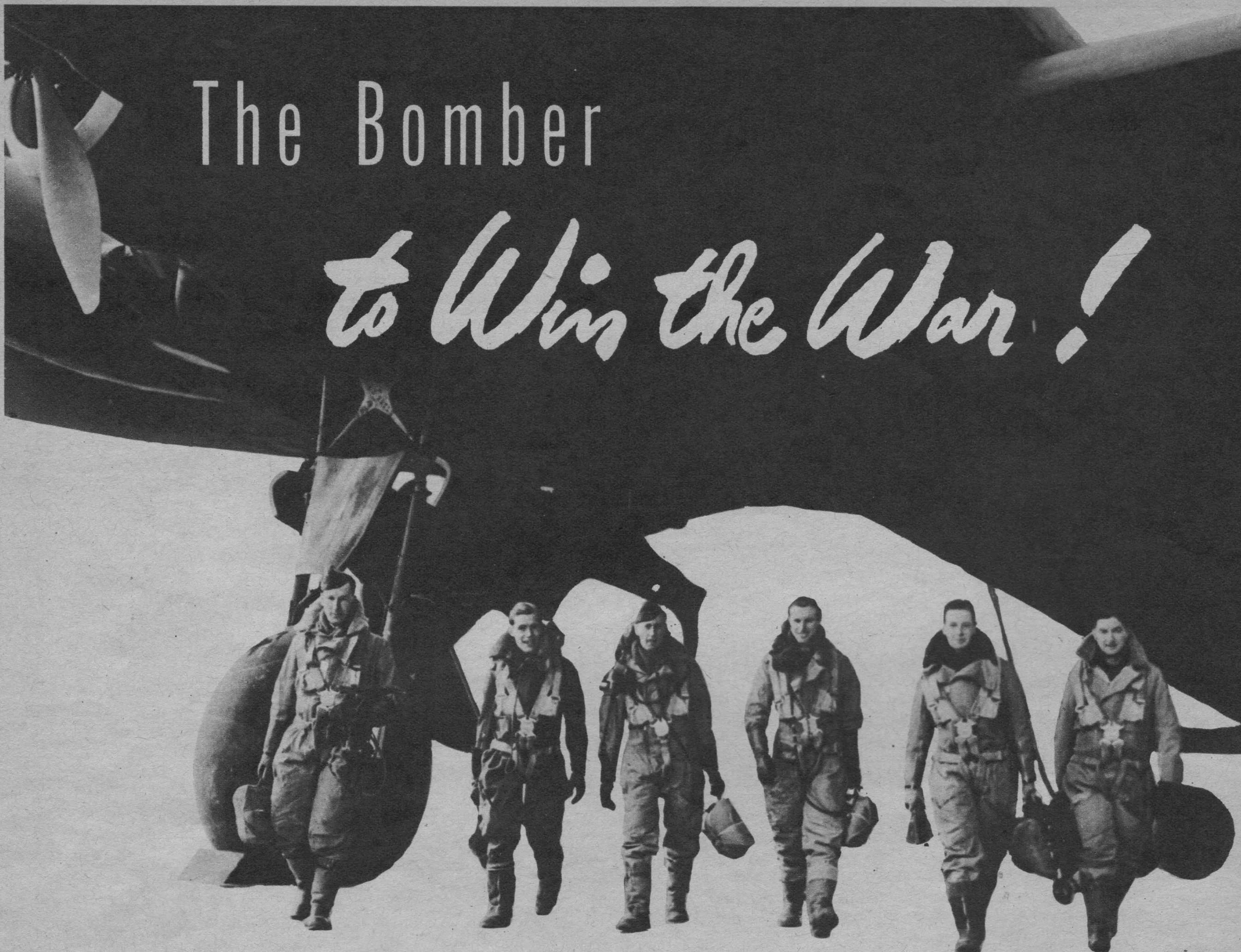
J. B., Britannia Beach, Can.—A Kollsman Sensitive Altimeter shows altitude as low as twenty feet above sea level.

C. A. K., Clarkson, Neb.—Wing guns of a fighter plane are located outside of the arc swept by the propeller blades and therefore do not have to be synchronized like those mounted in the fuselage nose. Sorry, but information on speeds and armament of U. S. military planes is restricted and therefore cannot be given out.

E. D., Connellsville, Pa.—The single-seater Republic used by the Swedish air forces is known as the EP-1, and basically is the same as the P-35. We do not know what difference there is between the P-35 and the P-35A. There is no such plane as the Republic P-40 Special. You can get an issue of Air Trails by sending 15 cents to Mr. Clifford of our circulation department.

J. E., Pasadena, Calif.—Identification markings of our military aircraft have been changed. All ships now display a white star on a blue circle

(Turn to page 57)



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What's Your Question?

(Continued from page 55)

on top of the left wing and a similar star underneath the right wing. The Vega Ventura is in service with the RAF.

B. B., Oklahoma City, Okla.—Some of the models shown in the "Pinch-hit Materials" article in our June Air Trails can be built from plans available at the U. S. Office of Education, Washington, D. C. The Spitfire III has a top speed of 407 m. p. h. Information on the speed of the SB2C-1 and SBD-1 is restricted.

E. S., Myrtle Beach, S. C.—Sorry, plans for the type of glider mentioned in your letter are not available at present. Due to regulations governing essential materials, the project of building a glider conforming with Civil Aeronautics Administration requirements is accompanied by great difficulties.

A. S. M., Jr., Hedley, Tex.—For names and addresses of colleges in Texas offering aëronautical engineering courses, write to the U. S. Office of Education, Washington, D. C.

R. L., Hartwick, N. Y.—Sorry, we have no plans for the type of glider mentioned in your letter and do not know where they could be obtained.

Miss A. C., Brooklyn, N. Y.—A booklet on the requirements and duties of an air hostess is published by the U. S. Office of Education, Washington, D. C. Write for it.

S. H., Los Angeles, Calif.—As far as we know, the Vultee Vanguard and Vengeance are not in the service of the U. S. air forces. The pursuit planes in army service are: Curtiss P-40, Republic P-43, Bell P-39 and the Lockheed P-38.

R. B., New Braunfels, Tex.—We suggest the book called "Aerial Navigation" issued and sold by the Superintendent of Documents, Washington, D. C., the price being $1. For definitions we recommend "Simplified Definitions and Nomenclature of Aeronautics," by Lieut. Leslie Thorpe, published by Aviation Press, 580 Market St., San Francisco, Calif.

J. Z., South Euclid, Ohio—For information regarding schools in your vicinity teaching aëronautical engineering, write to the U. S. Office of Education, Washington, D. C.

L. B., Madison, Me.—The German plane shown in the "Captain of the Clouds" picture was a Hawker Hurricane made up to resemble a Messerschmitt.

T. F., South Ozone Park, N. Y.—The Curtiss Hawk P6-E was an equal-span biplane fighter with a wing span of 31 ft. 9 in., length 22 ft. 7 in., height 8 ft. 11 in. It had a wing area of 252 sq. ft., was powered by a twelve-cylinder 675 h. p. Curtiss Conqueror liquid-cooled engine. The top speed was 198 m. p. h., service ceiling 25,000 ft.

D. S., Plainfield, N. J.—The picture which you sent us shows the latest version of the Curtiss SO3C known as the Sea Gull. The earlier models did not have any wingtip dihedral and had a different type of vertical tail surfaces.

R. M., South Bend, Ind.—The official name of the Zero fighter is Sento-Ki. It is entirely different from the Nakajima 96, 97, and 98. It has a retractable landing gear and is armed with two 20-mm. cannons or four machine guns.

E. W. L., Indianapolis, Ind.—For plans or kits for a secondary glider, write to either Bowlus Sailplanes, Inc., San Fernando, Calif., or the Briegleb Aircraft Corp., 16005 Bassett St., Van Nuys, Calif.

J. K., Jr., Butler, Pa.—If you intend to become a mechanic we would suggest that you study mathematics and physics.

G. S., Los Angeles, Calif.—Sorry, we do not know where you can get plans or blueprints for a full-size Spad; we doubt if they are available. A prop boss is a flange or thickened center portion of a propeller. It is most frequently found on wooden propellers.

J. F., St. Louis, Mo.—Sorry, we do not know where you can get photographs of all the planes mentioned in your letter. Suggest that you write and inquire from the Aeronautical Chamber of Commerce, 30 Rockefeller Plaza, New York City.

B. W., Columbus, Ohio—Suggest that you write to the War Department, Washington, D. C. It has recognition silhouettes of the ships mentioned.

Sgt. D. E. M., Fort Ord, Calif.—The Allison engine weighs 1,280 lbs. dry. The weight per horsepower is in the neighborhood of 1.45 lbs.

F. M. C., Jr., Overbrook, Philadelphia, Pa.—You can obtain an excellent book, "Aerial Navigation," from the Superintendent of Documents, Washington, D. C. Information regarding courses in navigation can be obtained from the Civil Aeronautics Authority, Washington, D. C.

THE LOCKHEED HUDSON

TWO PAGE CENTER SPREAD IN FULL COLORS

IN OCTOBER AIR TRAILS

Flying Officer Mackley

(Continued from page 37)

without losing a ship. The Whitley he flew made over forty raids. In all the thirty raids he himself made, the Whitley received only two small holes in the wings from antiaircraft. The myriad searchlights sweeping the skies and the uproar of many guns with the veritable rain of shell fragments seemed almost more of a menace in a nerve-racking way to the people on the ground than they were dangerous to the men making their bombing runs overhead.

Mackley is the modest kind of chap who feels it out of taste to get personal publicity. Like any soldier who has seen plenty of action, he thinks nothing of it. As much as we'd like to tell you more fully of his experiences in action, that story will have to wait for another and more peaceful day. But the highlights of the shows he has been in bear out and corroborate the reports of many RAF bomber pilots that we read in the daily papers. Once an oil refinery was burning in a monstrous mile-square inferno. The smoke towered upward for 8,000 to 10,000 feet, making it impossible for the bombers to come lower. Sometimes the fires were so bright that the glare through an open flare shoot was brilliant enough to read by.

Like thousands of other ex-model airplane builders, he is quick to credit his aëromodeling experience for his success in aviation. General familiarity with nomenclature and airplane design and construction acquired in model building was an added advantage when he took up flying. He learned to fly on a DeHavilland Gipsy at the age of twenty-two as a member of the Auckland Aero Club. Bill took to flying like a duck takes to water. In 1938 he won the Davis landing competition and was runner-up in the Mason Trophy for airmanship, and in 1939 won the Owen Trophy for forced-landing competition for pilots with more than fifty hours of flying time. All this proved to be excellent practice for the real thing. The emergency landing mentioned in Mackley's citation for the D. F. C. was extraordinary in that Bill's Whitley was the only one of the squadron to make it back to its home airdrome after fog had blanketed England during a night raid.

Bill Mackley is thin, about six feet tall, fair-haired and frank. Barring a moderate accent and a RNZAF uniform, you'd take him for just another American model builder. He is interested first in talking about models, then airplanes. That's the funny thing about this war in the air. You can never tell when you might be talking with a model enthusiast who might have a thousand hours' flying time—like Mackley. Now that he is out of the thick of the fighting, he's again building models.

Bill has still another hobby. It is to fly as many different types of airplanes as he can. He accumulates flights the way some of us save stamps Most of his 1,000 hours have been on Whitleys. He trained for bomber operations on Wellingtons, has flown Lysanders, Rearwins, Ansons, Oxfords, Harvards, as well as approximately fifteen other types.

Bill's chief claim to fame before the war was his four-year captaincy of the Auckland Model Aero Club. He talks of the members of a rival club as a bunch of buzzards. (Sound familiar?) Bill reports there are over two thousand keen modelers in New Zealand alone. He should know, for until the time he left for overseas duty he was chief designer and assistant manager in Modelair, Ltd., which put up kits for New Zealand's model builders. Luck, Bill remarks, doesn't count there as much as in the United States. Good thermals are comparatively rare—a lucky thing around Bill's home town of Auckland, for the sea is only a few miles away on either side of the city.

Bill Mackley's adventures in modeling will have a familiar ring to American builders. When he was fourteen (in 1929) the boy across the road built a few models. That was enough for Bill to pack away the old reliable model railroad and take to whittling sticks. His first model was made from pine and covered with tracing cloth (which is one material old-timers in this country don't list for their early attempts). The complexities of propeller carving stumped Bill, and the model never did get to the flying stage.

About that time Fred C. MacDonald was writing a series of articles on model-airplane building in the local newspaper on Saturdays. When, later, Bill became attached to Modelair, his boss was none other than the newspaper on Saturdays. When, paper sponsored a contest, Bill was really hooked. The official contest plans published in the paper were for a thirty-inch stick model known as Steady Jim. It was made from spruce, had a single surface wing with bamboo ribs and was covered with silk. While Bill didn't do so good in the contest, his model did fly for 17 seconds. The winner was enterprising enough to substitute skids for wheels, and the saving in weight was enough for him to win. In 1928 the Auckland Model Aero Club was formed. By 1930 Bill was using balsa and was getting a minute from his model, one of the earlier all-balsa models, plans for which appeared in an American magazine.

The first official flight of over five minutes in New Zealand was made by Mackley's Yellowbird. That was Bill's first engagement with a thermal. The flight went for 5:53 and there was the usual "chased madly with bikes—crashed on top of a tree." By 1935, modifications in the Yellowbird had made it a famous New Zealand model. To those newcomers who don't remember the Yellowbird, this model was a "box" with the typical straight undercambered wings RAF 32 section and undercambered tail then in vogue. The equally famous Redbird that followed in 1936 was built on a bet. And just to prove that our new-found allies from Down Under think the same as we do, the bet was over whether or not a diamond-shaped fuselage model would fly well.

Like any really active model builder, Mackley has tried all kinds of models, including pushers and biplanes. His two gas jobs built just before the war are beauties. An indoor hydro record set by Bill for New Zealand exceeded the world-record time of Bruno Marchi in the same event, though the time was never officially recognized. Baby Cyclones were Bill's favorite motors; he swore by the old Model E Cyke he used. Since motors from the States frequently cost forty to fifty dollars delivered, Down Under, you can readily understand why a builder there would pick one motor and swear by it. The last gas job Mackley built was too good to fly in contests and was left at home for the folks when he went overseas.

Bill started to mix flying and modeling as far back as 1937. In that year the Civil Air Reserve was started. CAR was the British equivalent of our own CPTP. Like the CPTP, it gave wings to a lot of modelers who subsequently went into active military flying. The student quota for New Zealand was 100. Bill Mackley was one of nine that made the grade from Auckland. The Civil Air Reserve provided some sixty hours of flying time, about thirty to forty of them solo. By 1938 Mackley had his A license. In September of 1939 came the war. Bill was selected for a short-service commission by the RAF, but withdrew his application to train with his own country's air force.

Bill hopes to attend the next national model meet in person—as soon as that big event is resumed. In the meantime, he wants to express his appreciation on behalf of the New Zealand boys for the splendid co-operation and flying job done by the American proxy fliers of the Moffett and Wakefield jobs from Down Under. As for ourselves, we will feel pretty safe in a transport after the war that has the words "Captain Winston Mackley" hanging on the sign up there at the front of the cabin.

Next Month—2-page Photo of Lockheed Hudson in Color!

Smoothie

(*Continued from page 28*)

in the 1941 Nationals with high hopes. However, when winding for the first flight, we were up to one thousand turns and still going strong when the motor broke. By the time repairs were made, the best conditions were gone, so we did not have a chance to make any long soaring flights.

CONSTRUCTION

Before starting construction, remember that success with a model depends on accurate and light construction. Save weight wherever you can, but not at the expense of weakening vital parts such as prop mechanism, landing gear and rear motor anchor. With careful wood selection, this model can be built down to three and one half ounces without the rubber.

For strength and lightness, the fuselage formers should be cut from laminated $1/32''$ sheet balsa. Lay the sheet on a flat surface, cut short lengths equal to the width from another sheet, glue these cross-grain and press until dry. While the laminated sheet is drying, cut out the keel outline and glue it in place on the full-size side view. Next cut the wing-mount half and glue it to the keel, making sure that it has the proper angle to fit the wing dihedral. Now cut the formers from the laminated sheet and glue them in place to the keel outline. Lift the half-completed construction from the drawing and glue the other half of the formers in place.

When all formers have been checked for accuracy, add the $1/8''$ square side stringers, making sure that the keel remains straight. Before adding the $1/16''$ square stringers, complete the rear motor anchor, the $1/16''$ sheet cabin covering and the retractable gear.

The retractable gear is strong and reliable if a good soldering job is done on the crossbar. Be sure to reinforce the keel with $1/8''$ sheet side braces at the keel slot and wheel well. The slot in the keel at the pivot point is cut just right to hold the gear at the proper angle for take-offs. On the original, the inside hook of the retractable gear was guarded with rubber tubing to prevent the possibility of the rubber motor catching. Also, the well for the wheel was sealed to prevent the entry of dirt which might chafe the motor.

The wing and tail constructions are conventional with the exception of the sheet covering. The $1/32''$ sheet should be sanded to a smooth finish

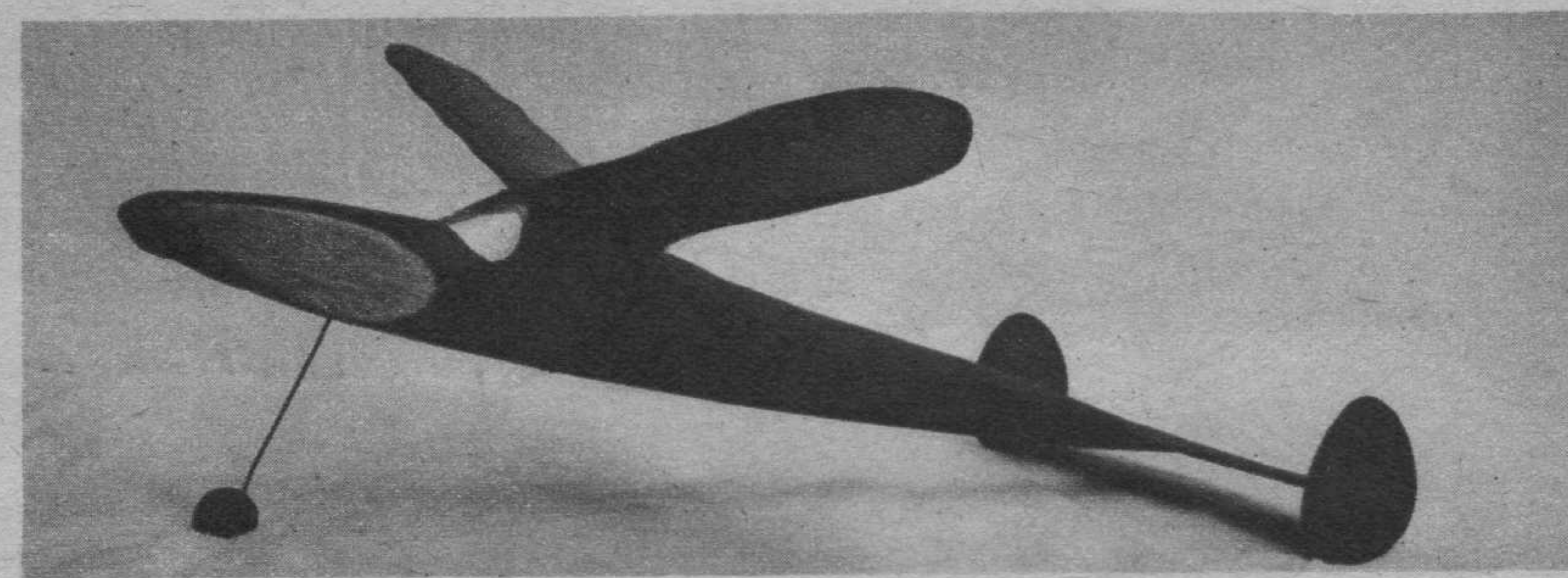
"My parachute got caught 20 minutes ago—but I didn't want to bother you while you were taking a bath!"

on a flat surface before it is added to the completed wing and stabilizer. Note that the center section of the wing at the dihedral break is covered both top and bottom with $1/_{32}$" sheet. The stabilizer has a slight taper, but ribs can be easily estimated and the high spots removed with a sanding block.

The low-pitched prop is carved to true helical pitch from the blank shown on the plans. When the proper airfoil has been carved, mark the place for the folding prop cut, cut the center section to the proper dimensions and cut the blade outline. Before cutting the blade break, glue the folding mechanism in place and wrap it tightly with silk strips. A little experimentation may be necessary to get the blades to fold correctly, but a perfect folding mechanism is well worth the effort.

The spinner may be easily turned, even if you don't have a lathe. All that is needed is a hand drill and a vise. Place the piece of wire in the chuck, run it into the spinner block and bend the wire back to prevent slippage. Carve the spinner to the approximate shape, and then proceed to turn out an excellent spinner with sandpaper in one hand and the crank in the other. Cut the spinner in half, hollow it out and then fit it to the prop hub. The joints should be filleted with balsa dust and glue.

Finish the prop and spinner with wood filler and glider polish. As soon as the finish is dry, cut the nose of the spinner off and hinge it so that you will have access to the winder hook. Do a good job on your prop and you will notice the difference in performance.

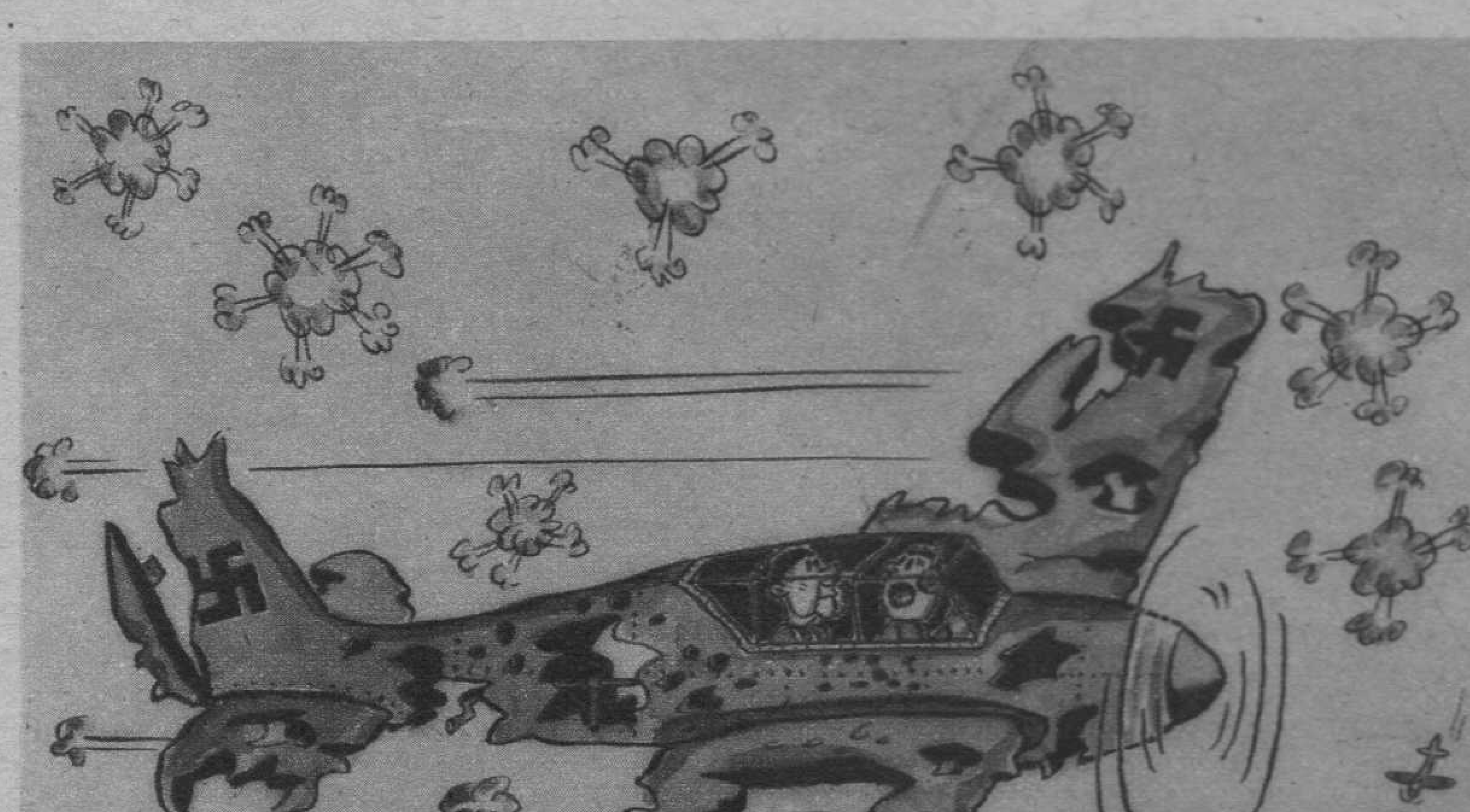


Silkspan considerably simplifies the covering problem. By applying it wet the fuselage may be covered in six pieces. Be sure to pull out all the wrinkles, because streamlining is useless without a good covering job. Don't forget to sand all the framework before covering. Enough dope is added to fill the pores. After light sanding, the model is completely painted with a coat of gloss to prevent sag and strain on the stringers due to the tightening effect of dope. The final step is to fair in the wing mount with balsa strips so that the camber makes a perfect fit with the wing mount.

Measure out enough rubber for ten strands of $3/_{16}$" ninety-six inches long. Put about forty winds in it and double it so that you have a braided motor of twenty strands of $3/_{16}$". The motor is pulled through the fuselage with a string and the $3/_{16}$" aluminum tubing rear motor anchor is put in place. Maximum number of turns, according to tables, are 1,150; we got in 1,300 once. Don't try it! Completed model with rubber weighed a little under seven ounces.

FLYING

The Smoothie pleasantly surprised us on the field because no thrust adjustments were necessary. In some cases, though, a little downthrust may be needed. The only necessary adjustments are right wing panel warped to additional incidence (look-



"It just said over the Gestapo radio that we returned unharmed—better take another look and see if this is really us!"

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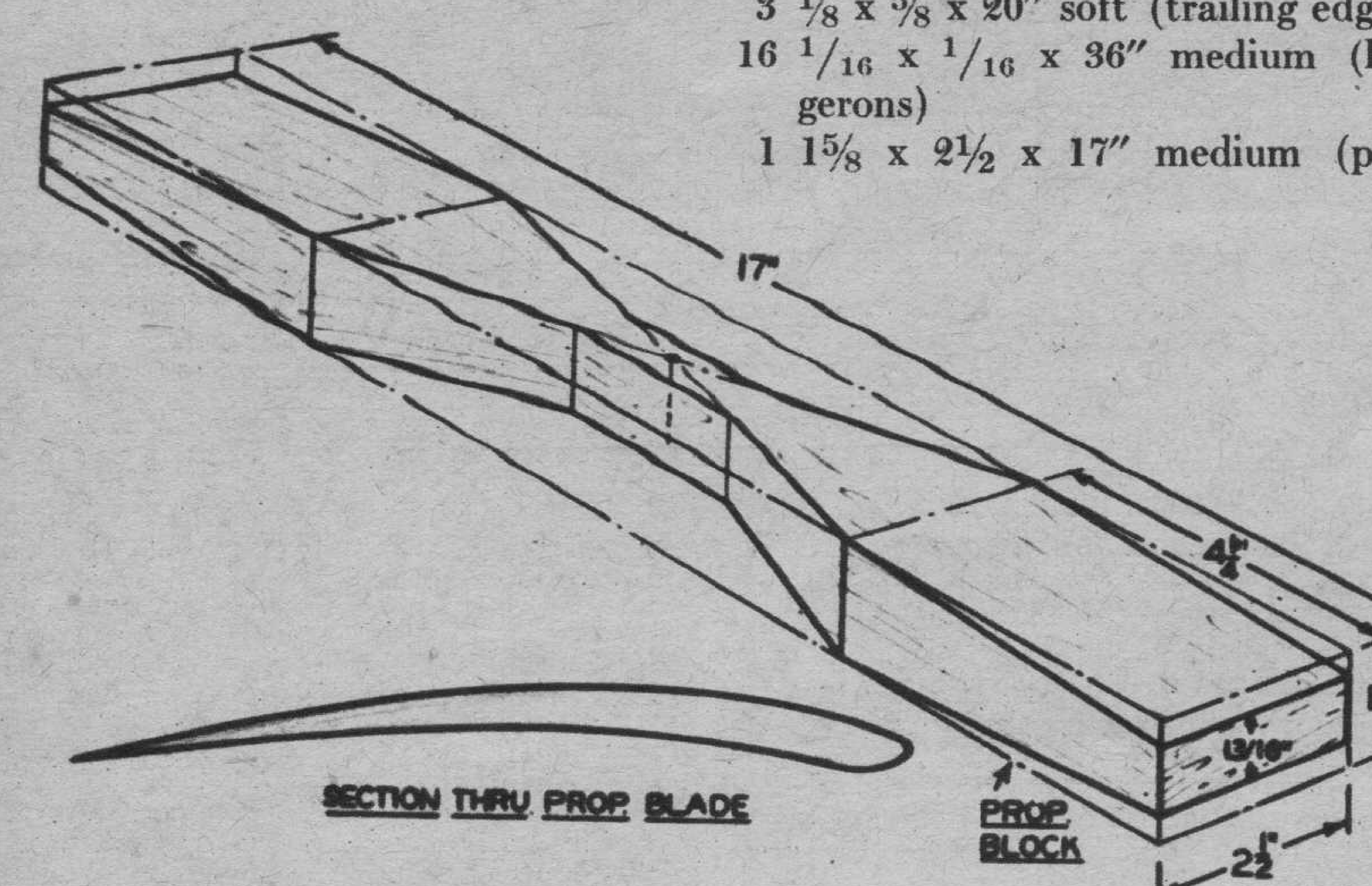
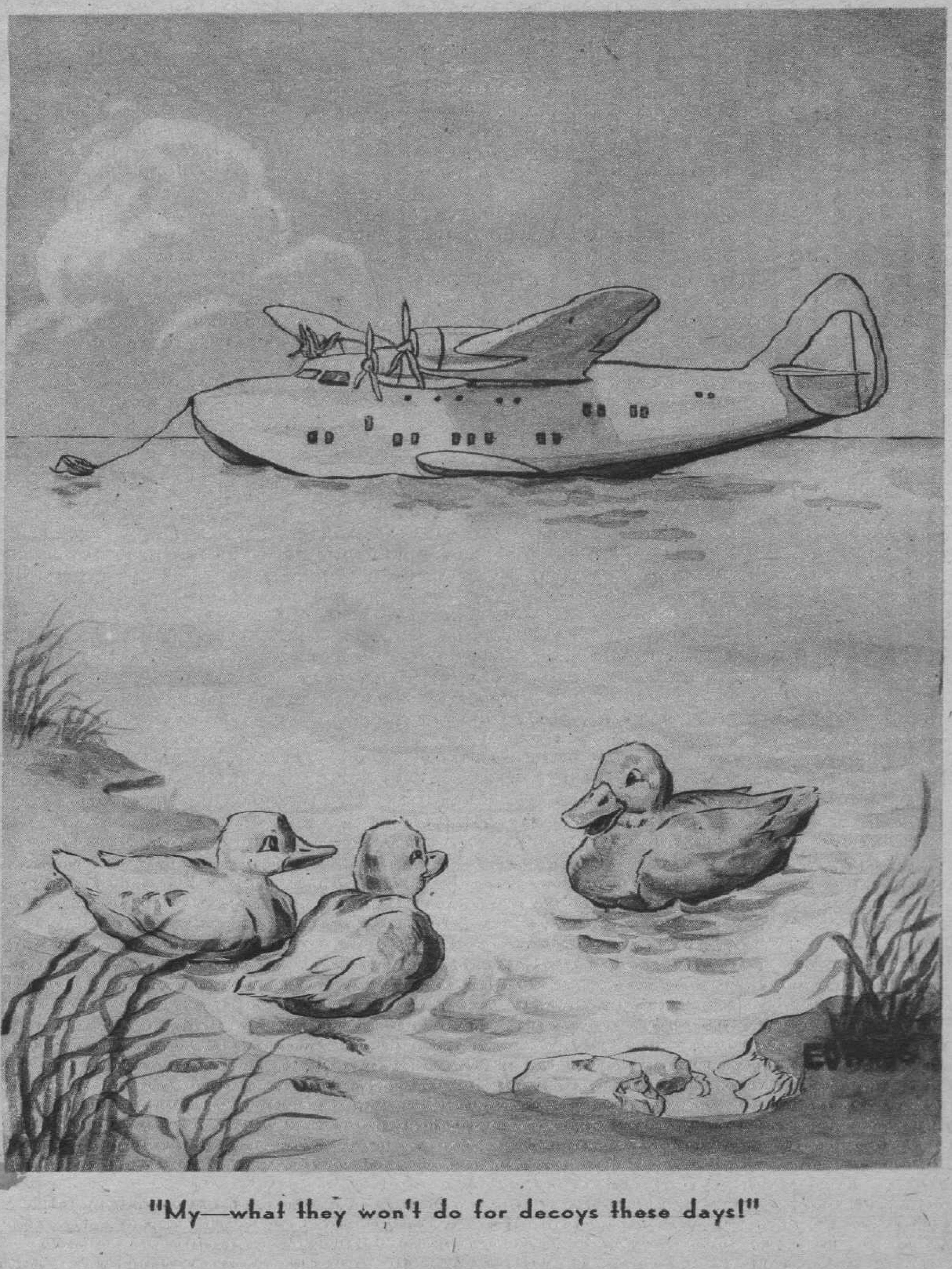
ing from front), and a slight bit of right rudder. The model should balance at a point directly over the center of the wheel in the retracted position. When correctly adjusted, the flight path should be as follows: wide right circles in climb without excessive banking, and tight, flat, right circles in the glide without mushing or stalling tendencies.

This model has been tested in winds up to 25 m. p. h., so don't let a little breeze scare you. If properly adjusted, the model will handle well in any kind of weather. When your model is adjusted and you witness the first full power flight, you should be well pleased with its fast, smooth climb and flat, soaring glide. May you soar to new heights with your Smoothie!



BILL OF MATERIALS

2 $1/32$ x 3 x 36" soft (formers)
1 ⅛ x 2 x 36" soft (keel, wing tips, rudders)
1 $1/16$ x 2 x 36" soft (ribs, cabin covering)
3 $1/32$ x 2 x 24" medium (leading-edge covering)
3 ⅛ x ⅛ x 36" medium (longerons, stab., L. E.)
1 $3/16$ x $3/16$ x 36" medium (wing L. E.)
3 ⅛ x ⅝ x 20" soft (trailing edges)
16 $1/16$ x $1/16$ x 36" medium (longerons)
1 1⅝ x 2½ x 17" medium (prop block)
1 2 x 2 x 2" soft (spinner block)
1 $1/16$ x 2 x 2" plywood
1 1¾" diam. wheel
3 sheets red Silkspan (light grade)
1 bobbin
1 wood screw
1 length $1/16$" music wire
1 small sheet $1/32$" aluminum
2½ feet $3/16$" aluminum tubing (motor anchor)
1 ball-bearing washer
1 tensioner spring
Soft iron wire (landing-gear binding)
80 feet $3/16$" brown rubber
Silk strips and thread
Lube, glue, wood filler, dope and gloss
Celluloid



"My—what they won't do for decoys these days!"

NEW Berkeley's "TACTICAL DEMONSTRATION" SOLID MODELS—

Different from anything you've ever seen!

Model Builders! Hundreds of "Tactical Demonstration" models are needed by training centers and schools throughout the country. Do your part now!

First of their kind, a definite improvement in replica models. The only solid models that have all these features:

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2—Built-up Cockpit 4—Authentic insignia and markings

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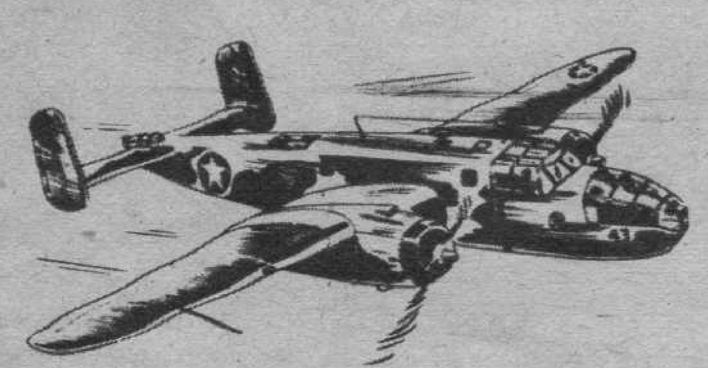
These great new kits have been developed by Berkeley Engineers with the full cooperation of many of the large aircraft corporations. All markings and details are complete and authentic! Look at the value included in every kit. Each kit includes:

√—Cut-to-outline balsa fuselage and wings! √—Model cement! √—Blanked hardwood propellers!
√—Full color decal insignia! √—Turned wheels! √—Celluloid for cockpit enclosures!

Berkeley Solids are designed to the "right" scale for practical use. Fighters are all accurate 3/8" scale. Bombers are 1/4" scale.

NORTH AMERICAN B-25

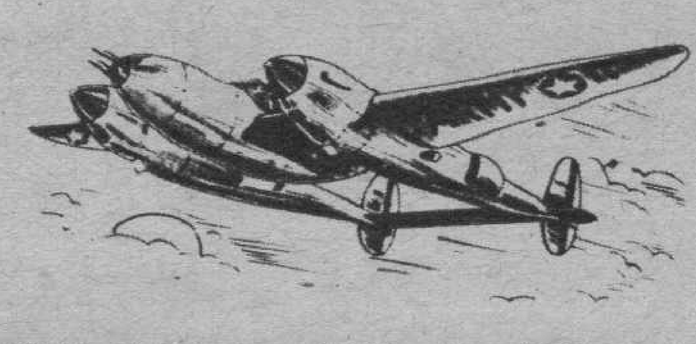
General Doolittle's own ship!



MODEL S-3. Span 17". Now you can build an exact copy of the leader in the Tokio Bombing. A "must" in every solid model builder's collection. **$1.00**

LOCKHEED P-38

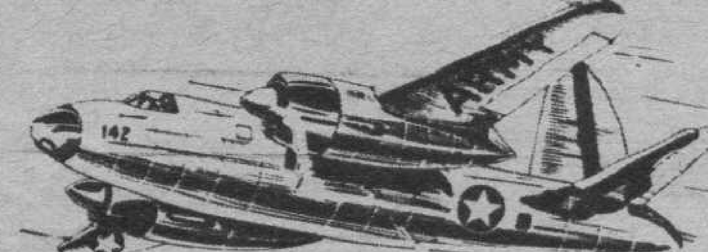
The world's fastest climbing interceptor!



MODEL S-2. Span 19½". The British call her "Lightning." The pursuit that is being used to knock the Japs out of the Aleutians! The kit builds one of the most beautiful models you have ever seen. **$1.00**

MARTIN B-26 "Marauder"

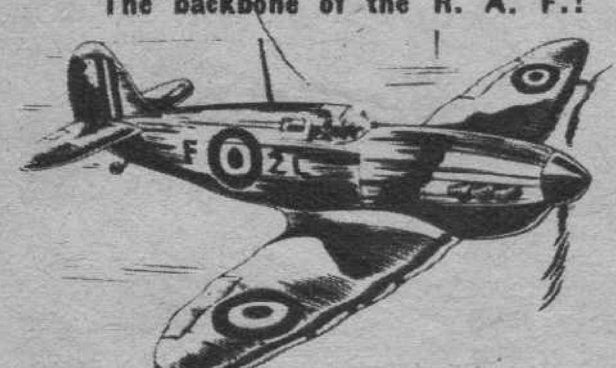
The fastest bomber in the world!



MODEL S-4. Span 16¼". The only bomber that flies at over 400 m.p.h. Build the winged bullet that fooled the Jap fleet by carrying torpedoes in her bomb racks! **$1.00**

SUPERMARINE "SPITFIRE"

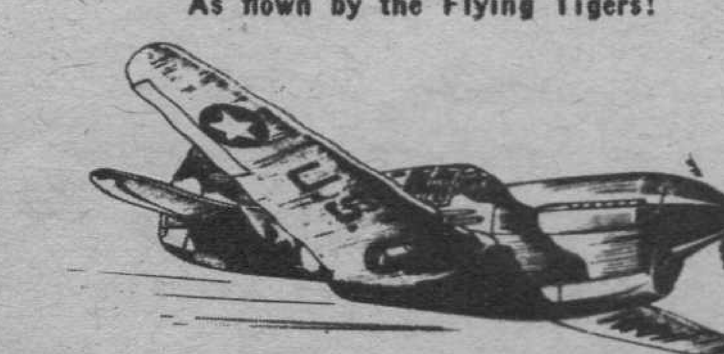
The backbone of the R. A. F.!



MODEL S-7. Span 13¾". Daily news reports on the "Spitfire" have made its remarkable achievements known to everyone. A real model of a real plane with super-detailed drawings. **50c**

CURTISS P-40

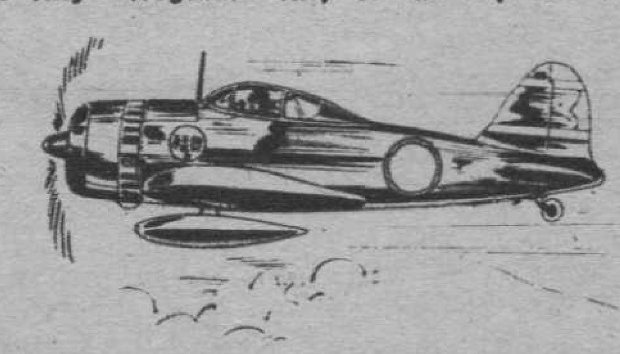
As flown by the Flying Tigers!



MODEL S-1. Span 13½". America's standard pursuit ship that set the remarkable record of shooting down Japs at the rate of 8 for 1. All details and insignia are from the latest "Flying Tiger" squadron in China! **50c**

JAP "ZERO" FIGHTER

The only "original" ship of the Jap Air Force!



MODEL S-9. Span 14⅝". A Berkeley Scoop! The only model of the ship you have been reading so much about. Its clean lines, long-range gas tank, and heavy armament tell us how this shipboard fighter attacked the Hawaiian Islands. **50c**

GRUMMAN "Wildcat" FIGHTER

Commander O'Hare's famous ship!

MODEL S-5. Span 14¼". The U. S. Navy's standard shipboard fighter. An exact duplicate of the ship that took on six Jap bombers single-handed and shot them all down! **50c**

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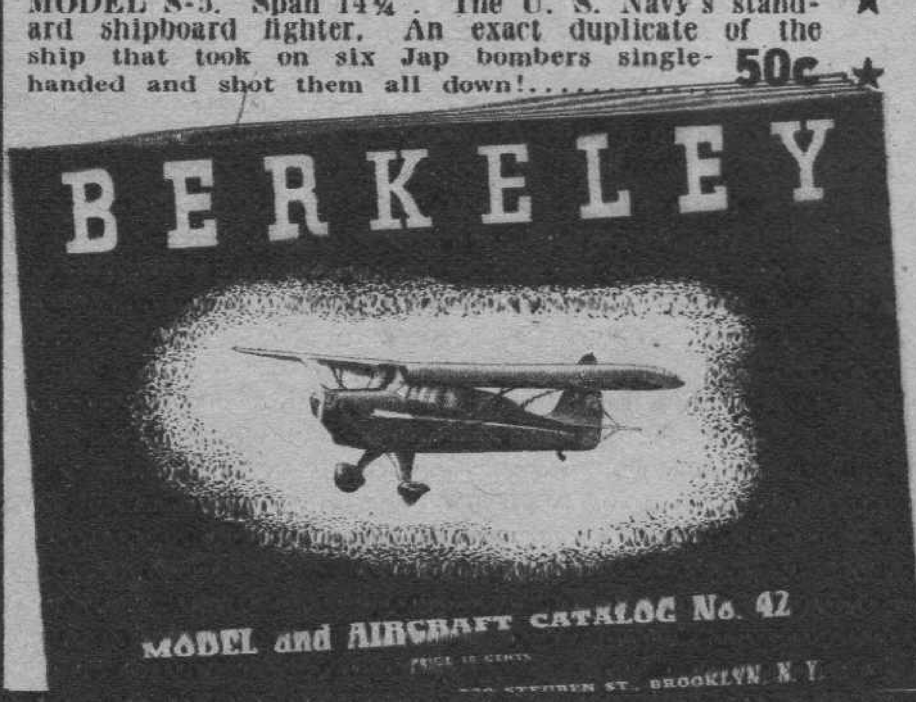
The flying cannon plane!

MODEL S-6. Span 12¾". The ship that is giving the Axis trouble all over the globe. One of the keenest solid models you can build. **50c**

MESSERSCHMITT 109-F

The German Luftwaffe's fastest Interceptor Fighter!

MODEL S-8. Span 12⅜". With 1150 horsepower and a duration of only 45 minutes, this ship was designed to try to protect Germany from our high-flying bombers. Model has complete details with German markings and insignia. **50c**



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Air Trails Pictorial Advertisers, Sept. 1942

SCHOOLS

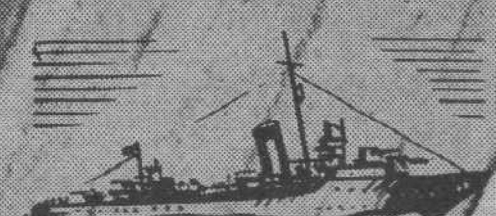
MODEL AIRPLANE KITS, MOTORS and SUPPLIES

MISCELLANEOUS

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

Why COMET IS CONSERVING BALSA

. . . and how you can join in this PATRIOTIC EFFORT



PERHAPS you have noticed that Comet Kits for making solid airplane models are coming through in woods other than balsa. You may have noticed, also, that in certain Comet Flying Model Kits, some pieces are being furnished in basswood, where such substitution will not affect flying qualities.

You may have wondered why these things have been done—and we'd like to tell you. As you may know, balsa is classed as a strategic war material. It is being widely used today by the government in making life-floats, which may save the lives of thousands of our men. It is being used for special purposes in ships for the Navy and Maritime Commission.

Balsa must come a long way from the forests of Ecuador, through dangerous waters. It should be used conservatively, not wastefully. In recognition of these facts, Comet has taken the initiative and voluntarily reduced its use of balsa as described above.

For example, Comet Official Identification Models conform to the requirements of the U. S. Navy Department of Education, which specify that these models shall be made of bass, pine or similar woods—but not balsa.

Here is an opportunity for every one of us to help our country's war effort in a very practical way. Let's show Uncle Sam that we know how to conserve that vital material—BALSA!

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