Supercharged Pilots

(Continued from page 33)

breathing natural air he switches to the plane's oxygen and takes off.

Instead of using a pipe, which has been found to be dangerous, inefficient and wasteful, he uses a specially devised mask. This allows complete absorption of the oxygen and permits no chance dropping of a pipe. There is a device in the mask by which the pilot can speak into his microphone, thereby allowing him to speak without removing his mask.

The ascent to 30,000 feet is thus made with comparative lack of discomfort. No nitrogen bubbles form and there is ample oxygen for attack at high levels. How important oxygen is and how dangerous the lack of it may be, cannot be stressed too highly. The length of time that an aviator can stand such work varies with the individual.

This in turn can be aided by proper diet and living habits. It has been recommended that persons flying above 10,000 be furnished with chocolate bars, because a diet high in carbohydrates increases an aviator's ceiling from 1,000 to 2,000 feet. The reason for this is that more oxygen is needed to oxidize a fat than a carbohydrate because the fat must have extra oxygen to unite not only with the carbon to form carbon dioxide, but also with the hydrogen to form water. Of course, the actual eating of candy must be done prior to the ascent if a face mask is used!

Diets must consist of nongas-forming foods. The expansion of gas in the intestines at 30,000 feet will be four times what it was at sea level. This expansion will not only cause interference with breathing but will cause distress. Animal charcoal is recommended for the absorption of gas.

Clean living, abstinence from excesses of any sort, and excellent physical condition must be the lot of any pilot who flies or fights at 30,000 feet. Even supercharging pilots before flight cannot remedy the effects of a sleepless night or a hangover.

Finally, what altitude should be considered as the limit to which one may fly? Flight surgeons agree that pilots must not ascend higher than 15,000 feet without oxygen, and better yet, 10,000 feet, if the flight is for some duration. For one thing, anoxia (lack of oxygen) may cause an injury to the brain that is permanent, and as has been pointed out, the effects of anoxia are so unapparent and so insidious that the results are present before they can be counteracted.

It is claimed that 40,000 feet is as high as our pilots can fly even with pure oxygen, adequate training and modern equipment. After that, stratosphere chambers, in which the pressure is maintained at a given figure, must be used. This does not seem to be a good idea, at present, because a single bullet piercing the chamber would cause the pressure to fall, terminating the engagement briefly and painlessly!

Straws in the Wind

(Continued from page 25)

years. Why? Because it was a radically new design. An unusually large replica of the ship having a wing span of thirty-five feet was constructed and tunnel tested. Small items, but important ones from the standpoint of the aërodynamicist, such as the location of the two superchargers and Prestone radiator ducts were fully explored and investigated. Many times the shape, size and location of these "necessities" were changed. Nothing was left to guesswork. Consequently when you see a particularly complex installation on one of our new planes, remember that there is plenty of reason for its location and shape based on actual facts and research. At one time it might even have been a small piece of molded putty placed "just right" on a tiny wing of a model.

Another one of Lawrence Bell's ships, the Airacobra, prize package of all pursuit planes and virtually a "flying cannon," went through practically the same long, drawn-out research. Unique in that its motor was mounted behind the pilot with a drive shaft whirling its air screw, the Airacobra presented a new problem to designers and engineers alike because there was little or no data on such a type airplane motor mounting. Two versions of the ship were tested in wind tunnels at the University of Michigan engineering laboratories. One model had the engine placed conventionally forward of the pilot and the other had the power plant located in its aft position as called for in the plans. The results of the tests proved conclusively that the "idea" was one that had merit. After similar exhaustive tests by Wright Field engineers at the Dayton, Ohio, laboratory, the army fell in agreement with the new radical design and construction work on the new deadly "flying gun platform" was given the go-ahead signal by the the air corps. The results have been encouraging, for the Bell P-39 is regarded here and in Britain as a truly great airplane. It might never have been possible without that small model that proved its merit.

It is necessary to build several types of models of each airplane of new design, thus enabling engineers to study air flow, weight, lifting capacity, pressure distribution and other aëronautical features that affect flying qualities.

The army, at Wright Field, has two wind tunnels used for testing models which are built in the model workshops at the materiel division. One of the wind tunnels is five feet in diameter and the other is fourteen inches in diameter. The larger one is used for testing portions of full-size airplanes and wings, while the

smaller wind tunnel is used for testing propeller airfoils.

(Right now, nearing completion at this great aviation research center is the largest wind tunnel in the world. A forty-foot-diameter tunnel that will send air through its funnel at better than 400 miles an hour. It will lead to larger models and in some cases full-size airplanes to be tested here. The "big wind" was built at a cost of more than $2,500,000.)

Skilled workers are hired by Uncle Sam to build the small models that are to be tested in these tunnels. Special templates are made so that the woodworkers can make the models to exact scale. Here is where the cost mounts up. Many hours are spent in cutting the wood to the desired shapes. Extreme accuracy is required, for discrepancies would make the wind-tunnel experiments of doubtful value. These models have to be correct to "hair-line" accuracy.

Lathes for turning out small round fuselage parts and other special equipment have been especially designed for the Wright Field woodworking shops, so that the wood craftsmen have everything at their fingertips to produce the experimental warplane model.

There are generally six types of models: the *performance and stability* model; *pressure distribution* model; *drag* model; *spinning* model; *flutter* model; and the *free-flight* model. Each of these models has its own particular function in producing results for a specified test.

The performance model is complete in every detail and is used to determine the general flying characteristics of an airplane. The pressure distribution model is only part of a model depending upon which portion of the airplane is under consideration, and it is used to learn the amount of pressure that is applied to that particular part of the plane when it is in flight. The drag model is used to find out the amount of resistance offered by the various parts of the model when subjected to the windstream. The spinning model is one tested to make certain that the airplane will recover from a tail spin. The flutter model is used to test the flutter characteristics of any part of the plane. (Flutter can be compared to shimmy in the wheels of your automobile.) The free flight model is used to determine the controllability and stability of the airplane in free flight. These models in themselves and in name represent the types of tests that are run with each in trying to determine generally the all-around performance of an airplane before it is built.

Perhaps the most interesting of the wind-tunnel tests is one that is not carried out at Wright Field. It is known as the spin test utilizing the spinning model. The test is carried out at Langley Field, the N. A. C. A. laboratories, and a vertical tunnel is being contemplated for Wright Field under the rapidly expanding air corps program.

The spin test is conducted in a vertical wind tunnel. The model is dropped into the tunnel in which there is air blowing upward to support its surface. The model is equipped with a delicate and intricate clock-timing mechanism which moves its small control surfaces so as to cause the model to stop spinning. If the model straightens out into a dive, engineers know that the plane is safe for spinning. The model is caught in a net at the bottom of the tunnel.

There are two methods of supporting the performance models in the wind tunnels. One is the National Physical Laboratory's balance scale system, and the other consists of wire attachments. The latter is used at Wright Field, but the new wind tunnel will incorporate the first process.

When the model is suspended in the wind tunnel by wires, the lift and wind resistance can be recorded on balances and scales outside the tunnel. Wires are attached to the wing of the model and as the wind is drawn through the tunnel the model is blown back—depending upon its own resistance—and as it pulls the wires back it indicates on the balance scales outside the tunnel the amount of its resistance. Other wires attached to undersides of the wings indicate its lifting capacity by the same method.

Ordinarily tests in the tunnels are made at an air speed of 100 miles per hour. Using this figure as the basis for their calculations, engineers can learn approximately the speed and performance of any type airplane in existence today.

Flying Box Cars

Continued from page 29)

$1,000 a day in insurance payments for the idle machine. From New York to Honolulu went new dies and fifty connectors from the Anaconda Wire & Cable Co., for a big construction job held up by a breakdown. To Portland, Oregon, from San Francisco a gear was sped by plane to a cannery, saving 5,000 tons of fresh fish. Several packages containing a plane shaft and weighing 1,000 pounds were flown from Wisconsin to Chile. Detroit shipped vitally needed auto parts weighing 2,000 pounds to Los Angeles. A 1,205-pound shipment of aluminum was planed from Pittsburgh to the Burbank, California, plant of Lockheed. Last January, a 750-pound Diesel crankshaft needed in a navy defense project at Wake Island was rushed by United and Pan American to the Pacific outpost.

All of which makes it as plain as a pikestaff that American aviation is capable, if given an opportunity, of heavy freight operations. With much of the world's air transportation commandeered by the military authorities and stepped up to blitz speed, indicating possibly the commercial pace to come after the war, the time to begin heavy sky trucking is, therefore, *now,* according to some experts. They point out that such operations not only would speed up defense, but would blaze the trails for post-war services which are certain to come. A vast cargo fleet, operated by the U. S. government or privately, is pictured by these men as shuttling back and forth between far-flung industrial points, where vital defense parts are manufactured, and assembling centers, saving days and weeks in the production of finished machines and weapons. And come war time, with its threat of air attack, these ships could operate with considerably more safety than surface carriers.

The possession of such a fleet in time of hostilities, it is further stated, would be invaluable. As Grover Loening, noted aëronautical designer, pointed out to the National Aviation Forum in Washington last year: "We have but to look at the photographs of the most recent German air invasions to see our old friend the trimotor Ju.52—one of the most familiar airliners in the world—doing yeoman service by carrying troops, parachute troops, demountable guns, ammunition and all manner of supplies just like nothing more than a flying freight car."

True, in time of war, the army would promptly take over about 400 of the big airliners now in operation, but expert observers insist at least 10,000 to 15,000 would be necessary in blitz tactics. For example, our defense outposts are yearly stretching farther from home frontiers, which means that to stave off lightning surprise attacks great masses of shock troops would have to be rushed from garrisons and cantonments in hours, not days, to be really effective. Some time ago the U. S. army dispatched several regiments from New York to Alaska, the trip taking thirty or more days, whereas forty to fifty commandeered airliners could have done the job in less than twenty-four hours. In time of war the need of such speed is obviously imperative. With 1,000 planes like the new B-19 the army, for instance, could put down ten divisions in Brazil, 3,000 miles from the U. S. border, in fifteen hours. And no wonder—this great plane has a maximum weight when loaded of eighty-four tons and can carry forty tons of cargo, more than a railroad box car.

But we don't have to look entirely to B-19s; with minor alterations in design, the big combat fleets of Boeings, Martins, Douglases and Lockheeds coming off the assembly lines today could easily be transformed into all-cargo carriers. Moreover, with a standardized blueprint, automobile and aircraft factories all over the land could turn out freighters like doughnuts in a doughnut factory.

As for the United States, the ratio of cargo carriers to combat ships is about one percent, but even as small as it is, the army has long operated one of the world's best air-freight services. "There is an air-freight operation right here in the U. S. and a very successful and efficient one," Mr. Loening also pointed out. "It is run by the U. S. army. Perhaps again, as it did with the original air mail, in 1919, the army will show the way. With no less than seven squadrons of specially equipped load-carrying aircraft some sixty in number, the army moved over 2,000,000 ton miles of freight in the last year, carrying all manner of supplies between the depots at Dayton, Ohio; Middletown, Pennsylvania; San Antonio, Texas; et cetera, to air fields and factories, loads including entire loads of engines, propellers, parts, munitions and even lead pencils. And, of course, all these craft are also fixed for conversion to troop carriers at short notice."

For a number of years, in fact, the army air corps has employed the "DSC," a typical Douglas liner resembling the DC-2, for cargo haulage. A low-wing monoplane, its cabin is thirty-three feet long, its loading door at the after end (some have sliding tops). A DC-5, three-ton carrier, also is in service. But soon to be delivered to the army for troop transport is the brand-new Curtiss-20C, largest twin-engined aircraft ever built in the U. S. Dwarfing in size all transports now operated by the domestic air lines, this ship has a wing span of 108 feet, is seventy-six feet long, is powered with two 1,700-horsepower Wright Cyclone engines (they are more powerful than any commercial transport engines and have electric propellers with three blades), and weighs 40,000 pounds.

Originally designed for substratosphere commercial use as the CW-20, this ship was to accommodate thirty-six passengers as against twenty-one in the current DC-3s, and about 6,000 pounds of cargo. The craft is all metal and designed with two concentric circles intersecting so that the floor joins their points of intersection, thus affording spacious passenger accommodations above and cargo space below. The fuselage is "pressurized" (or supercharged) to enable the plane to cruise at 20,000 feet with equivalent "cabin altitude" of 6,000 feet. Maximum speed is 243 miles per hour. Introduction of cargo is done from a trapdoor at the bottom side. Ready to come off the assembly line of the Curtiss-Wright plant in St. Louis are 200 of these behemoths, all for the army.

It is doubtful, however, that were they being turned over to the air lines, as planned, they would satisfy needs for heavy cargo business. These needs call for a single-purpose, economical all-cargo ship—main bar to full freight operations. This craft must possess adequate hatchways, among other requirements; its floors must be well reinforced.

But in May, 1939, Benny Howard, racer-designer-engineer, announced that he was mapping a flying box car; it was to be a high-wing monoplane, twenty-two feet long, seven feet high and seven feet wide, with a wing span of eighty feet. Tail was to swing out on hinges to permit loading of an 8,000-pound cargo from the rear. Cost of operations was figured at the time at twenty-six dollars per one hundred flight miles. Charles H. Babb, international airplane broker who converts and sells old passenger craft for use as freighters abroad, has designed an even bigger high-wing monoplane for all-cargo purpose; it is one hundred feet long, carries a payload of 11,500 pounds, and unhinges its nose for loading.

Air experts believe that one of the chief drawbacks to past realization of full freight operations has been the failure of shippers and carriers to differentiate between a strictly luxury passenger-express service and straight cargo operations. They contend that such haulage must be based on slower and therefore low-cost traffic. The emphasis, in their opinion, should be on the plane's lift rather than its speed. Indeed, today much of the big airliners is wasted in helping the take-off for long runs. Shorter runs consequently should be the rule, thus providing more payloads. Furthermore, in keeping with the lower standards of these operations, the latest, high-speed craft would not be needed, nor would the numerous and skilled personnel be required, since there would be fewer safety rules to fulfill.

These experts like to conceive an ideal future cargo carrier which might be called a streamlined tin goose, for the way these old trimotors pick up bulky cargoes in their slow-poke fashion is the marvel of air traffic men. Extending the concept further, the future air freighter might well, in their mental blueprints, be a behemoth like the B-19, geared for a comfortable 125-150 miles an hour, a great, huge-winged ship built to carry a whole lot mighty cheaply. It could, too, pull a string of trailers. There seems to be no question in the minds of traffic visionaries that these trailers will play an important part in coming air freight. It has been

pointed out, for example, that a Douglas DC-3, slowed to about 100-125 miles an hour, might conceivably pull eight fully loaded "box cars" designed on the same type of plane.

Tentative routes for these projected freight lines already have been worked out in some blueprints. One of the first to be suggested is, of course, that between New York and San Francisco, with vast feeder services tapping adjacent farming and industrial sectors along the way. The American Air Freight Corp., for example, has a pretty good idea of where it wants to operate. Some of the projected runs: Los Angeles to Boston, via Southern points, passing through New York from Washington; Los Angeles to Boston via mid-continental points, also up past New York; San Francisco to Boston via Chicago, Great Lakes points and New York; and Laredo, Texas, to Minneapolis via Kansas City and Chicago. As a matter of fact, the company was the first to file such planned routes with the CAB.

In fact, more than a year ago it was announced that the big air lines were angling to set up the framework for heavy freight operations. Some of the lines, like United, hired management engineers to make surveys. Chester M. Mayer, president of Air Express International Agency, Inc., which promotes air express abroad, is credited with starting the ball rolling, charging that Rail Express Agency (REA), which controls the ground pick-up and delivery service throughout the nation, did little to solicit air business.

At that time the General American Transportation Corp. warned the railroads that if they didn't wake up and combine with the air lines and REA to control the air cargo business, truckers might line up with the air carriers. This was realistically emphasized when the U. S. Freight Co., an important carload forwarder and motor truck operator, named an air freight consultant and mapped the nucleus for a ground system. Some of the railroads also got busy. The Kansas City Southern and the Seaboard Airline applied to the CAB for certificates to operate air freight services. Apprehensive, REA launched a gigantic survey among 100,000 shippers to ascertain future needs of the field.

Last January, an application of informal nature to operate transcontinental air lines strictly for carrying freight was filed with the CAB by the American Air Freight Corp., a newly formed California company. Before asking for a formal request for a certificate of necessity and convenience as air carrier under the "grandfather clause" of the Civil Aëronautics Act, founders planned to devote two years to surveying routes, evolving a ground pick-up and delivery service and developing suitable aircraft. Then in March, Colonel Edgar S. Gorrel of the Air Transport Association announced the formation of Air Cargo, Inc., which will engage in sky carrying of freight and express. The corporation is owned by American Airlines, Eastern Air Lines, Transcontinental & Western, and United Air Lines, which handle about ninety percent of today's air express.

Next after the need for ships of this type to expedite the dawn of widespread all-freight operations, are lower rates. Air lines and shippers together have clamored for a reduction in current high tariffs. Loening and others believe that cheaper charges will be obtained only when the REA monopoly is broken. In July, 1939, Loening demanded a slash in tariffs when, joined by air-line executives, he protested a REA request to the CAB for a certificate to act as a carrier, a request (later denied) which was allegedly made to formalize the agency's grip on air express. Loening at the same time urged formation of a new ground handling corporation to build fifty ships of eight tons immediately.

There are any number of opinions on desirable air freight rates. General agreement appears to be on one point: the larger the payload the lower the ton operating cost. The cost, it is declared by some, diminishes only slightly between nine and one-half and thirteen tons, and in this bracket hovers around five cents per ton mile. Oft-mentioned ideal rate for air cargo is ten cents a mile. REA shippers today pay eighty-six cents per ton mile compared to twelve to eighteen cents by rail. Curtiss-Wright figures cited a flying cost of 6.14 cents per ton mile for flight legs of 200 miles or 5.29 cents for 800 miles. According to these figures, based on operations of the CW-20, with all additional costs, including pick-up and delivery, a ship could operate competitively with railway express. As a matter of fact, stripped down to haul cargo from the River Rouge plant to assembly lines, old Ford geese got the rate down to ten to fifteen cents.

Much talk on a better rate structure has centered on the contention of some experts that a delayed or "deferred" service would solve the problem. Opponents of this view, and foremost among them are REA executives, reply that while American shippers want lower rates, they do not want deferred deliveries.

There is much to be said on both sides, as can be seen, but it's likely that the present national defense emergency will have more to do with settling the question than anything said on what now might be called the side lines. Right now some of the heaviest air freight traffic has to do with shipments to far-flung military, naval and defense projects—machinery, vital parts, bundles of blueprints, supplies, et cetera.

And if war comes, scores of big commercial airliners will promptly have their innards yanked out to make room for troops or munitions. And, any way you look at it—whether we get in or not—cargo ships are bound to take up the slack of military production when the conflict is over. Hundreds of bright, new bombers on the assembly lines will be converted to peaceful purposes. Big business will not overlook its opportunities. Glenn L. Martin has pointed up the whole question with his boast: "Give me enough money to build a ship big enough, and I will build a plane able to carry wheat to Europe cheaper than ocean-going ships!"

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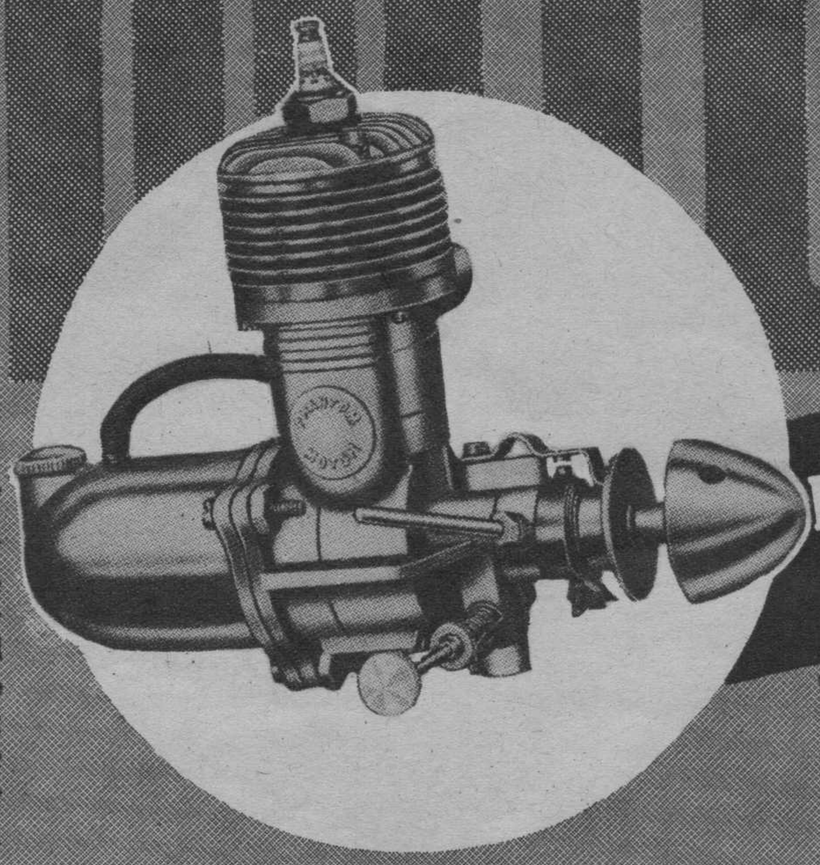

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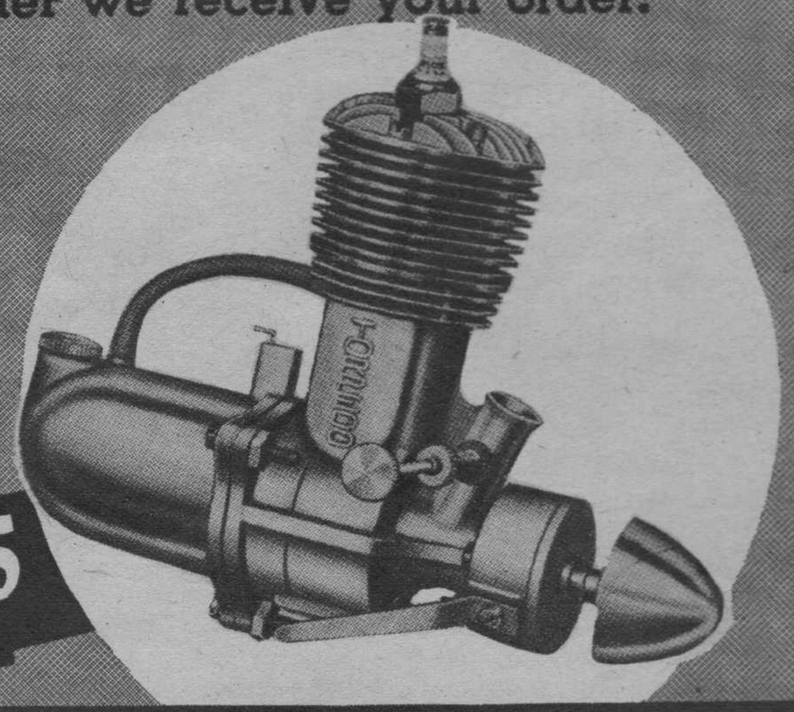

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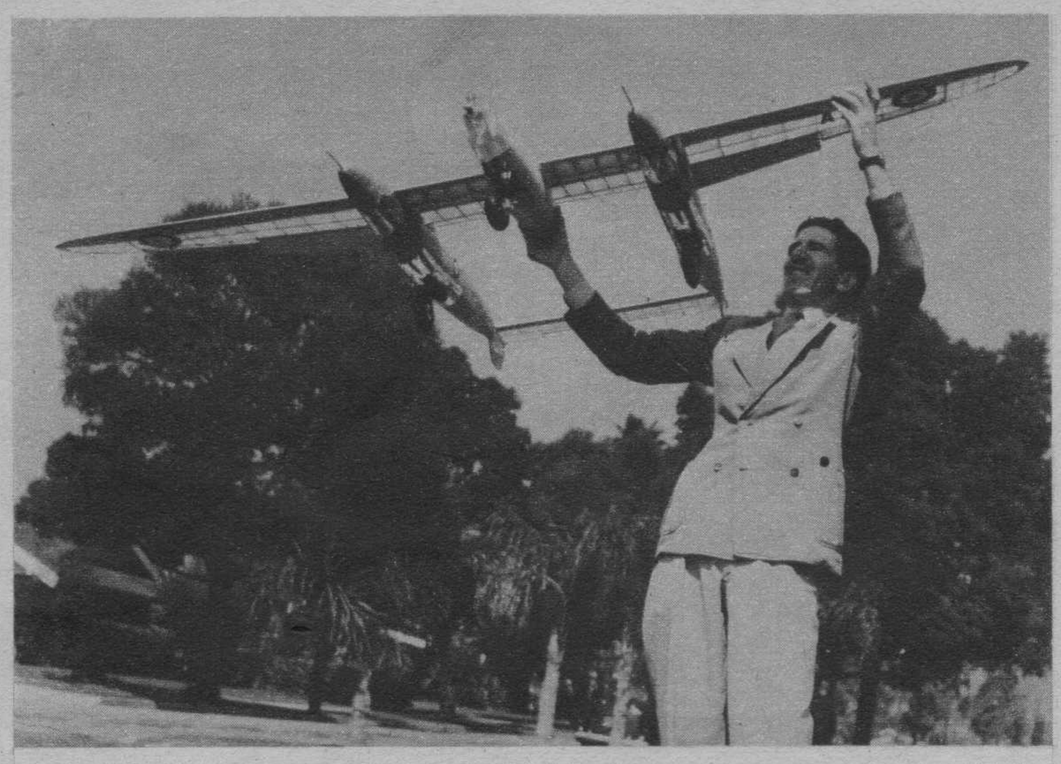
Fun for young and old. The Potter family of Alexandria, Va.—all three generations of them—at Berlin, N. J., meet. Potters are contest goers.



H. S. Dion, Glendale, Calif., thinks his ship unusual enough to publish. We agree. Don't you? Inspired by P-38, has pusher and tractor propellers.

Model matters

Gordon Light's Dope Can. Moon's On The Field.

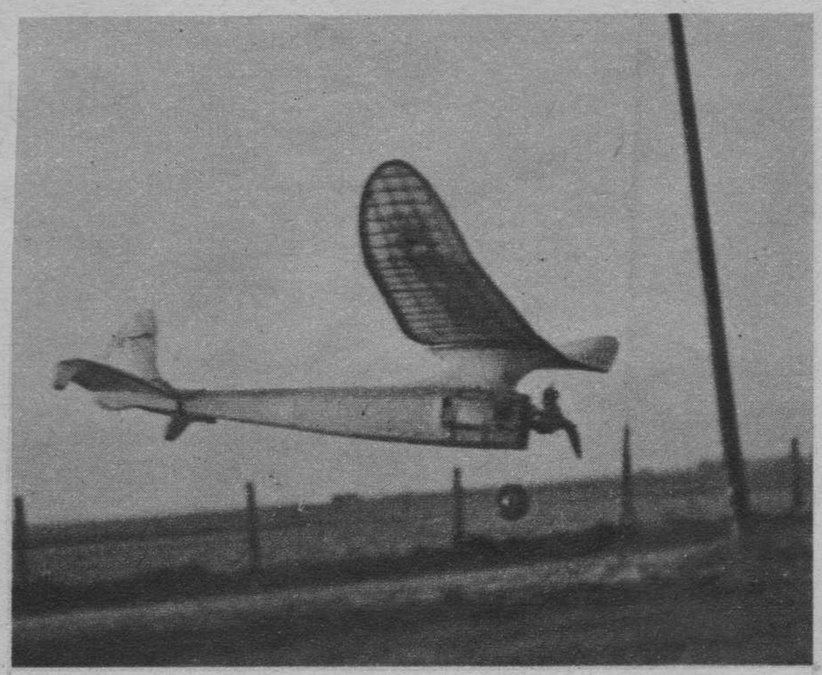
THE DOPE CAN. (By Gordon Light.) Recently newspapers carried an interesting shot of forty four-engined Douglas transports lined up outside the American Airlines hangar at LaGuardia Airport. Complete with the airline's insignia and license numbers it looked like a genuine collection of the company's rolling stock. But both caption and close inspection revealed that the airplanes were models lined up for a trick photo. Very clever!

Roy Marquardt has finished his graduate study at Cal Tech and is working in the aërodynamic department of Douglas. We hope he has time to keep up his low-speed wind tunnel experiments so nobly begun a few years ago.

The motto of the South Jersey Gas Model Airplane Association is "Clean Altitude Above All"—which is a good thought for anyone interested in getting more than a few prizes out of the hobby.

The monthly newspaper of the Fresno Gas Model Association is designed to circulate news and ideas among the clubs on the West coast. R. O. Spacy (editor) and E. Weymouth (assistant) put out the first issue last April. F. G. M. A. has a membership of nearly seventy-five with a goal of one hundred by the end of the year. In November, 1940, the club was formed by five builders who thought a club offered the maximum in model fun. John Drobshoff is one of the most successful FGMA members in contest circles. He was the West coast champion in 1940 and won the Air Trails Trophy at the Chicago Nationals.

The hobby lost one of its stalwarts in Robert A. Romeiser. He died last May in Indianapolis after a four-weeks' meningitis infection. *(Turn to page 59)*



Robert Johnson, Bloomingdale, Ill., supplies this action shot of his Comet Sailplane in a glide. Note single wheel.

Elmer Powell and his Brown-powered Scientific Flagship. The smaller ship, his own design, is powered by a Bantam.

MORE ABOUT THE BUZZARD BOMBSHELL.

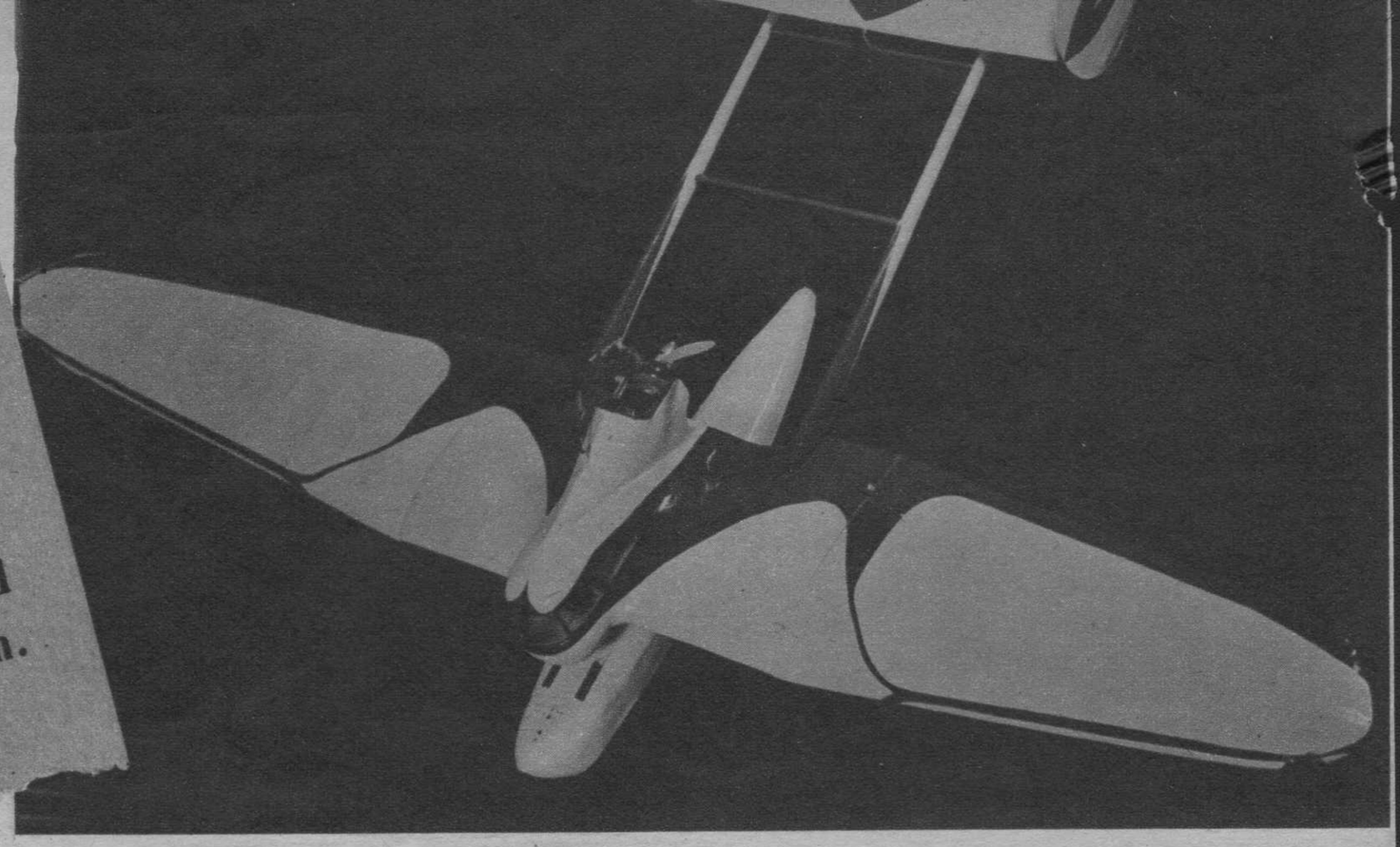
In June Air Trails the featured gas model kit survey "Your Choice of Kits," mentioned Aircraft's Buzzard Bombshell as a "boxlike contraption." Although these words of an experienced builder who himself regards the Bombshell highly enough to fly one in contests are modeler's lingo, we fear some readers will give them a derogatory meaning.

We want to go on record as saying the Bombshell is one of the best-looking and possibly the finest performer published in Air Trails this past year. Anyone who recalls the Bombshell plans in the October 1940 issue knows what a swell job it is. We said then, "Our nomination for all-American gas job is this Nationals Class C, Open, record smasher."

Photographer says, "This model astonished the experts. Almost flew out of sight on 20-sec. motor run." F. Horch.

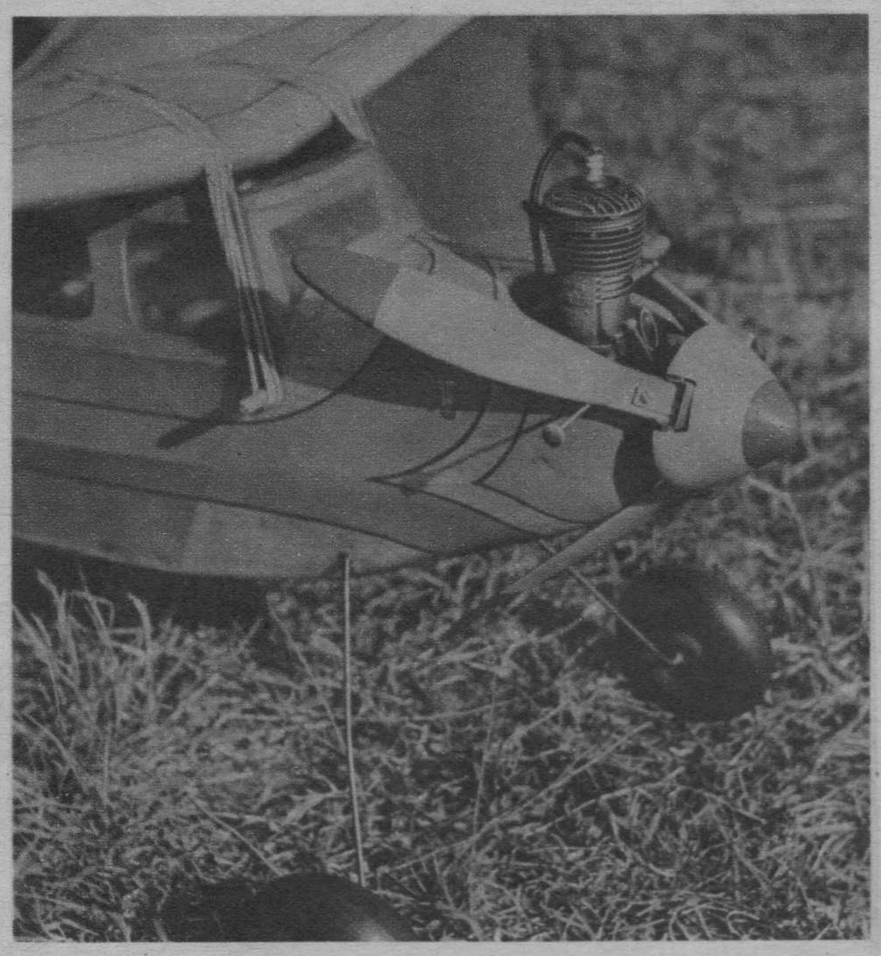
MODEL TINTYPES

Ideas both good and "screwy" abound in this latest dream ship collection.

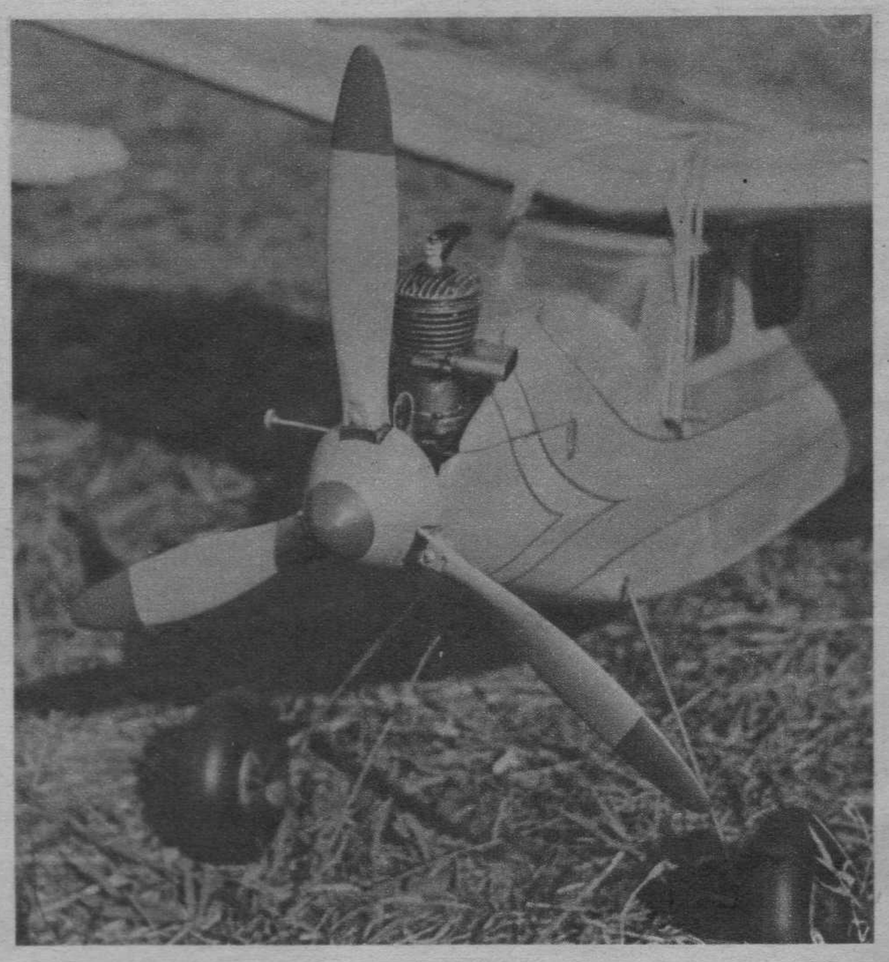


This tricky number features detachable outer wing panels, pusher engine, twin booms, kitchen sink—

Art Gray and prize "finish" model at Berlin, N. J. Has three-bladed prop, Super Cyclone.



How Gray's propeller works. Each blade is hinged near prop hub and folds back in glide, thus reducing air drag.

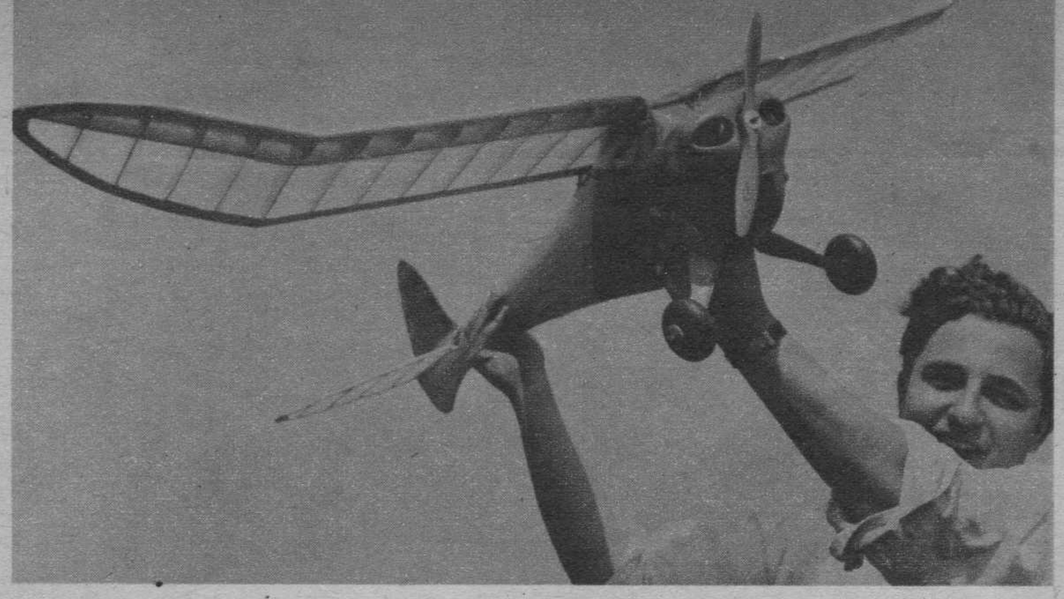


Centrifugal force holds folding propeller blades in position when the motor is running. Hinges must be strong for safety.

Jack Powell and Bantam-powered gas model won Flight Command best finish contest.

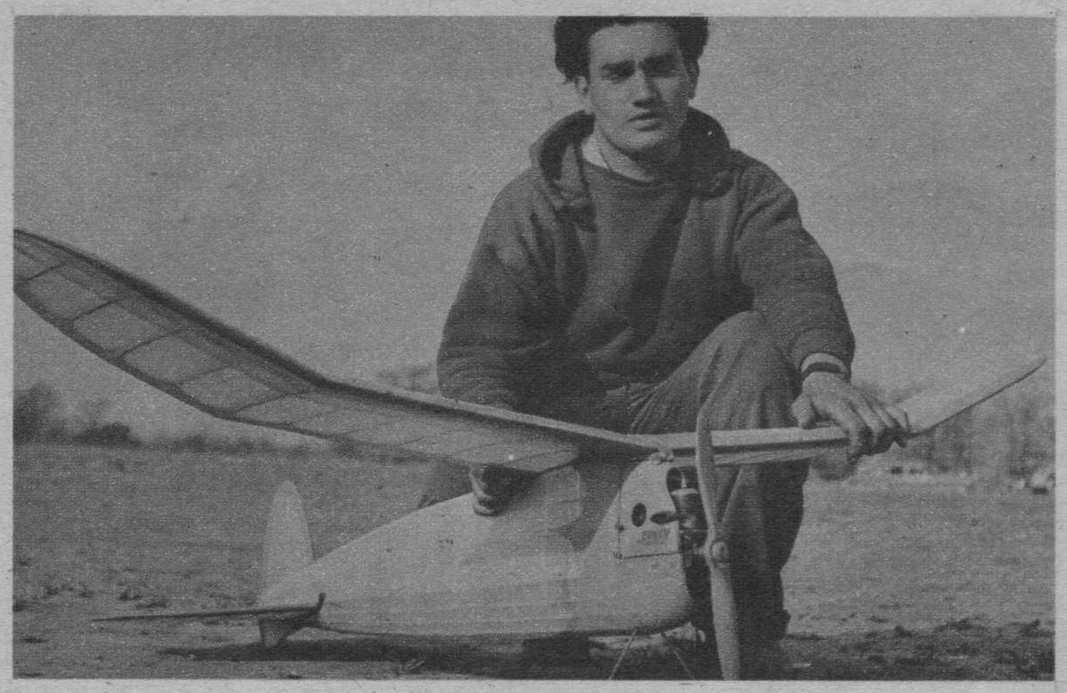
We like this one for its design. Crutch construction, sheet-balsa fuselage, "U" stabilizer, no rudder. Cliff Travis.

This Class A pusher is Robert Harrison's dream ship. Powered with a Megow 199, it flies well. One wheel and fin skids.

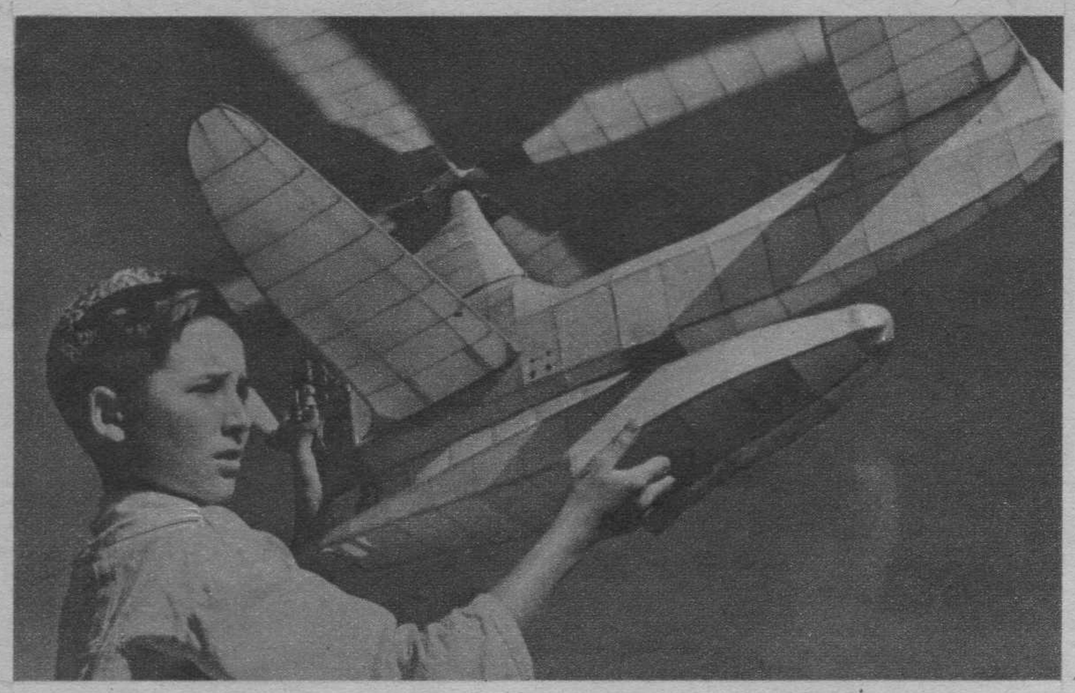


John Ullman's Class A, Elf Twin-powered job looks something like a light plane with that nose cowl he's worked out. Nice model, we would say.

Leon Shulman's Super Zombie has inclosed engine, retractable monowheel. Skin friction is reduced by lack of fuselage area. Note folding prop.



Sal Taibi just got a job with the N. A. C. A., but had to take off twenty pounds to do it, hence the sweatshirt. Oh yes, that's a gas model, too.



This Russian what-is-it could be an autogyro, or anything else. Apparently, it's a tail-first, pusher seaplane. Think you'll make one?

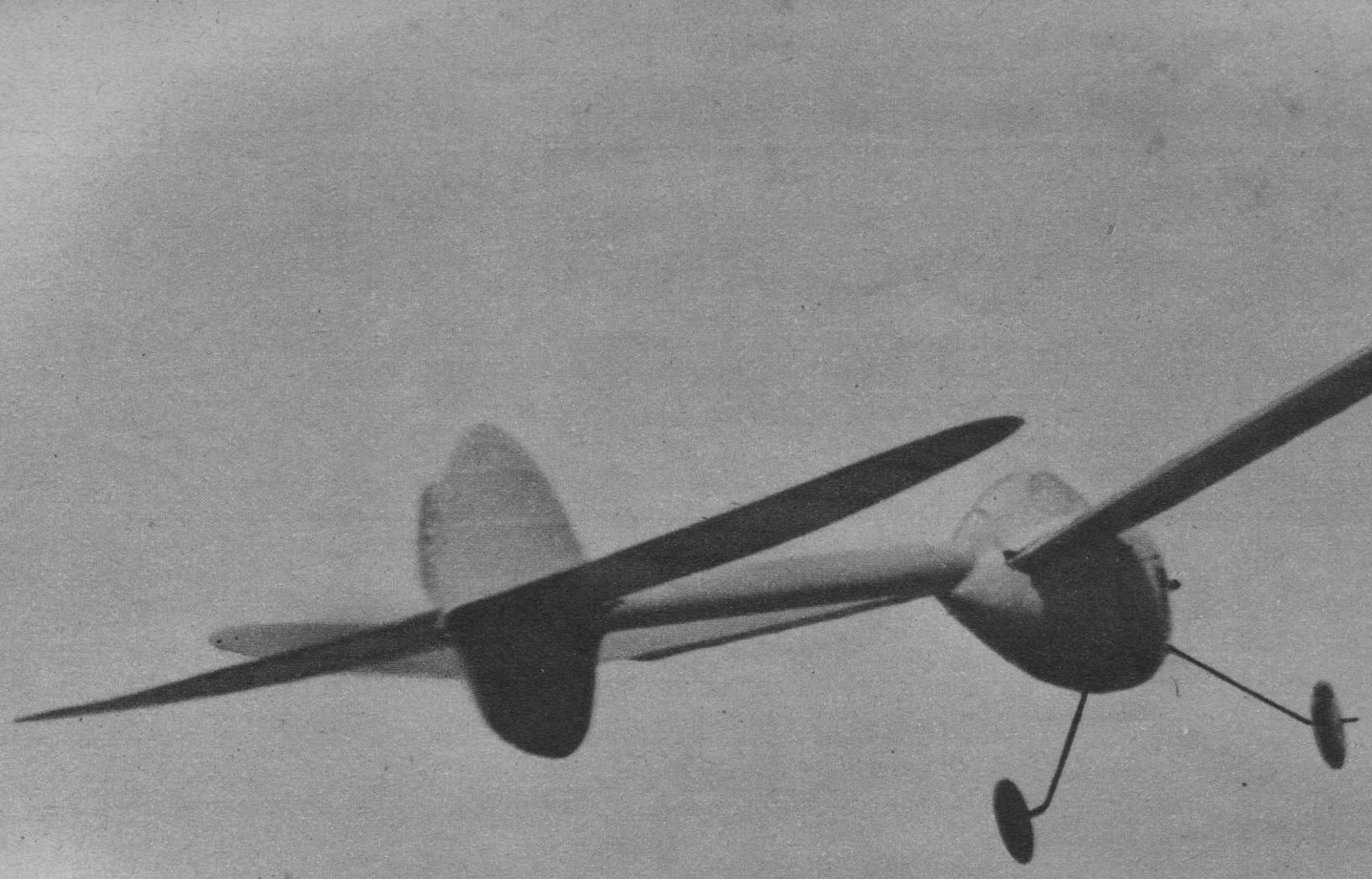
George Reynolds, Jacksonville, evidently likes parasols, and the higher the better. Maybe it's because of that hot Florida sun. Ohlsson 60.

It's a stick-up. Charles Richburg, Tampa, uses a four-foot stick and a single-strut wing mount on his job. It's a neat trick—if you can do it.

Frank Hernandez made this snappy racer-type model. Has cockpit with pilot, shielded wing lights, spats. Flies nicely.

Geodetic wings distinguish Elmer Wassman's gas job. Spars are eliminated. On the whole, it looks a whole lot easier.

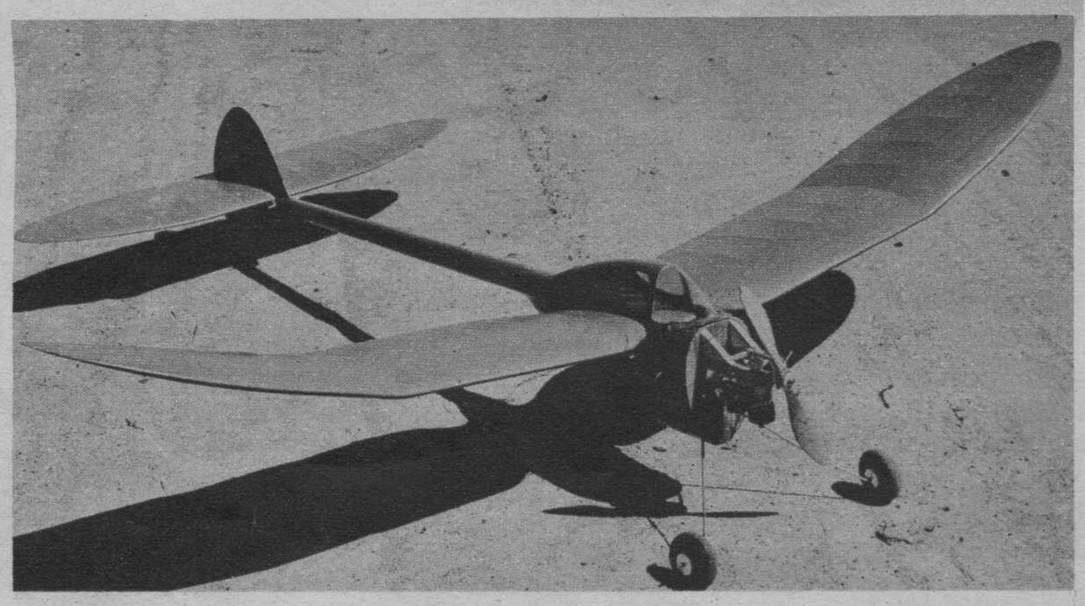
One way to launch a gas buggy. Mac Jurist just grabs his Atom job by boom and let's go.



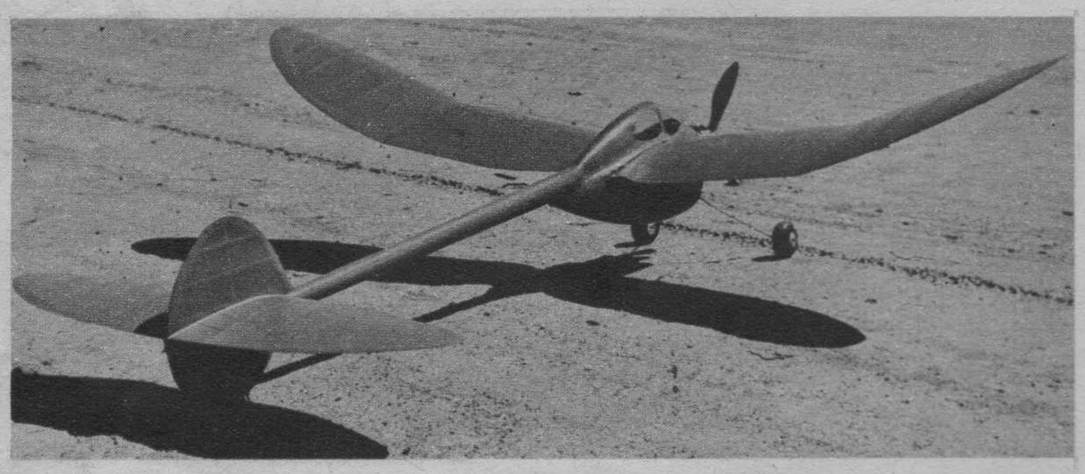
NOMAD

Pod-and-boom aerodynamic efficiency make this realistic Class C gas model a top-notch performer.

BY CHARLES HOLLINGER



The Nomad is based on experience gained from two earlier pod-boom jobs.



Long-tail moment arm enables Nomad to handle Ohlsson 60s, Super Cyclones.

And here is the intrepid pilot himself, goggles, helmet to boot. Balsa block.

THE Nomad marks the third endeavor of the designer to create a top-notch flier using the pod-and-boom arrangement as a basis. Wind-tunnel tests show that it has the least drag of any fuselage design and there is practically no fuselage interference where the tail surfaces are concerned, regardless at what angle it may be flying. Why isn't it used more? The answer is that most modelers don't like the type of construction that is required, namely, planking and the bending of sheet for the boom. This slight extra work is well repaid by the performance that is gained.

In the month of May, 1939, the first of this series made its appearance. The model was designed with efficiency (high lift and low drag) as its keynote. An 8-foot wing span, 4-foot stabilizer, double rudders and short moment arm (to keep cross section to a minimum) resulted in a remarkable gliding angle of 12:1. I know that when this is called remarkable there will be some who will say, "Shucks, that's nothing, my rubber model has nearly a 20:1 glide." Wind-tunnel tests have proven this to be absolutely untrue. We of the Tacoma Gas Wings Club have found through tests and observations at contests that the best rubber-powered models have a glide ratio of about 6:1 and the best gas models of approximately 9:1.

Well, we had better get back to the model. True, it had a fine glide coupled with a slow sinking speed, but there was one bug and that was stability. Under low power it left nothing to be desired, but when the Brown D was opened wide it couldn't be counted on. This was due to the short moment arm, small rudders and lack of sufficient dihedral.

In the second design some efficiency was sacrificed to attain proper flight characteristics. Features of this model were an inverted M&M motor of .23-cubic-inch displacement, stabilizer on top of the rudder and a fifty-percent moment arm. This little 42-inch job proved to be a fine flier, at least good enough to win two first places, one in a thirty-mile wind with a time of 3 minutes, 54 seconds. Susceptibility to right spirals was its undoing later.

With the experience from these two as a guide, the Nomad was formulated in March, 1940. At that time a retractable gear had been planned for it, but this was passed over for the sake of simplicity. A single rudder was used because *(Turn to page 56)*

SPECIFICATIONS

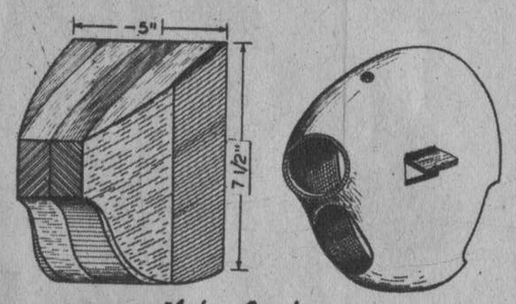
WING SPAN	78"
WING AREA	SQ. FT. = 6 1/2
WING LOADING	8 OZ.
LENGTH	60"
POWER USED	OHLSSON "60"
PROPELLER	14-15"

WEIGHTS

WING	12 OZ.
FUSELAGE	38 OZ.
TAIL SURFACES	3 OZ.
TOTAL	3 LBS. 4 OZ.

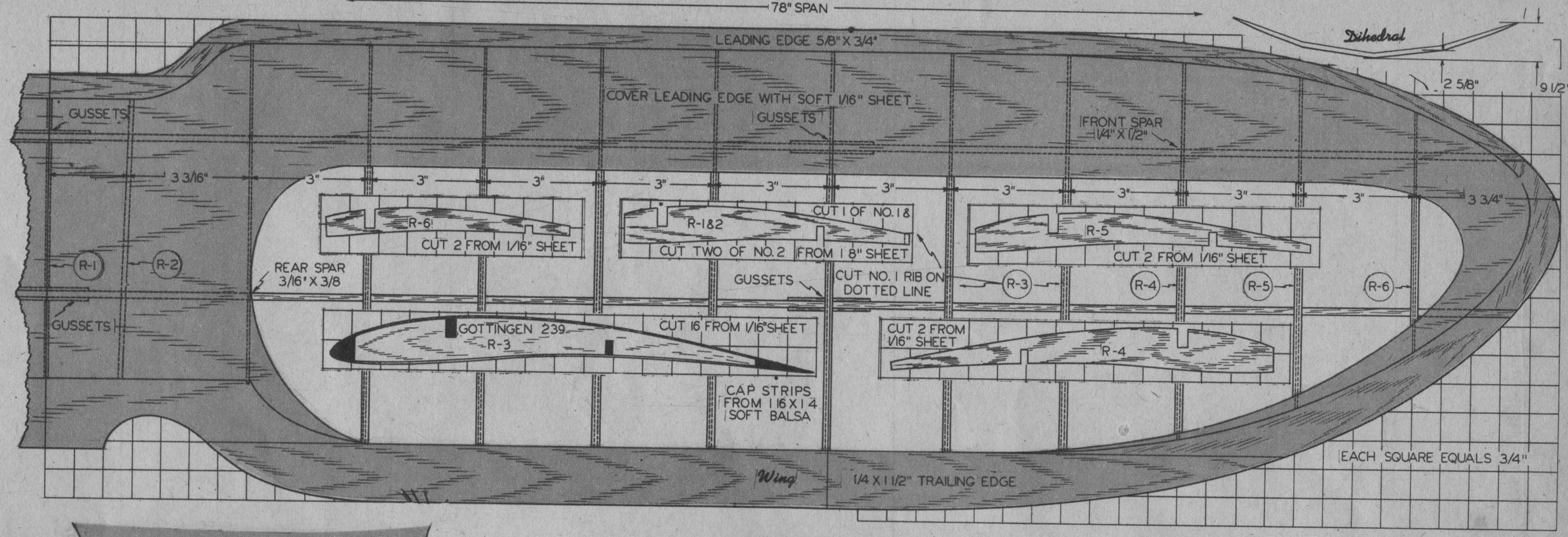
ANGULAR SETTINGS
(TAKEN FROM CENTER LINE OF FUSELAGE)

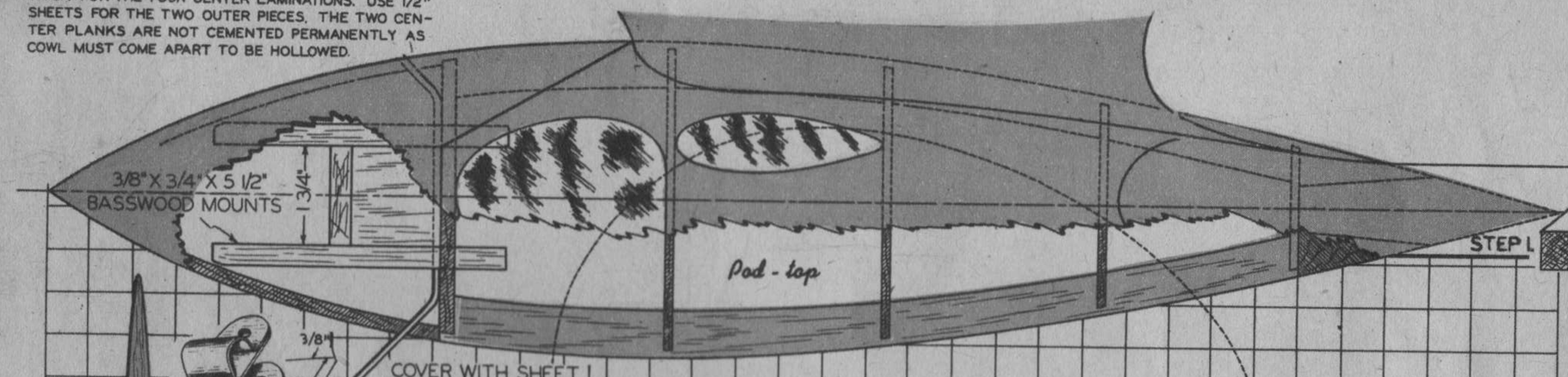
WING	2° POS.
STABILIZER	0°
MOTOR	2° NEG.
	3° LEFT THRUST

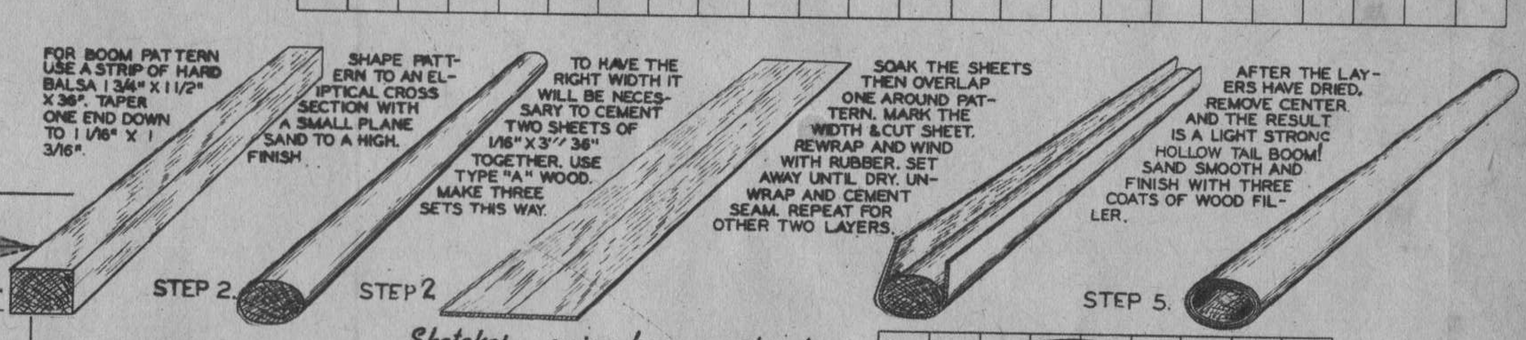


Motor Cowling

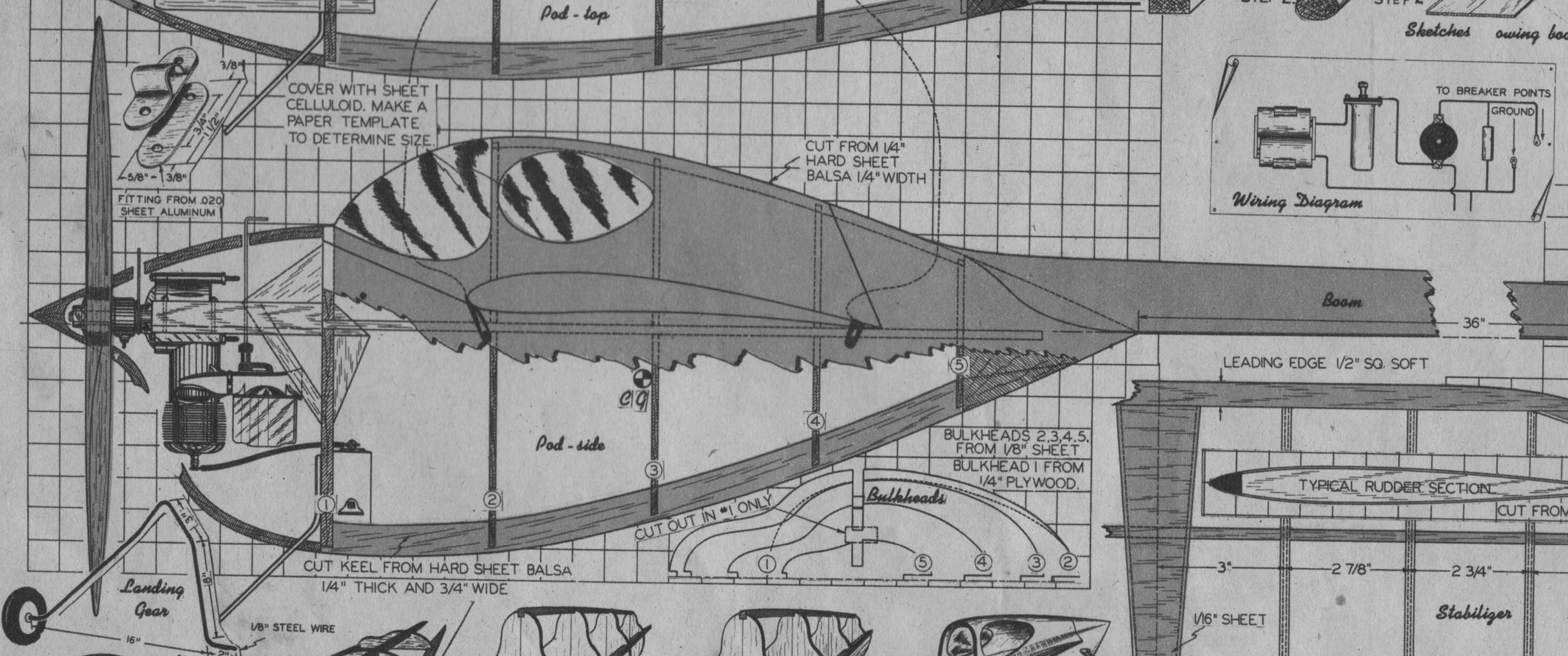
BUILD UP COWLING FROM SOFT PLANKS OF BALSA 1" THICK FOR THE FOUR CENTER LAMINATIONS. USE 1/2" SHEETS FOR THE TWO OUTER PIECES. THE TWO CENTER PLANKS ARE NOT CEMENTED PERMANENTLY AS COWL MUST COME APART TO BE HOLLOWED.





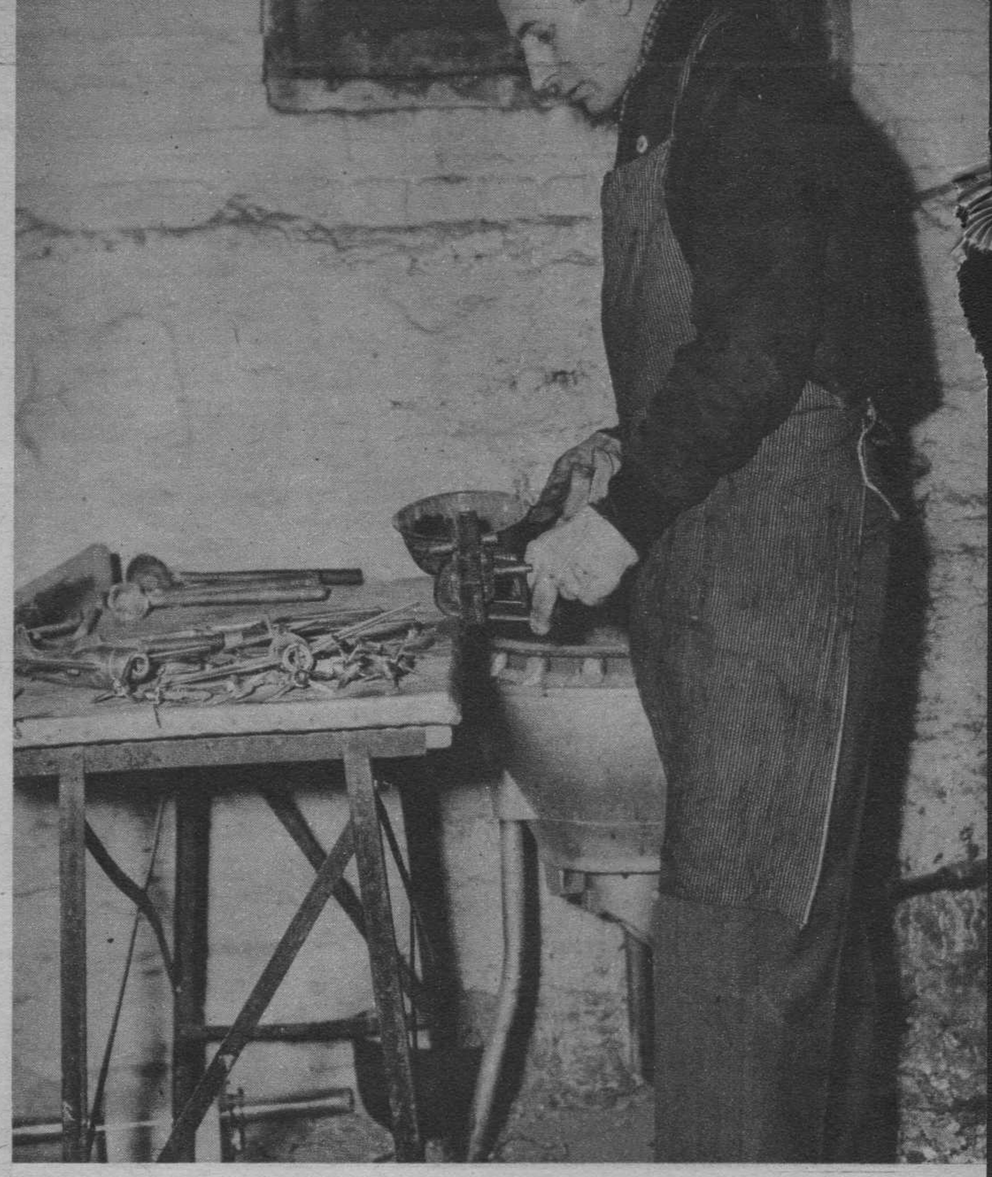


Sketches owing boom construction



Wiring Diagram

Putting finishing touches on batch of Grumman midwings, part of an order of 1,500. Note DC-4.



Pouring molten white metal into small prop mold held in vise.

MODEL CAREER MEN

Joe Battaglia makes a scale hobby into a career.

JOE BATTAGLIA has been building models for twenty-two years. Says Joe, "It started with one of Mom's best table knives and a crude attempt at carving a weather-vane propeller. That was before balsa wood. But we had gas models, believe it or not."

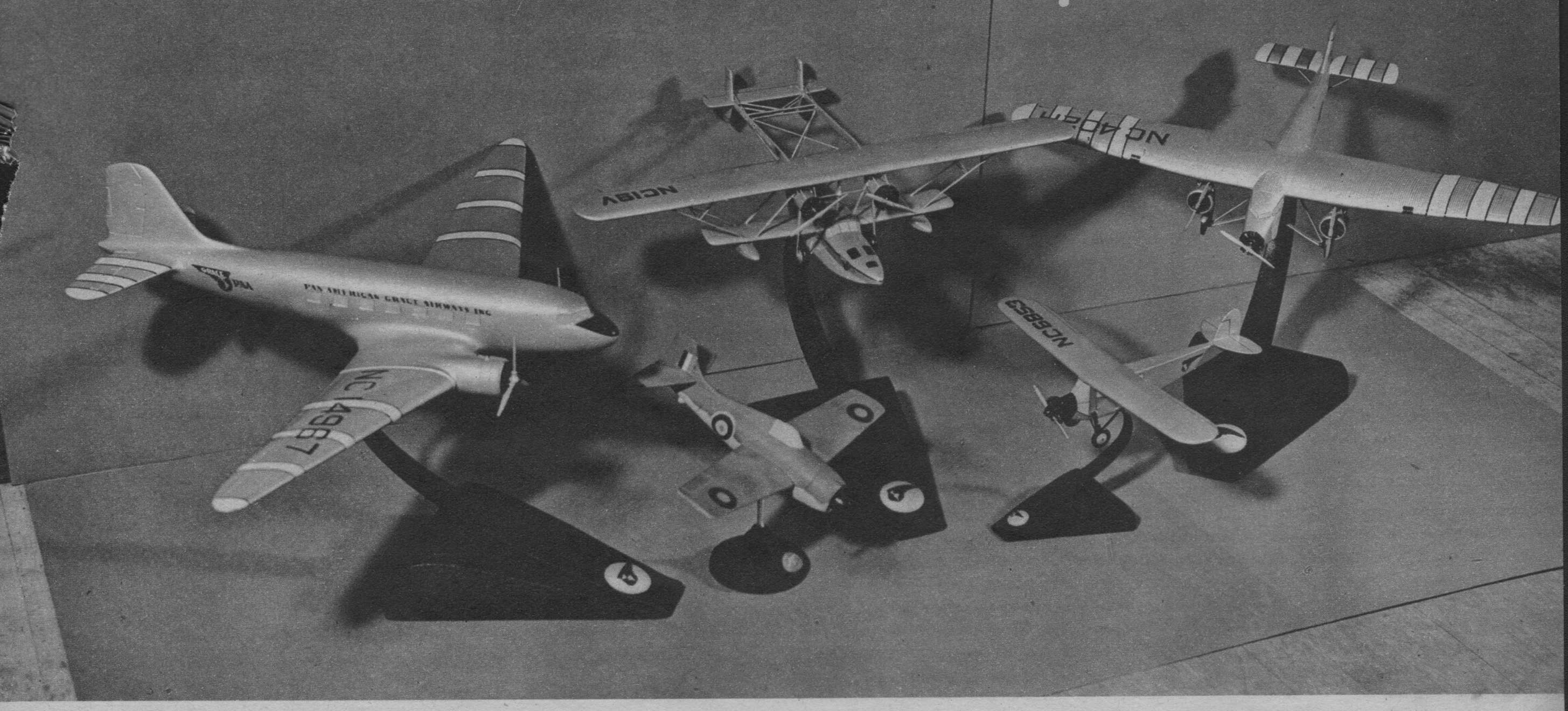
Even Joe himself has no idea of how many models he's built. Certainly it runs into the thousands. He recently turned out 1,500 metal Grumman midwings in three months. His largest job, a six-foot Pan American Clipper, required six months. Somehow, he found time enough to have a fling at making boats, trains, liquid-powered rockets, toys and what-have-you. But Joe's outstanding success has been his precision custom-made model airplanes.

How he makes metal models is shown on these two pages.

Sawing wood wing blanks for Stinson. After assembly carved blanks become pattern for plaster casts from which bronze molds are made.

This Pan American Clipper was a six months' job. The plane itself is wood carved, but the pedestal is cast. Some Battaglia models are on display in museums.

Plaster is poured around model to make casts. Casts are then duplicated in bronze for molds. White metal is cast in the bronze molds.

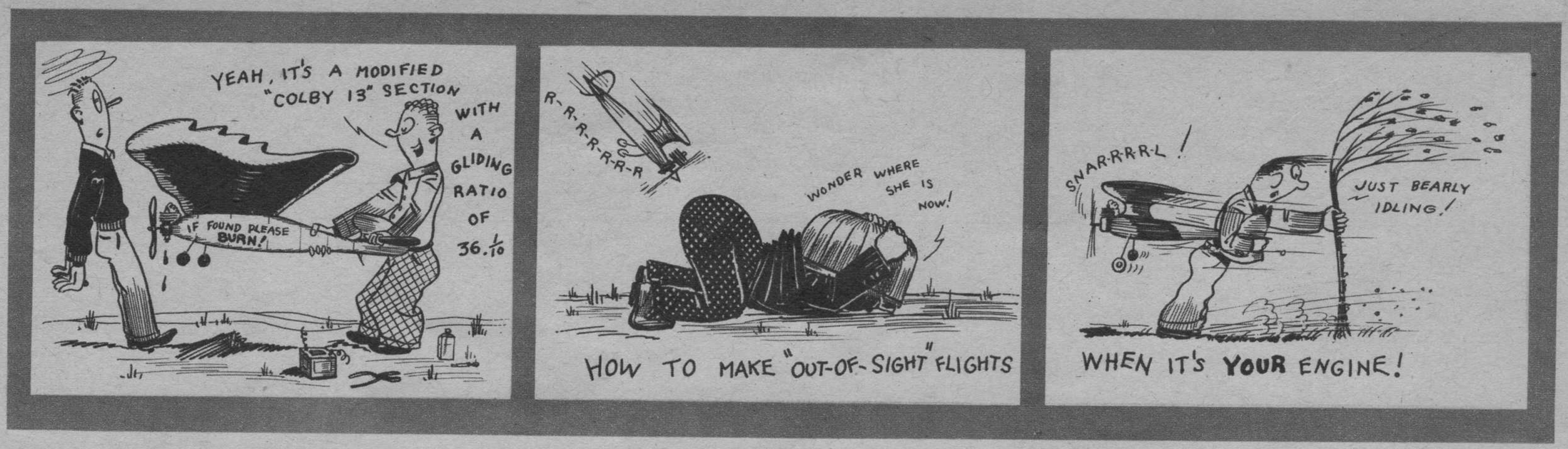


Recent Battaglia models. British Grumman is cast, others built from wood on special order for airline official. Ford, right, has covering corrugations. Fairchild 71, front right.

Joe holds wooden pattern of DC-4. Left and right plaster cabin core molds against wall. Sand packed between them and baked to form core for making of the final bronze mold.

Paint trimming is done with an airbrush. The unpainted sections are protected by metal mask. These models are seen on display all over the country in air transportation offices.

Finished transport models sell for about $35. The molds cost as much as $900 apiece. Thus an order for 1,500 Grummans worked out for $5 apiece.



SLIDE, RULE, SLIDE!

BY GEORGE HUGGINS

THE beginner who is now building, or who has just completed his first gas model, is considerably handicapped by his lack of some of the finer technical aspects of this interesting sport. The following formulas will enable the veriest tyro to compete with builders of greater experience.

MOTOR SPEED

When discussing your pet motor, you must always assume a motor speed of 10,000 r. p. m. When discussing relative merits of other motors, you are to assume speeds of not over 4,000-5,000 r. p. m. However, when relating some particularly sensational flight of your own, you must never concede that your motor has developed high speed, but it must invariably be described as having run at "part throttle," "four-cycling," or "just barely turning over."

RATE OF CLIMB

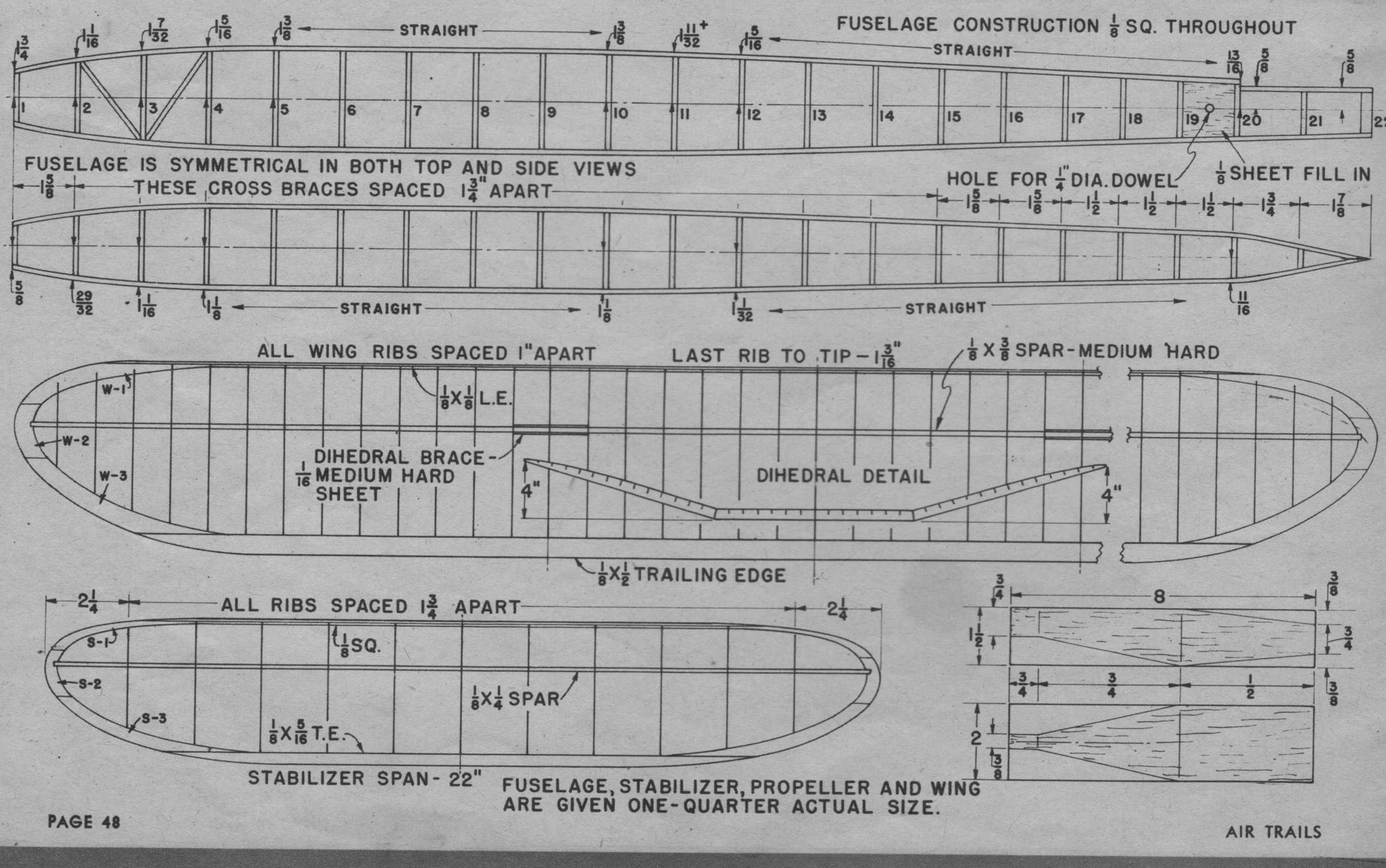
All gas models previously climbed at the rate of 1,000 feet per minute. This got rather monotonous, so it must be assumed now that all gas models climb at the rate of 2,000 f. p. m. When your motor cuts off, your altitude can be ascertained readily. If you are still able to read the manufacturer's trademark on your air-wheels, your ship is 500 feet high. If estimating the height of a friend's or competitor's ship, similar altitudes can be taken as fifty feet or "barely off the ground."

GLIDING RATIO

A ratio of 10:1 is very favorable indeed, but due to the fact that you have "modified" the airfoil section, you should easily be able to claim a glide ratio between 18:1 and 22:1. Fo *(Turn to page 57)*

★ ★

MULVIHILL TROPHY WINNER



MULVIHILL TROPHY WINNER

BY HOMER HELLER

THIS model was completed the week before the Nationals and was first test-flown in Chicago. During the tests I was able to average between 3½ to 4 minutes quite consistently. On its first official flight on the day of the contest it flew out of sight after almost twelve minutes (11:54:7) and another ship was used to complete the day's flying.

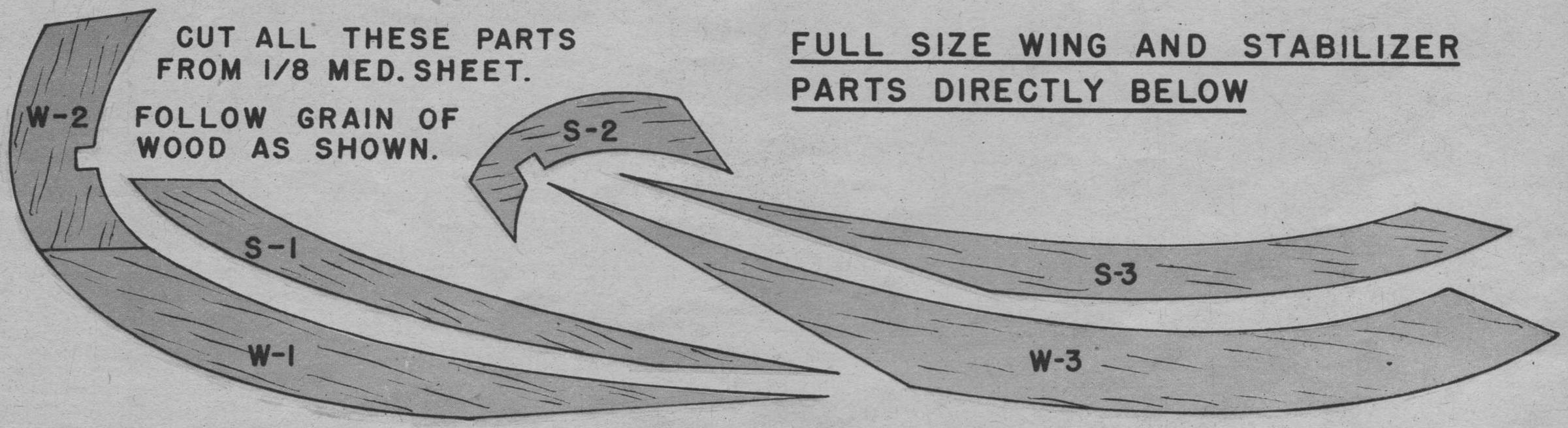
CONSTRUCTION

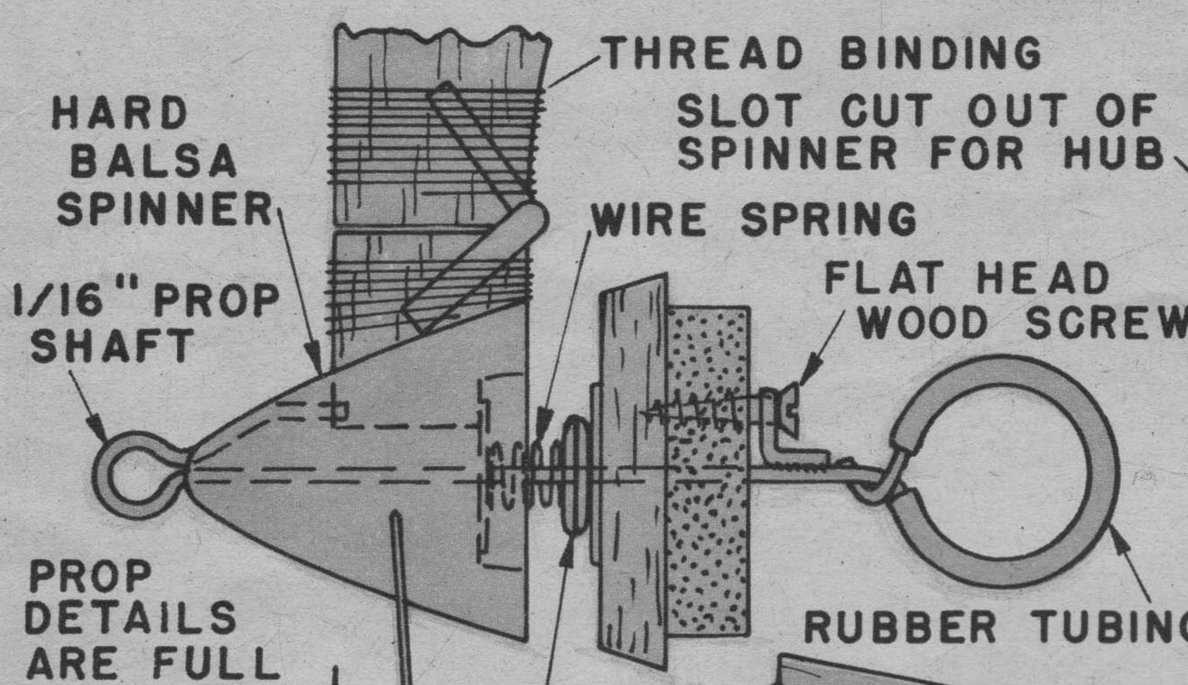
The fuselage is built in the conventional manner, by first making two identical sides, one above the other to insure similarity of shape. The longerons should be 1/8" square hard balsa and the cross braces 1/8" square medium soft balsa. The two halves are then joined by cementing the cross braces in place, starting at the widest portion and working toward each end, and thereby forming a rectangular fuselage. The front and rear ends are both filled in with 1/8" hard sheet balsa as indicated on the plans.

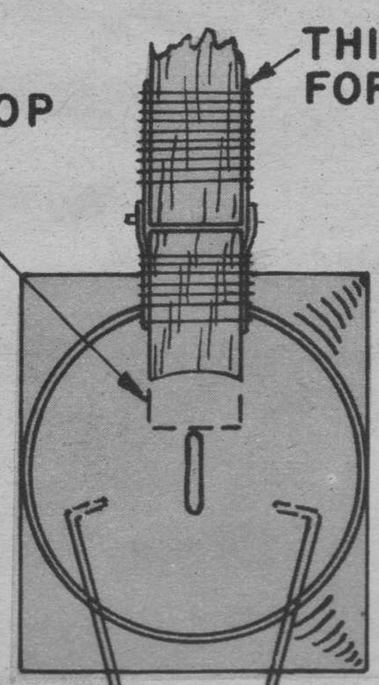
The wing is built in three 14" panels, which are joined after all are complete. The dihedral breaks are reinforced with 1/16" hard balsa. The ribs are made from 1/16" sheet (soft) balsa. See plans for further details.

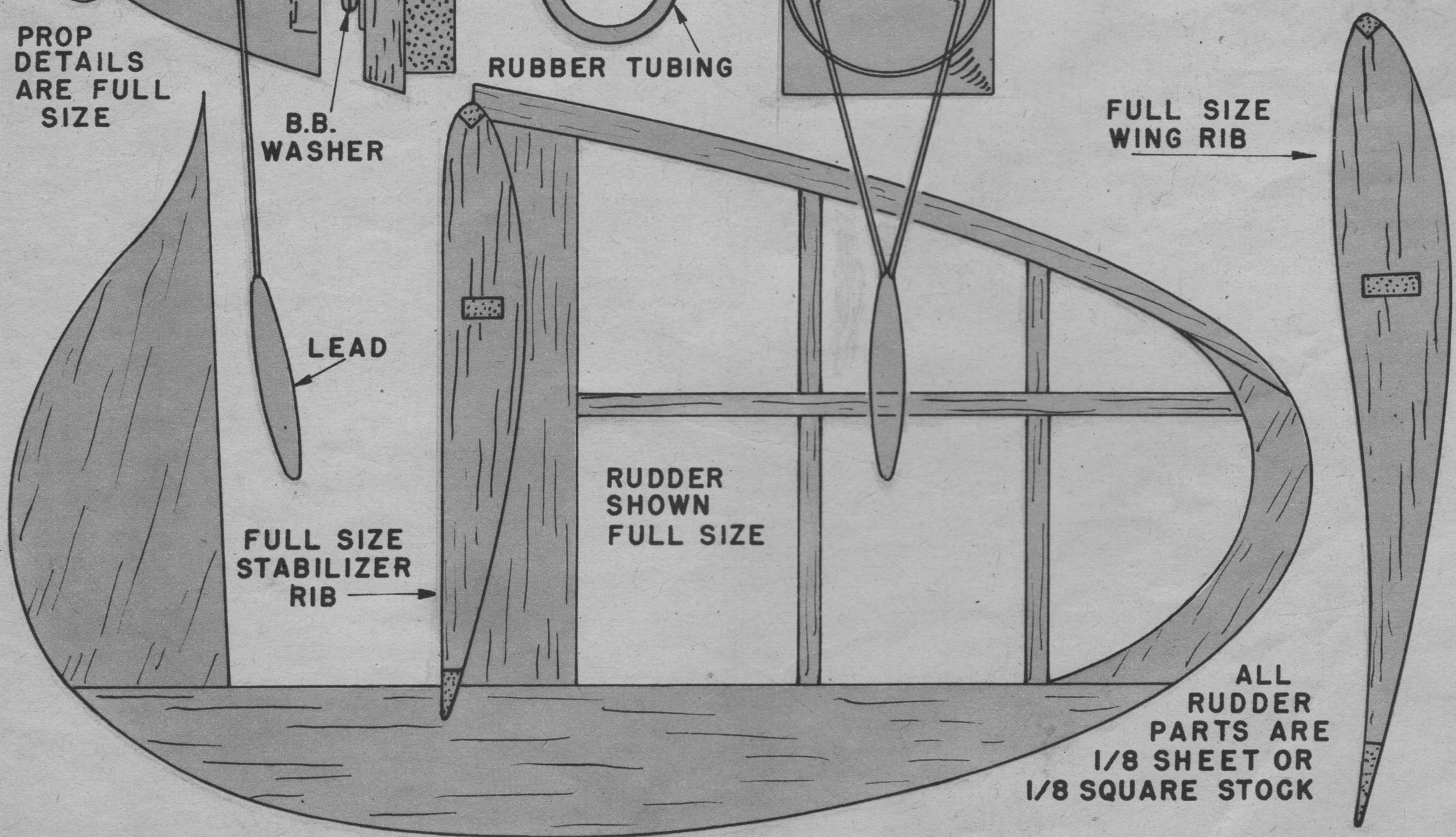
The stabilizer is built in much the same manner as the wing, using wood sizes and grades as specified in the plans. The rudder has a flat cross section of 1/8".

The propeller is carved in the usual manner from a medium block of balsa, measuring 8 x 1½ x 2". Cut the blade to about a 1/8" cup at the halfway point, diminishing to a *(Turn to page 65)*



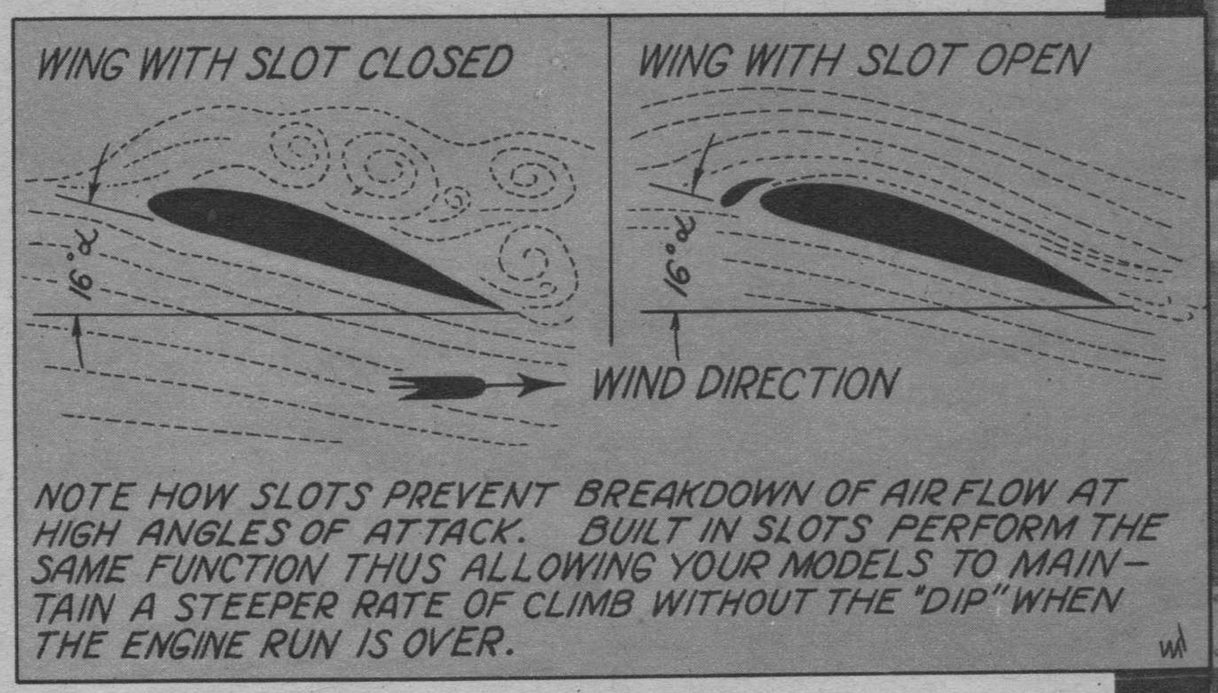






WHY SLOTS?

Massachusetts Institute of Technology tests prove value of "letter-box" wing tip slots.



NOTE HOW SLOTS PREVENT BREAKDOWN OF AIR FLOW AT HIGH ANGLES OF ATTACK. BUILT IN SLOTS PERFORM THE SAME FUNCTION THUS ALLOWING YOUR MODELS TO MAINTAIN A STEEPER RATE OF CLIMB WITHOUT THE "DIP" WHEN THE ENGINE RUN IS OVER.

Bill Tyler, left, shows Doug Corrigan details of the Jordan-Marsh slow-speed model wind tunnel in Boston. Model aerodynamics are a specialized problem.

BY JACQUES SHAW and BILL TYLER

THE use of slots in aircraft wings, in recent years, has become increasingly popular. To determine whether the benefits derived from slots by full-scale aircraft are applicable to model aircraft, a series of tests were run off in the four-foot wind tunnel at the Massachusetts Institute of Technology.

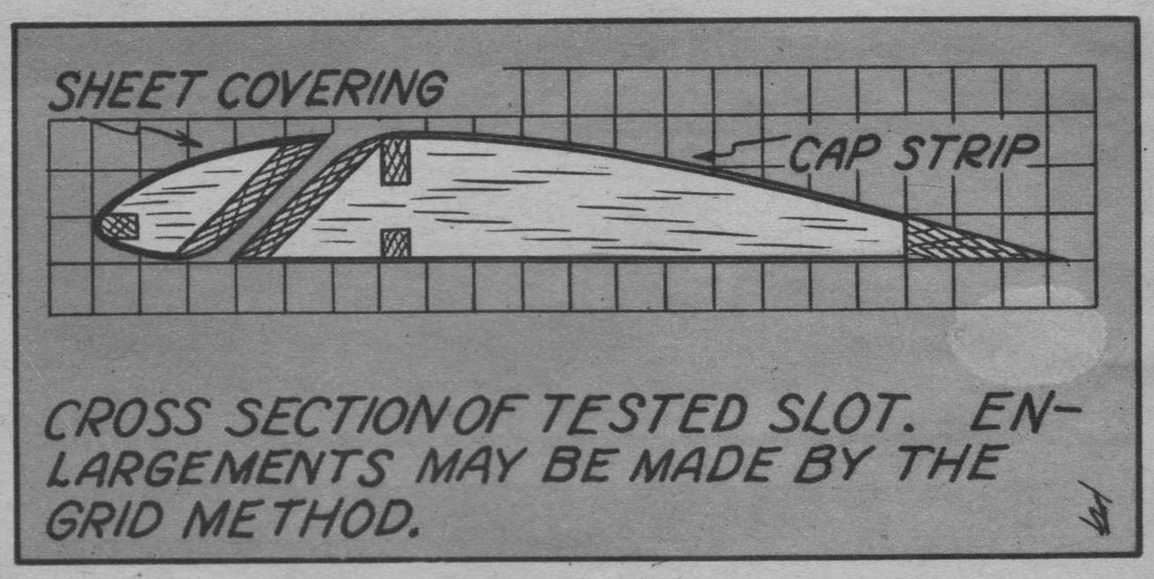
The basic qualitative theory of the slotted wing is relatively simple. We may consider the portion of the wing ahead of the slot as a wing itself. This "wing" acts on the air passing over it just as any wing will, and there is a resultant downwash off the trailing edge. This effect, combined with the speeding up of the air stream in the slot itself because of its venturi tubelike construction, allows the stagnation point of the boundary layer to occur much closer to the trailing edge. The location of the stagnation point determines where the streamline flow is going to break away from the wing, or where "burble" will start, for this burble point creeps up toward the leading edge, determining how completely the wing is stalled.

To insure uniformity, the same test section for both the slot and nonslot observations was used, this being made possible by the simple expedient of doping a small piece of tissue over the slot openings.

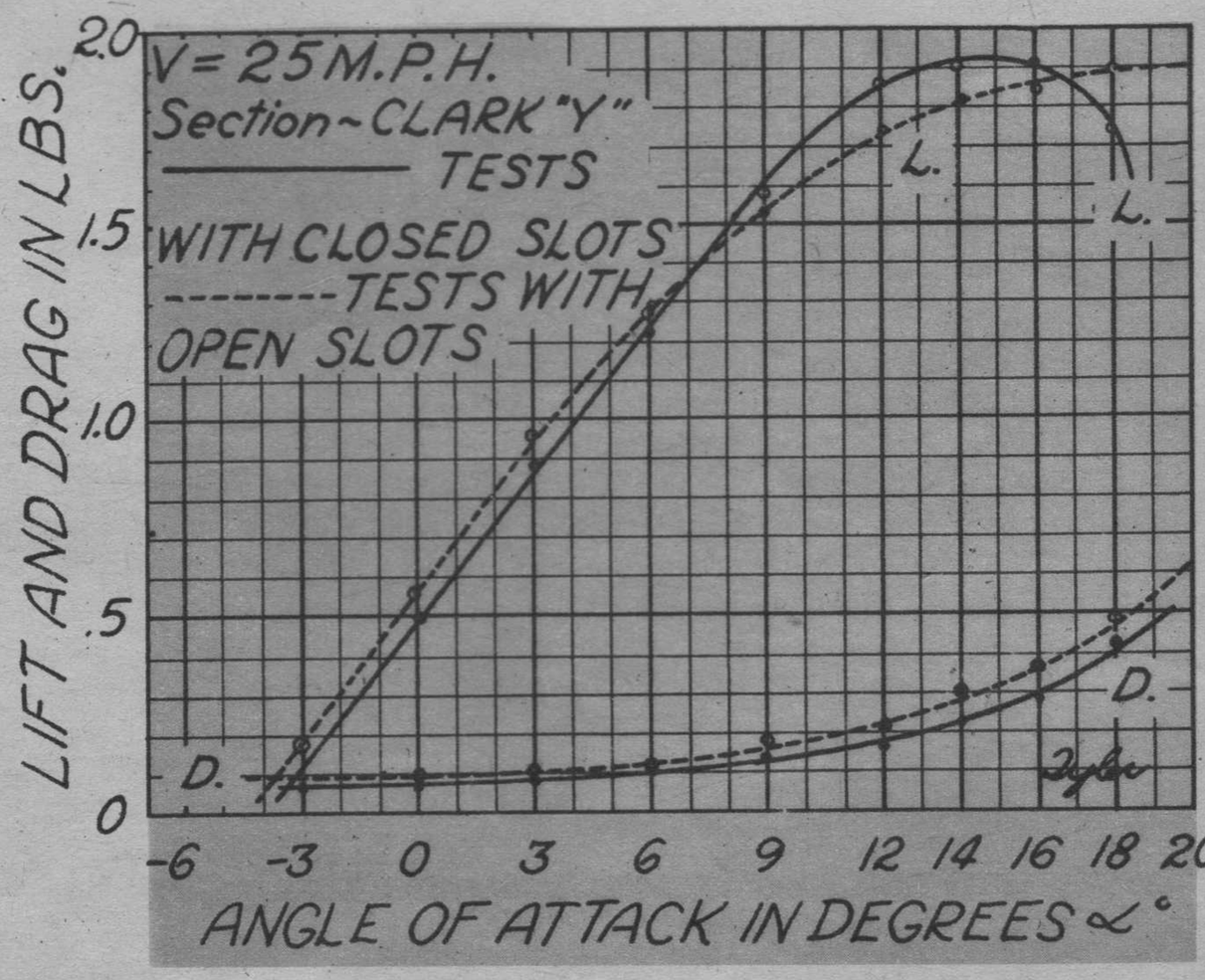
The test section itself was of standard proportions for the particular tunnel used. It had a 30-inch span, aspect ratio of 6—1, constant chord, Clark Y airfoil, and square tips. With the exception of square tips, the section is typical of many wings in use, and it was learned that the tip shape had negligible effect on our results in this case.

The structure and finish of the section were made to conform as closely as possible to an average gas-model wing. Specifically, the ribs were spaced 2 inches apart and capped, and the leading edge was sheeted. The slots were 9 inches long, and placed on the tips.

It can be seen from the plots of lift and drag that substantial advantages may be obtained by the use of slots, accompanied by some slight disadvantages. Note the lift curve of the nonslot wing. It rises in conventional manner along a virtually straight line and then rounds off rather *(Turn to page 65)*

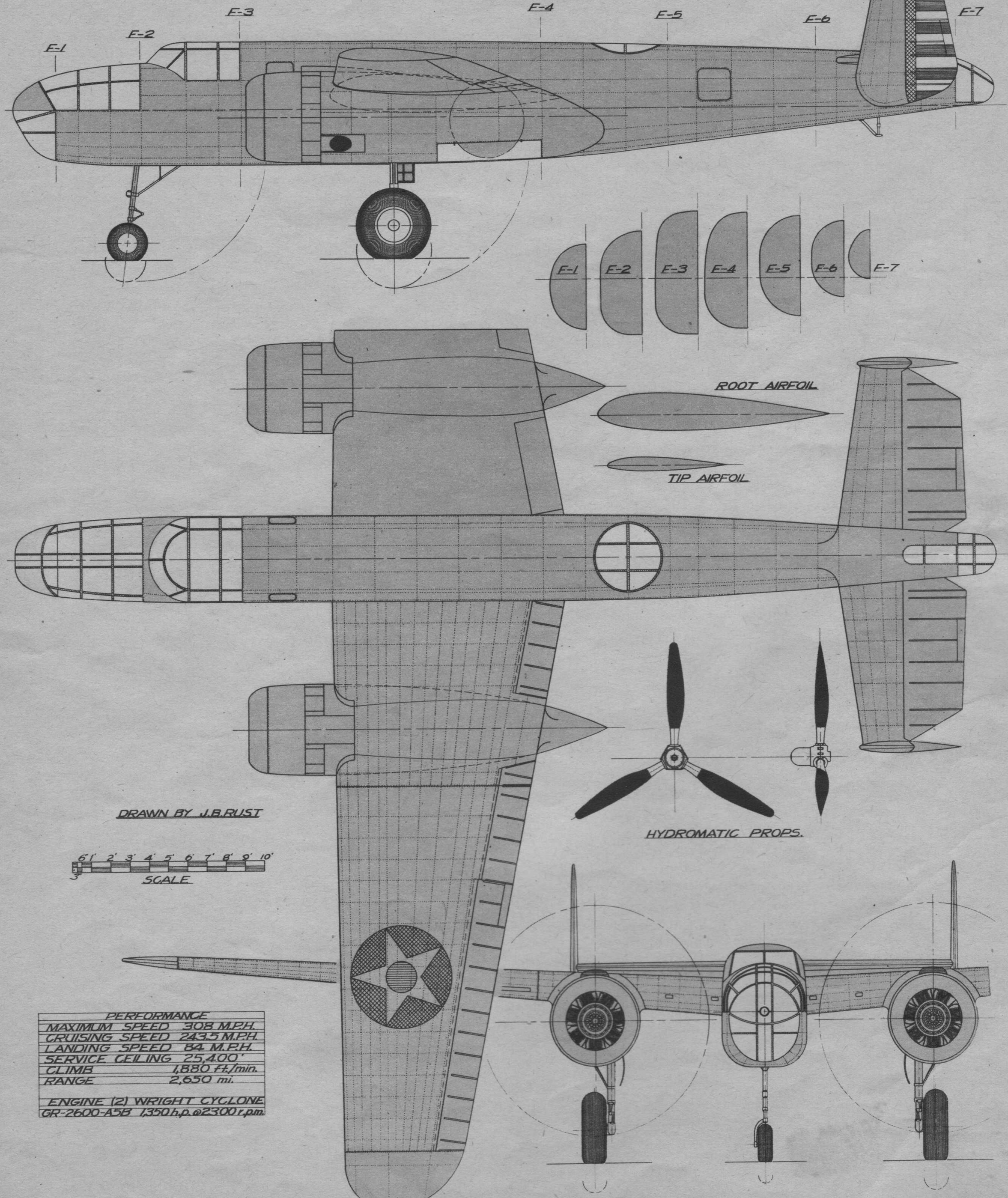


CROSS SECTION OF TESTED SLOT. ENLARGEMENTS MAY BE MADE BY THE GRID METHOD.



NORTH AMERICAN B-25 Army Medium Bomber

SPECIFICATIONS:	
SPAN	67' 6"
LENGTH	51' 5"
HEIGHT	14' 10.5"
WING AREA	610.1 ft.²
WING LOADING	39.33 lbs./ft.²
POWER LOADING	7.5 lbs./h.p.
EMPTY WEIGHT	16,000 lbs.
GROSS WEIGHT	24,000 lbs.
FUEL	916 GALS.



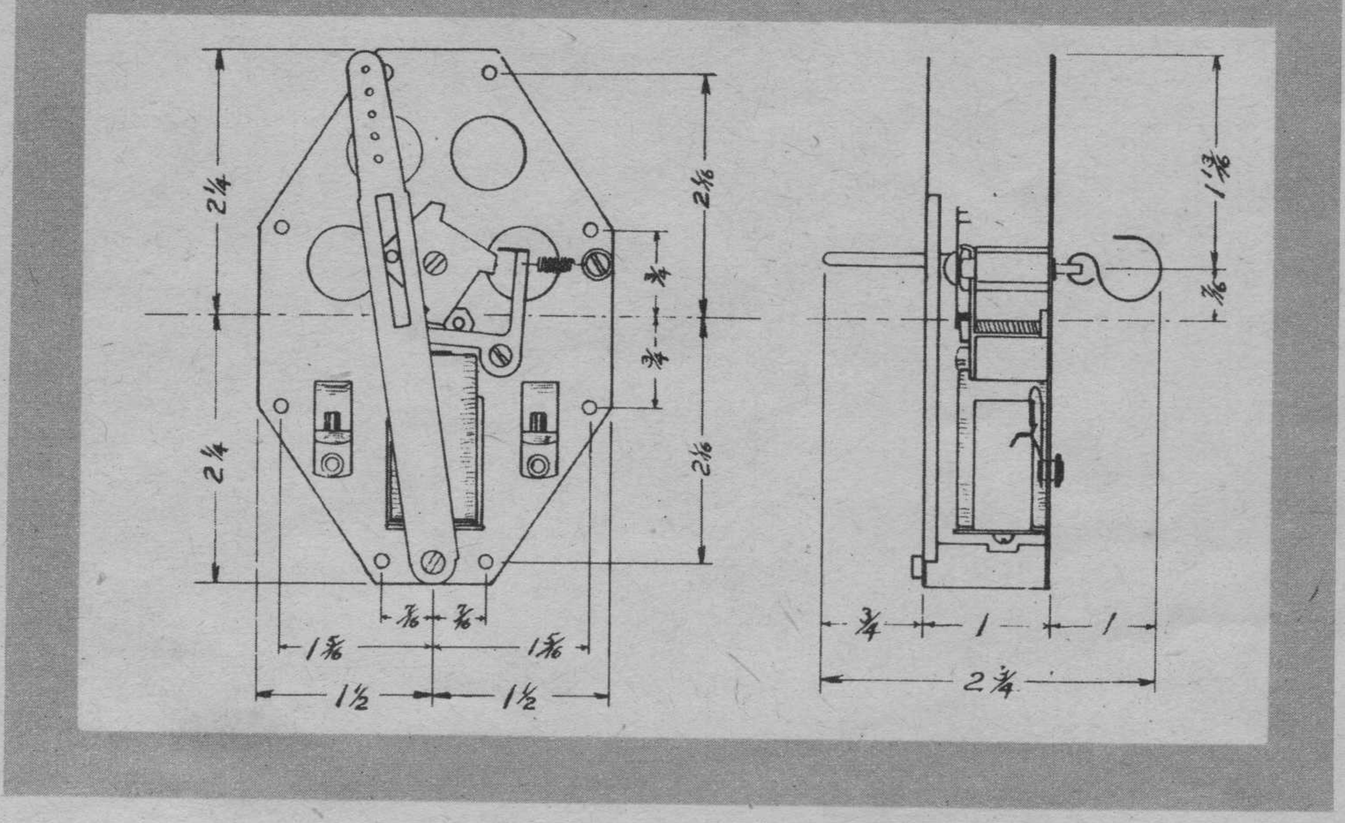
DRAWN BY J.B.RUST

HYDROMATIC PROPS.

PERFORMANCE	
MAXIMUM SPEED	308 M.P.H.
CRUISING SPEED	243.5 M.P.H.
LANDING SPEED	84 M.P.H.
SERVICE CEILING	25,400'
CLIMB	1,880 ft./min.
RANGE	2,650 mi.
ENGINE (2) WRIGHT CYCLONE GR-2600-A5B 1,350 h.p. @ 2300 r.p.m.	

NEW RADIO CONTROL ESCAPEMENT

Left or right rudder does not depend on proper series of pulses; automatical return to neutral.



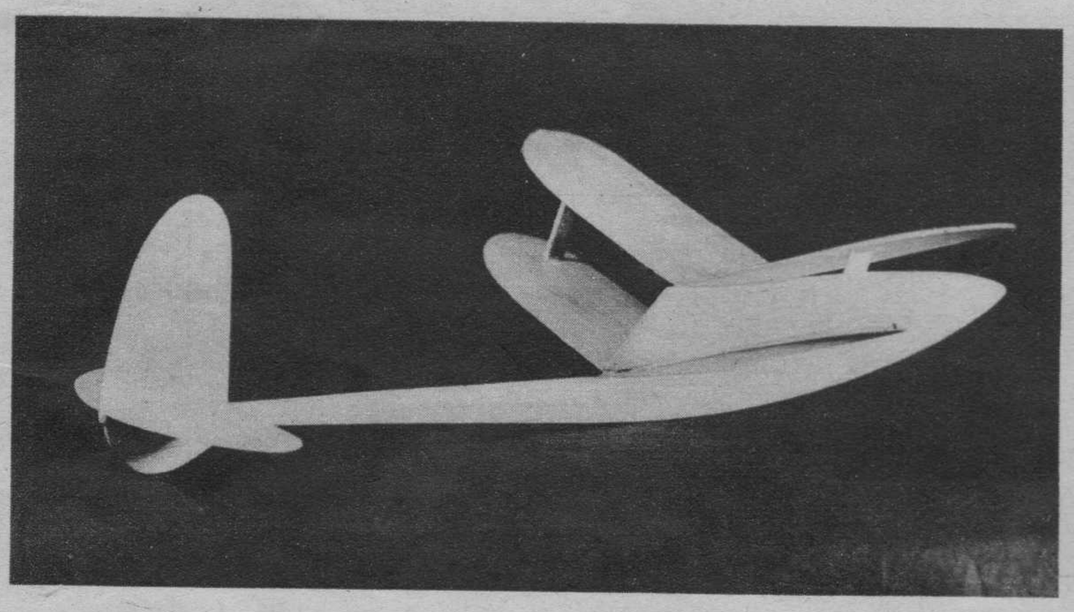
RECENT trends in the radio-control field have been toward standardization of two basic control systems. One employs the rubber-powered escapement mechanism originally introduced by Ross A. Hull and the other utilizes the reversible miniature electric-motor drive with limiting switches first described by Clinton B. DeSoto. The advantage of the escapement system include lightness, simplicity and economy, while the motor drive excels in reliability as well as offering a variable degree of control.

One reason why the motor drive is more reliable than the rubber-powered escapement is that it can be fitted with a centralizing switch. As used in the RCH (Radio Control Headquarters) No. 1345 control-drive assembly, this switch always returns the control to dead center, either at the option of the operator or automatically when the control is released. Furthermore, the determination of right or left rudder is a positive operation and does not depend on the proper series of pulses, as is the case with the escapement.

"Why isn't it possible to endow the escapement mechanism with these same qualities?" we asked ourselves. There followed long sessions over the drafting board, a succession of experimental models—and finally the idea came along that turned the trick, an idea so simple that we wonder now why we didn't think of it in the very beginning (as is usually the case with ideas of that sort). All it takes is a few changes in the escapement disk of a standard RCH No. 121 escapement—and presto! we have a device that gives us right rudder when we push the button once and left rudder when we push it twice. What about neutral? Why, neutral is restored the moment we lift our finger from the button. When the signal is turned off the escapement goes back to neutral.

We best can describe the new escapement by first giving the principles of the standard RCH No. 121 escapement *(Turn to page 58)*

★ ★



DOUBLE-DECKER

BY AUSTIN RINALDI

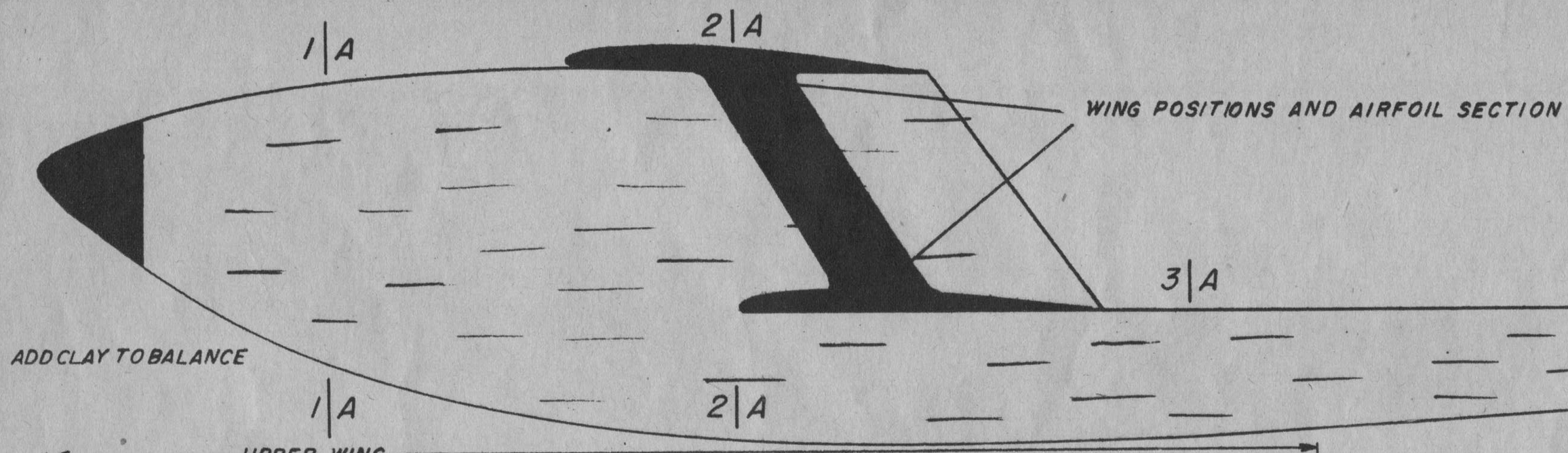
This nifty all-balsa biplane glider has plenty on the ball. Wait until you see it fly.

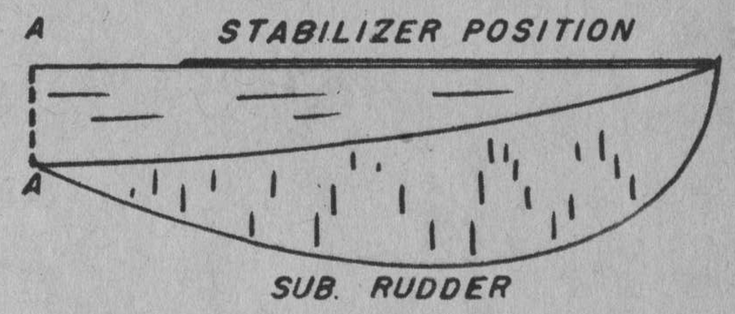
HERE it is, something different—a Class B hand-launch biplane glider that's a peach in looks and in flight. Despite the theory that monoplane gliders are superior, this ship was designed, and after some changes here and there, has proven itself in many contests a match for the ordinary monoplane glider. It is of simple construction and can be easily built by anyone who has made other gliders. It is just the job for you model builders who are getting tired of that same glider everyone brings to the contests. This ship can also be used as a catapult glider by cutting a catapult groove in the lower section of the body. Not once while being catapulted has it looped, but climbs until the power is exhausted and soars around, turning in good flights.

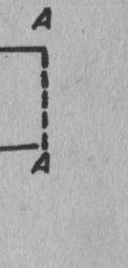
But without going any further, the picture and plan impress you enough. Check the bill of materials printed on the plan and see how little it will cost to build this biplane glider.

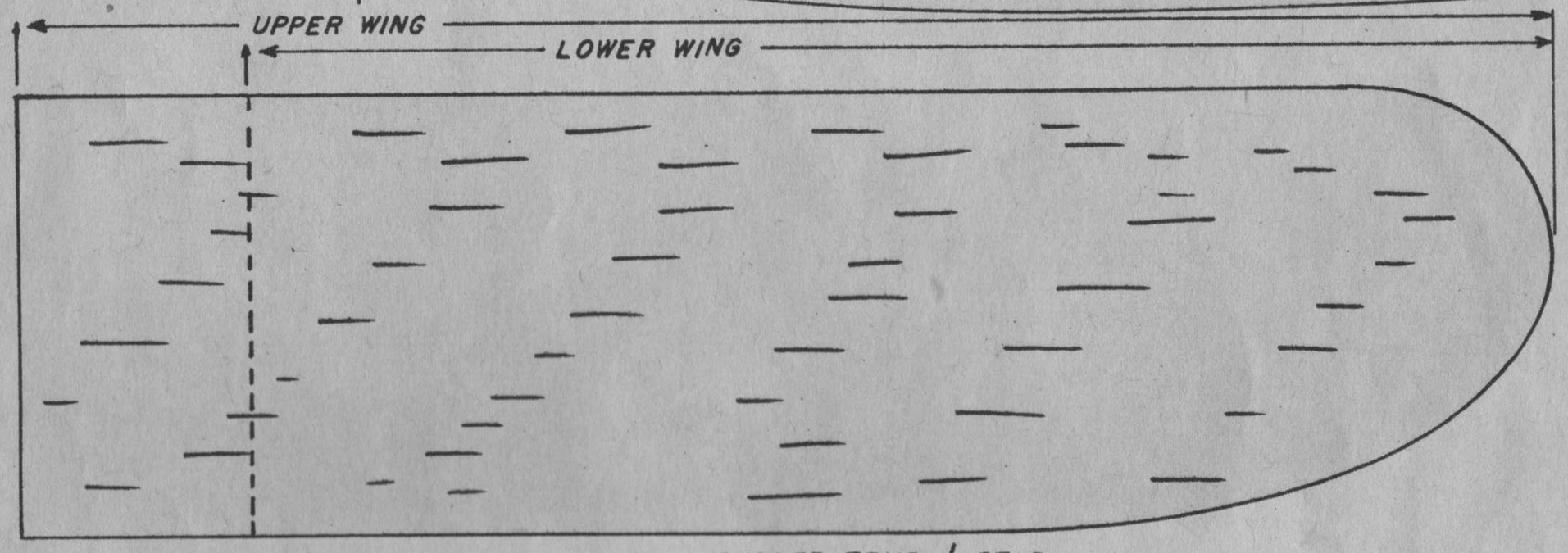
CONSTRUCTION

The first job in construction is the wings. The plans are full size, so all you have to do is trace the wing pattern on a sheet of 1/8 x 2" medium-size balsa and cut to shape the four half wings. Sand these to the airfoil given on the plan. When this is done glue in dihedral of both wings (making sure that both wings have the same amount of dihedral) and then set aside to dry. When dihedral is completely dried, polish wings with either clear or colored dope, whichever you prefer. The next thing is to cut out body from 1/4 x 2" sheet of medium-hard balsa, sand to cross section as given on plan, and rub a coat or two of glue into body to strengthen it before polishing. In cutting out slot for lower wing be sure that it is set at 0° incidence (this is very important) and cut groove for upper wing which must also be set at 0° incidence. Then glue lower wing in place. When it dries, glue on upper wing, and while that's drying, cut out stabilizer and rudder from 1/32" sheet balsa. Sand these to streamline airfoil, polish. Glue stabilizer to body, setting it at 0° incidence. Then glue on rudder, and cut wing struts from 1/8" sheet balsa, sand to streamline and glue to position as indicated on plan. *(Turn to page 58)*

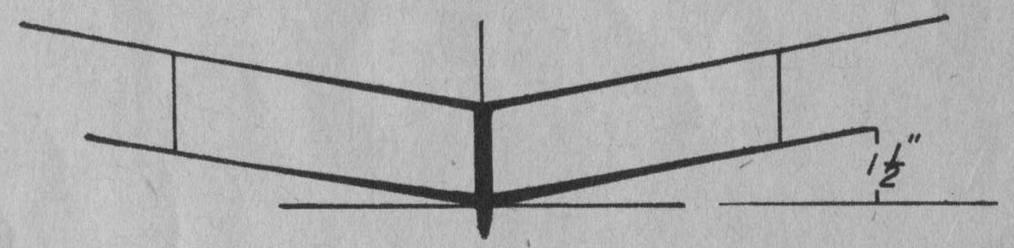








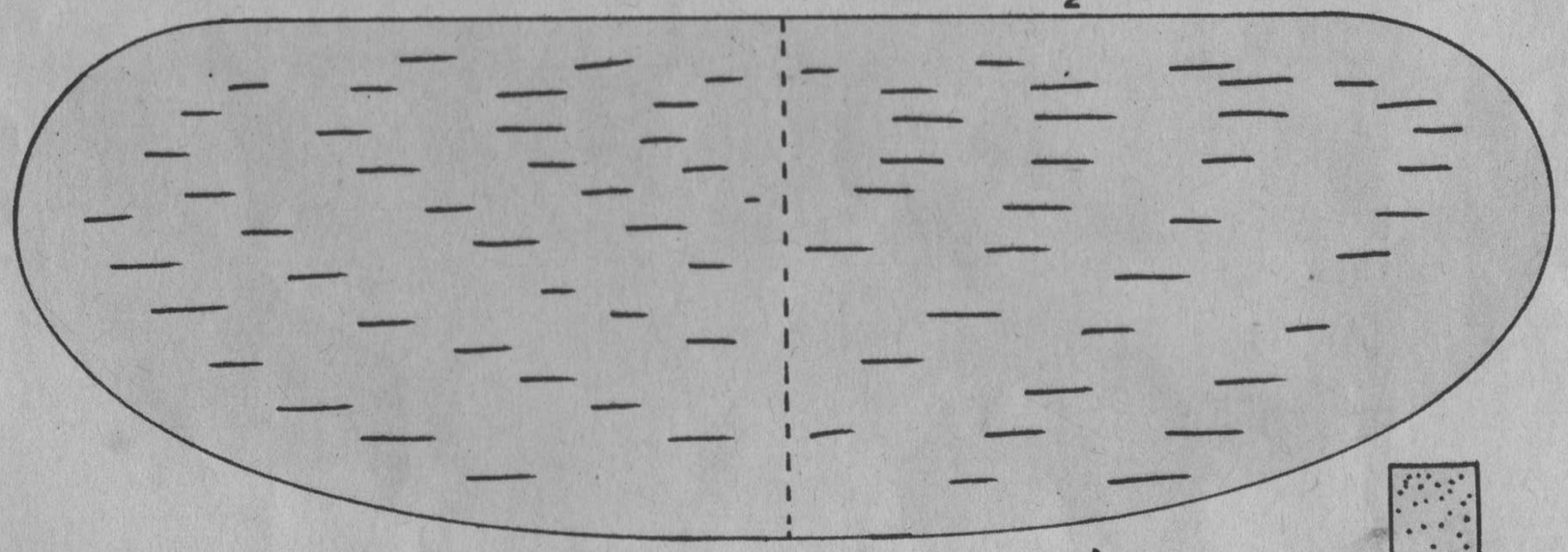
RUDDER TEMP. $\frac{1}{2}$ STAB.



FRONT VIEW $\frac{1}{4}$ SCALE

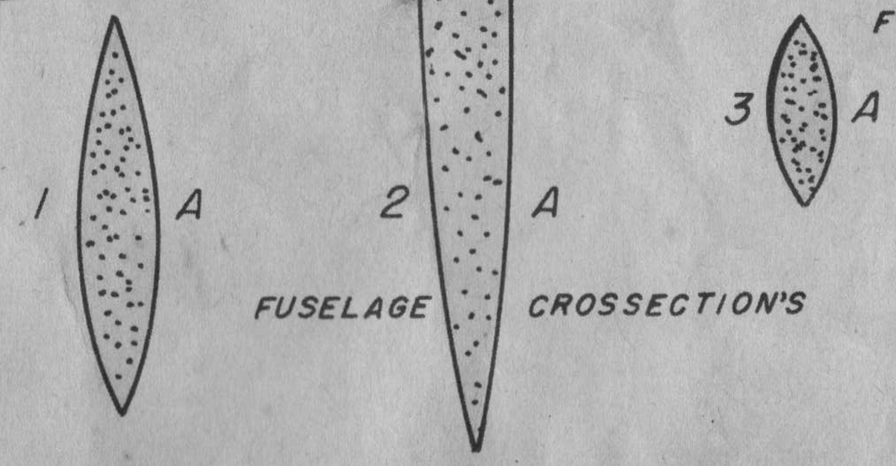
NOTES

CLASS (B) H.L. GLIDER — BEST TIME 2 - MIN. 32 - SEC.
FLY IN TIGHT CIRCLES — USE 0° ON ALL SURFACES
GIVE ALL PARTS AT LEAST 5 COATS OF POLISH, SAND BETWEEN EACH.
CEMENT ALL JOINTS WELL. — WAX ALL LIFTING SURFACES

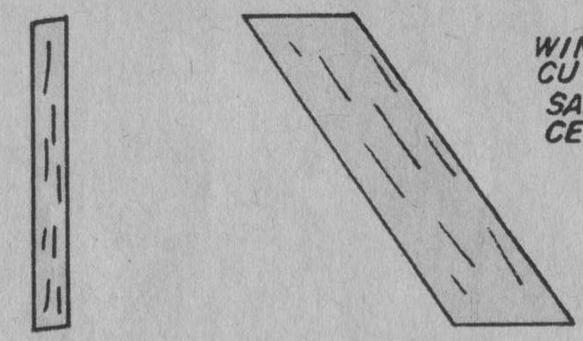


BILL OF MATERIALS

FUSELAGE —	$\frac{1}{4}$" X 2" X 15"	1 OZ. CEMENT
WING —	$\frac{1}{8}$" X 2" X 30"	1 OZ. GLIDER POLISH
TAIL ASS. —	$\frac{1}{16}$" X 2" X 12"	WAX, CLAY, SANDPAPER



FUSELAGE CROSSECTION'S



FRONT VIEW — SIDE VIEW

WING STRUT FULL SIZE
CUT FROM ONE EIGHT SHEET
SAND TO A STREAMLINED SECTION
CEMENT IN PLACE BEFORE WAXING

CLASS-B- H.L. GLIDER
BY AUSTIN RINALDI

DOWN THE RUNWAY

Official aeromodeling news compiled by the Academy of Model Aeronautics, governing body of model aviation in America.

CONDUCTED BY AL LEWIS, EXECUTIVE DIRECTOR

Lucky 711? One thing about the Academy of Model Aëronautics that makes it different from most organizations is that there are no free memberships or gas model licenses issued. In other words, any youngster can pay fifty cents or one dollar for a license with the knowledge that even the oldest enthusiast or important leaders in the model industry must also pay a similar sum if they desire to enter formal competitions.

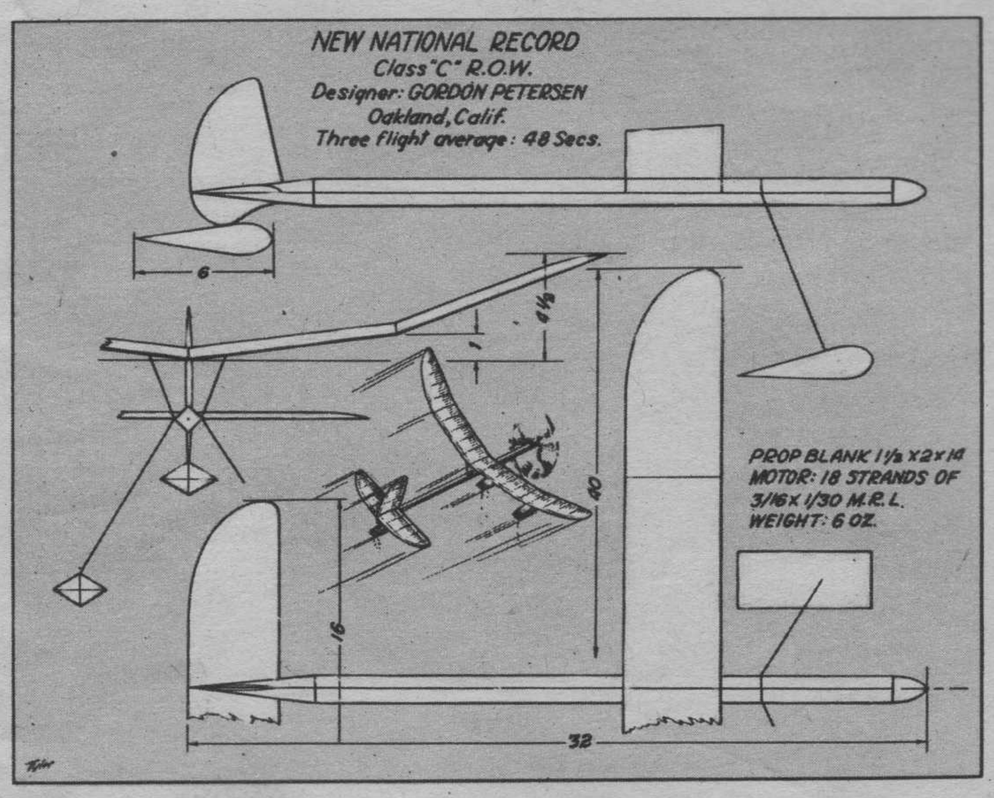
Because of this it will be of interest to know that one of the newest licensees of the Academy of Model Aëronautics is that well-known problem child, Mr. Charlie McCarthy, whose protégé, a young chap named Edgar Bergen, is a well-known private flier and amateur ventriloquist.

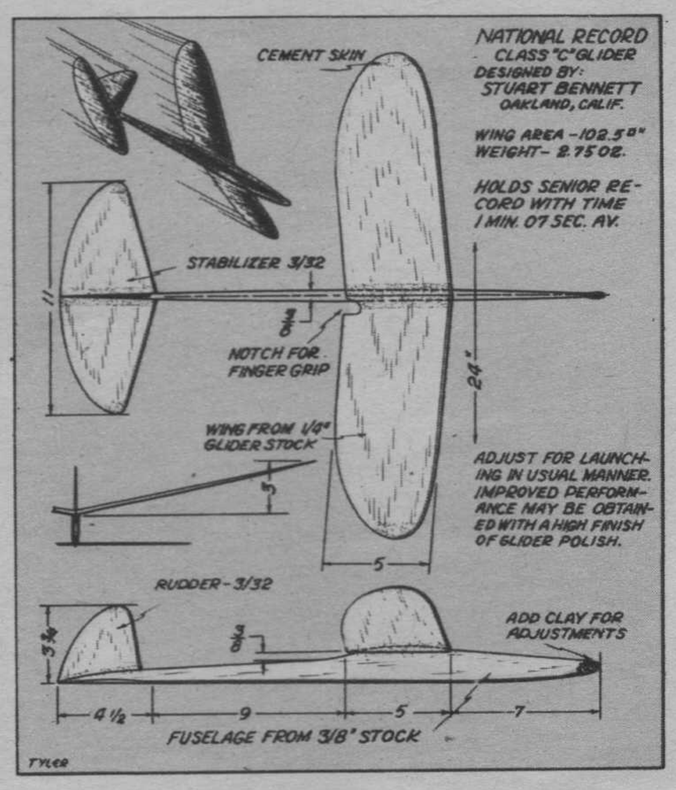
Modelers may recall young McCarthy's exploits with model airplanes which consisted mainly in scaring the daylights out of contest officials. It seems in one of the meets in which Charlie entered, according to subsequent revelations aired over a national network, that he took delight in mowing down the contest directors and it was only their agility and experience that saved them from being demolished by Charlie's craft. In forwarding McCarthy's application for gas-model license, this other chap, Bergen, said that Charlie has changed his way of living and in signing the gas-model pledge has agreed to live up to the safety-first principles established by the Academy of Model Aëronautics. In recognition of this complete change of character, the A. M. A. officials awarded No. 711 to C. McCarthy, and at last reports he had received his credentials and was more than pleased with materials issued by Academy headquarters in Washington.

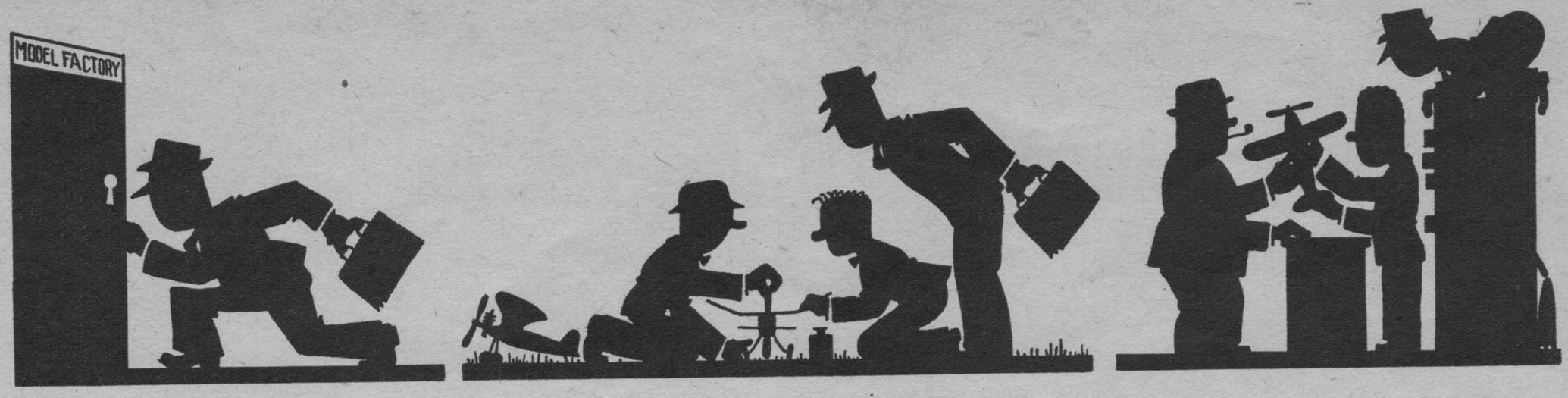
★ ★ ★

A Few Plain Words. In these times of national defense and increased aviation activity, model builders throughout the country, and especially leaders of the activity, must realize that they have a responsibility when it comes to flying model aircraft. Models must not be flown in congested areas near cities, near large highways, on or near established air ways, or on or near an airport without the full approval of the airport director. These are not just commonsense regulations set by the Academy, they are Federal rules and ones that cannot be violated under any circumstances.

A certain amount of laxity has crept into the model program with the introduction of thousands of new model fliers during the past year or so. That we must become more careful and considerate is evidenced through the following letter *(Turn to page 58)*







Harry McCall and Cleveland Shop.

MACO MAKES GRADE

LIKE many another model airplane firm, the West Side Model Distributors of Cleveland, Ohio, started in life as a distinctly different enterprise. Back in 1933 H. D. McCall, president of the concern, launched a secondhand magazine firm in a corner of a plumbing shop in Cleveland. Maco—as his friends know him—was assisted by his wife, and the little firm added a few model kits and supplies as a side line shortly after the business opened.

The first shop was by no means pretentious. Library tables served as counters, but business was so good that within a month larger quarters were sought. The firm remained in the new location for two years, when it was moved to its present location at 9609 Lorain Avenue. By that time Maco really began to build up his model business, and after a visit to Chicago and the *(Turn to page 66)*

Harry runs American Airlines Club.

"DON'T QUOTE ME!"

Talk of the trade as overheard in factory, field, store.

QUERY: Is there any truth in the rumor that Jack Keener, Madewell Motors, Oakland, California, is contemplating the production of a Class B engine to sell for $12.50?

We hear that Ohlsson & Rice Manufacturing Co. is thinking about capturing the medium-priced Class C engine market with a low-cost "60."

At this writing there is still no word from the Model Industry Association as to what success their committee has had with the O. P. M. Looks bad!

The distributors of the Xacto line (high-grade hobby knives with surgical blades) will soon introduce one or two low-priced numbers selling for 15 and 20 cents.

High cost of paper board reflected in the price of boxes has affected tremendously the manufacturers of model kits, particularly the low-priced ones. Fred Megow urges some action by large users to prevent unjustified skyrocketing of box prices.

Ben Shereshaw, president of Miniature Motors, Nutley, New Jersey, manufacturers of the Bantam, is teaching drafting in a Newark defense school. If you cannot get any materials, might as well do something useful elsewhere!

American Junior Aircraft Co. is discontinuing its warehousing facilities in Bush Terminal, Brooklyn, due, no doubt, to the fact that every boat shipment east of this ever-increasingly popular line is sold before the boat arrives in New York. Shortage of material and steel have caused the discontinuance temporarily of the 10-cent Coast Guard models. Perhaps future versions will have plastic engines and nacelles!

The Comet 35, which has been going to town, is undergoing a few minor improvements in the arrangements of the extended needle valve. Bill Bibichkow of Comet Model Airplane Co. was in the East recently and visited the Academy's headquarters in Washington. He has been the "spark plug" of the Model Industry Association's Show Committee.

Berkeley is working on three Apache kits, based on the Air Trails design by Henry Struck. Plastic construction will be used extensively, eliminating need of shaping nose blocks, et cetera. Berkeley recommends their Brigadier for beginners. Ready in August, it will be a new streamlined.

Burd Model Airplane Co. has appointed D. D. Boselly, 5053 Range View Avenue, Los Angeles, California, their Pacific coast representative who will warehouse Burd's complete line of popular-price model airplane construction kits at 4207 N. Produce Plaza, Los Angeles.

This set-up enables Pacific coast dealers and jobbers to obtain Burd models without having to wait for the merchandise to be shipped from Baltimore.

Don't quote me, but it is being rumored that the largest stock of Strombecker airplanes, guns, boats, trains, Bill Dings and tanks in the State of Pennsylvania is now in a warehouse in Philadelphia. It might be wise for the Pennsylvania dealers who have experienced difficulty in getting their Strombecker orders filled to write to M. B. Spotts, wholesale model distributors, 3141 N. Broad Street, Philadelphia, who has *only key* to that warehouse.

Bill Effinger, Jr., of Berkeley Models in Brooklyn, honeymooned in Bermuda. We wonder if his Clipper flight will influence new design trends by Berkeley.

BY THE TRAVELING SALESMAN

Nomad

(Continued from page 44)

they have proven less sensitive than the double type. Most persons remark about the long moment arm employed. This is to handle the "hot" motor at full power. The midwing was chosen for a speedy, unhesitating climb, and because a cabin could be placed over the wing blending with the design nicely. For more realism a dummy pilot was carved which added a great deal to the appearance. Why not try him in one of your future ships?

CONSTRUCTION

We'll start with the pod first by laying out the center line, marking intervals of three-quarters of an inch and then connecting, which will form the graph. If you don't care to use this method, use a pair of dividers and enlarge six times. Mark out the location of the bulkheads accurately by using the dimensions from the top view. Be sure to use hardwood for the four keels. Follow the steps shown for the construction of the pod fuselage. In planking use soft sheets of $\frac{1}{8}$ x 2 x 18" that are cut to a width which can be worked easily, about two inches wide on the shallow curves of sides and about one-half inch wide on the sharp curves of the top and bottom. Taper the tail ends down, of course, and wet the outside of the pieces before gluing in place. This simplifies the job a great deal. After planking is completed and roughly sanded, cut out the tail block from a piece of soft wood $2\frac{1}{4}$ x $3\frac{5}{8}$ x $4\frac{1}{8}$". Apply a coat of cement to rear bulkhead and tail block. Let them dry and apply the second coat on both, then put together. This must be cemented well because the tail boom is attached to it.

The plans show clearly the various steps in the construction of the tail boom. Just remember to put a strip of wax paper under the seam before you glue the first layer. Also keep the core free at all times by moving it out slightly, as each layer is cemented. If this isn't done the drying cement, which contracts when drying, will make a very tight fit and make it necessary to cut and receive. You don't have to soak both sides of the sheets; just the outside of the bend will do the trick. Each layer is to be formed and dried before gluing.

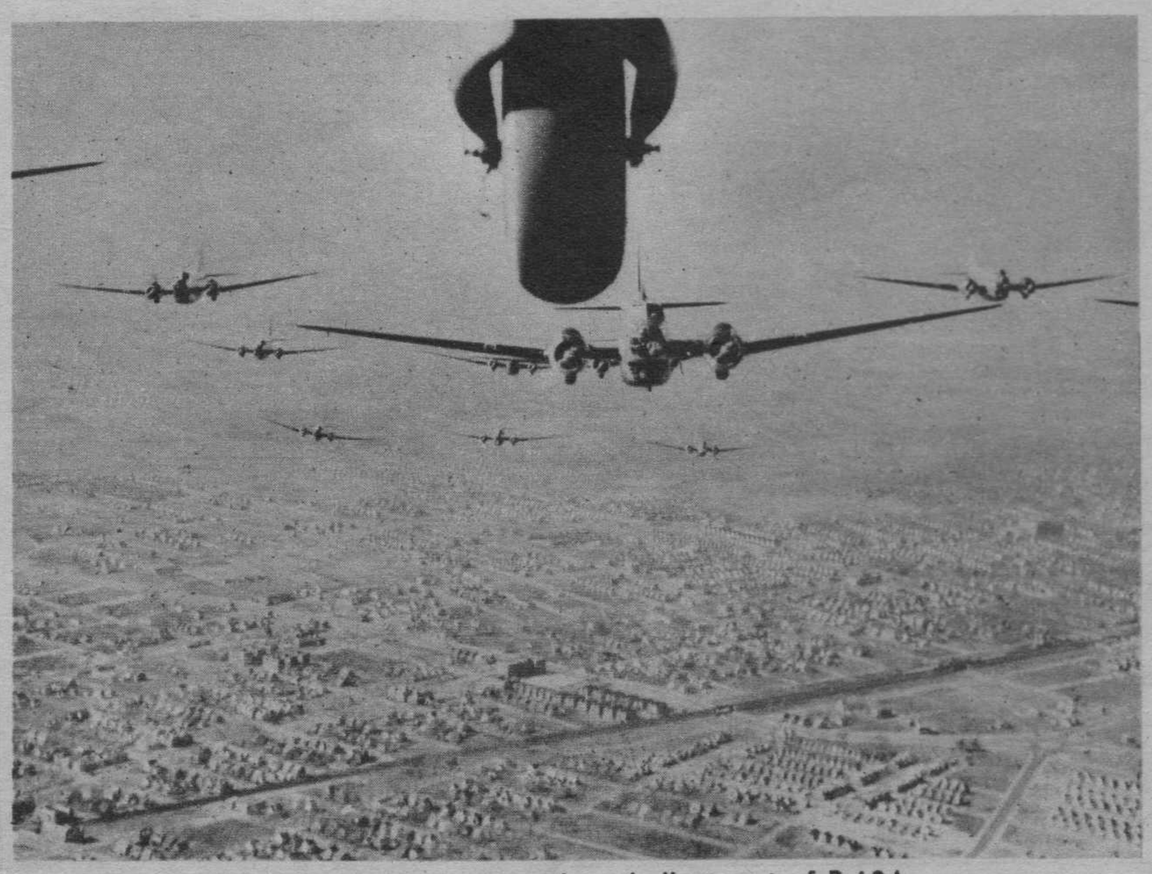
After the boom is finished it is ready to be attached to the pod. Set the pod on a level keel first, holding in place with blocks of wood, books, et cetera. Cut the large end of the boom to fit pod, using the plans as a guide. When fitted correctly, coat both with a generous amount of cement and put in place. Check with a level to see that it is right. After setting for at least eight hours, mix some balsa dust with glue to the consistency of a paste and apply at joint, making a generous fillet. Let dry twenty-four hours and sand to a smooth surface. This is the whole strength of the connection, so do it well. It's surprising how strong this mixture is when properly worked.

Finish the pod and boom down with coarse to fine sandpaper. Apply three coats of wood filler and one coat of clear dope, sanding carefully between each coat.

Form the landing gear from $\frac{1}{8}$" spring steel wire and attach with aluminum fittings as illustrated. The wheels can be made from two layers of $\frac{1}{2}$" sheet balsa $3\frac{3}{4}$" diameter, or regular $3\frac{1}{2}$" air wheels may be used.

Construction of the wing is conventional. Enlarge the plan six times with a pair of dividers or ruler as you did for the pod. The airfoil section is the Goettingen 239. This was selected from a series of airfoils tested at twenty-nine feet per second (twenty miles per hour). Full data and ordinates along with many other sections are given in the N. A. C. A. Report No. 124. The airfoil was thinned slightly, sacrificing a slower sinking speed for a higher rate of climb.

The ribs are cut from $\frac{1}{16}$" sheet, except the three center ones which are $\frac{1}{8}$" sheet. Cement ribs to top spar. Attach trailing edge, being sure front edge is raised to match the undercamber. The leading edge is glued in place next. Slide rear spar in place, gluing each rib securely to



Bomber formation seen from belly turret of B-18A.

it. At this stage put in the required dihedral by butting the leading and trailing edges. Raise each tip 4" above your working surface. As soon as the breaks are glued and thoroughly dry, cut at center section and raise each tip to 9½" and cement carefully.

The leading edge is covered with $^1/_{16}$ x 3" soft sheet to form a good entry and to gain extra strength. Center section is covered on top and bottom with some thickness. The underside of the leading edge is not covered with sheet as above, but is capstripped for the full chord. The wing capstrips are $^1/_{16}$ x ⅜" and are of very soft wood. Shape leading edge and tips with a knife or a small hand plane, finishing with sandpaper to provide a smooth covering.

The original model was covered with silk and this is recommended. Paper can be substituted, however. Use clear dope for applying the silk and a mixture of half dope and half glue for covering with bamboo paper. Spray covered wing with water. Let it dry. Follow with one coat of clear dope.

Construction of the rudder and stabilizer will be the next step. Enlarge the plan first. Taper stabilizer spar from ¼ x ½" to ¼" square at the tips. Ribs are made from $^1/_{16}$" sheet and will be glued in place on the spar. Shape the trailing edge before cementing to the ribs. The leading edge is made in two pieces and the tips are cut from ¼" soft sheet. Shape the four tip ribs, then cap with $^1/_{16}$ x ¼" strips on top and bottom. The rudder is made in the same way, using ¼" sheet as the outline. Be sure to raise ⅛" above surface to make the section symmetrical. When covering and doping be careful of any warping tendency.

Since the pod was made in one piece, it will be necessary to cut the cabin part loose. First mark with pencil the exact part that is to be cut loose. With a sharp blade cut through the planking and top of the firewall as shown. Then cut through Bulkhead No. 2. This bulkhead may be trimmed to within a quarter-inch all around the cabin part or it all may be removed. Remember that is for the cabin only and not the lower part. With No. 2 removed proceed with No. 3. It isn't necessary to trim No. 4, just cut it straight across so the cabin may be lifted off. Cement the windows and the windshield in now. Be sure to use a piece of paper for a pattern, employing the cut-and-try method in order to get the exact shape. Trace on the celluloid, cut out and cement the two halves in place.

When installing the wiring follow the diagram as shown in the drawings, being sure to make your wiring neat by soldering all connections where needed.

The original model was colored red. About thirty percent orange dope was added to achieve a red-orange color. Three coats were used on wing and tail, with four coats on pod and boom. Sand lightly between each coat with 400A wet or dry carborundum paper. Water is used with it to cut faster and more evenly for a smooth finish.

FLYING INSTRUCTIONS

Move the batteries until center of gravity is in correct place as shown on the plan. When this is done attach the cabin, using several strips of transparent cellulose tape to do the job. Test-glide the model until you become thoroughly familiar with it. Increase the incidence in the stabilizer if it shows the least tendency to stall and use negative incidence if there are any diving tendencies. Start motor, run at half throttle and launch just as if you were going to glide it. The timer should be set for about ten seconds. The Nomad should circle to the left under power and to the right in the glide. When adjusted properly and with an opened motor you can count on 2½ minutes every flight.

Until we meet again—many happy landings!

Slide, Rule, Slide!

(Continued from page 48)

uninformed persons, this can be described as "flat as a pancake" or even "as level as a billiard table" if your friends are all pool sharks.

DURATION

All degrees of optimism are embraced in the following formula for calculating your duration on test hops:

$D=TE^2$ (D being your claimed duration, T the actual flight time, E the exaggeration.)

This formula accommodates both the big fibber and the medium fibber. For example, for the medium fibber:

T (actual flight time) is 1 minute. E is found by your estimate of motor run. If it actually runs 30 seconds, and you say it has run 15 seconds, your E factor is 2. Therefore D (your claimed duration) is TE^2 or 1 minute x 2^2 or 4 minutes.

For the big fibber:

T (actual flight time) is 1 minute. Your motor runs 30 seconds and you say it runs 10 seconds, so your E factor is 3. Therefore D equals TE^2 or 1 minute x 3^2 or 9 minutes, your claim for this flight.

GASOLINE CONSUMPTION

Your motor will run for at least 2 minutes on 1 eyedropper of gas. Even if it takes two or three tankfuls to get it started, you must still insist that your motor is quite frugal. If you must refill your tank after every 10-second flight, this can be explained by saying that your ship tipped up and the gas ran out, the gasket leaks, the tank leaks, et cetera, et cetera.

RECORD FLIGHTS

If you will make a practice of closing your eyes tightly for about five or ten seconds during the glide, a very fine total of "out-of-sight" flights may be claimed.

New Radio Control Escapement

(Continued from page 52)

The rubber-band motor is hooked to an escapement disk with four tabs bent up at 90°, which engage an escapement arm. Part of this escapement arm is also the armature of a small electromagnet, which is operated by the receiver relay. When the electromagnet receives a pulse from the receiver, the armature depresses, releasing the escapement disk one quadrant. As the escapement disk rotates, a projecting pin slides in a slot in the rudder bar, moving the bar to its next position. Beginning at neutral, the first pulse will move the bar to "left rudder," the second back to center, the third to "right rudder," the next back to center, and so on. It is therefore often necessary to go through one entire cycle to get to the desired rudder position, because the escapement rotates in only one direction.

Now instead of having four tabs on the escapement disk we only have two. These are situated opposite each other. One of these tabs, which we will call A, is made slightly longer than the other. The escapement arm it will be noticed has two stops, one at the end of the horizontal part of the arm, and one at the end of the vertical part. We will call the stop at the end of the horizontal arm X, and the other Y. The shorter tab on the disk we will call B. The escapement is now adjusted so that when the arm is off the magnet, that is when there is no signal from the transmitter, X will stop A but will not stop B. In this position, of course, Y can stop neither A nor B. In other words, when the signal is off the disk will always rotate until A is stopped by X. This is the neutral position of the rudder or elevator. From this neutral position one signal will draw the arm down on the magnet and Y will stop A. This will be either right or left depending on the hook-up. We will say it is right. One more signal, or two signals from the neutral position, will allow the disk to rotate until Y stops B. This will be left. As long as the signal is held, the rudder will stay in its right or left position. As soon as the signal is turned off, the rudder will come back to neutral. In other words, we have an escapement that keeps in step all by itself!

We have installed this escapement in the ten-foot pusher RC-1, and have had very satisfactory results.

Down The Runway

(Continued from page 54)

received at Academy headquarters recently.

"As you know, I hold a private pilot's license, and am now grinding away for my commercial with instructor's rating. Flying as much as I do around the thickly populated skyways of Long Island, I know the grave danger of gas-powered model aircraft on the loose.

"Matter of fact, I had always treated the problem of uncontrolled model aircraft pretty lightly as any sort of real menace to pilots—but one day, as I came in for a landing in a little field not far from Roosevelt Field, one of these gas-powered jobs whizzed out of the tall grass straight at my ship. Believe me, it was some moment! The model plane missed my ship's prop by a fraction—and I proceeded to neatly mess up my landing and leap four or five times across the small field like an enraged bullfrog. Of course I was mad—and scared to death!

"Today especially the act of flying model aircraft near the scene of any airport or auxiliary field is really criminal. Student pilots need every ounce of concentration they possess to land or take their ships off the ground, and there is really no excuse for carelessness on the part of gas model owners who fly their powered jobs near the scene of such activities."

The author of this message is not an aviator with no understanding of the model builder and his work. The writer is Miss Jeannett Eastman of New Rochelle, New York, a licensed pilot and member of the 99s, international organization of women pilots. Miss Eastman has been building model airplanes for the past few years and holds A. M. A. gas-model license No. 3642. Miss Eastman, who is one of the best-looking feminine model builders you could ever hope to meet, is a skilled craftsman and has achieved a considerable reputation in the built-up replica scale model competition field. She placed first and second in two of the largest scale-model competitions ever held and her metal-covered Gulfhawk is the result of months of careful work.

★ ★ ★

Be Safe—Fly Safely. The editors of Air Trails join with the Academy of Model Aëronautics in urging that all model airplane builders exercise extreme care in flying their craft.

This hobby-sport is too fine a one to restrict through carelessness on the part of a small number of model fliers.

Be Safe—Fly Safely, away from crowds or other air activity.

Double Decker

(Continued from page 52)

FLYING AND ADJUSTING

Take the ship to your favorite flying spot and test-glide, adding clay to the nose to balance it and warping rudder for turn. When a long flat glide is obtained throw model into the air. For best launching hold one finger behind wing, giving ship a little bank, and toss it straight out. When model is adjusted a higher altitude may be obtained by adding positive to stabilizer and taking a little clay off nose. From here on it is all yours, and lots of luck in flying.

Model Matters

(Continued from page 41)

Bob was seventeen years old, had attended several nationals where we got to know him. He won high-school varsity letters in track, was an expert tennis player, and a championship model builder. Last October Air Trails published plans for his Crusader, a contest-winning rubber-powered fuselage. The Stofers—Harold and Thelma—of Indianapolis, knew Bob very well and had taken him along to the contests. What they miss most of all is the pleasant and contagious smile he always wore, reflecting a happy outlook on life.

"If you can't beat 'em, join 'em," or something like that, should have been followed by a Philadelphia woman. Her husband was a model builder and she was recently divorced from him on the grounds that he spent so much time building models he neglected her and their child. Instead of this drastic action she should have bought herself some supplies and joined the model ranks. Many a wife has found she couldn't compete with the model hobby (which by the way is much more deadly than golf, stamp collecting, et cetera) so they, too, built and flew models—taking care never to get too good and embarrass their husband which would probably drive him to divorce!

Aëro speed merchants will have a chance to get it out of their systems at the Florida State Meet. A speed event for gas models tethered with a seventy-five-foot rope is included in the events. Speed events have always attracted builders despite the short course necessary and the difficulties in timing accurately a few seconds of flight. Pylon flying with gas models eliminates this trouble. A few rules can be formulated and a national record set up for planes of this category. After all, this type of speed event is all that model race-car fans have to look forward to in life. Looks as though it has possibilities for aëro-modelers. We hope William Thomas, Florida State AMA director, will tell us how this event worked out.

Anne doesn't live in Astoria any more. Unless, of course, Lars Johansson was lucky enough to find his 48" Bowlus-type glider which soared out of sight last April. He towlined it from Astoria, Long Island, and watched it climb steadily in sweeping circles, drifting out of sight on a southwest wind. It was built from a Cleveland kit. Color was red with black trim. The name Anne was painted on the pod-fuselage.

With defense claiming raw material and production facilities, the model industry may be forced to curtail production of motors and reduce the consumption of balsa wood and other special items. The Academy of Model Aëronautics was enough concerned to confer with the Office of Production Management regarding priorities in aluminum alloys and bronze, also rubber motor and balsa wood. AMA officials pointed out that model building forms a sound basic training for the aircraft workers and pilots who are so necessary.

Model building has been an important phase of Germany's air-training program. Yet gas motors for model work are scarce. Few individuals own them because they're too expensive. Some of the larger clubs own one or two. Winners of rubber contests are allowed to use them for limited lengths of time. The Quaker City *News Flash* estimates that in Philadelphia there are more than 500 boys with at least one motor and many of them have two or three. Our gas activities are far and away ahead of any other country and our model effort should be given its share of material to keep the industries and the activity humming.

Of course, if the bottle necks get real tight, we can always use hardwood and specialize in gliders. For many years German competition has been limited to models built exclusively from material available inside Germany. Synthetic rubber motors were inferior, but otherwise the hardwood models stacked up favorably alongside balsa. So it looks as though true model love will find a way, regardless of what materials are available.

The Witch City Gas Model Club of Salem, Mass., has had a rough time with their contest weather. Mrs. Marjorie Day says they are not a bunch of sissy fair-weather fliers, but after all there is a limit. Sunday is model-flying day for the Salem crowd and invariably it was windy following six days of tantalizingly calm week days. WCGMC meetings have been featuring news-letters from other clubs which are read, discussed and digested by the club members. It's a good idea. We know our individual club is the best, but it wouldn't hurt us to review the doings of the little club in Frog Hollow. They might have hit upon something that missed us. WCGMC insignia is a witch riding a gas model. In case you don't quite get the idea, you better review Salem's part in early American history.

Organized model building in Jacksonville, Fla., is coming back strong. Model Aëro Club is the name of the new club. Last August the old club went under for the third time. Until recently the boys had been free-wheeling without any organization. Old-timers and newcomers have formed MAC and the heat is on. Acting Chairman Al Anderson is dishing out enthusiasm and information about MAC. You can write him at 416 West Eighteenth Street, Jacksonville.

Winter has come to Bungo-Bungo. As Cousin Hugo puts it—"It may be 92 in Jersey City, but it's winter down here." He explained that their seasons are always a half year ahead of ours. He hated to miss our national meet. For the last year he had planned the trip. It would have been nice to go north for the winter. But at the last minute he talked it over with the warden and the guards and they recommended he finish his course at reform school before leaving the country. He threatened to visit us for the 1942 contests. Meanwhile, he'll keep us posted on the breath-

taking and thrilling model news as it unfolds in B-B.

A letter to the editor of *Aëro Modeller* (English) published in the February, 1941, issue gave American modeling a pat on the back. Hugh C. Furneaux was the writer. He liked the sensational progress made over here in gas design and in radio control. Praised the Academy of Model Aëronautics organization and policy and said they were more effective than the corresponding English organization, Society of Model Aëro Engineers, which he accused of having a somewhat stuffy and reactionary policy. He liked the plans for championship models and articles by experts presented in our model literature.

Following publication of this letter, the English boys jumped on Mr. Furneaux and began to take our model set-up apart. Comments were that American modeling was confined to producing kits and engines to suit the pockets of all from twelve years old upward and selling them to thousands of people who probably don't know the first thing about power modeling. The SMAE was defended in glowing terms along with unfavorable criticism of our AMA.

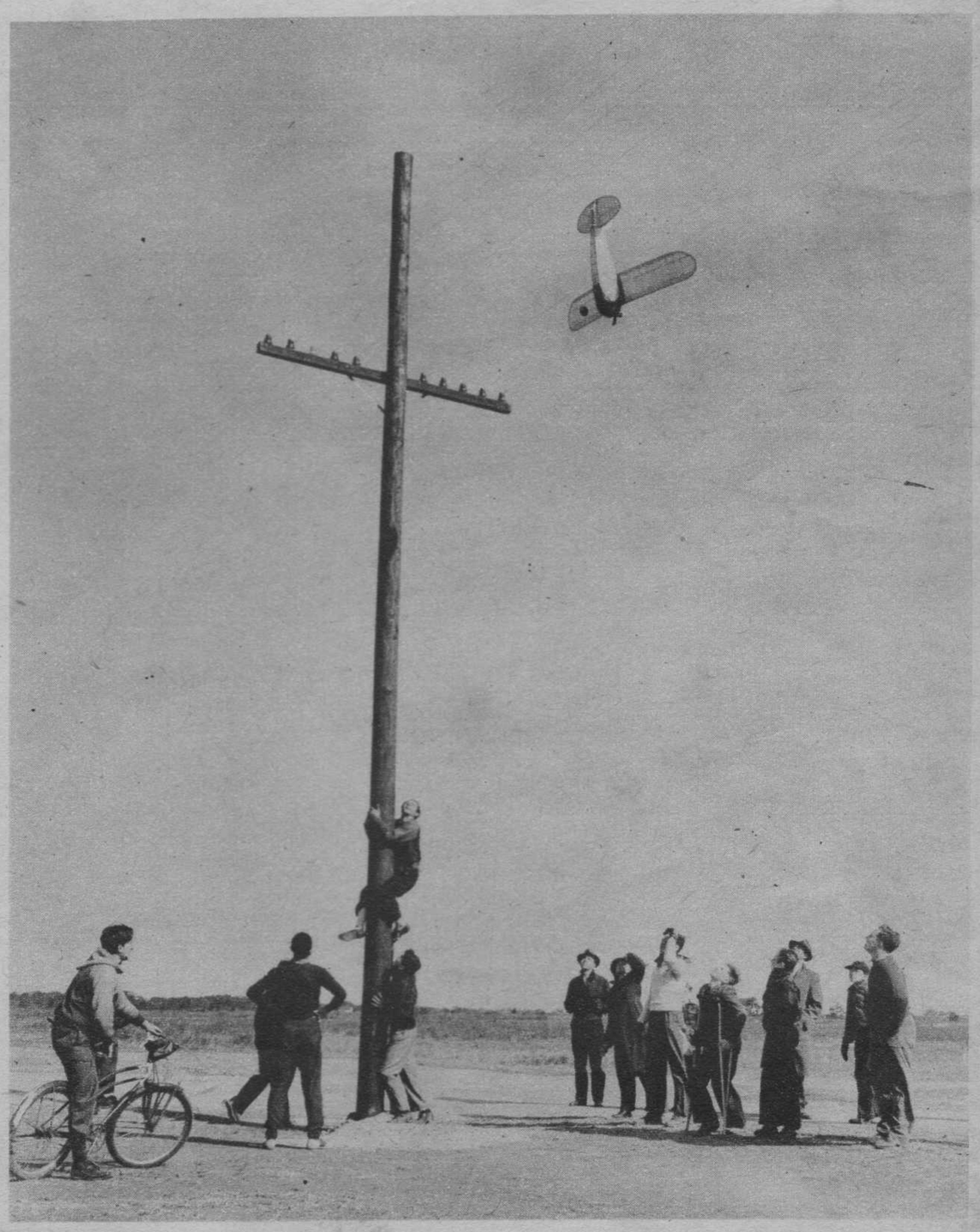
Mr. Furneaux's letter was refreshing. Too often criticism from England left the impression that they thought American models were hodge-podge collections of sticks that always caught lucky thermals. Commenting editorially, the *Aëro Modeller* sensibly analyzed the argument: ". . . It is all a question of outlook. So many people in an argument of this sort overlook the fact that models are built and designed to meet very different conditions. It is not possible to compare fairly a typical American with a typical British plane, as, of course, they are designed to meet two entirely different sets of conditions."

ON THE FIELD. (By Carroll Moon.) The season of contests is with us. Once more we feel the urge to attend the almost weekly meets, to hear the roar of "hot" motors, and to loose our ship on the runway in the hope that it will "catch one" and "stay up."

As this is written we have before us a score of contest announcements. By the time these words have reached the printed page most of the contests will be history. The Eastern States (June 7th at Hadley Field, N. J.) is the biggest thing on the contest horizon. Right now in our basement shop a wing is being built for that great day. If you insist, it's a Buzzard wing, although only 90% the size of the original—the better to accommodate an OK 49.

Yes, the contest season is with us. We'll have reams of material in the coming months about great performances and we earnestly request all publicity chairmen to get the results to us as soon as possible after the last prize has been awarded.

San Francisco modelers report, by means of a news page in the San Francisco *News*, the results of weekly contests. The publication, a Scripps-Howard unit, is actively behind model flying and the publicity does modeling a great deal of good in that area.



"Listen, Mabel, as I was saying—hello, hello—Operator! Operator!"

The California Championship meet, held May 3rd and 4th, was divided into two classes. The rubber-powered division was held May 3rd and results indicated that the weather was not too helpful in making good flights. Jim Morris won first in the senior outdoor fuselage ROG class with 2:28; second was Don Laustem with 1:57; while Perry Broz was third with 1:24. The open class was won by Bob Amos with 1:39; Gene Larson with 1:08 was second, and Charles Werle was third with :51. Junior class was won by Robert Ozowa with 1:14; second was Curt Holzhauser with 1:06, and Norman Busse was third with :48. The outdoor stick event, junior class, was won by Charles Dosset with 3:05. Senior stick was taken by Jim Katayma with 2:27; Robert Irwin was second with 2:04, and Stan Burns third with 1:39. The open stick event was won by Bob Amos with 2:01; Charles Werle was second with 1:02, and Dick Schumacker third with :47.

Bob Blau won the speed event, with Lester Elmore second and Bob Mueser third. Jim Morris won the flying scale event; M. Andrade was second, and Bob Mueser third.

The gas division of the championship meet was held on Sunday, May 3rd, despite a high wind which cut the times to a great extent. Clyde Holloway took the senior event, with Richard Chamberlain second and Frank Niblet third. Vernon Oldershaw won the open event, with Harry Waltz second and Donald Foote third.

The meet was sponsored by the San Francisco *News* and the San Francisco Exchange Club. Dr. Irving A. Dundas was meet chairman; Negley Monett was in charge of publicity, and Wesley Wooten handled arrangements.

At last we have at hand a report of a contest which admits that "thermals abounded," and by looking at the times turned in at the second annual Superior California Gas Model Contest, held April 27th, we can vouch for the fact that the models did exceptionally well. Before the day ended four national records had been beaten. They were Class C, junior senior and open, and Class B open.

Donald K. Foote, of Oakland, flying a Class C ship, took first in the meet with the sensational time of 24:37. Carl Guidici was second with 14:40, also flying a Class C job. Don Lampson, of Lakeport, Cal., flying a Class B ship, took third with 14:14, and another entry of Don Foote's was fourth with 14:06. Jack Cudd was fifth. Other winners were W. H. Pittenger, Ralph Igler, Dick Pittenger, Gorden Peterson and Rob McCord. Gene Larson took Class A honors with 6:11.4. Ted Ravellette, AMA State director, directed the meet.

The sixth annual Southwestern Championship Gas Model Airplane Meet, sponsored by the Exchange Clubs of San Diego (Cal.) County, was held April 27th at Aëroneers' Field. The meet, one of the largest on the coast so far this year, attracted 366 entrants and more than 5,000 spectators.

Walter (Ross) Houck, of Ocean Beach, took first place with a time of 22:07 for two flights, the last being

out of sight. He received $50 cash, the Consolidated Aircraft Trophy, the Southeastern Exchange Club AMA Trophy, the National City Exchange Club Class C Trophy and a Blue Ribbon.

Ray Acord, of Hollywood, was second with a time of 21:22, while Charles Koby of Van Nys, last year's winner, took third, doing 20:49. Bob White was fourth, Ray Budwig fifth. Ray, incidentally, took the Class B Trophy in the bargain, his time being 15:47. Bruce Main won the award for the best-looking ship and Miss Eva Wells won the award for the women's event. Holly Watrus won the Fireball event for the most spectacular performance.

Harold Strawn was contest manager and Rupert Ranger was contest director.

The San Diego Aëroneers, who were cosponsors of the event, presented an excellent meet and are to be congratulated on their fine handling of the affair. Charles Underhill is president of the Aëroneers. Bill Sweet is vice president and Mrs. Rae Davis is secretary. Treasurer is E. J. Brown; Franz Secrest, corresponding secretary; Harold Glinès, recorder.

An interesting item in the contest was the very comprehensive program which gave a list of entrants, the motors used, and ships. According to this list, almost every type of motor made was sported by contestants. Super Cyclones, Ohlssons and Bunch motors predominated, but others used included Hurleman, Brown, Torpedo, Dennymite, Atom, Forster, Madewell, Elf Twin, Brownie, the Willard, Bantam, Perky, Comet 35, Baby Cyclone, Sky Chief, Little Dynamite, O. K. and a Clark Special. 360 entries were listed.

Gotham Gas Gossip—The well-known Creedmore Flying Field is almost a thing of the past. A large hospital has been erected on the old field and power lines now intersect it. The new field is so near the houses that residents have called police to keep modelers from flying in that area. Instead, all flying (or most of it) has been transferred to Hicksville, L. I., a bit farther away, but a much better location. The site is just west of the famed Aviation Country Club, and the flat terrain enables modelers to retrieve ships quite easily. Only one fault—the thermals are terrific. For example, one recent Sunday, Sal Taibi lost a Tiger-powered Pacer with a 7:55 flight. Jerry Stoloff lost a Bantam-powered ship (called the Swami) after six minutes, and during the same day a Scientific Mercury with a Dennymite did almost ten minutes before disappearing.

Incidentally, the Sky-Scrapers Fall Contest (sponsored by AMA) will probably be held at Hicksville. The date has been set as August 31st.

New Yorkers bemoaning the lack of a flying field should drop a line to Arthur Hasselbach, care of Jackson's Model & Supplies, 3079 Third Avenue, Bronx, N. Y. There's a gas-model contest open to residents of Greater New York and New Jersey to be held opposite the Bronx-Whitestone Bridge, on July 20th.

LET'S BE SCIENTIFIC. (By James R. Custin.) During the past few years we have witnessed the growth of the bigger and better type of model airplane contest, with a list of prizes that makes "bank night" look like a piker's affair. Sponsors are thrown for a loss with every meet, and modelers lap up the cream with little thought to what they are giving in return.

Four or five days before a meet, the contestant rushes to the nearest hobby shop and buys the latest and most popular gas model kit. Then begins the twenty-four-hour-a-day grind of turning out the model in time for the contest. The house is upset, the family kept awake, electric bills go sky high, meals are late because the kitchen table is covered with balsa wood and cement, and everyone has a beautiful grouch. (How do you suppose I know all this?)

At last, on the morning of the meet, the modeler emerges with his creation—to give it its test flights. If he has done a sloppy job, he excuses this on the ground that it will stay up just as long as anybody else's—in a thermal. If he has turned out a very neat job he will probably regret the extra time spent when some crate that looks like a wreck hooks a riser and smashes all the records.

The average contest has degenerated to the level of a glorified bingo game. Most of the models are kit jobs, figured out by some genius who makes a profession of model airplane designs. It is no longer necessary to know even the most basic elements of aërodynamics in order to build a prize-winning contest model. The whole thing boils down to a question of who can adjust his model best and then hook the strongest riser with it.

Yet sponsors are inveigled into putting up cash for this sort of thing on the grounds that it stimulates a wider knowledge of the principles of aëronautics among youth, encourages the development of a scientific attitude, et cetera, et cetera. So does Chinese checkers.

It has always seemed to me that a contest ought to be a real test of aëronautical knowledge and skill. It ought to provide modelers with a chance to try, under actual competitive conditions, the ideas and theories which they have worked out in their models.

As one means of encouraging such a scientific attitude, I feel that an original design competition ought to be made a part of every major contest. The judging of such an event does present some difficulties, but these are not so great as to rule it out completely. Some sort of a scale can be evolved, with a little thought, which would make such judging less arbitrary than would seem necessary at first glance. I believe that the idea is worth considerable study.

More stringent loading and motor run rules, during the past few years, have tended somewhat to cut down the luck element in contests, but they have not eliminated the thermal current. Since it is almost impossible to select only cloudy days for model airplane meets, I suggest the night

contest as a possible solution to the problem.

A row of automobile headlights and a spotlight provide illumination for starting motors and making adjustments. Flying lights on the model make it easy to time and find. Both the model and motor must be carefully adjusted before the meet, since it's pretty hard to fumble with close adjustments in the dark.

While a night contest cannot so easily be made into an elaborate affair, with a couple of hundred contestants, thousands of spectators, and an impressive list of prizes, this is not entirely an evil. The contest is a model airplane meet, rather than a ballyhooed show, and contestants are forced to concentrate on the performance of their ships. Furthermore, night contests are real fun, as anyone who has ever attended one will testify.

But the burden of cleansing model aviation of the toy airplane attitude is not entirely on the sponsors and directors of contests. The aëromodeler himself must adopt a scientific point of view with respect to his hobby if it is to be more than just a passing fad. He must realize that the model airplane is really a powerful means of aërodynamic research, and he must do something about it.

"How am I going to do it?" you ask.

Well, it is obviously impossible for anyone to try to do experimental or research work on anything so complex as the model airplane considered as a whole. It is necessary, therefore, to select some particular problem or phase of model aërodynamics and concentrate on it. The model airplane is certainly not too small for specialization.

Following are some suggestions for research projects which can be carried out by any ambitious modeler.

Model airplane clubs looking for some activity to fill the nonflying months would do well to select one of these problems for group study. The idea is to choose one problem and stick to it until everything has been learned that there is to know about it.

Stability. In spite of the reams of paper that have been filled with discussions of spiral stability, no one really seems to know much about the subject. I can cite at least three theories purporting to explain the mechanism of the spiral dive, each of them very plausible, and each contradicting the others. And I have seen models built in strict accordance with each of these theories smash themselves to bits in vicious spiral dives.

The study of spiral stability is not a simple one, but the fellow who can come up with the right answer will really have accomplished something worth while. One method of attacking the problem might be the use of a pendulum attached to a movable rudder tab.

Even such a comparatively simple matter as longitudinal stability presents many problems for the model builder. We know, for example, that, other things being equal, a longer tail moment arm generally makes for more stability. But just what are the limits of this effect? Suppose we used a seventy-percent tail moment arm? Or one hundred percent? The answer won't come by thinking about it. Someone has to try it. How about you?

And what about downthrust? Why does one model fly perfectly well without it and the other require a great deal in order to keep it from looping? Your guess is as good as mine, but we can't find the answer by guessing. It will take some honest experimental work to find out.

Control. Closely allied to the problem of stability is that of radio and remote control. Radio control presents an interesting and challenging problem to those who have the necessary knowledge and ability. The perfect radio control has not yet been invented. Even the army uses a telephone dial system which is far from the ideal cockpit-type control of which R. C. enthusiasts dream.

But even the simplest radio-control system can be of inestimable value in a study of stability problems. Nor is it necessary to use a radio signal for remote-control operation. A movable control surface can be actuated by the timer arm at a predetermined moment, or combinations of timers and controls can be used. The value of such apparatus in the study of stability is obvious.

Airfoils. The largest part of the performance of a model is determined by the wing planform and airfoil section used, yet modelers are notoriously careless about airfoils.

Too many model builders simply chop out a rib that looks like an airfoil, and then hope for the best. When asked what airfoil section they are using, they beam and brightly say that it is an "original design." Then if the ship works well, they praise the airfoil; if it works poorly, they don't know what's wrong.

The only way to determine the efficiency of an airfoil is to compare it directly with another. This means the construction of several wings for each ship, identical in all respects except airfoil. If the modeler thinks he has something unusual in the way of an original section, he can test it by direct comparison with other foils of known characteristics.

It is in this matter of airfoils that the kit model has an excellent place. A model built from a kit is usually dependable from the standpoint of stability and general performance, so that when different airfoils are tried on it the number of variables involved is reduced to the minimum.

Motors. The big problem here, of course, is how to get more power out of the present corn popper. And maybe some day some research genius will figure out why it always starts perfectly on the bench, but always balks just before an official flight.

But the field of motor research is not limited to the gasoline engine. Successful steam engines have already been built for models, and it is possible that with research and development they can become serious rivals of the gasoline motor. Diesel, compressed-air and rocket motors

also present interesting fields for thought and experiment.

And the rubber motor is not to be neglected. Running torque and horsepower curves on rubber motors of various sizes and kinds is an excellent and very useful exercise in applied physics. If you're interested in chemistry, you might figure out the perfect rubber lubricant. The possibilities in the field of rubber motors are virtually inexhaustible.

Right here, by the way, is a good place to say a few kind words in behalf of the rubber-powered model. There are now only a very few hardy souls who still fly rubber-powered ships year after year, just for the fun of it. Yet the rubber model is far superior to the gas-powered ship for experimental purposes, since it can be built much more quickly and cheaply.

The rubber model, moreover, presents a real challenge in the matter of design and adjustment, because its power run varies over such a wide and continuously changing range. All too many young modelers are starting out by building gas models, often with disastrous results. More experienced fliers should point out to them the importance of starting with rubber-powered craft.

Propellers. Mere mention of the name should suggest a host of problems. One suggestion for particular study might be this: Does the propeller which delivers the greatest amount of static thrust necessarily deliver the greatest amount of power in actual flight?

Structure. Structural design is still a wide-open field. Geodetic and monocoque construction present possibilities for experiment, as do papier-mâché and various other plastics. Light weight, strength and simplicity of construction are the goals to aim for.

Unorthodox Types of Aircraft. Recently there has been considerable interest in model helicopters, and several successful and promising designs have already been evolved. The small number of modelers working with helicopters makes this an excellent field for further work by the fellow who likes to lead the way.

Very few model autogiros have been made to work successfully, yet the model autogiro may possess some advantages over the fixed-wing airplane. The same is true of ornithopters.

Canards, seaplanes and amphibians present other possibilities for experiment for the fellow who has a spare gas motor and a little ingenuity.

Gadgets. There are still a host of gadgets which must be perfected. How about a really effective two-wheeled retractable landing gear? Or a good folding or freewheeling prop for gas models? Or a gadget to drive coaxial gas props in opposite directions, thereby eliminating torque problems? Or automatic wing flaps? Or slots? Or—shades of Buck Rogers—retractable wings that permit skyrocket climb and unfold to produce that floating glide?

Measuring Devices. The essence of science is measurement. Yet, after the construction stage, the only measurement that takes place on the average model is timing the motor run and flight.

No one has yet invented an altimeter suitable for models, yet think of the advantages of such an instrument. And how about a practical airspeed indicator that will make a continuous record of airspeed at each stage of flight?

Some amateur psychologist might make a study of human errors in the timing of motor runs, and devise a means of remedying them. We know that one timer will clock a motor run at nineteen seconds while another may call it twenty-one. What's the answer?

No matter which of these problems you decide to work on, certain precautions must be observed.

A scientific approach demands careful planning and building. It requires constant checking and measurement. One successful flight proves nothing. Six successful flights prove very little. Fifty consecutive successful flights prove the point convincingly.

The scientist starts with a problem, and possibly with a tentative solution. Then he devises a means of attack—the experiments which he will perform. He sets up his apparatus carefully, checks every step to see that no disturbing factors enter the picture, and works patiently. If there is a possibility of error, he repeats the experiment, taking averages if necessary.

When he has finished, he may find that his tentative solution or "hypothesis" was eorrect. Or he may find that it was all wrong, and then he has to start out on some other track. But he never quits until he gets the right answer.

That ought to be the spirit in which the aëromodeler works. That is, in fact, the way the successful modelers work—the ones who win contests consistently, risers or no risers.

So—let's be scientific.

Mulvihill Trophy Winner

(Continued from page 49)

symmetrical cross section tip. Then shape the blade, sanding it well, following with four coats of clear dope, sanding lightly between each coat and finally rubbing it well with rubbing compound so as to obtain a smooth, glossy finish. Care should be taken to obtain a perfectly balanced prop so as to obtain good flights consistently. Refer to plans for prop assembly and tensioner.

The model is covered with regular Jap tissue. Use dope to apply paper and always run the grain of the paper the long way in order to eliminate excessive sagging. Cover the total under surface of the wing first, sticking the paper directly to the underside of each rib in order to obtain the best airfoil, then cover the top of the wing. Spray the entire model with water, and paint the wing and tail assembly with one coat of clear dope and the fuselage itself with two coats.

The tail assembly is then cemented directly to the tail boom; the rudder's trailing edge being offset approximately $^1/_{16}$" to give a right circle.

A motor consisting of 18 strands of $^3/_{16}$" flat rubber with about six inches of slack is used, and is held in place in the rear by ¼" hardwood dowel rod.

FLYING

The model should be tested in the evening when there is very little wind. A ⅛" incidence block should be slid under the leading edge of the wing and can always be changed if necessary. Make several test glides. If the model stalls during these glides, move the wing back a bit; if it dives, move the wing forward. The angle of incidence can always be changed by slipping different-size pieces of balsa under the trailing or leading edges as the case may be. After a flat glide is obtained, wind the motor about 150 turns and launch into the wind. It should turn to the right and spiral upward. Adjust for turn by giving it more or less right thrust. Correct stall with downthrust. Adjust carefully each time the number of turns is increased. The model flies opposite torque, both under power and in the glide.

"Why Slots?"

(Continued from page 50)

sharply at the stall point—about 15 degrees.

The slotted wing lift curve does not rise as swiftly, or with a linear variation, but at an angle of attack of 20 degrees the lift is still increasing. This means that there is much less tendency for the model to reach a critical stall point, where it will violently "whip out," with subsequent loss of valuable altitude.

As the stall is approached, the lift decreases gradually and the model "mushes" slowly out of the near-stall. Obviously the adjustment of such a model would be greatly simplified, as the model will fly within a greater range of actual surface settings without disastrous results. Even after the initial adjustment period certain variations in standard conditions could be detected and corrected before any serious damage occurred.

But for this extra dependability we must pay a price—namely, increased drag. The increased drag is very slight at low angles of attack, but rises somewhat as the angle of attack increases. This increased drag, combined with the somewhat flatter lift curve, gives a lower maximum value of L/D for the wing, to which the glide is more or less directly related. (Fuselage, strut and tail drag also affect total drag.) In other words, a perfectly adjusted model which never gets into trouble is better off without slots, but models in general being what they are, any such device which so increases the dependability of the model is highly desirable. How many times have we seen ships turn in one super flight to, shall we say, three or four poor ones—with no apparent change in adjustment?

The usual location of the slot is just at the rear of the leading edge. The section tested was of this type.

This arrangement gives the maximum increase of lift at high angles. The increase of maximum lift diminishes as the slot moves toward the trailing edge, but there is also a decrease in the extra drag caused by the slot. All in all, however, the speed of model aircraft is low enough so that the lift considerations outweigh those of drag, and the slot should be placed near the leading edge. It should be tapered from bottom to top, and all the corners well rounded to minimize drag. The walls of the slot should form a mean angle of about 45 degrees to the chord line.

The single slot in the leading edge is by no means the only means for accomplishing what has just been set forth. Slots which are carried forward and above the wing proper, multislotted wings, all do the same thing. It was thought, however, that the structural fragility of these systems would render them too impractical for small aircraft usage.

So, you fellows with an experimental bend, let's try something different. Put some slots in your wings, and check your performance both with and without slots. If you run into difficulties drop us a line, and we will try to answer your questions.

In the next issue—a new stick model by

DICK KORDA

Maco Makes Grade

(Continued from page 55)

Comet factory, a much larger supply of kits and parts was incorporated into the new outlay of stock. Since that time the firm has added to the lines carried until it now carries a representative stock of all the better-known model manufacturers.

In 1938 Mr. McCall not only became active as a businessman in modelcraft, but took to the flying end of the game. He organized the Propeller Gas Model Club, the name later being changed to the American Airlines Gas Model Club. Today this group has forty-five very active members, including the "boss" himself, who is quite a competent craftsman.

In 1939 the club took in the Nationals at Detroit, and in 1940 the Nationals at Chicago. Of course, Maco went along to supervise flying on both occasions, and his fatherly, or professional, touch produced excellent results. At Detroit, Robert Bessee won the Class B open event and at Chicago, Bill Schwab scored high in all three gas events. Bessee's picture, by the way, graces the cover of the Champion Spark Plug advertising folder.

The "boss" himself gets as big a kick out of flying as other members of the club, and last year won the open gas event at the Erie, Pennsylvania, meet. He has also placed in several meets, including a second in a Pittsburgh, Pennsylvania, contest. Officers of the club are Ralph Mitchell, president; William Barries, vice president; Eldred Hoopengarner, secretary, and H. D. McCall, treasurer. Air Trails readers who visit Cleveland this year for the Scripps-Howard air meet are cordially invited to stop in and visit with Mr. and Mrs. McCall and, of course, the members of the club.

The American Airlines Gas Model Club has sponsored an annual gas-model contest each year for the past two years. This year the meet will be held on August 10th.

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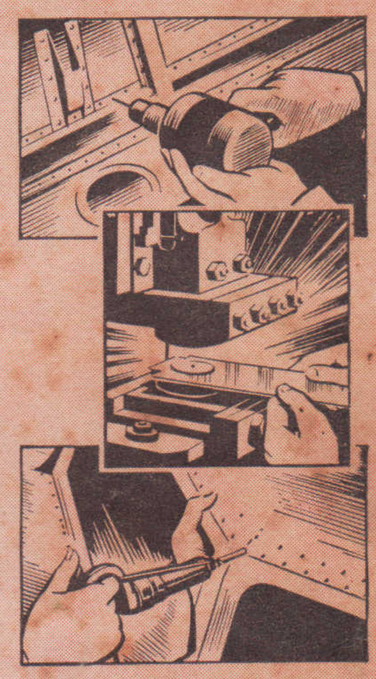

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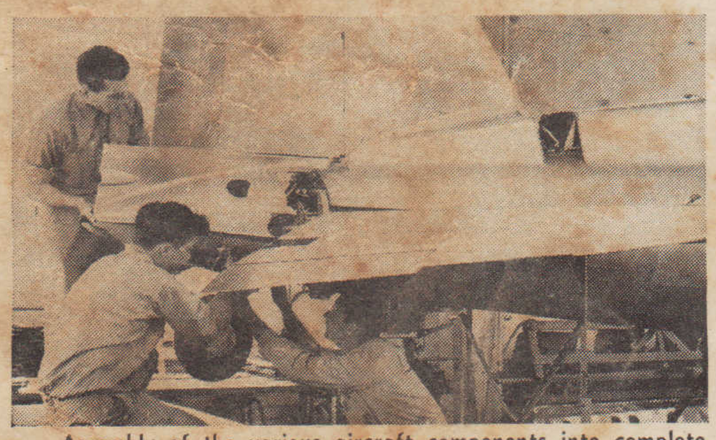
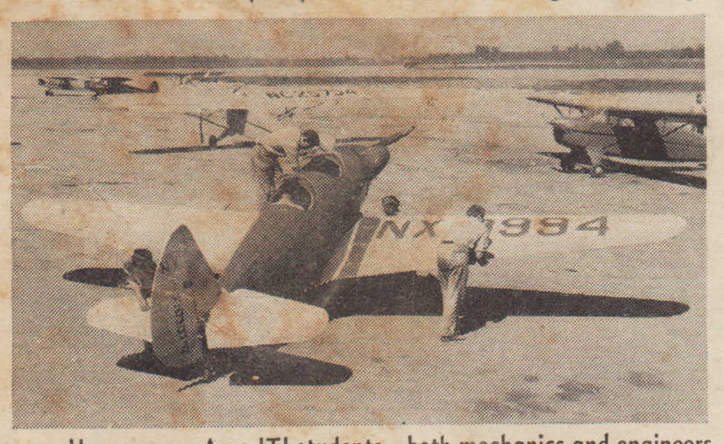


Assembly of the various aircraft components into complete planes—including large, all-metal ships—is a standard part of Aero ITI training...giving you priceless experience far advanced over simple operations such as drilling and riveting.



Here you see Aero ITI students—both mechanics and engineers—giving a student designed and built plane final inspection before its first test "hop"...a typical example of how Aero ITI training reaches the ultimate in practical experience.

As an Aero ITI-trained man your up-grading is already well along BEFORE you enter the industry. This is PROVED by the outstanding records of the 2766 graduates employed by 99 firms in aviation. It is the rule rather than the exception that Aero ITI-trained men are soon advanced beyond their starting jobs. Many have gone through the more advanced stages of up-grading quickly—or been excused from it entirely—and soon placed in supervisory posts. Many more have stepped directly from Aero ITI into preferred jobs—responsible jobs, such as power plant installation, final assembly, experimental, and inspection.

The superiority of Aero ITI training has also won many graduates jobs with the big airlines...in maintenance work, one of the finest jobs in all Aviation. Aero ITI engineering graduates, too, consistently are selected for the more specialized phases of aeronautical engineering because of their more practical, more thorough training.

Before starting ANY aircraft training, for ANY branch of Aviation, be sure it will take you a long way, that it will bring you real success. These are the all-important reasons you should be satisfied with nothing less than Aero ITI training. For the sake of your whole future, write today, or send the coupon, and get complete information on what Aero ITI training can mean to you.

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