



Curtiss Commando 120 of these troopships of the sky could move 12,000 men with much equipment



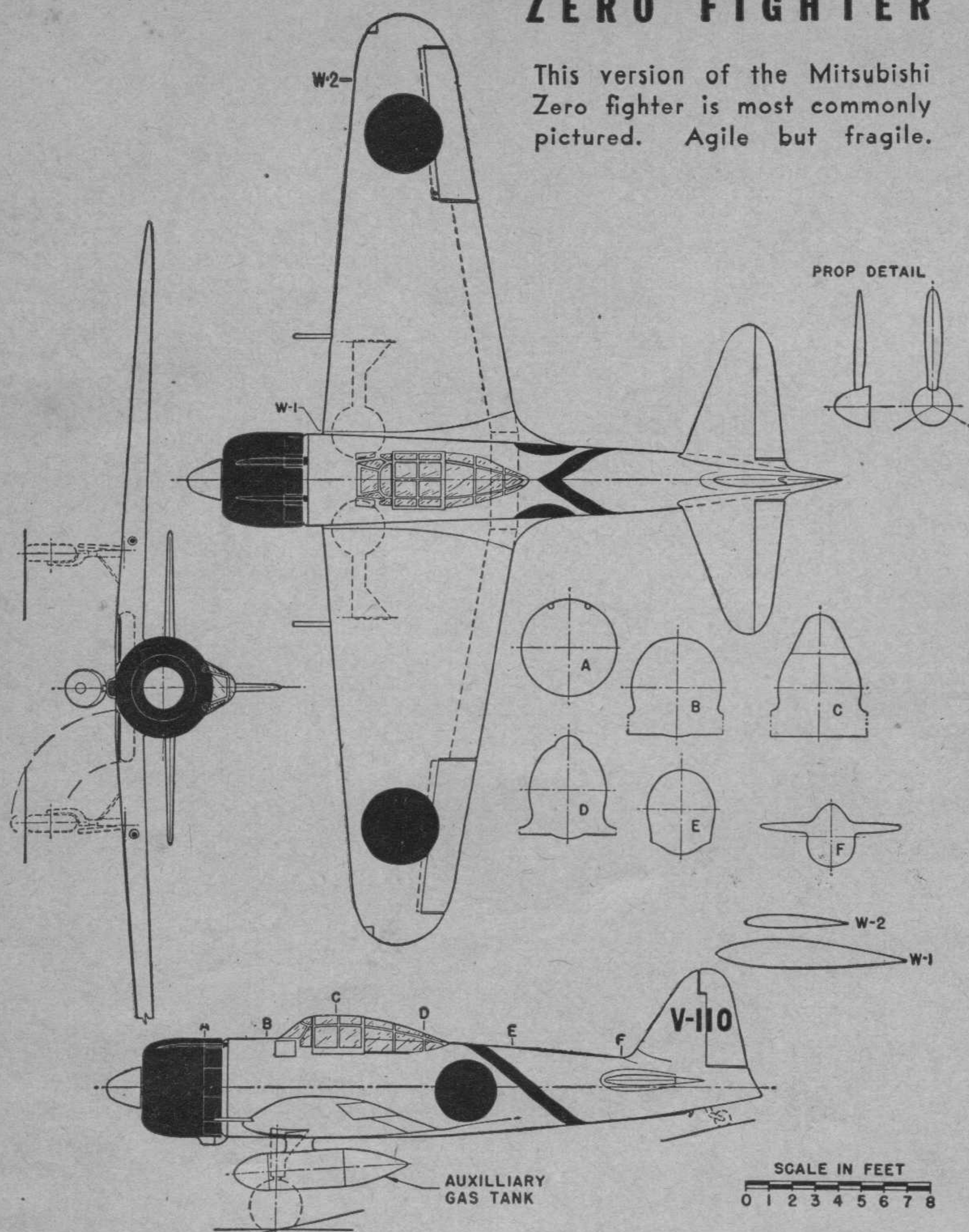
Kodachrome by Rudy Arnold

from coast to coast within 48 hours. Biggest twin-engined ship in the world, it carries jeeps, field pieces

FAMOUS FIGHTERS

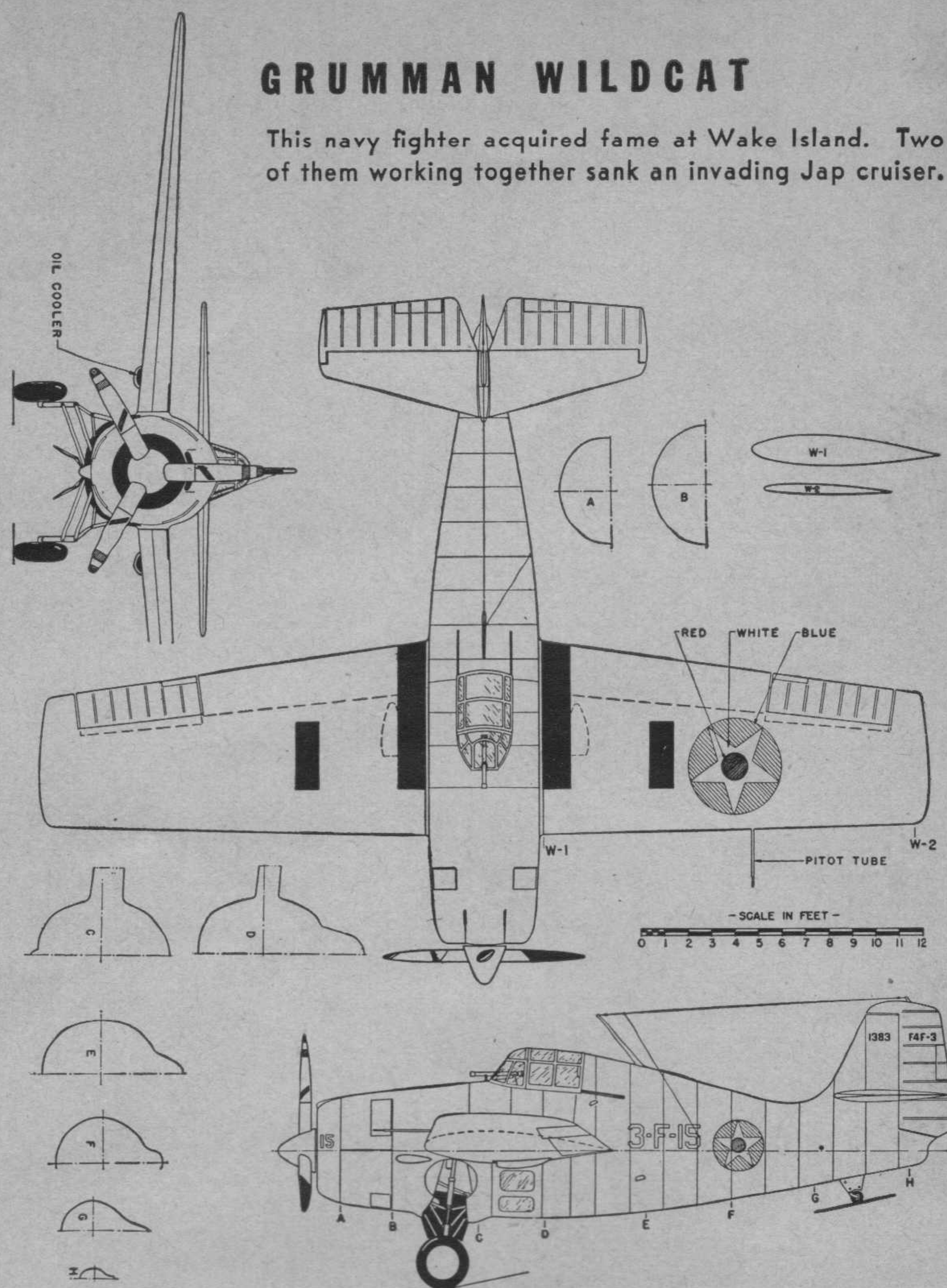
ZERO FIGHTER

This version of the Mitsubishi Zero fighter is most commonly pictured. Agile but fragile.



GRUMMAN WILDCAT

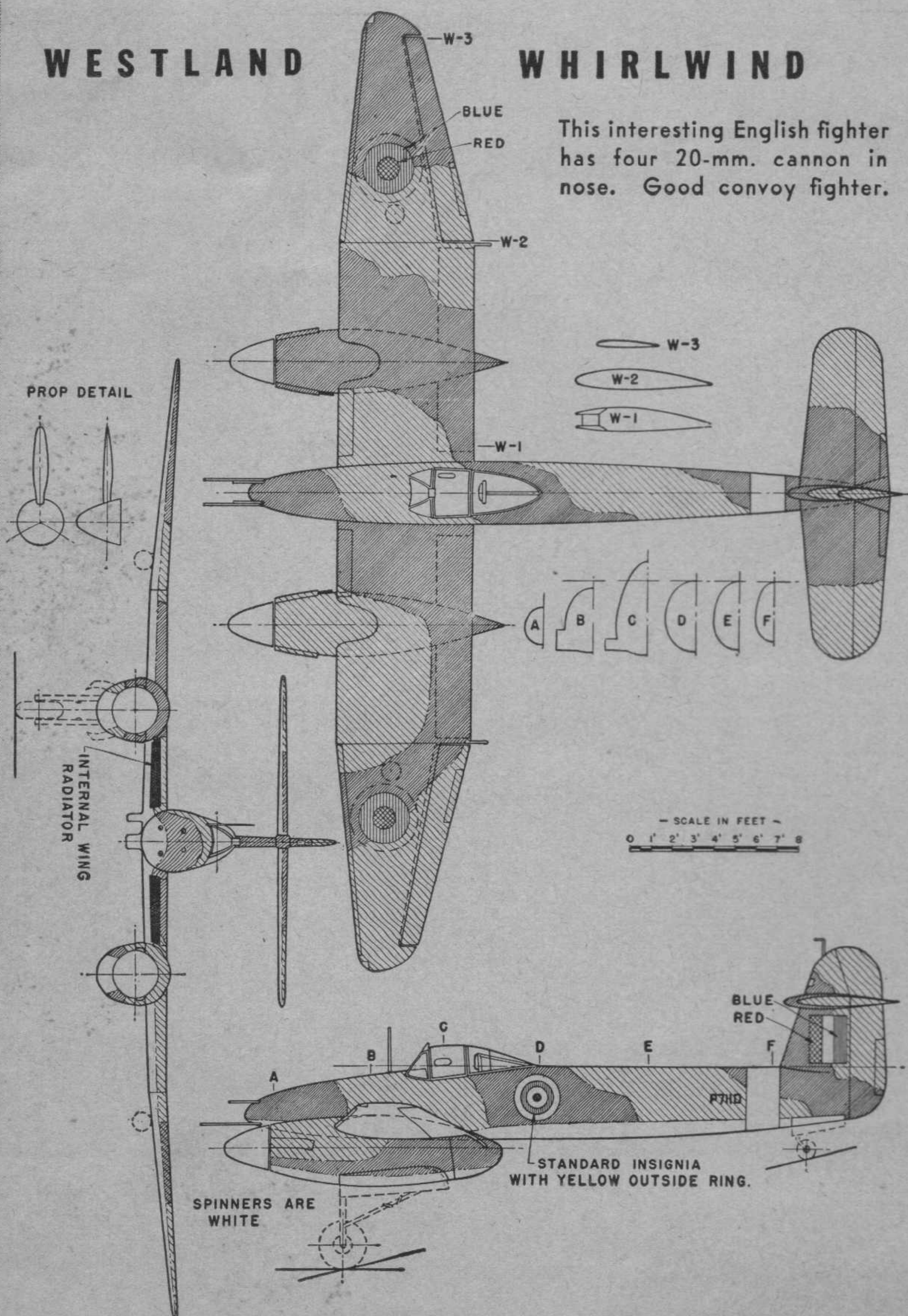
This navy fighter acquired fame at Wake Island. Two of them working together sank an invading Jap cruiser.



WESTLAND

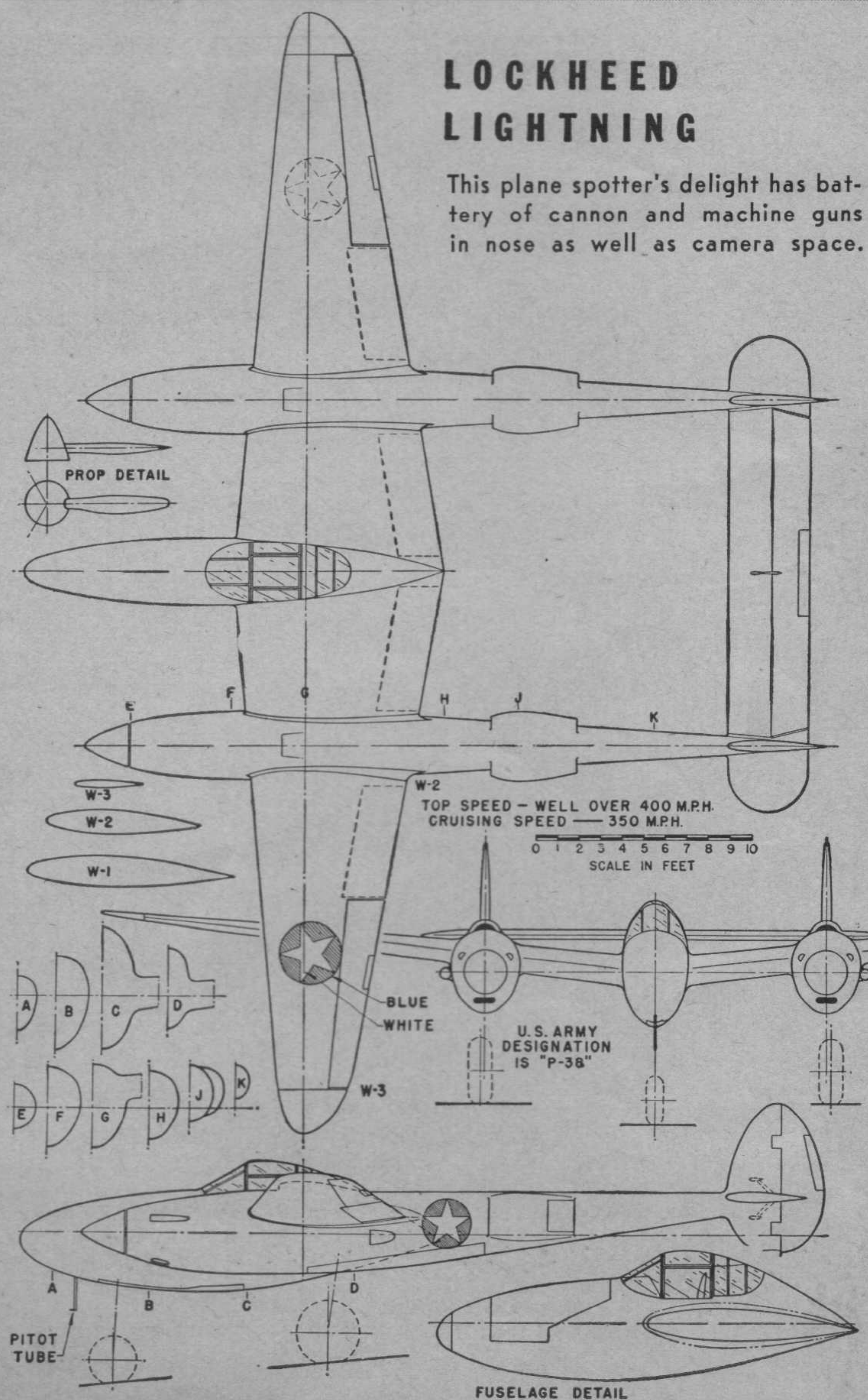
WHIRLWIND

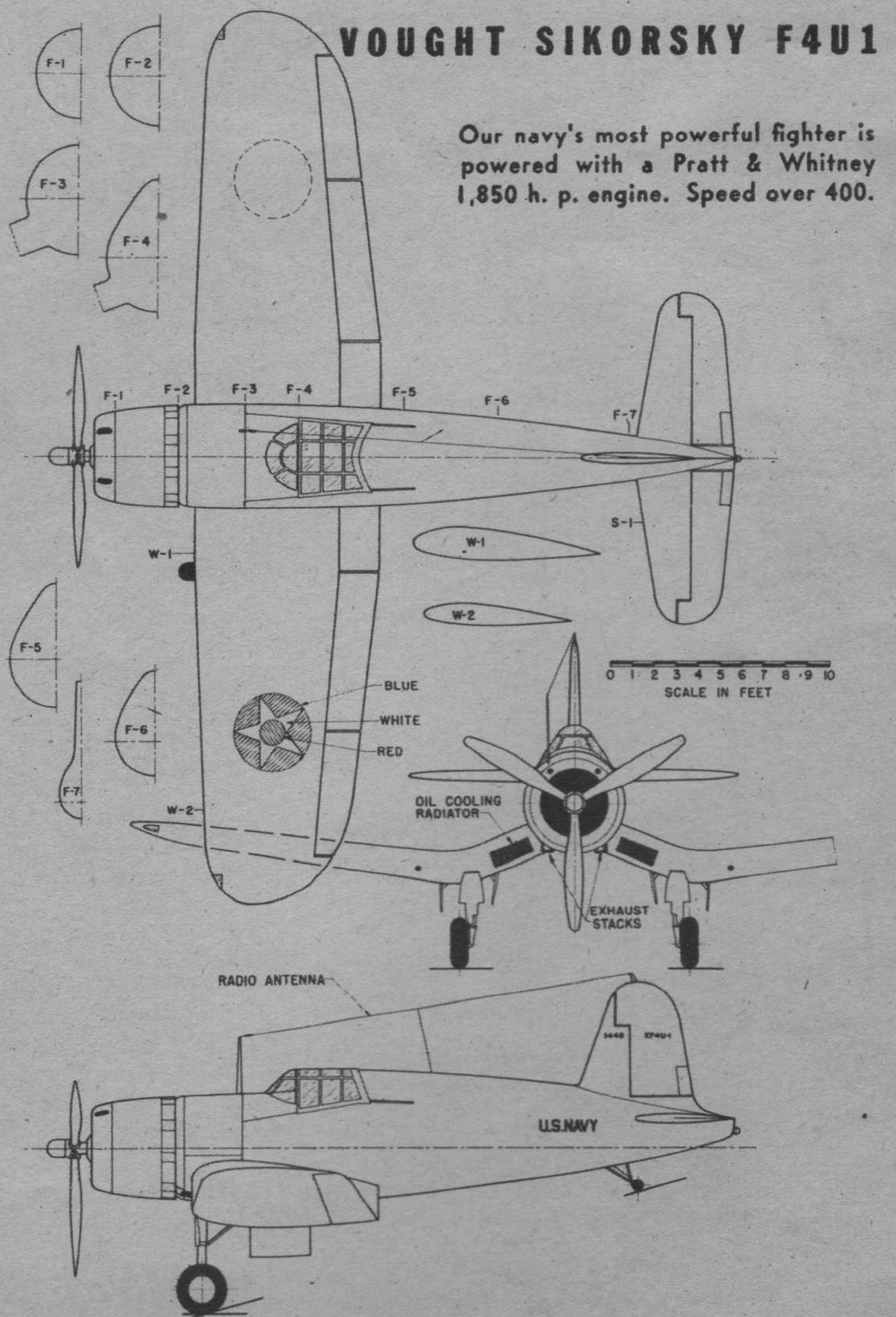
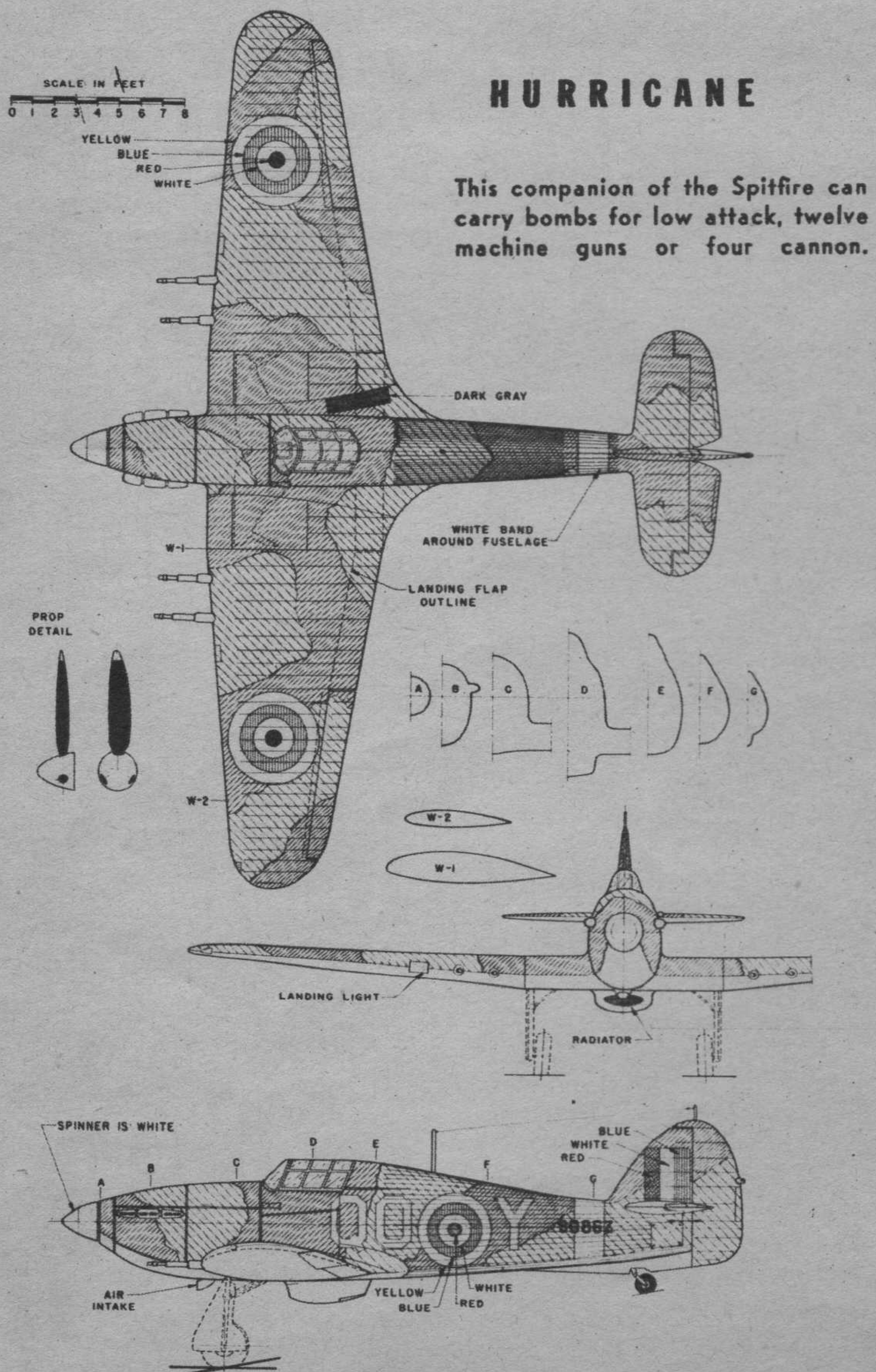
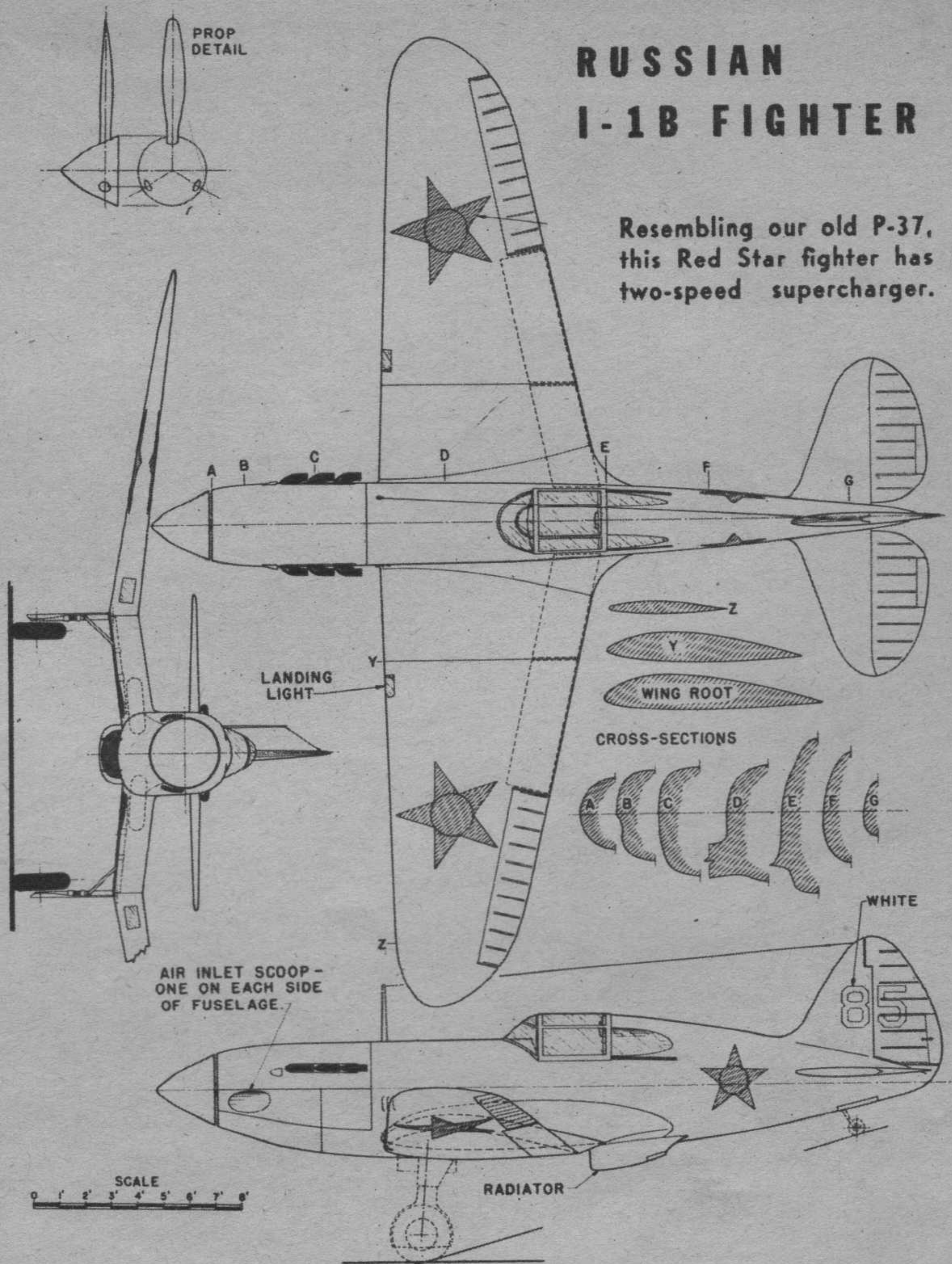
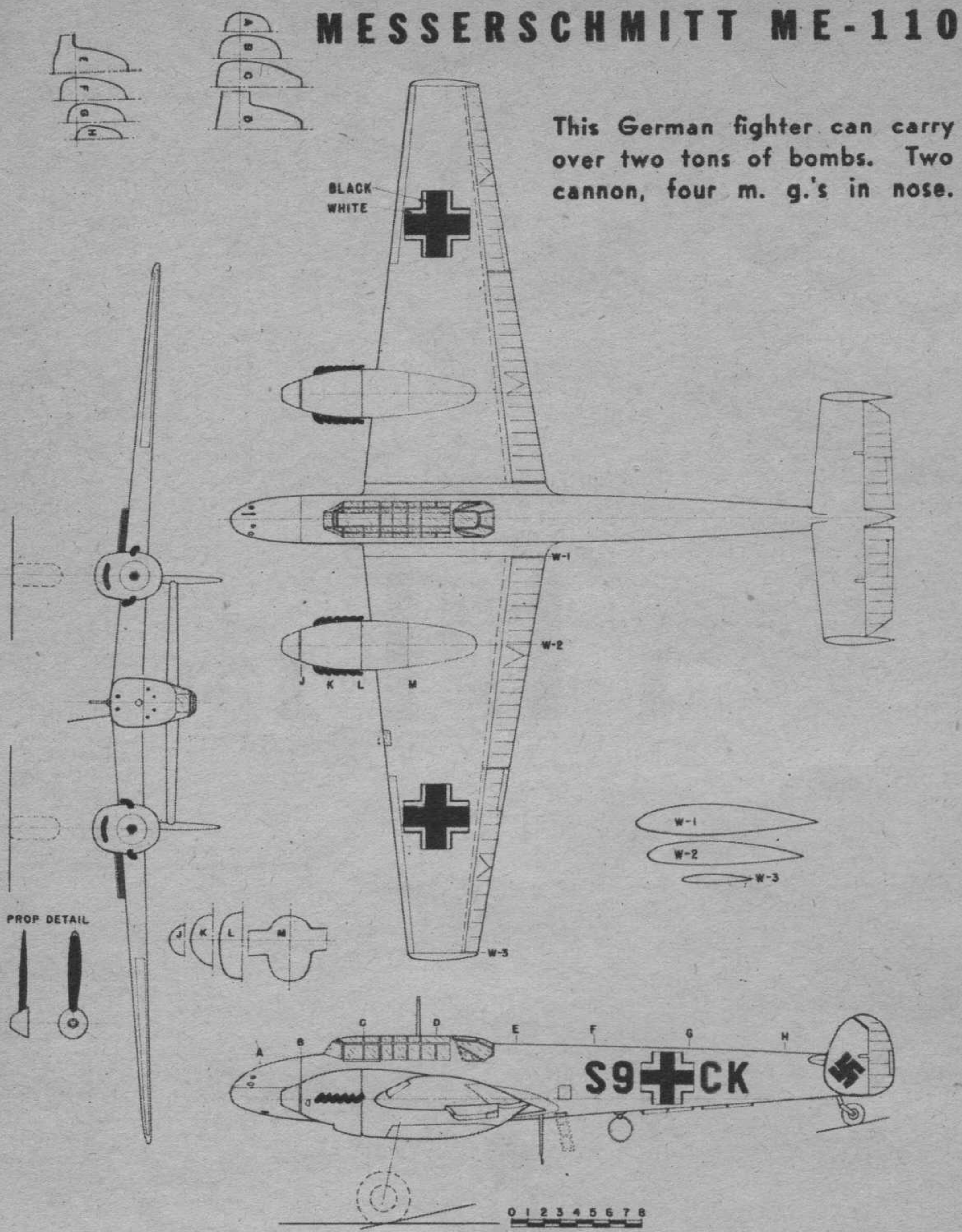
This interesting English fighter has four 20-mm. cannon in nose. Good convoy fighter.



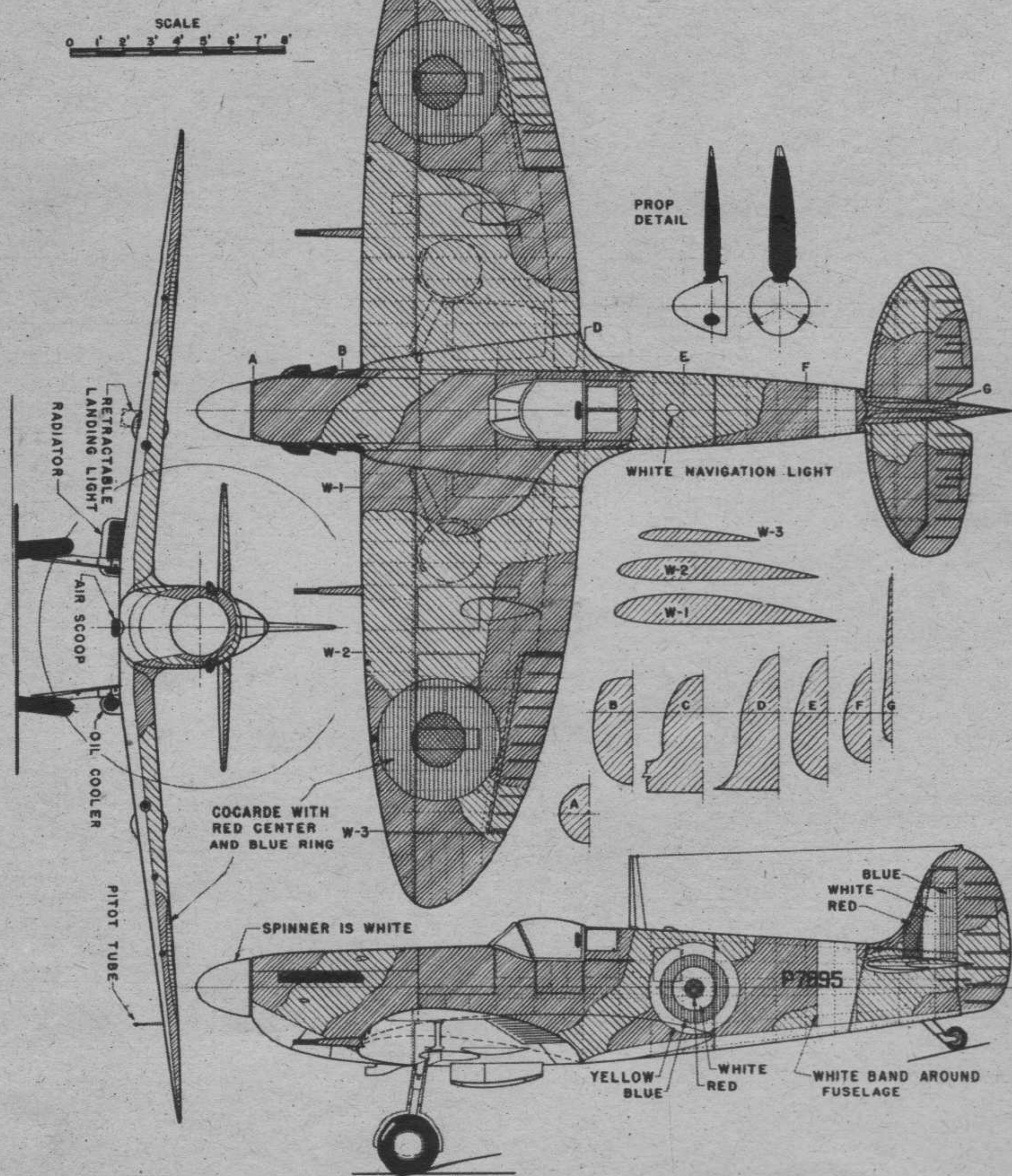
LOCKHEED LIGHTNING

This plane spotter's delight has battery of cannon and machine guns in nose as well as camera space.



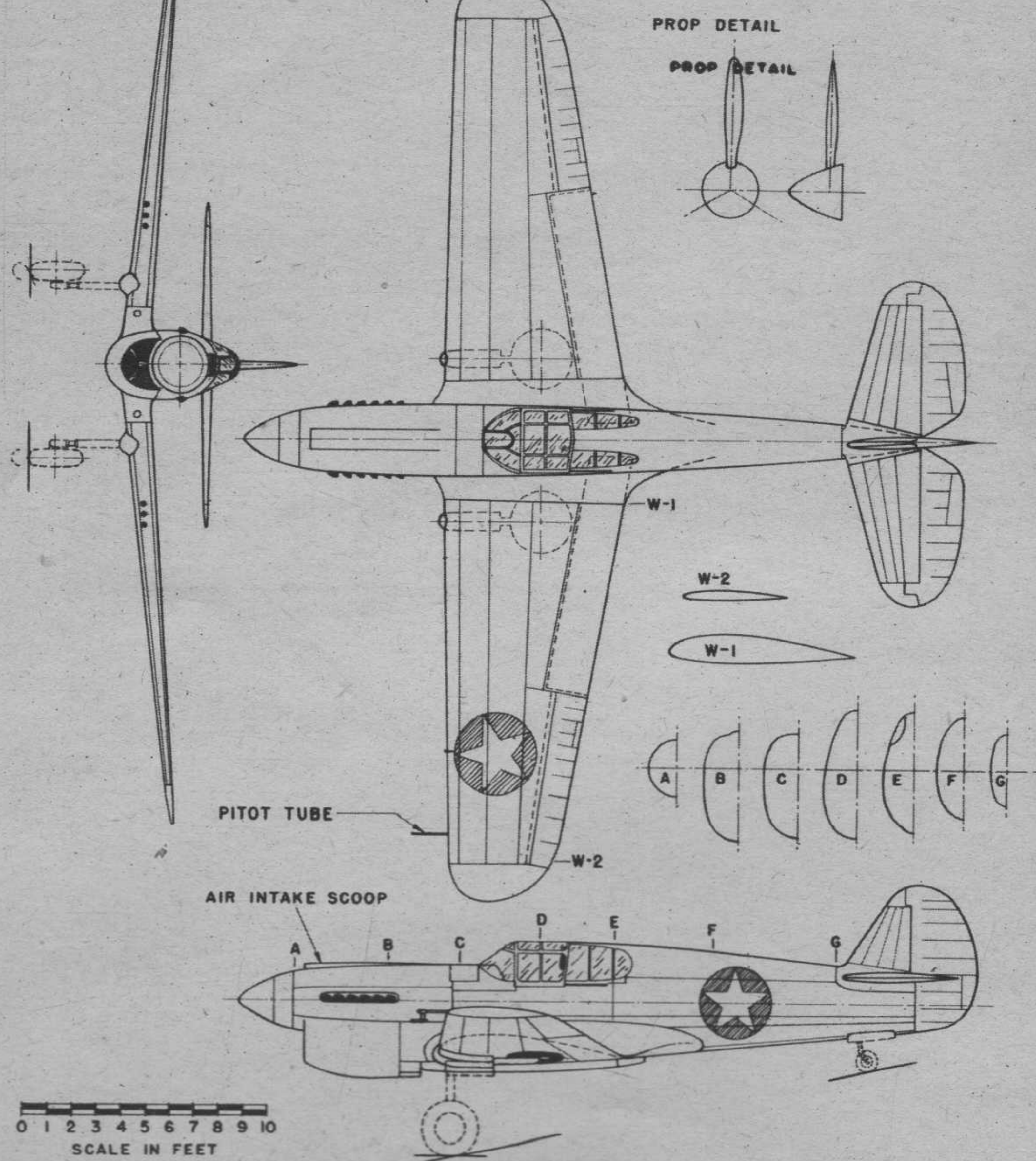


SPITFIRE



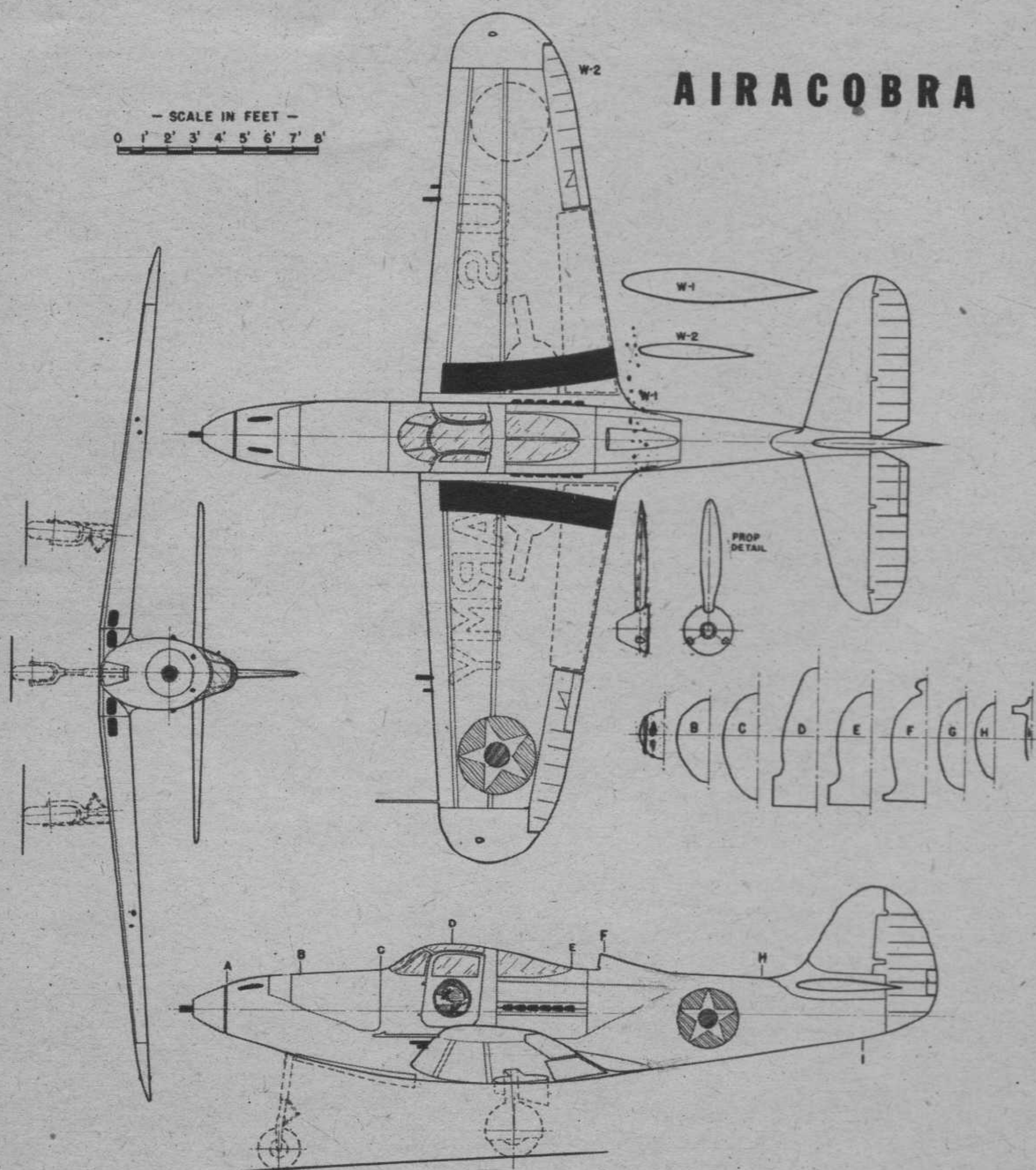
This famous fighter, defender of London, is now equipped with two 20-mm. cannon, four Browning machine guns, newest Merlin.

KITTYHAWK



This RAF version of the P-40D has done outstanding work in Africa against best planes Axis can send against them. Allison engine.

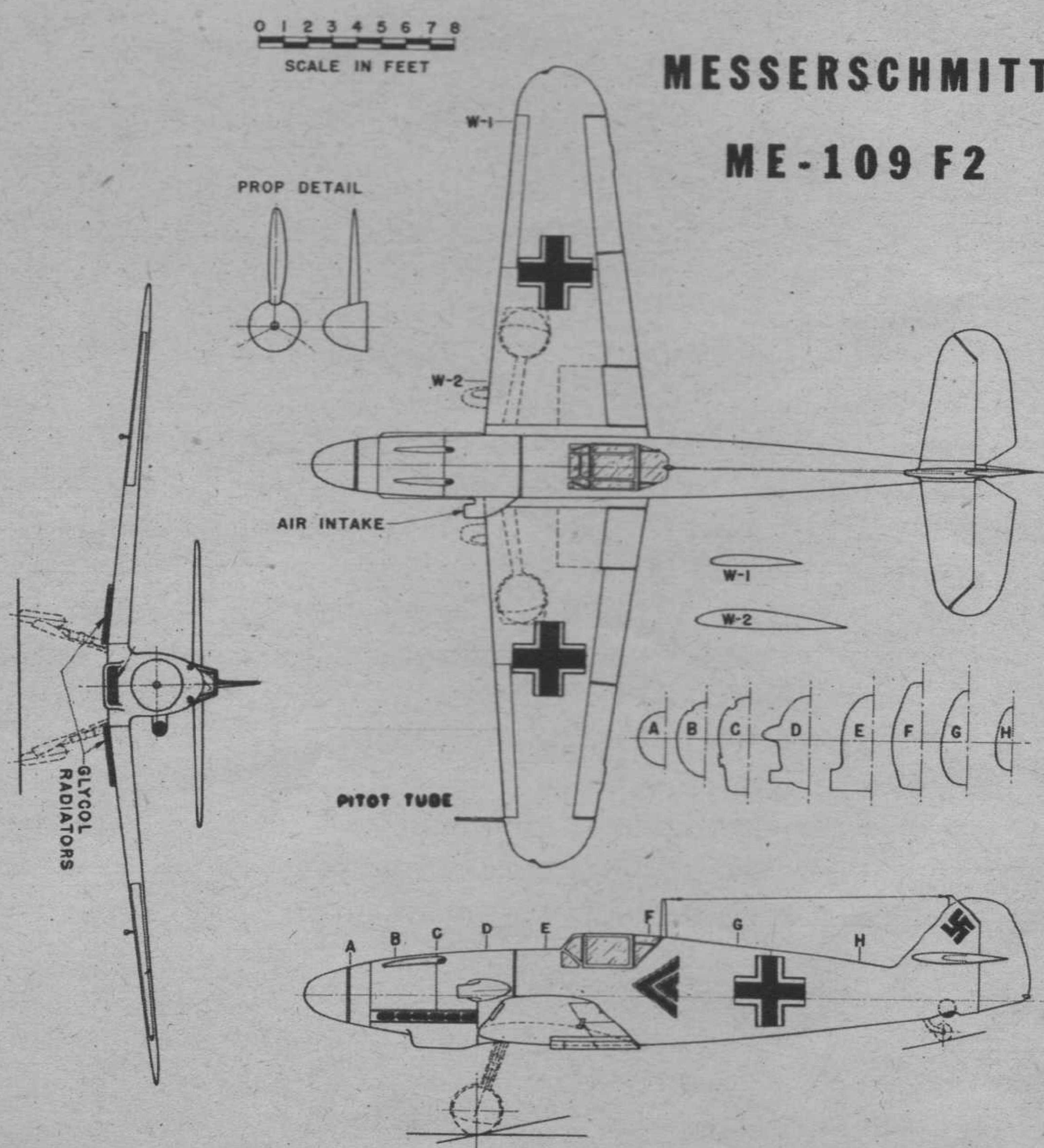
AIRACOBRA



This plane, designed around a 37-mm. cannon laid on the lofting floor, has proven effective against tanks, armored cars, bombers.

MESSERSCHMITT

ME-109 F2



Dressed up with new rounded wing tips, cantilever tail, huge nose spinner, this latest version of Me.109 is Hitler's standard fighter.

Grumman Wildcat

BY EARL STAHL

You'll enjoy building this F4F-3 used by marines at Wake Island. She's tops for performance.

STANDARD fighter of the U. S. navy and marines is the Grumman Wildcat F4F-3. A single-seat, pursuit of midwing design, it is sturdily built and possesses a high degree of maneuverability. It is primarily designed as a shipboard fighter.

Like most military planes, performance figures have been restricted. However, these details of the Grumman G-36, a similar ship used by the RAF fleet air arm, have been released: A twin Wasp engine of 1,200 h. p. affords a top speed of 330 m. p. h. Cruising speed is 300 m. p. h., and the landing speed is less than 70. Climb is more than 3,000 feet per minute, while the cruising range is 1,150 miles.

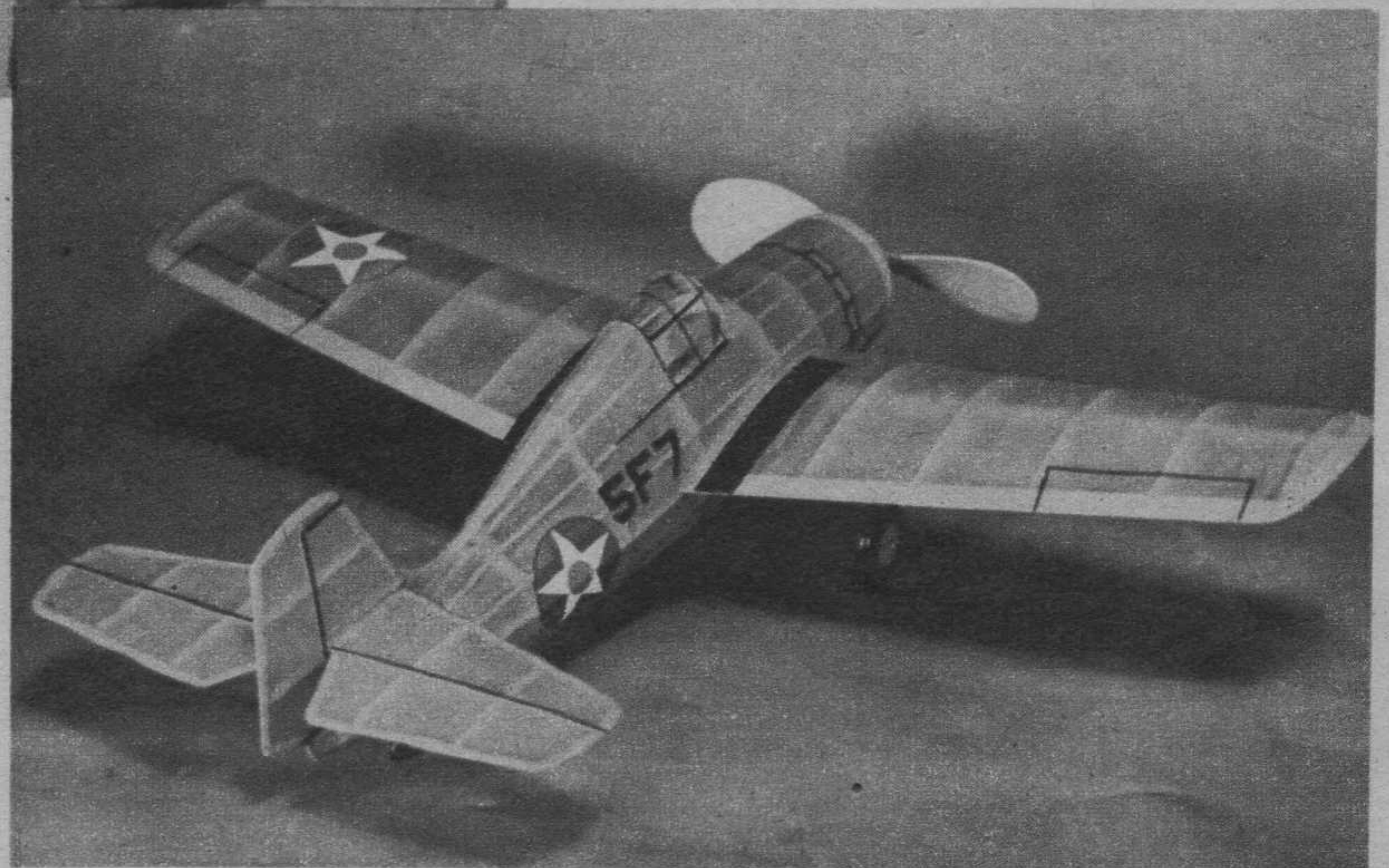
Every flying scale fan will want a model of this outstanding plane for his fleet. Simply built to conserve materials and attain lightness for best flying ability, the little ship has proved to be a stable, consistent performer. In spite of the bulky, heavy appearance of the real ship's design, the model has a snappy, tight-spiraling climb and easy glide. Needless to say, the model's ability to withstand abuse is inherent.

The pages of plans are drawn full size, and they are intended to be joined together. It is best to make tracings of the important parts and thus the magazine will be kept intact. All balsa wood should be selected carefully to assure a sturdy, light structure; make all frames accurately and, finally, cement each joint firmly.

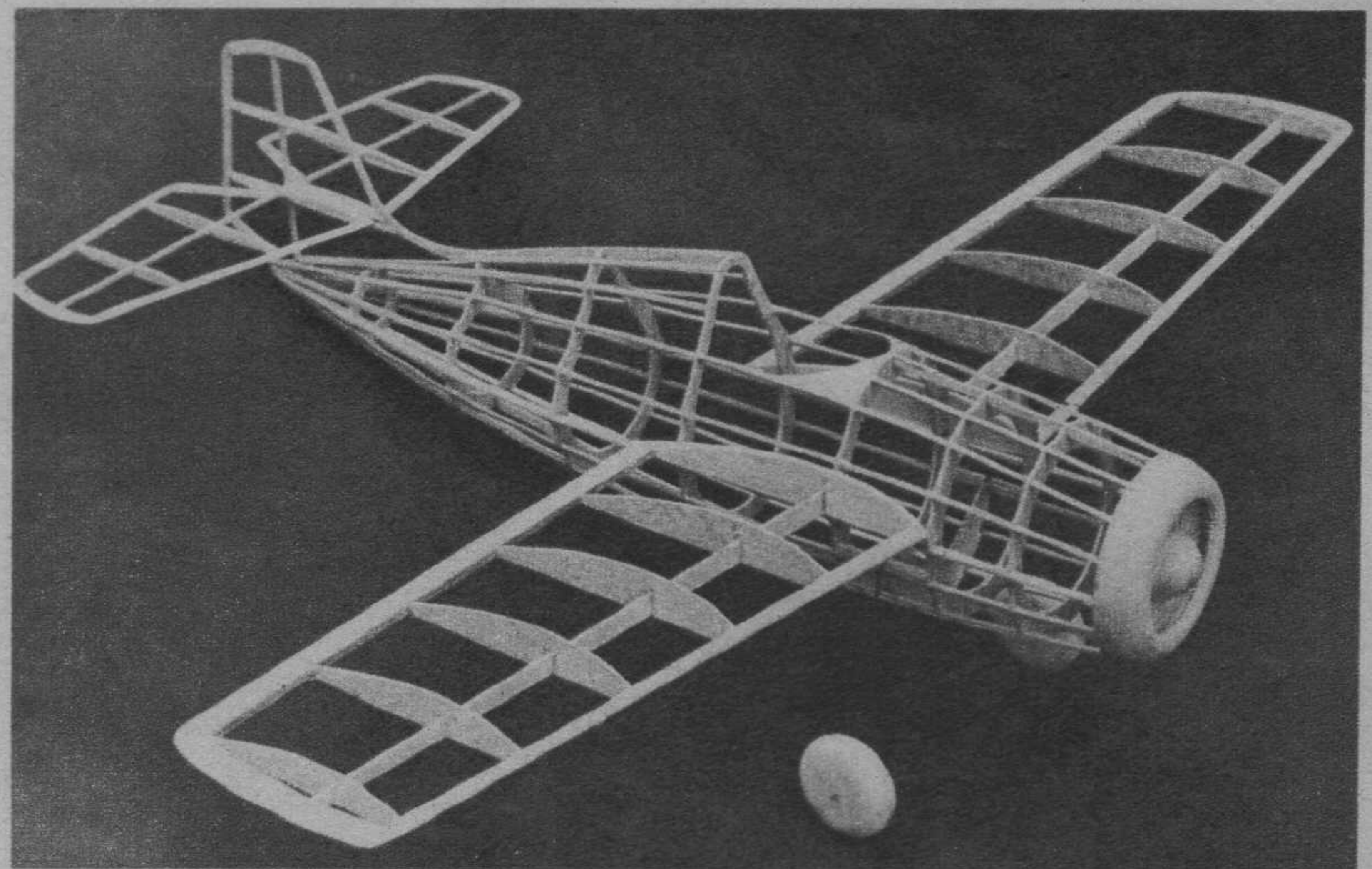
CONSTRUCTION

The keel and bulkhead method of construction is employed for the fuselage. Notice that the rudder is built right with the fuselage; it is in reality a part of the top keel. Cut the various parts of the four keels—top, bottom and two sides—from $\frac{1}{16}$ " sheet as shown. Bulkheads also are $\frac{1}{16}$ " sheet, and only the notches shown are cut out; others are marked to be cut later as needed. Assemble over the fuselage plans by pinning the top and bottom keels into place. Half of the bulkheads are cemented into position and a side keel attached. Now remove this structure from the plan and add the remaining bulkheads and side keel. Stringers are of firm $\frac{1}{16}$ " square stock. Attach those closest the side keel first and onto both sides at the same time to keep from distorting the frame. Cut notches as required for a neat, accurate job. Where the wing joins the fuselage, $\frac{1}{16}$ " thick riblike pieces are cemented to the bulkheads and side keel as shown on the side view.

The extreme front of the nose is made with laminated disks of $\frac{1}{8}$ " sheet cut to the shape of Bulkhead A. Remove the centers of the two front disks so that a dummy motor can be installed if desired. Trim to shape with a razor blade, then sand to complete the nose. Details of the nose plug are given and it likewise is made from laminated disks of hard $\frac{1}{8}$ " sheet. Cement the back portion within the cowl; the front section is removable to permit stretching of the rubber motor for winding. As shown, a hole is drilled for the prop shaft and washers are cemented to the front and back to fix the line of thrust. (Turn to page 63)

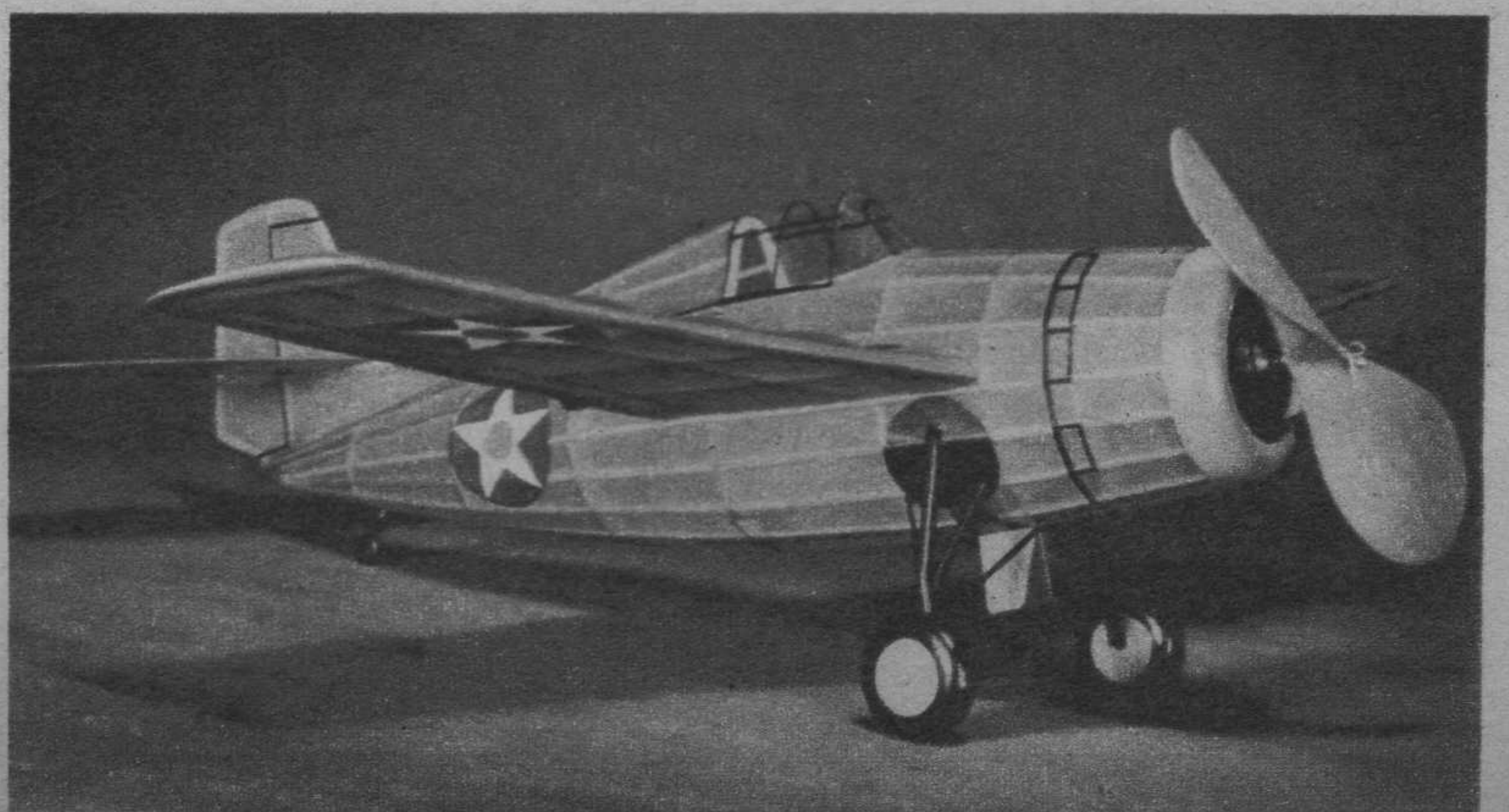


Can you tell it from the big brother? The Wildcat includes large tail area, ample dihedral, which are necessary for all successful flying scale models.



Designer Stahl stresses simple frame-work construction for good flying qualities. You'll find this job no harder to build than a square-sides boxcar.

Under view and tuck-up wheels for a Jap view of the Wildcat. Note the well-proportioned prop with free-wheeling, for astounding performance.



6" PROP.

A.

B.

C.

LG.

D.

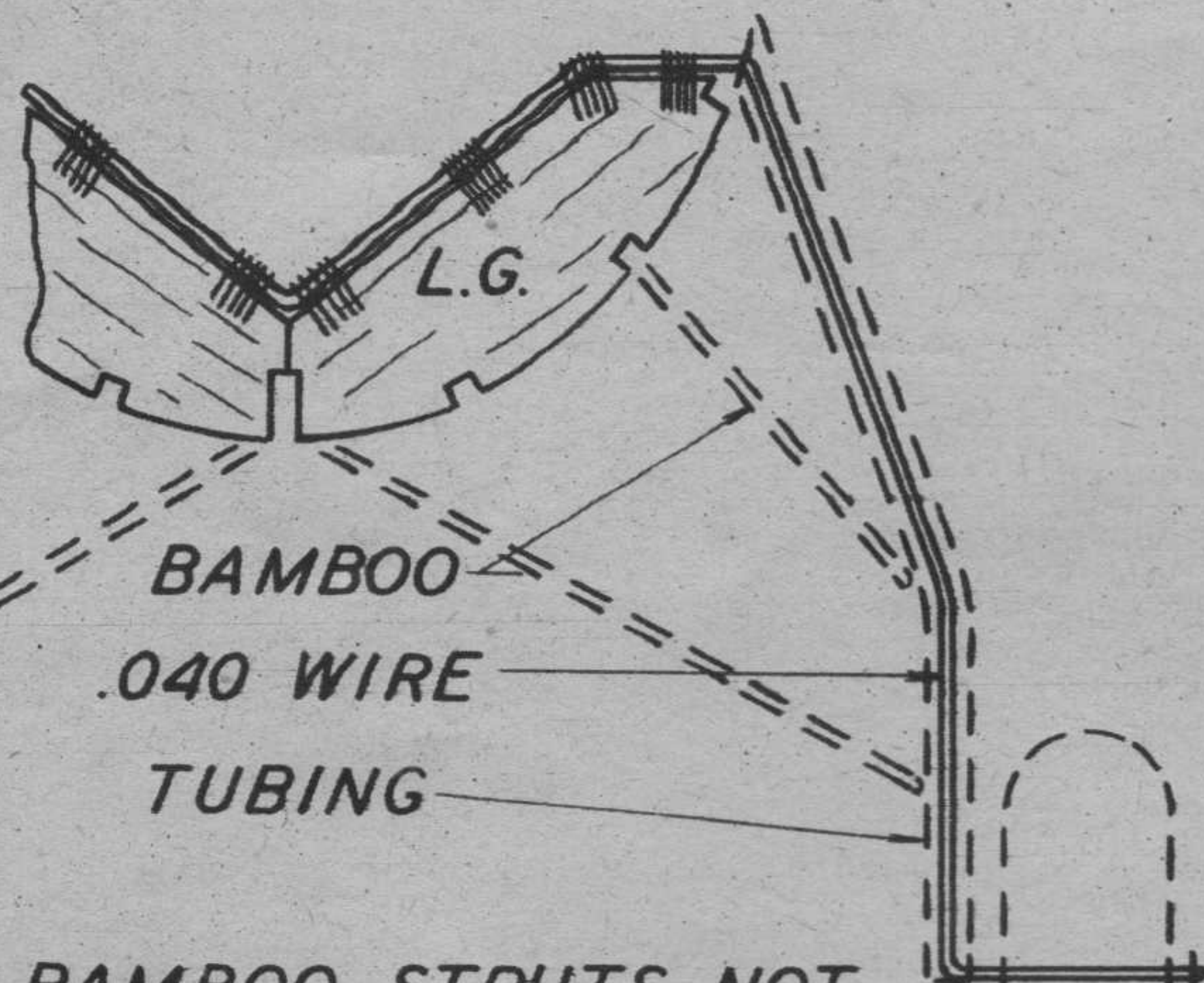
E.

1/32" SHEET

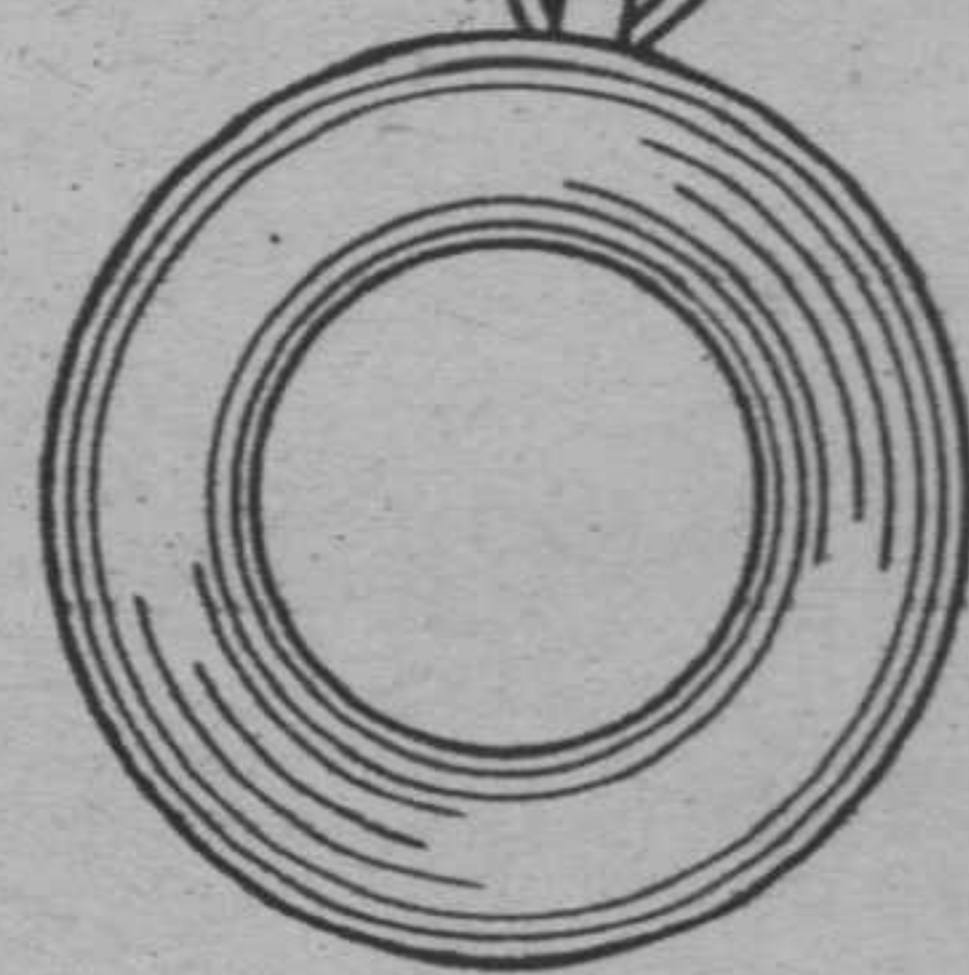
CELLULOID
WINDSHIELD

NOSE
PLUG

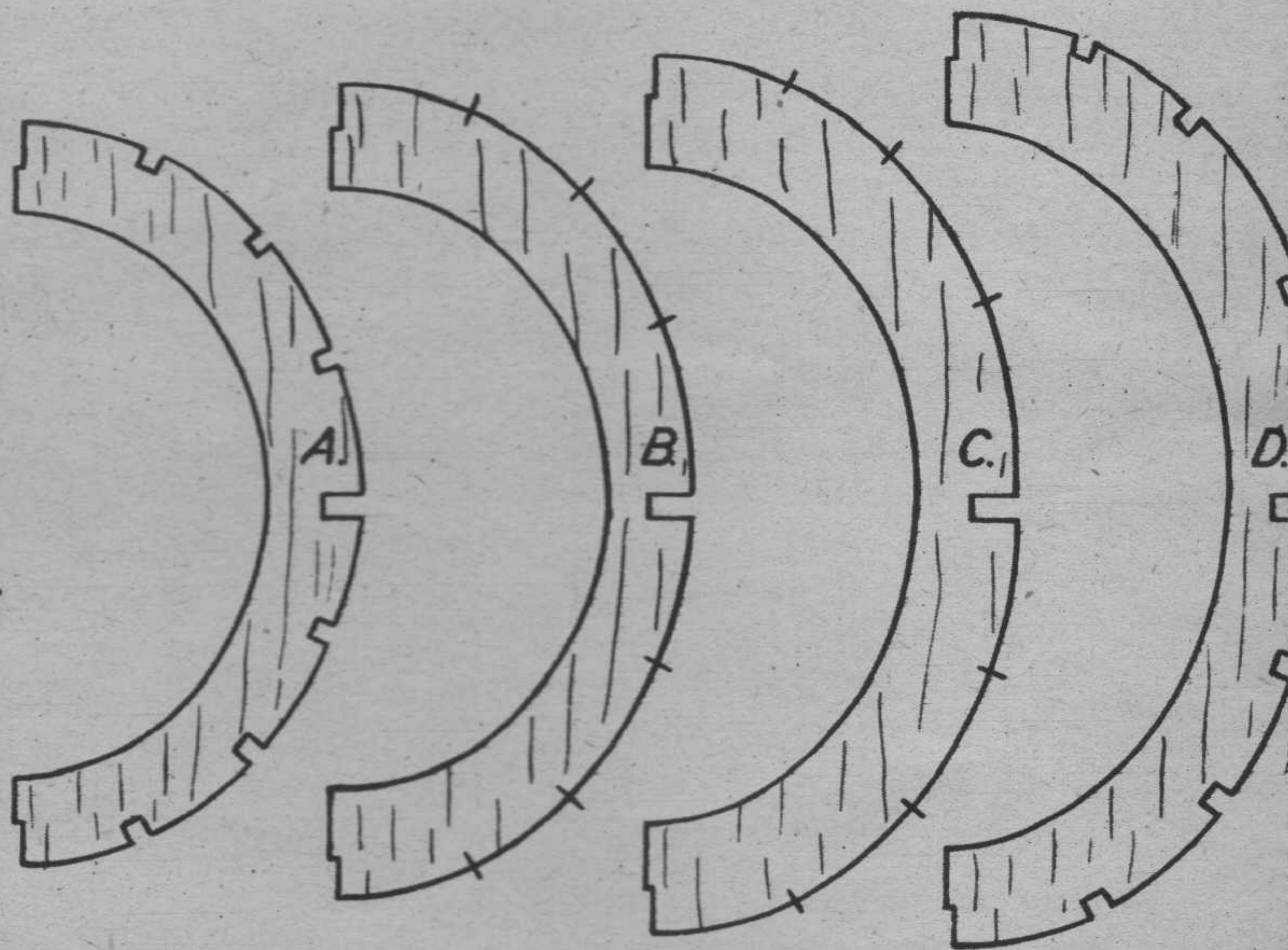
1/16" SHEET



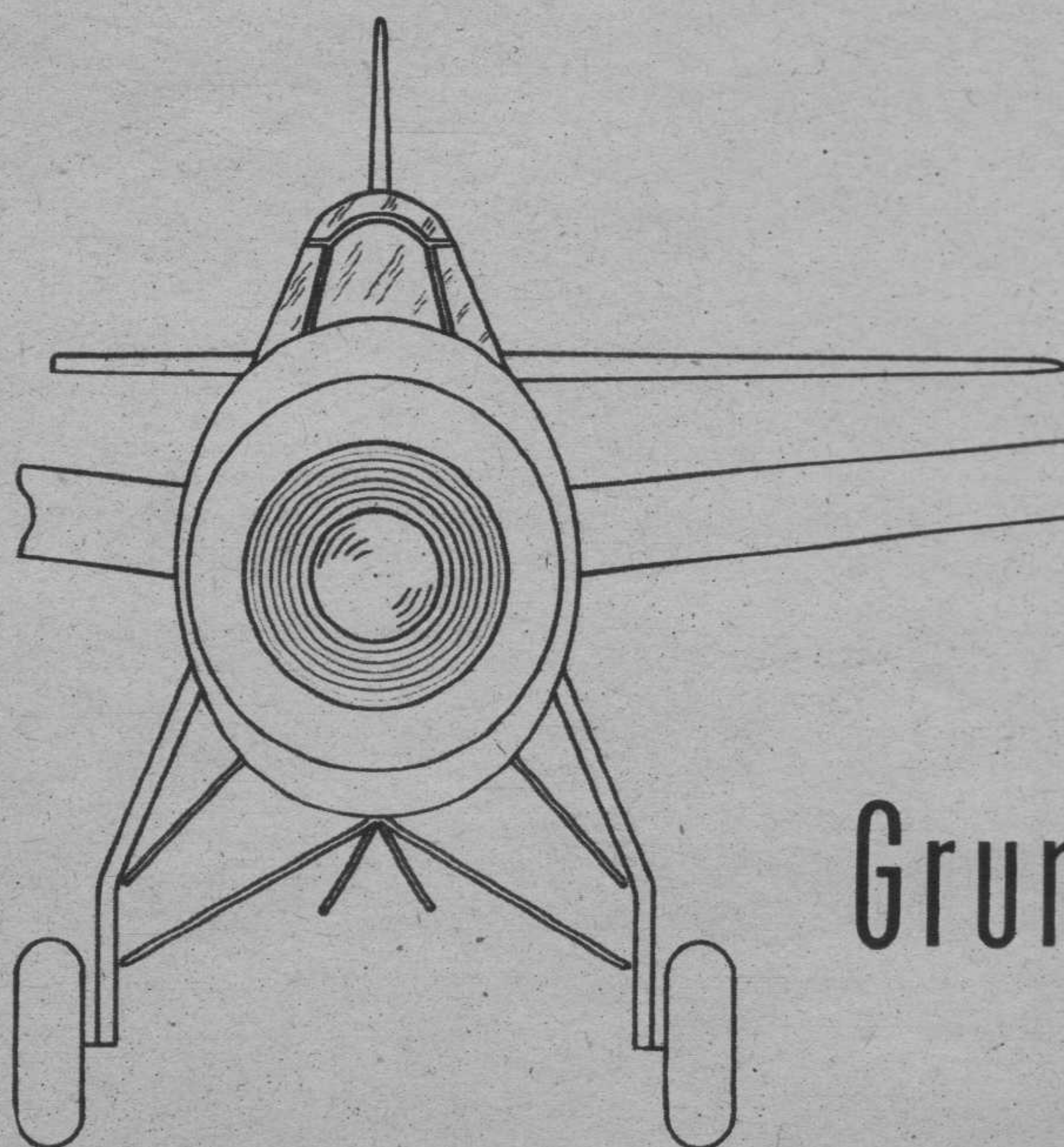
BAMBOO STRUTS NOT
ATTACHED TO MAIN
LEGS THUS PERMITTING
THEM TO SPRING FREELY



BALSA WHEELS



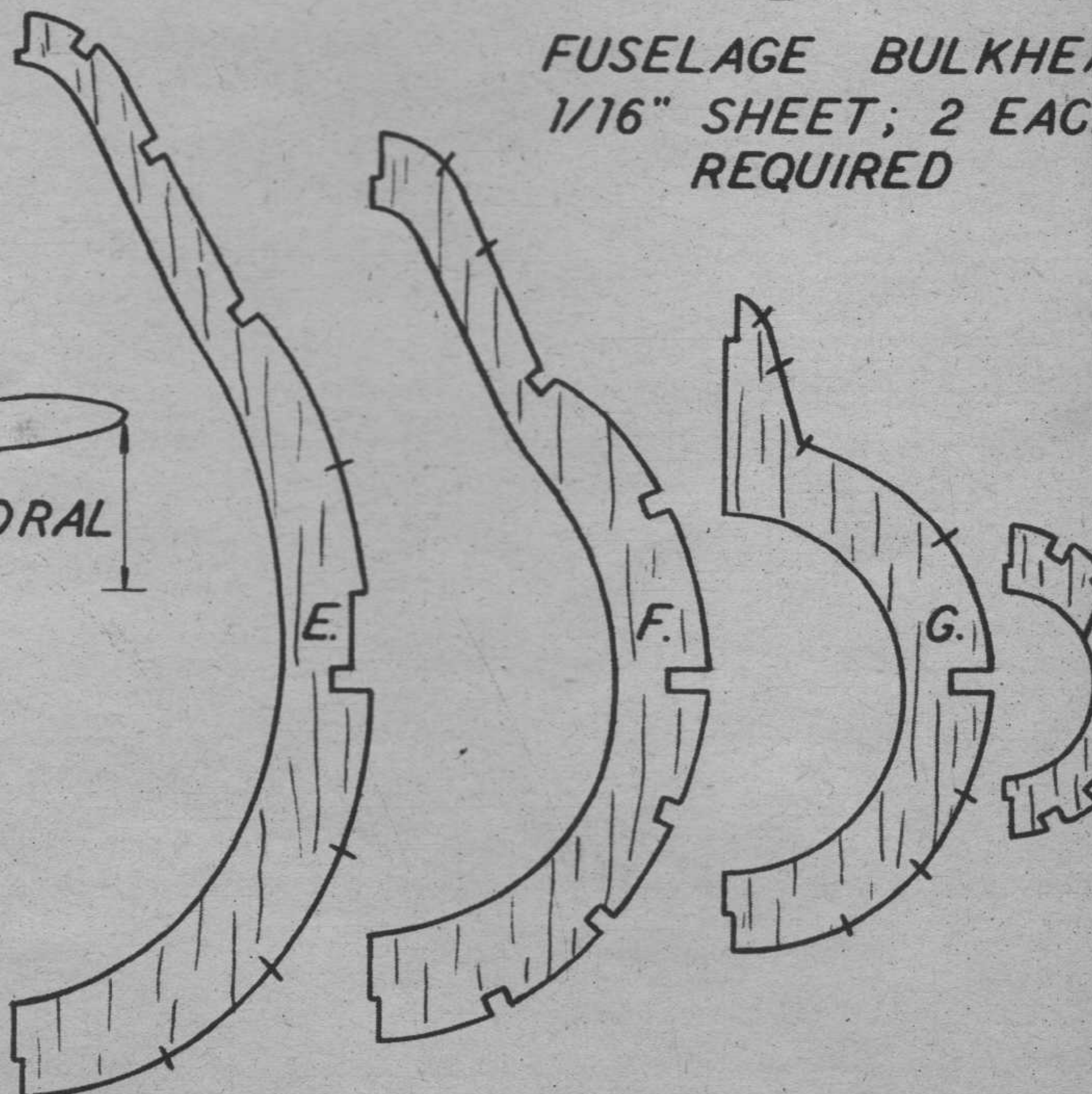
FUSELAGE BULKHEADS
1/16" SHEET; 2 EACH
REQUIRED

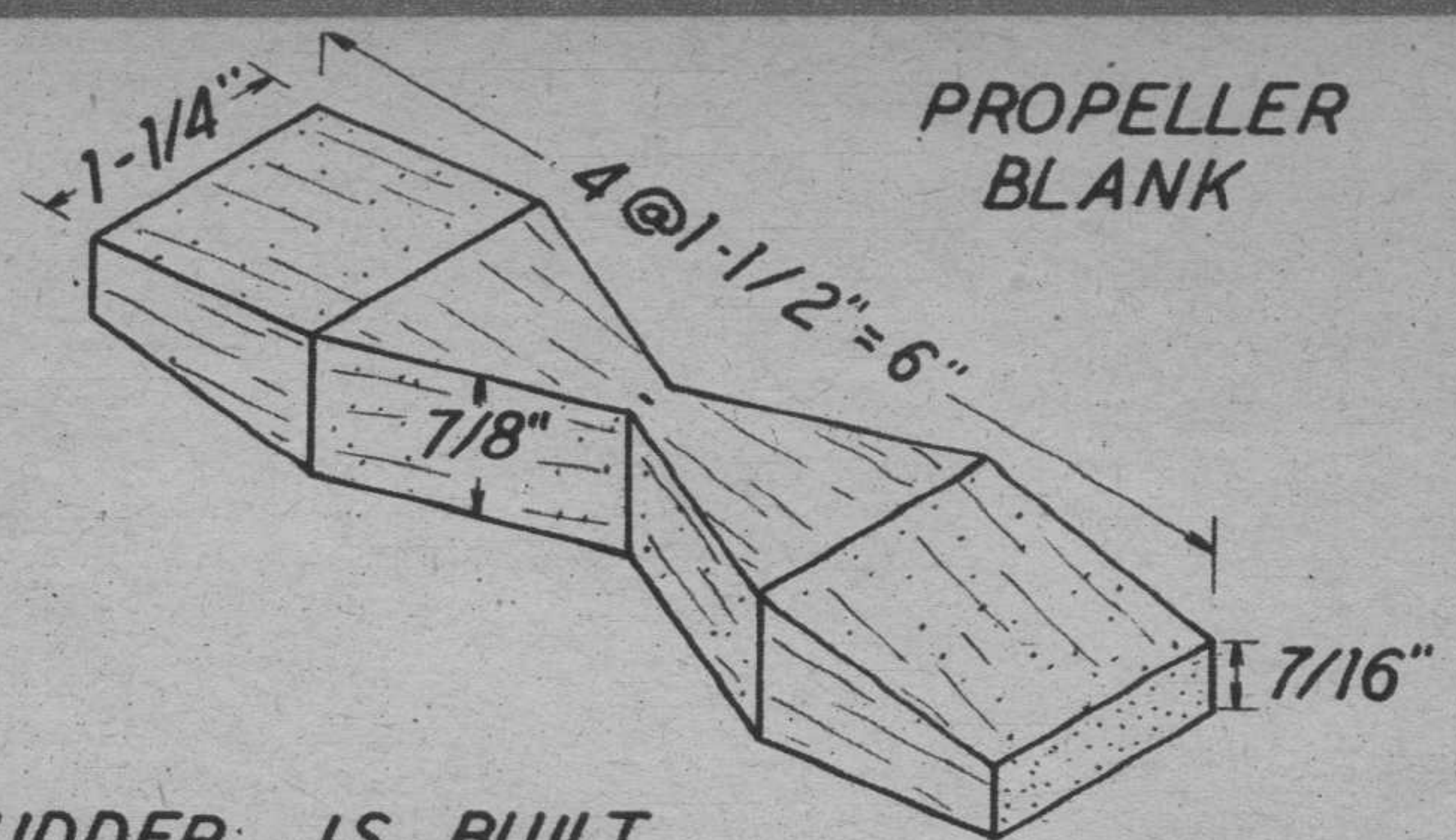
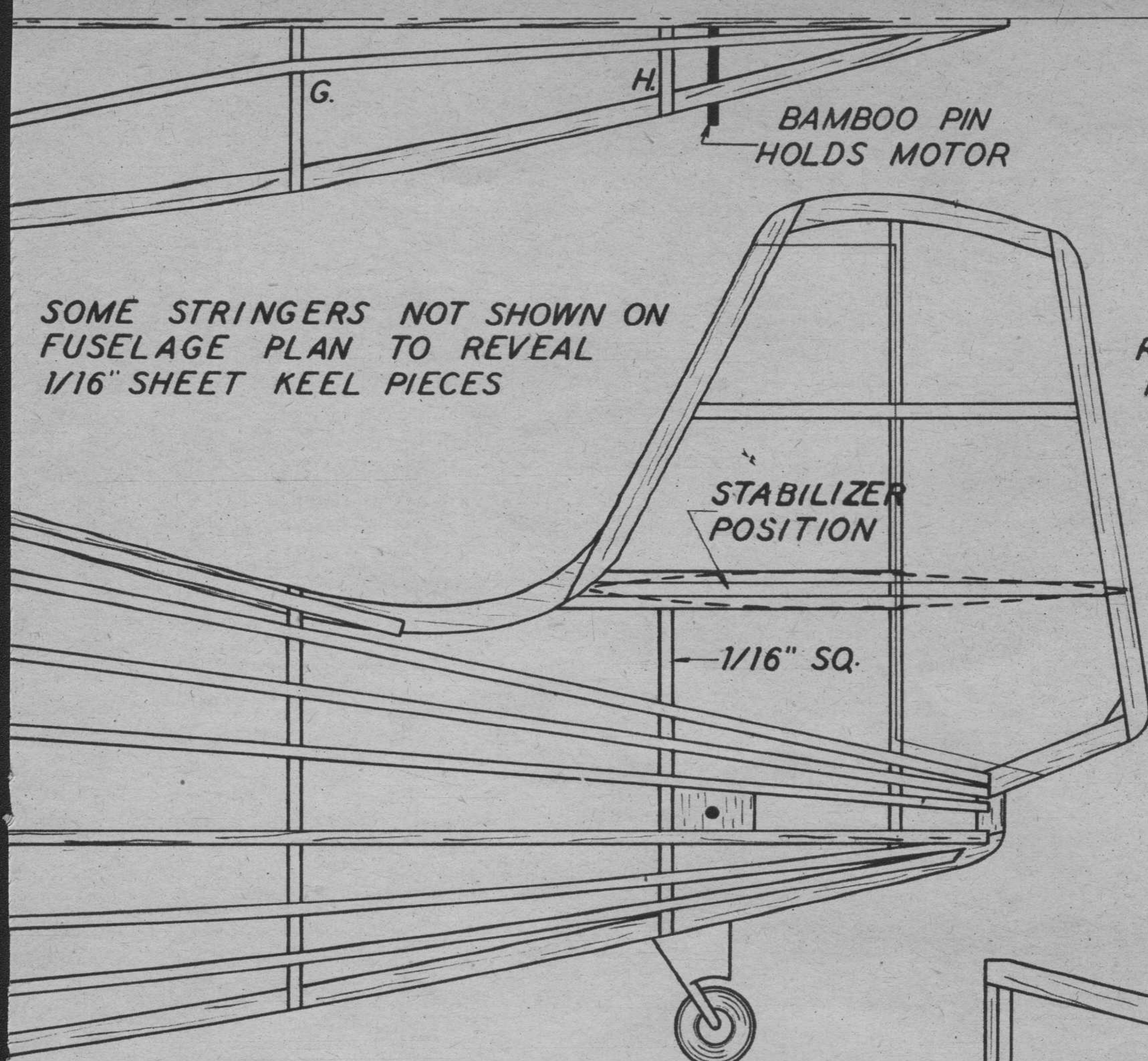


FRONT VIEW
1/2 SCALE

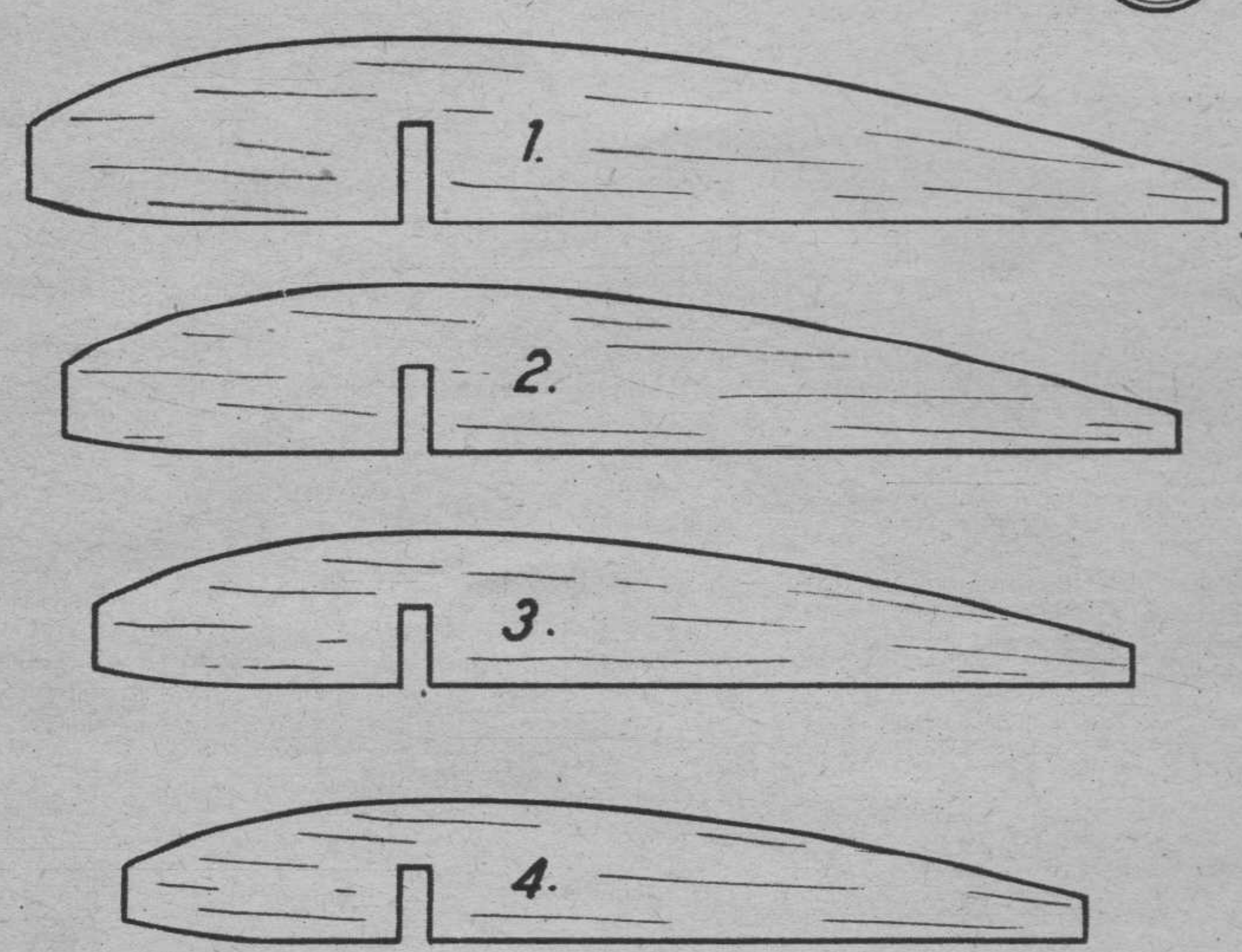
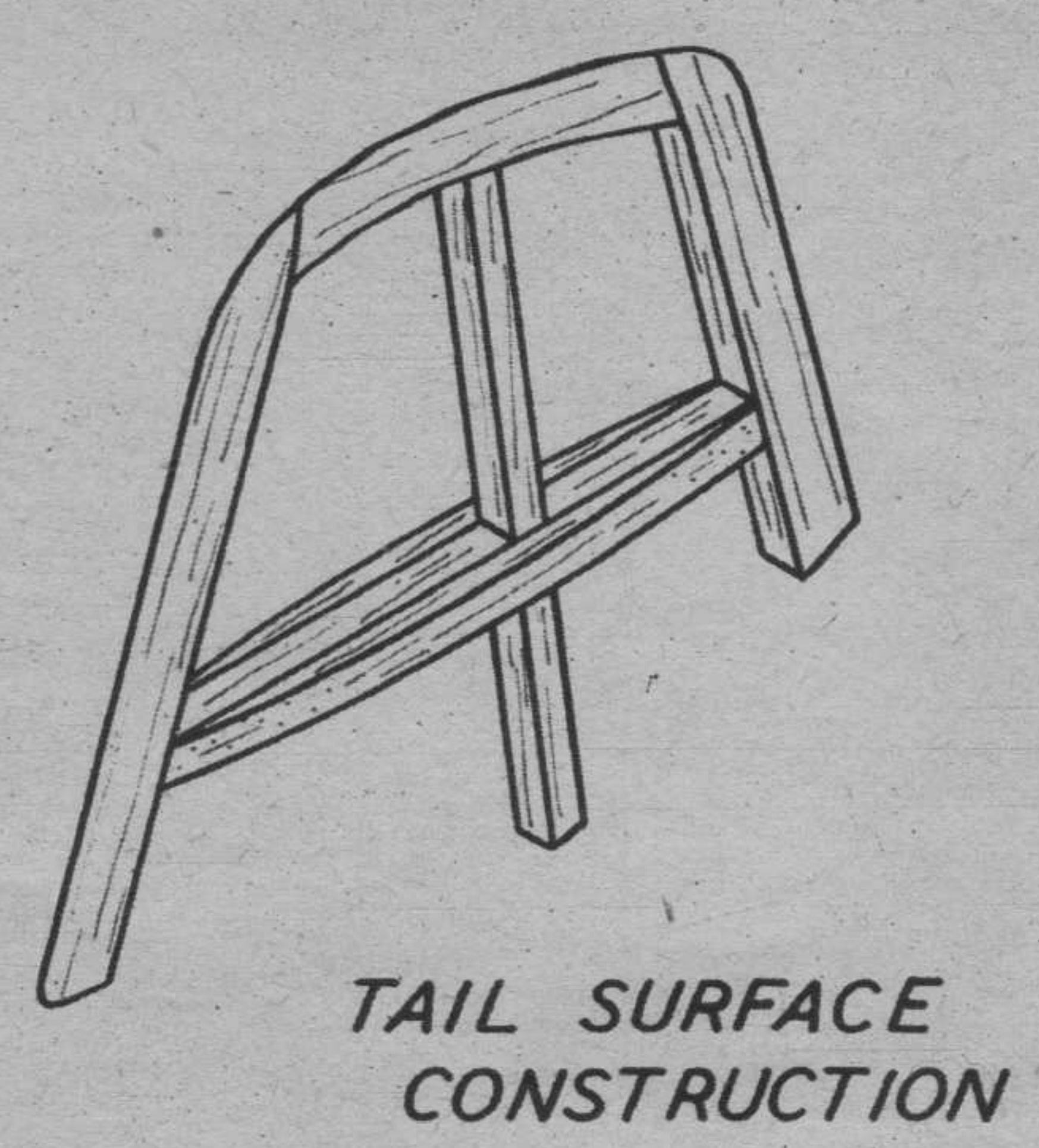
1" DIHEDRAL

Grumman Wildcat

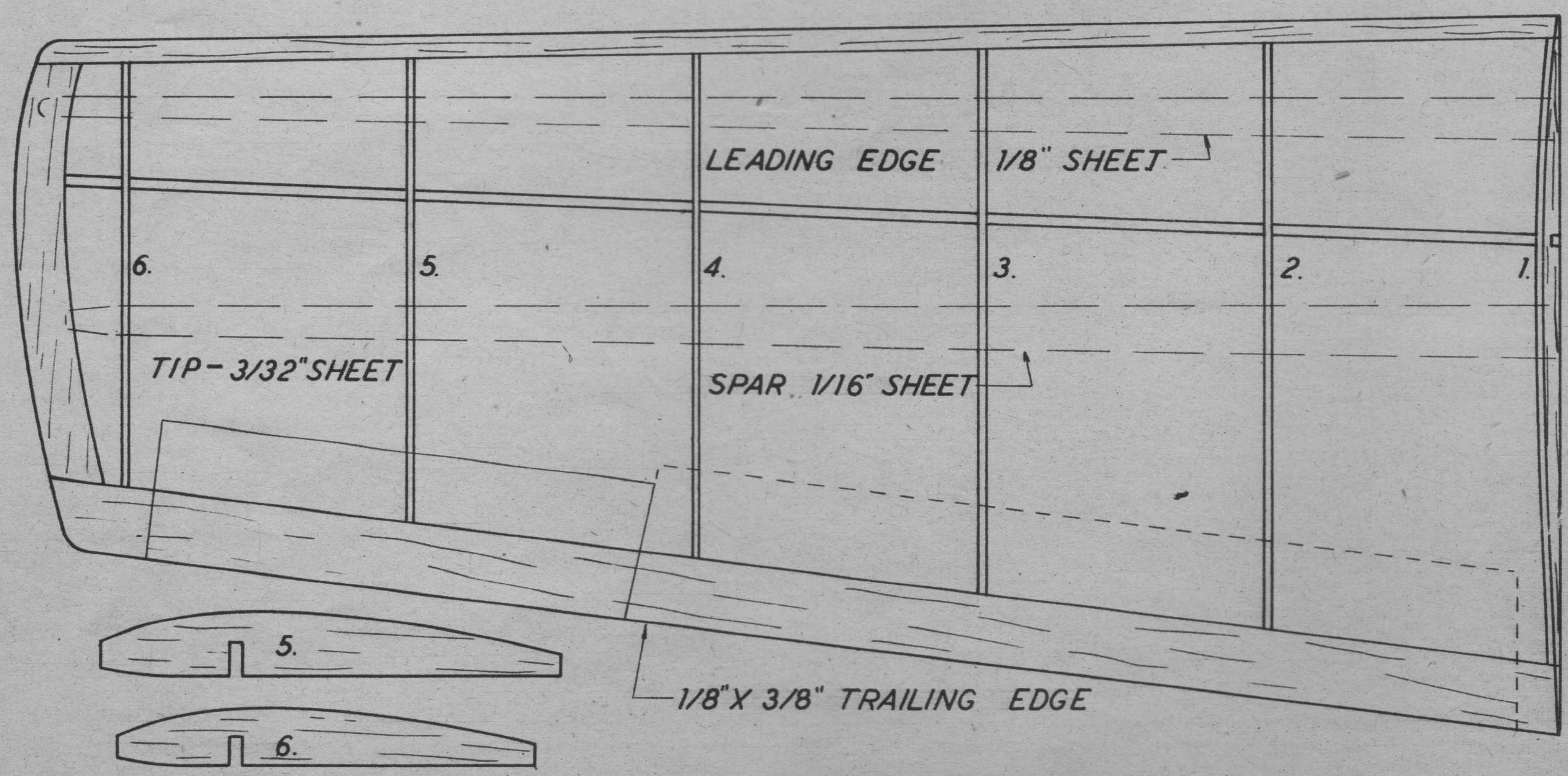
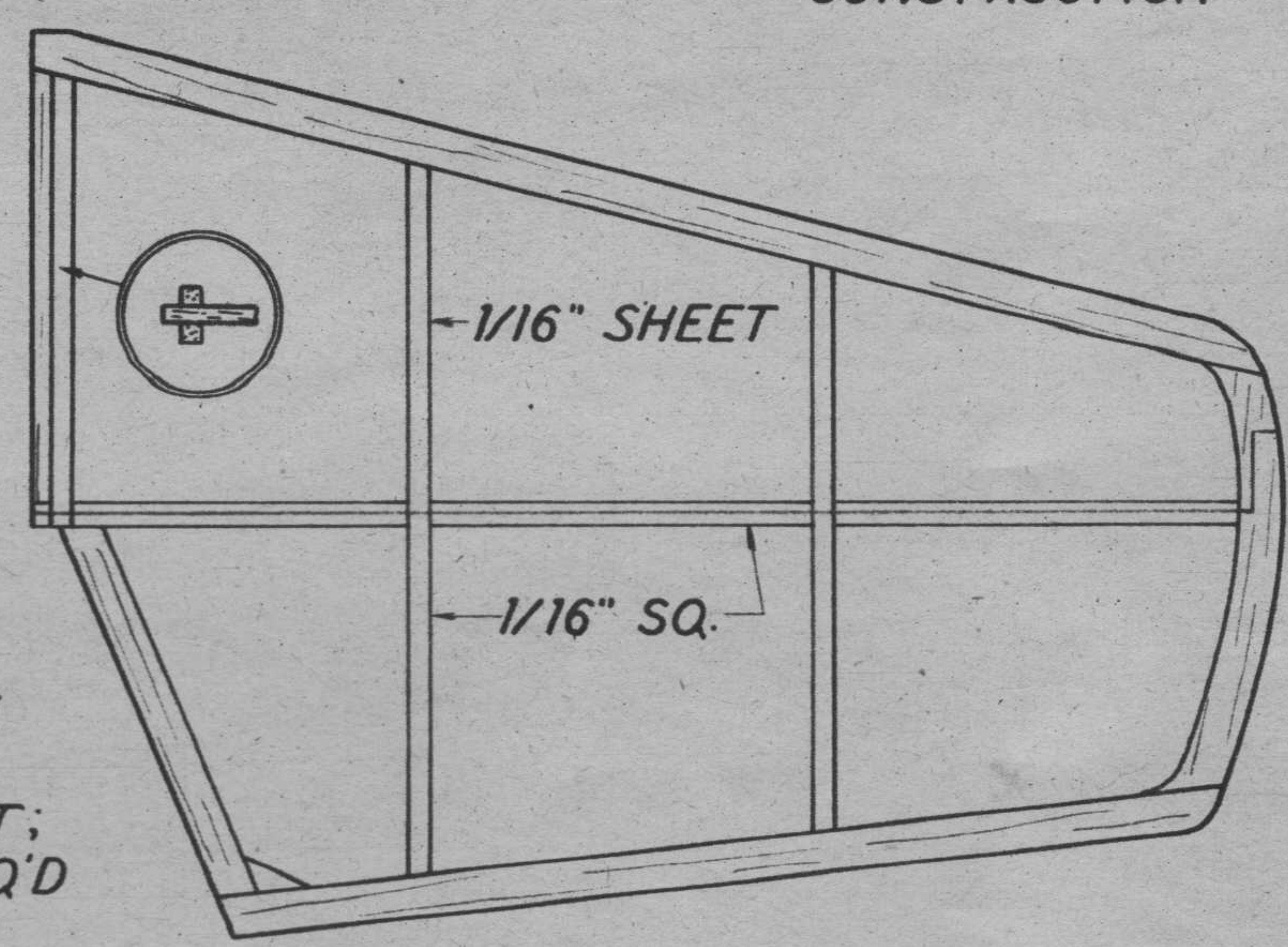




RUDDER IS BUILT
INTEGRAL WITH
FUSELAGE



WING RIBS
CUT FROM
1/32" SHEET;
2 EACH REQ'D



The Fighting French Air Force

(Continued from page 13)

combat planes, the Morane 405 and the Potez 63. During the winter those were somewhat outclassed by the newer German types. However, in the spring, the French air force began to receive the Dewoitine 520, Bloch 17, V. G. 33, which, in turn, were somewhat better than the Luftwaffe planes. American planes came and were much appreciated because their infinitely superior engines gave the French personnel an added sense of security. French armaments were of higher quality than those mounted on the German aircraft.

With France out of the war, the disbanded airmen showed that their one overwhelming desire was to resume fighting on the side of the Allies. The Vichy government did all it could to prevent the realization of that patriotic aspiration. A large number of demobilized fliers escaped to North Africa. There they were still treated like criminals. Guards stood over them constantly. Then began that laborious series of escapes to the British and other bases where the Fighting French air force finally took shape.

One fine morning a Frenchman flew away from Oran in the plane of the Italian Armistice Commission. It would have been remarkable even as an isolated phenomenon. But such methods were applied by countless loyal Frenchmen. A certain well-known pilot was being decorated for heroism. High functionaries from Vichy assembled at Casablanca in his honor. He offered to entertain them by an exhibition of aerobatics. His most thrilling stunt was to disappear in the clouds and land at Gibraltar. Disregarding Vichy orders, other French pilots took up their planes, heading for Gibraltar. Spanish machine guns at La Linea and antiaircraft artillery shot down a good many. Others fell into the sea when their fuel had been used up.

Other flying patriots engaged passage in small unseaworthy fishing boats which had no protection against submarines and were susceptible to sudden storms. Just the same, many supporters of General de Gaulle made their appearance in Tunis, Syria, Martinique, Indo-China. They have since distinguished themselves in air war over Africa and elsewhere. To mention the names of these intrepid men would bring disaster on their wives, children and parents in occupied and unoccupied France.

Later the escaped pilots, aerial gunners and bombardiers derived peculiar satisfaction from their contribution to the Allied drive which expelled the Vichy forces from Syria. Nazi transports were landing on Syrian airdromes. They were laden with German soldiers bound for Iraq. To the complaints of the Fighting French that Vichy was permitting the enemy to use that French colony against the United Nations, the traitors cynically replied that the Germans had only made forced landings and after a few hours' repairs de-

parted. Yes, indeed, retorted the patriots, the landings had been forced upon the Syrians.

French Air Commissioner Valin said over the radio in his appeal to the people of Syria:

"In particular you in Aleppo and Damascus, who envy our comrades and rage in your hearts to see German planes landing on your aërodromes on their way to Iraq, knowing full well that by receiving and refueling the planes full of troops you are committing a hostile act against those Fighting Frenchmen whose battles I have just related. In all conscience, you must not do it; you will not do it. You cannot go down in history under the weight of such an infamy."

General Valin's eloquence was not in vain. Of the Frenchmen in Syria who went over to de Gaulle, the largest proportion were members of the air force.

Loyal pilots and the equipment that they had brought after the various escapes from France and colonies could be formed at once into complete squadrons on British soil. There was an insufficiency of spare parts, not to mention the fact that of the enthusiastic volunteers who presented themselves, the experts in various aeronautical specialties were not available in the required ratios. Those who escaped before completing their aviation training in France were given an opportunity to resume their studies as observers, gunners, radio operators and ground crews in the RAF training centers. After undergoing the necessary instruction, the French form their own squadrons or are temporarily attached to the RAF units, or are sent to British schools for further specialization.

While Goebbels over the Berlin radio was saying that no more Frenchmen were escaping to England or her overseas outposts, General de Gaulle announced in Brazzaville, Africa, that more than 2,000 of such zealots had been enlisted in General Valin's command. In fact, this gratifying influx of aviation manpower made possible the creation of a civil air line in Fighting French Africa where enormous distances make such a liaison indispensable. General Valin tells us that: "With only five aircraft, two Dewoitine 338 twin-engined long-range transports from Air France, two Farman 228s intended for the South Atlantic service, and an Italian Cant found in Beirut, we have organized a regular air service between Damascus and Brazzaville, covering three times a month the 11,000 kilometers of the journey there and back."

Speaking of Brazzaville, it is interesting to note that in the heart of the Dark Continent the radical-design Flying Wing, a plane which originated in America, became the nucleus of the Fighting French air organization in those parts. Assembled at the Cunliffe-Owens' plant in Southampton, it was flown southward by Jim Mollison, the famed transatlantic pilot. Completely unarmed, it

traversed over 6,500 miles of the open sea and enemy-controlled territory before reaching Brazzaville. Powered by two 860 h. p. Bristol Pegasus engines, the machine does 225 m. p. h. and flies 1,250 miles nonstop with eleven passengers and a crew of four.

Packing the crew, passengers and freight in the central portion of the wing, this craft became a familiar sight in the air above Brazzaville. Taking off from the modern airport, it heads down the Congo, banking over the raging rapids that make the river one of the world's most perilous. It turns, gathers altitude over the spot where Explorer Stanley camped more than fifty years ago, flashes over Leopoldville and the Belgian Congo, over the island of M'Bamou crisscrossed by countless estuaries on the left and heavily wooded on the right. The natives below point skyward and say "M'opepe," their word for airplane.

But to return north, where the Fighting French have more aircraft. There a few active and loyal reserve officers worked feverishly after the collapse of France to make use of the many flying volunteers who clamored for continued service. Rather quickly two units, bombardment and observation, had been set up and dispatched to Africa. The airmen as well as sailors were put in command of Admiral Muselier, de Gaulle's trusted colleague.

Two months later a squadron of Blenheim bombers, another of reconnaissance planes and a third one of Dewoitine fighters, all manned by Frenchmen set out for Africa. In six weeks they were followed by a second squadron of Benheims. A number of French fighter pilots remained in Britain at the disposal of the Fighter Command.

In August, de Gaulle and the British government reached an understanding whereby the Fighting French air force was recognized as an entity, with its own uniforms and discipline. The sole Allied force in exile to enjoy such privileges, it has proven itself worthy of them. England, Africa, the Levant States have seen repeated exploits of de Gaulle's airmen. Emerging from the hard school of English military aviation, the French have shown their mettle in knocking down Messerschmitts, Focke-Wulfs, Junkers. They have flown Martin bombers over Somaliland, shooting down Mussolini's Savoia 79s.

They maintain a pursuit group in England and three in Syria: bombardment, pursuit, reconnaissance. In equatorial Africa the aviation units are commanded by Lt. Col. Carretier, former companion of Mermoz. An air service is maintained between the Atlantic and Mediterranean bases. In England the Ile de France pursuit group includes army and navy fliers. For reasons of easy recognition, their planes display British colors, but are also marked with the Croix de Lorraine, yellow on a blue background, on each side of the cockpit. Previously operating in British pursuit units, the Fighting

French have all taken part in the sweeps on France, the Netherlands, the Channel and the North Sea.

The Lorraine bombardment group in Syria includes the elements of the earliest bombardment group which had been functioning in Africa for a year, carrying out more than eighty combat missions during the Koufra and Abyssinia campaigns. Another group, formed in Egypt and also specializing in bombardment and ground attack, entered action in the first Libyan campaign and on Crete. The Lorraine group is composed of the Metz and Nancy squadrons.

The Alsace group incorporates the Strasbourg and Mulhouse squadrons. The former, under the name of French Fight Flight No. 1, operated from July, 1941, as part of a British squadron based in the Middle East, carrying out numerous protective missions there, and also in Crete and the first attack on Libya. When the Mulhouse squadron came from England at the beginning of 1941, it won special distinction in the defense of Tobruk. Each of its pilots made from six to eight flights daily against the enemy, who always held numerical superiority. At the same time as their British comrades, these Frenchmen received the personal congratulations of Prime Minister Churchill.

Fighting French aviation was growing increasingly important and the complexities of its manifold operations demanded an experienced head. General de Gaulle decided that youthful Colonel Valin was an ideal chief. So, Valin was made brigadier general and commander of the air force as of July 10, 1941. No better appointment could have been made. Aside from Valin's demonstrated loyalty to the cause of the United Nations, he was among the first in France to grasp the significant future of air power. Early he became a noted specialist in night flying. Long before the war he studied and perfected night bombing techniques. General Valin is forty-four years old.

Almost twelve years ago Valin became concerned with the question of groups of planes operating at night without headlights and landing in darkness. Nevertheless, his service career began in the cavalry. He distinguished himself on a number of occasions in World War I. After the war he visited the Levant and Morocco, remained for a while in the far south, took part in the Riff Campaign of 1925. Returning to France in 1926, to a cavalry regiment not yet motorized, Valin decided that there was no substantial future for the cavalry. He transferred to the air force. After serving as an observer on a plane in 1927, and balloon pilot and observer in 1928, he began specialization in nocturnal flight and bombardment. In 1930 he was squadron leader, then staff officer of the Twelfth Air Brigade. Along with night work, he completed extensive studies in air-war tactics.

In March, 1940, Wing Commander

(Turn to page 46)



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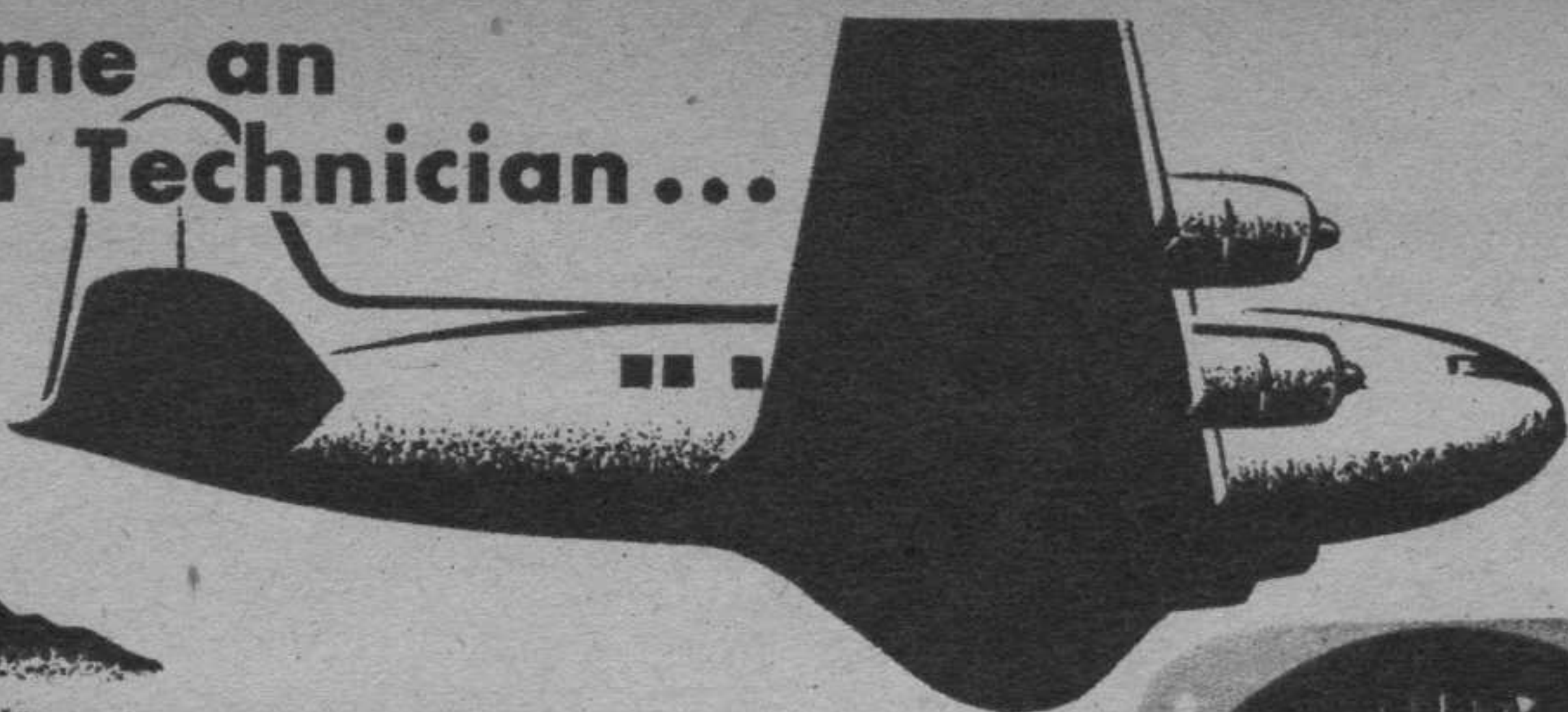
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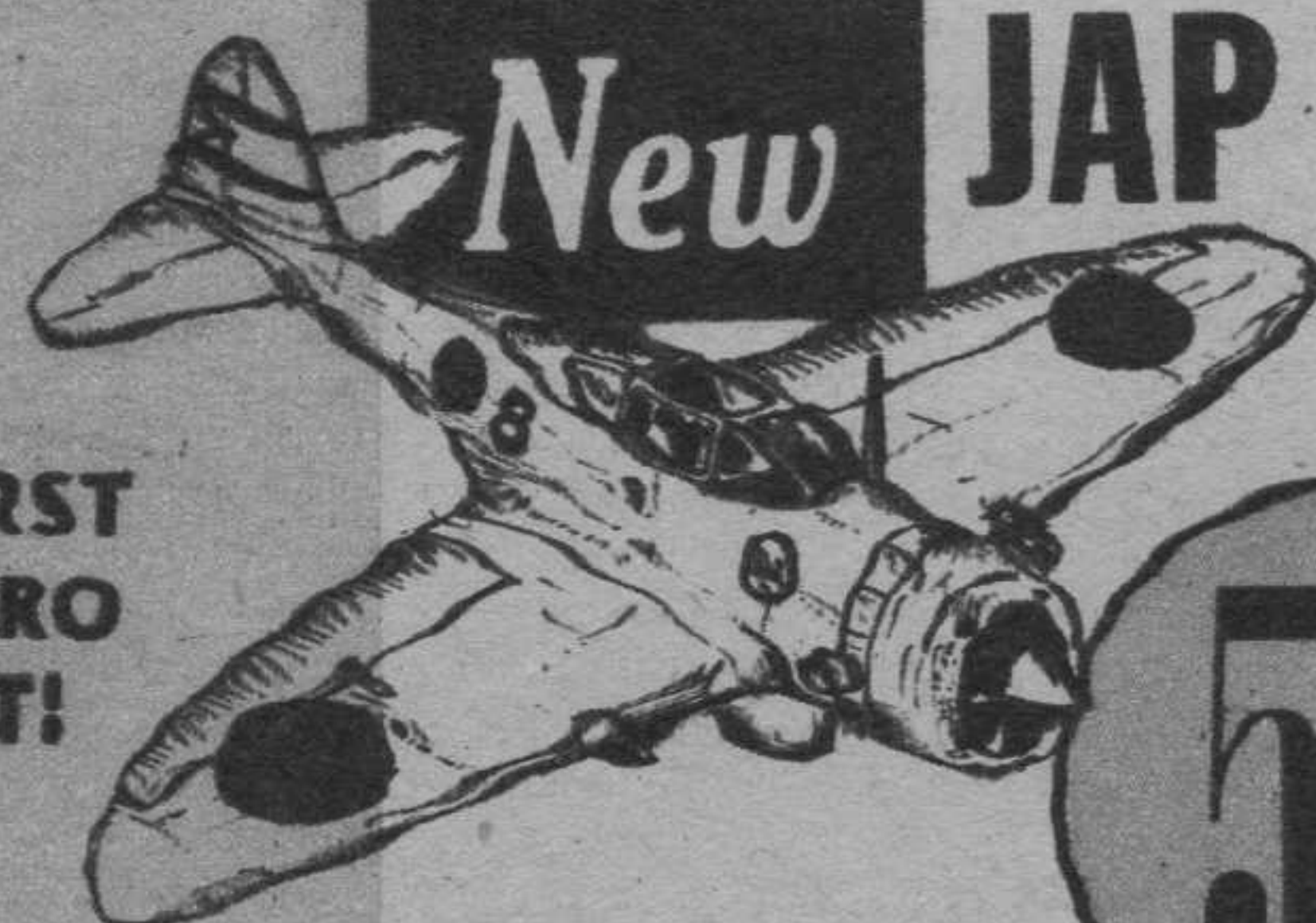
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The Fighting French Air Force

(Continued from page 44)

Valin was lent to the Brazilian government for the organization of their air force. At the same time he was offered a post in General Gamelin's cabinet. He declined in the hope that he would soon be able to return to combat duty. Unfortunately, the armistice found him still in Brazil. Living up to his South American contract, he was determined to join General de Gaulle as soon as he discharged his obligation.

After the armistice, most of the officers in service were pensioned off, but Wing Commander Valin was promoted. Vichy was repeatedly approached by the Brazilian government with a view to keeping Valin as personal adviser to the air minister in Rio. It was even suggested that he should draw up his own contract. Group Captain Valin shook his head negatively as he patiently waited for a chance to sail for England. He took the first boat from Brazil after the expiration of his contract. On the eve of his departure a cablegram from Vichy begged him to accept the post and offered promotion and unprecedented privileges.

To this message—the third on the subject—Valin replied that he was going to serve France where his conscience told him he must best serve her. His devotion to France shines in his attitude toward the young airmen in his charge—those in the RAF schools, in the Fighting French avia-

tion school in Africa, and above all, those engaged at the various fronts. Of his air force, Valin says that they "—did not come to fight under the emblem of the Croix de Lorraine to flee from persecution or to be paid wages (which are lower than those they would receive in the Vichy air force) or for political reasons. The proof of this lies in the fact that almost all the Fighting French airmen are actually engaged in combat. They came only to fight against the Germans who occupy France, their country, who occupy Europe and who still hope to occupy England and then, one day, the whole world. They came only to fight the common enemy, and in doing this, I assure you, they represent the true feelings of all French people."

This combination of great patriot and airman and an inspiring leader of men has a simple philosophy for the hundreds of hours he is spending in air combat:

"In the unhappy but glorious days through which we are passing, one great idea must emerge to guide us: We now know our enemy, we know of its barbarism, its brutality, and also its weakness. For us there is no other solution but to vanquish, completely, totally, without compromise. Along this path, the only one which is open, all free men may be sure to find us always at their side, resolved to follow it to the end."

Exit Balsa—Enter Basswood

(Continued from page 28)

the same size. Some manufacturers have already made plans to replace balsa stocks entirely with basswood.

One result of the change-over will certainly be the development of better craftsmanship, for no longer will Benny Bumblefingers be able to hack out a ship with a nicked-up razor and ma's second-best paring knife. Sharp knives and tools will be required for working basswood, and a small jig saw will be invaluable.

With basswood, solid models will be more durable and more able to withstand the perils of mantelpiece display. Because it is less porous it takes a finish much better than balsa, a definite advantage for display models.

In flying models and tow-line gliders, basswood should be combined with lighter balsa substitutes, such as bond or drawing paper, cardboard and fiber. (See Ersatz Model—June, 1942, Air Trails.) One thing is certain—there will be fewer cases of "accordioning" fuselages when basswood is used; that is, if there is any rubber to accordionate them. Cementing must be done very carefully and strips should be soaked in boiling water before attempting acute curves.

I see no reason why a complete gas model cannot be built from basswood strips and sheets. Admittedly it will be heavier, but it will also be more durable. The ease with which balsa

works, and its lightness, all too often has permitted a completely unaerodynamic and slipshod model to be helicoptered to great height by the motor and wafted by a strong thermal to first place in a contest. Not so with basswood. Anyone getting a four-minute limit with a basswood plane will have done so through dint of superior designing and building skill, which is, after all, what a contest should be for.

But where basswood really comes into its own is in U-control. Here weight is of comparatively little consequence and strength and durability are of supreme importance. (Witness the 4 1/4 lb. 24" ships by Dick Korda in the September, 1942, Air Trails.) Round, streamlined fuselages may be turned from solid basswood blocks on a lathe, and oval cross-sectioned fuselages cut to outline on a jig saw and shaped with a draw knife. Hollowed out with a woodcarver's gouge, they will take ear-bending crashes that would register on a seismograph. Built-up wings and tails of basswood will take plenty of punishment.

You may not like to work with this new wood at first; you may like it less when you put your ship on the scales, but you can't fail to appreciate its qualities when your pride and joy tries to emulate a prairie dog diving into its hole.

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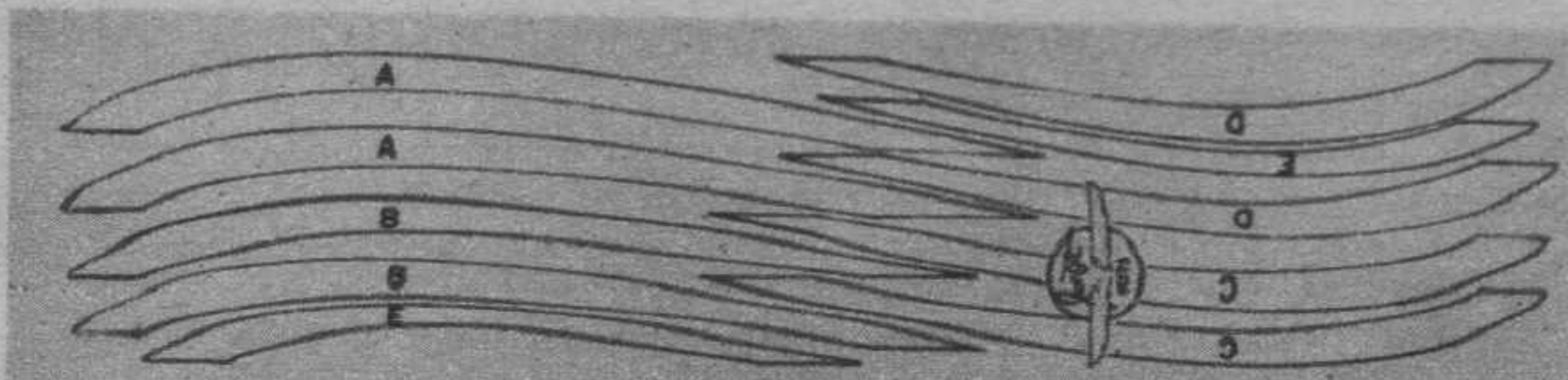
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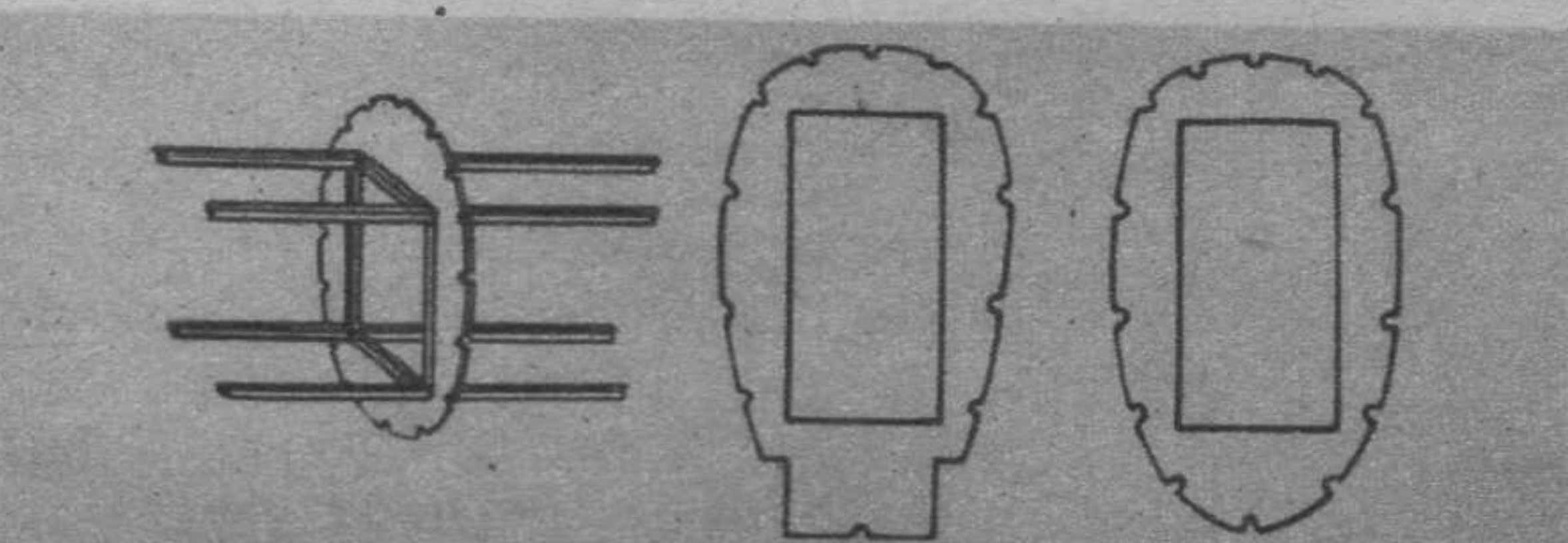
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Torpedoes Have Just Begun to Fly!

(Continued from page 20)

Sea, the China Sea, the Bay of Bengal, and the north and south Atlantic, we sent forth hundreds of destroyers at a time. Huge formations roamed every vital theater of war where enemy convoys and warships were to be encountered. The destroyer planes were massed in great numbers, just as the British and American air forces massed tremendous bomber fleets for the air offensive of 1942 against Nazi-occupied territory on the Continent. The tactical use of these swarms of torpedo craft—some of which were giant flying boats, some land planes the size of medium bombers—neutralized Axis sea power by making it so hot for venturesome warships that even battleships and cruisers were kept hidden in harbors to save them from destruction. Even this tactic did not work; the destroyers skimmed right down into the bays and inlets to torpedo vessels at their anchorages.

Without shipping, it was only a matter of time until Japan, then Germany, caved in; neither nation was self-sufficient. This is a rather pleasant bit of fanciful thinking. But is it fancy? Let's look at the record.

"The way to sink a warship is to let water into it, not air." A statement something to this effect is credited to our flying chief of the naval air service, Rear Admiral John H. Towers. His apt phrase explains in a few words why large-scale usage of the torpedo plane—and its big brother, the destroyer plane—could actually neutralize Axis sea power. There is no single war utensil which will let as much water into a ship as the torpedo; this is fact No. 1—not fancy. Fact No. 2 is that the airplane is the swiftest means of delivering the tin fish to the scene of crime, and aiming it accurately after arrival.

Time was when many a naval expert did not believe in the practicability of the torpedo plane, but the war had not been long in progress before the mossbacks revised their earlier unfavorable opinions. Early one night in November, 1939, Swordfish torpedo planes of Britain's fleet air arm slipped off their carrier and joined RAF craft that were bombing the Italian port of Taranto. The slow, obsolete Swordfish damaged two capital ships so badly they were laid up for months, and several smaller warships were sunk within half an hour's time. Then there came the night battle of Cape Matapan, when the fleet's air arm craft tracked down the great battleship *Veneto Vittorio* and crippled her. Of the would-be rescue force which the Italians sent to the aid of their pride and joy, four cruisers and several destroyers were sent to the bottom of the Mediterranean. Half of the British home fleet roamed in search of the Nazi battleship *Bismarck*, but it was a torpedo plane which first hit and slowed down the huge floating fortress during the evening of May 27, 1941, thus permitting the Royal Navy ships to catch and sink Adolf's

pride and avenge their comrades of the ill-fated *Hood*.

The advantage has not always been with the Allies, however, as the Japanese torpedo planes demonstrated at Pearl Harbor in sinking two of the greatest ships ever built—the British battleship *Prince of Wales* and the battle cruiser *Repulse*. We returned and partly evened the score during the battles of the Coral Sea and Midway Island. In the latter engagement, the torpedo bombers and torpedo-carrying patrol bombers played a most conspicuous part.

The torpedo plane is a mighty weapon indeed, but the handling of it involves the toughest job in naval flying. At first glance the tactic appears simple. The torpedo bomber comes in fast and low, flying directly toward the target. It skims just above the waves, releases the torp at the enemy vessel, then pulls up and away to put as much distance as possible between the plane and the ship before the boom comes. In actual practice there's a bit more to the story, which is why torpedo operations involve more casualties than any other naval flying tactic.

In order to reduce these high casualties of men and machines, the torpedo bombers usually try to attack swiftly from behind some sort of concealment. They may dart in from low-hanging clouds; they may strike at dawn or dusk, at which time the planes are not so prominent in the uncertain light while, contrariwise, the vessels are silhouetted against the horizon. Or the torpedo craft may be provided with artificial concealment, should the attack take place in clear weather. This is accomplished by having one or two planes lay a smoke screen between the approaching torpedo craft and the warships. These "smokers," which usually are scout bombers, swing in fast and low and lay the smoke in strings parallel to the course of the enemy vessels, and from 2,000 to 3,000 yards away to one side. The smoky trail sifts down onto the water, making a hanging curtain of blue-gray concealment.

Now the planes come down, usually in three-ship sections in echelon formation. The targets usually are capital ships—battleships, carriers, or cruisers—and, as such, they are protected by a screen of light cruisers and destroyers that are riding somewhere along the flank. As the torpedo planes approach, this protective screen throws up a terrific barrage of antiaircraft. The low, fast-flying planes are hard to hit and often there are casualties at this point, before the torpedo planes ever get into position. Once past the cruiser screen, the attacking planes are confronted by the antiaircraft fire of the bigger ships, but speed is usually in their favor.

Then they enter the smoke screen. The enemy gunners cannot tell at just which point the torpedo bombers will emerge from the smoke, so they do the next best thing. They know

(Turn to page 50)

It takes SKILL, Mr. Yamamoto

DURING THE BATTLE OF MIDWAY THE JAPS FELT THE MIGHT OF AMERICA'S AIR POWER. THIS OVERWHELMING VICTORY WAS A TRIBUTE TO AMERICAN SKILL. SKILL WHICH ENABLED U. S. ARMY BOMBERS TO INTERCEPT THE JAP FLEET FAR AT SEA AND TO SCORE DECISIVE BLOWS IN SPITE OF ENEMY RESISTANCE. ONE OF THE JAP CARRIERS MET ITS DOOM AT THE HANDS OF ARMY FLYERS AND ONE OF THE NAVIGATORS WHO BROUGHT THESE DEADLY TORPEDO BOMBERS UNFAILINGLY TO THEIR TARGET WAS A GRADUATE OF THE WEEMS SYSTEM OF NAVIGATION.



Martin B-26 Marauder

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Torpedoes Have Just Begun to Fly!

(Continued from page 48)

that the ships will be flying low, so they fire a heavy barrage just in front of the hanging smoke curtain, throwing up geysers of sea water with which they hope the planes will collide. This often happens. The planes dart out of the smoke at such speed that a pilot sometimes hits a column of water before he can maneuver. At this speed the plane will be smashed into bits, much the same as if it had collided with a brick wall instead of a wall of water.

The tin fish are released as soon as the planes come through the smoke screen. The torps are dropped so as to form a staggered crisscross pattern as they approach the enemy ships. No matter which way the warships attempt to turn to dodge the torpedoes, a hit or two is virtually assured. Unlike bombs, the tin fish hit below the vessels' armor belts, where they let in water instead of air.

Although the torpedo planes may escape enemy fighters, anti-aircraft, and the huge columns of water, there are other perils. Should the plane fly too close to the water as the torpedo is released, the splash of the big tin fish plopping into the sea may send a column of water high enough to hit the plane's tail. This noses the plane into the drink at terrific speed because the pilot is too close to regain control of the plane. There is also danger when the fish is dropped from too high an altitude, although this occurrence is not so frequent. The heavy head—where the explosive is located—and the action of the tail fins, make the torp hit the water at a downward angle instead of a flat bellywhopper. The high speed—the plane is doing better than 250 miles per hour—forces the torpedo up out of the water, porpoise fashion, and the plane may run into the leaping fish with ghastly results. Even if the torp does not jump high enough to hit the plane, it may be thrown off course by this leaping action.

The torpedoes are dropped from about twenty feet over fairly calm water or ground swell, but the pilot and bombardier must use their well-conditioned judgment at all times. In the older types of torpedo craft, the pilot aimed his plane at the enemy vessel and ordered the torpedo-man to release the fish at the proper instant. In the newer types, the bombardier sights the vessel, orders the pilot to remain on course (the same as in high-level bombing) and releases the torp at the opportune moment.

The tin fish are carried in racks somewhat on the order of bomb racks. As the fish is released, a latch is thrown which, by the opening of a valve, permits the stored compressed air to start the small engine that drives the torpedo. In addition to this engine, the torpedo is filled with gadgets which help to keep it on its deadly course.

At the front end of the tin fish are a tiny propeller and detonator. As the torpedo plows through the water

on its way toward the target, the water friction turns the little prop, causing the propeller to unscrew itself and drop off, thus exposing the detonator pin and "arming" the torpedo. (Some types have propellers that do not drop off, but are merely pushed backward upon contact to set off the explosive charge.) Next comes the explosive head, and immediately aft of this is the air chamber containing a cylinder in which the compressed air for motive power is stored under pressure of about 2,500 pounds per square inch. Then there is the balance chamber, which contains a pendulum device that activates the horizontal fins and thereby controls the depth at which the torp runs beneath the surface. Aft of this is the compressed-air engine that resembles a miniature airplane radial motor. Through a small gear box it turns the two contra-rotating propellers by means of a concentric drive shaft. The fifth section is known as the buoyancy chamber, whose function is to keep the 2,000-pound torp from sinking. This compartment is occupied only by the gyroscopic steering mechanism that actuates the vertical rudders so as to hold the torp on course.

Outside, on the aft end, are the control surfaces that closely resemble those of a dirigible or plane. Horizontal fins and rudders control up-and-down movement, and the latter are connected to the pendulum apparatus. Vertical fins and rudders furnish directional guidance, and these rudders are worked by a rod connected with the gyro. Aft of the control surfaces are the twin propellers, mounted in tandem.

There is no strategical or tactical reason why torpedo work should be confined to navy aircraft, although this was the case prior to the outbreak of the war. Land-based aircraft possess inherent advantages over carrier-borne planes and these benefits are to be capitalized upon. The modified Martin B-26 Marauders of the army air forces proved sensational during the battle of Midway and in the Aleutian Island episode; they have the range, they are faster than most Axis fighters, and they are well gunned with defensive armament.

The type of destroyer plane mentioned earlier in the discussion may well be an outgrowth of this converted medium bomber; or it also may be derived from the patrol bomber type. This latter type probably would be much on the order of the Martin Mars or the Boeing Sea Ranger, having a wing spread of around 200 feet and an overall length of 120 feet. Of its 140,000-pound gross weight, about 25,000 pounds would constitute its "useful load," meaning that ten full-sized torpedoes could be carried aboard, along with other necessary equipment and armament. The hull of the giant boat would consist of upper and lower levels. Working from the bow aft, we would find the bow turret and bom-

(Turn to page 52)

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1 1/2x 1 1/2x 12 6c ea.
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Plywood—1/16 3/4, 3/16, 1/4 40c ft.

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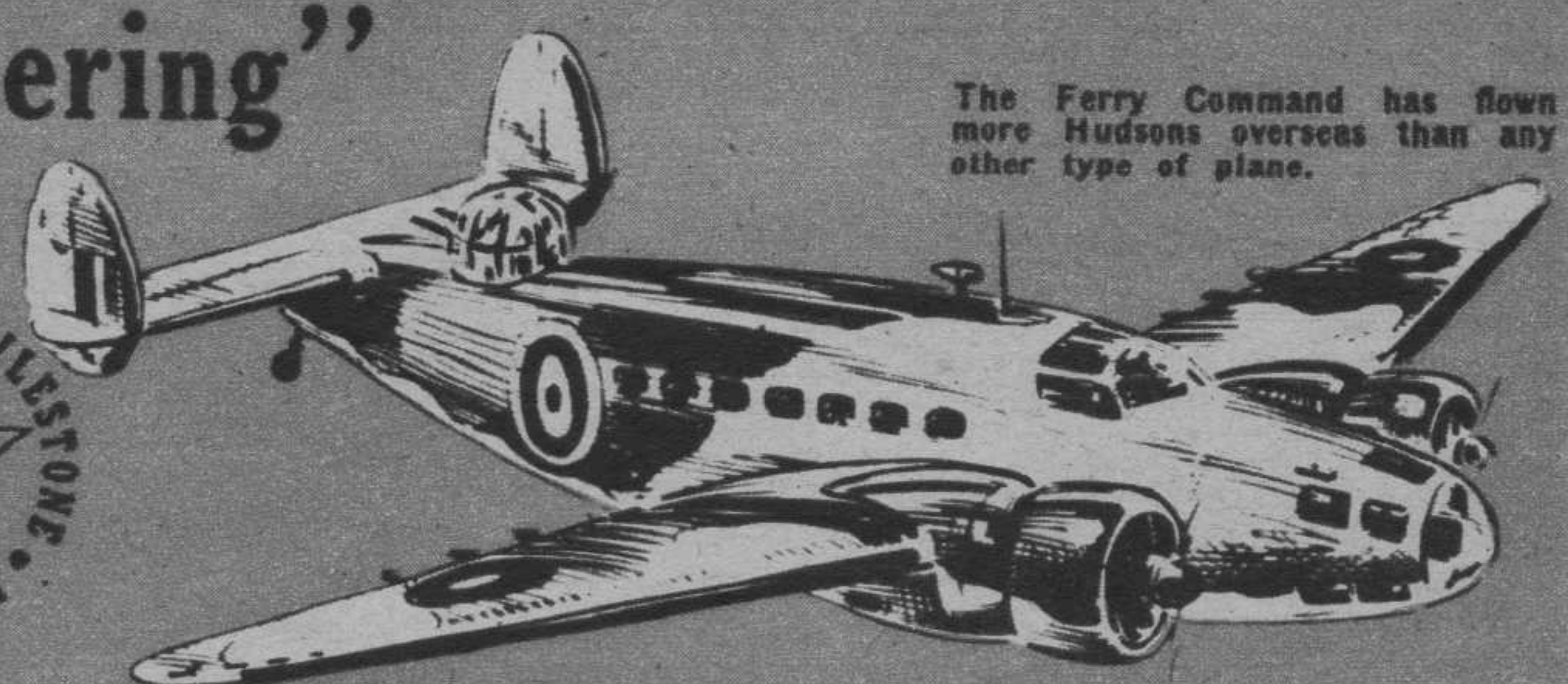
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— writes S. L. K. of Chanute Field

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The Ferry Command has flown more Hudsons overseas than any other type of plane.

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Widely used by crack American and Allied pilots over the Pacific, and in the Australian patrol. Beautiful 49% model correctly and minutely detailed, with retractable landing gear, and "full dress" of camouflage. Flies fast and furiously with its "full load of eggs." C-D Master Kit SF-95.....\$7.50

(Left) 15 Authentic C-D Master Models of World War II Planes

These designs (in kit form) embody an amazing amount of "nowhere else procurable" authentic detail—typical of Cleveland's 23 years of painstaking research to produce the finest models possible—magnificently suited for educational purposes. Such features as easily-built Retractable Landing Gear, Surface Radiators, Exposed Superchargers, Detailed Machine Guns, Cannons, Bombs, etc.—all expected visible details—are standard with all Cleveland-Designed (C-D) Master Models. Each model is like a miniature course in full-size aircraft construction.



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- 75—Grumman "SKYROCKET" Shipboard Fighter. 31 1/2".....3.50
- 76—Bell "AIRACOBRA" Cannon-plane Fighter. 25 1/2".....3.00
- 77—Curtiss P-40 "TOMAHAWK" Fighter. 28".....3.00
- 78—Hawker "HURRICANE" Night Fighter. 30".....3.00
- 79—Vought-Sikorsky "CORSAIR" Fighter. 30 3/16".....3.50
- 80—SBC-4 Curtiss "HELL-DIVER" Dive Bomber. 25 1/2".....3.50
- 81—Republic P-47 "THUNDERBOLT" High Altitude Fighter. A "battleship" in weight and fire power. 30 3/4".....4.00
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- 84—German JU-87 STUKA Dive Bomber. 30 3/16".....3.50
- 85—Lockheed P-38 "LIGHTNING" Fighter. The World's Fastest. Super-detailed. 38 3/4".....4.00
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- 89—Douglas SBD-3 "DAUNTLESS" Shipboard Dive Bomber. World's hardest-hitter. 30 3/4".....3.50
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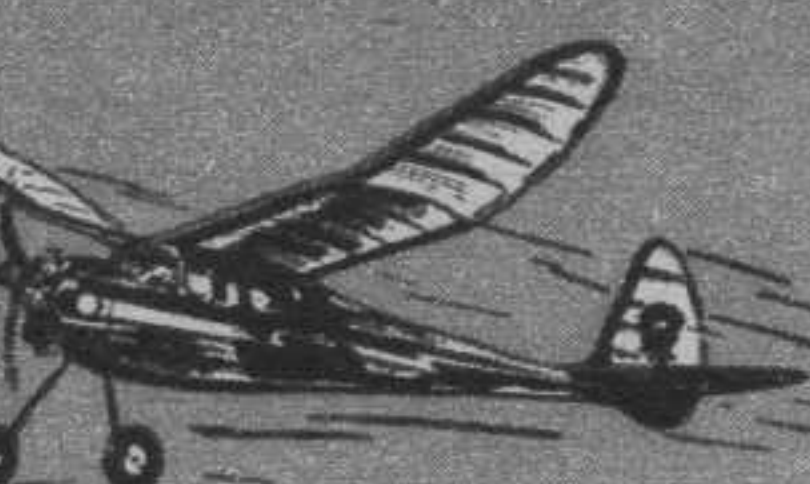
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Our correspondence files are packed with letters from top-ranking pilots, bombardiers, instructors, cadets-in-training, etc., to say nothing of aviation mechanics of every class, lauding the pre-training advantages that the building of C-D Models has given them. The big variety of C-D Model Kits offers excellent educational opportunities in learning plane construction, part names, plane identification, specific reasons for varied plane designs and structural differences, flight theory and general aeronautic mechanics, etc.

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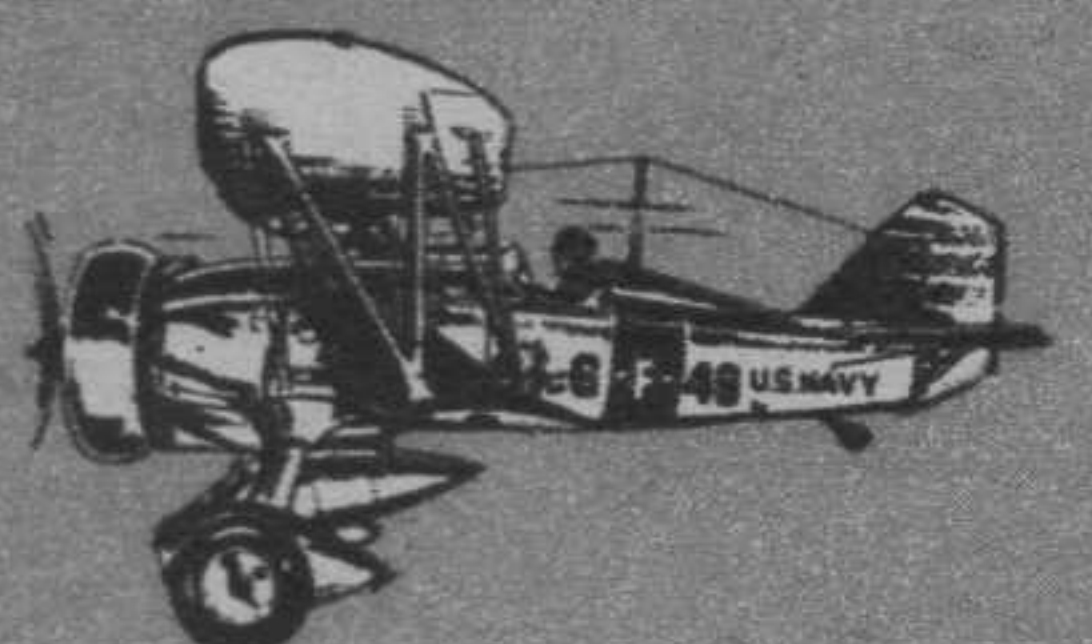


ROOKIE AMAZES OLD TIMERS

"I am a control tower operator at this very busy field. My job requires that I be able to recognize, almost instantaneously, any type aircraft used by the Army. I can only say that without ever having built model airplanes I would be lost, and I would require many months to become proficient at a task at which I am now good. I am new at the work, and the older fellows seem quite amazed that a rookie with only seven months army service can recognize all these plane types. I feel safe in saying that I wouldn't trade my model building experience for any money that might be offered. I think Cleveland is doing a marvelous job in training the young men of the United States in this time which almost necessitates model building experience. I've built your models, and I know." (From an operator in an Army Flying School in Texas.)

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are used in this model, typical of C-D's masterful engineering.



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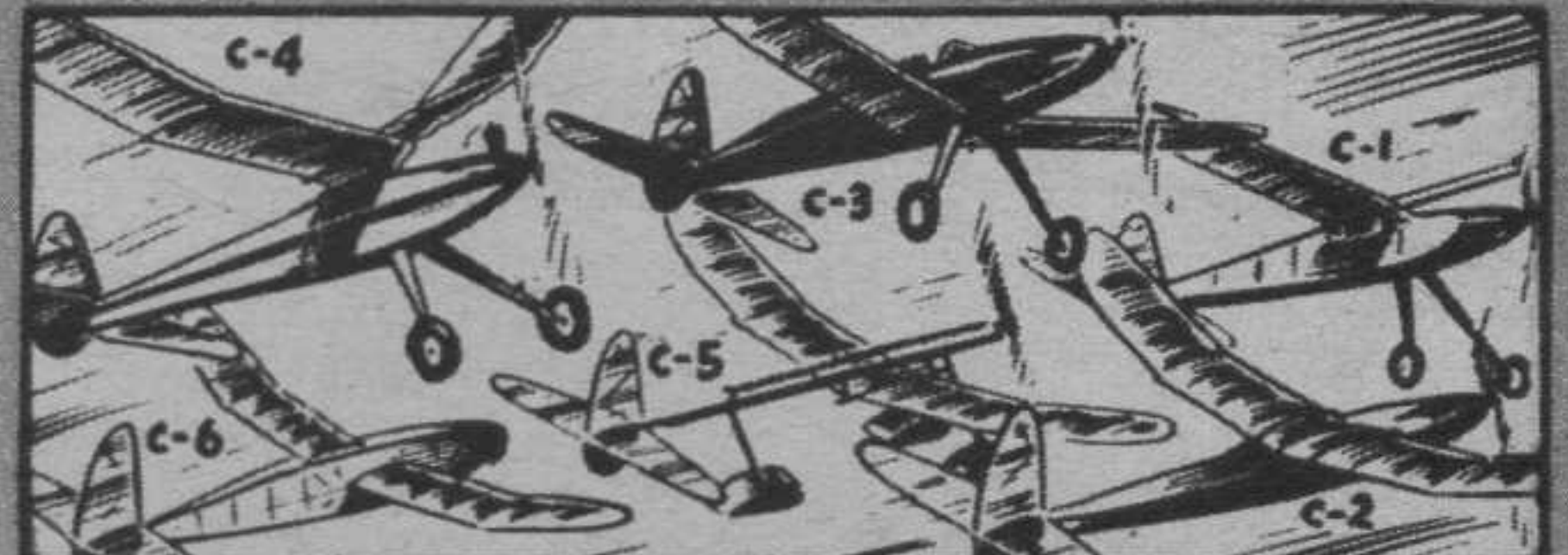


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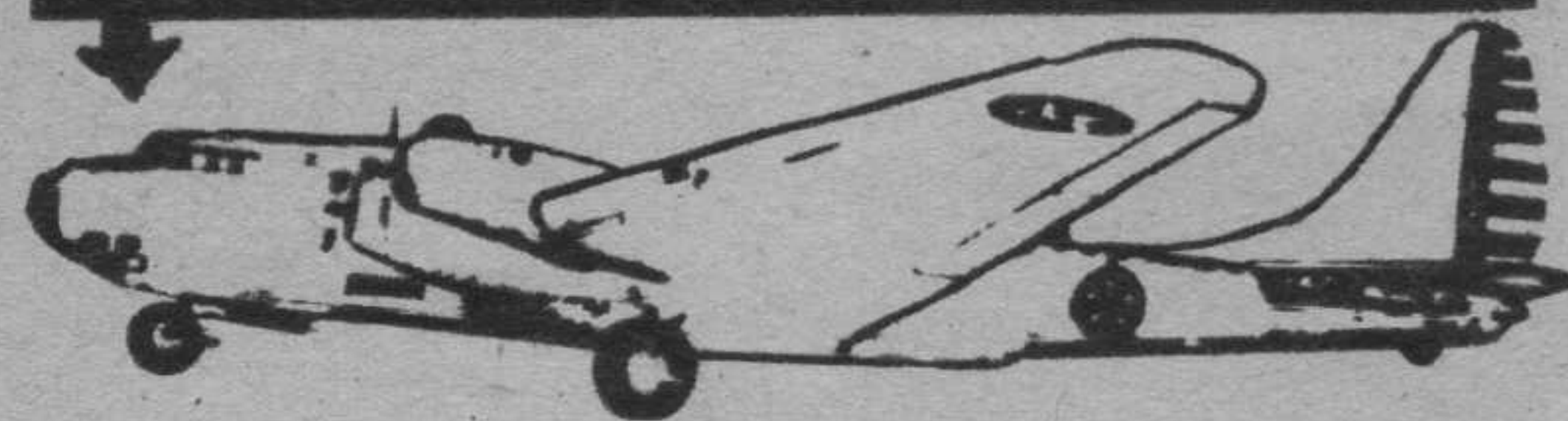
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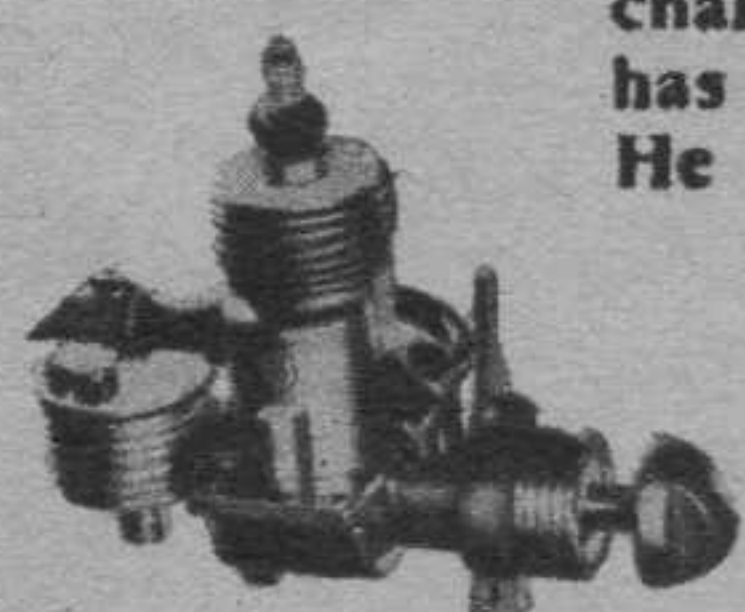
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Torpedoes Have Just Begun to Fly!

(Continued from page 50)

bardier's station immediately beneath. Next, on the upper level, come the pilots' cabin, the flight engineer's panel and controls, the navigator's station, and the radioman's equipment. The torpedo and bomb bay extends from the wing clear down through the hull's lower level. Aft of this are the top turret and waist gun emplacements. Then come the crew's quarters, and, in the tail, another gun turret. Instead of carrying the torpedoes tucked beneath the wing, as is now the practice with patrol bombers, the tin fish aboard this huge destroyer plane are laid horizontally in racks the same as bombs. Bottom doors are not practical, as yet, for big flying boats because the stresses on the planing surface are too great; the hull must be absolutely watertight and well braced. This destroyer uses torpedo doors, one on either side of the hull, which open upward and are located just above the water line. Upon being released by the bombardier, the torps roll from their racks down a short track consisting of four rails. Like bombs, the torpedoes may be released singly, in pairs, or dumped in salvo, in which case they would slide out of hull openings in close succession.

Imagine what would happen to Adolf's *Scharnhorst* if attacked by a plane of this sort releasing half a dozen tin fish at one time! To this fearsome striking power is added a 250-mile speed and sufficient range for the destroyer to fly from here to Europe and back. Mass use of these destroyers could well impose the aerial blockade of Axis nations.

The torpedo tactics, deadly as they are now, could be made more so by the use of radio-controlled tin fish that are guided straight toward their targets after being released by the plane. Here's how it would be done.

Recalling that the torpedo's buoy-

ancy chamber is occupied only by the relatively small gyro mechanism, a compact radio receiver unit, including the relay and control unit, could be installed conveniently within this space. A short single-wire antenna fixed between small, stoutly built masts on the torp's topside would be adequate for picking up the carrier waves from the transmitter control aboard the destroyer plane. These impulses would work through the relay and control unit which is hooked up to actuate the control wires running to the torpedo's rudder and elevators. The transmitter unit on the plane would, of course, be slightly larger. In this huge plane, space is not so limited. The transmitter control—the workings of which are familiar to many Air Trails readers—would be handled by the bombardier from his vantage point in the destroyer's nose. This device would have its own separate antenna and a monitor unit with a miniature control stick which the bombardier would move to the right or left to guide the torpedoes.

With this form of control, the torps could be released and guided to the ship while the destroyer plane was from five to eight miles away, well out of the immediate danger of the warship's antiaircraft fire, but well within the bombardier's sight. Experiments are under way at the present time concerning these radio torpedoes, and several models were proved practical during the latter days of World War I.

The large-scale use of these destroyers, with or without radio-controlled torpedoes, could very well win the war. The United States has the advantage of experience in this department, and we have the finest planes and pilots in the world to work with. And both Hitler and Hirohito know by now what we can do when we go to work.

From Box Kite to the Clouds

(Continued from page 32)

difficult to adjust for tight circles.

From the accompanying sketches you'll get all the information to build the necessary equipment, so we'll limit ourselves to describing just how this apparatus is used. Select a day with enough wind to fly the kite. Now lay out the kite cord along the field and attach it to a stake which is driven in the ground. At the other end attach the kite to the string, place the glider in the release, pull out the timer, and launch the kite into the wind.

As the kite carries up the glider you can start running in the direction of the wind, and by the time the timer has released you'll be in a good position to observe how the glider reacts to adjustments.

Since this idea shows up the performance of the glider rather than the ability of the builder to master the difficulties of the old style towing method, the author would appreciate learning of your success with this new system.

Next Month

FLYING MODEL OF GRUMMAN WIDGEON

A black and white photograph of a B-24 Liberator bomber in flight, viewed from the side. The aircraft is dark-colored with a white star insignia on the fuselage and tail. The tail number '15158' is visible. A smaller aircraft is flying above it in the background.

BS-401 Boeing B-17E—"Flying Fortress" or "The Terror of Germany"
BS-402 Avro Manchester—Unusually large British bomber
BS-403 Blohm & Voss BV-142—Germany's latest 4-engined bomber

BS-404 Short "Stirling"—England's most sensational bomber
BS-405 Consolidated "Liberator"—Our long-range high speed bomber
BS-406 Focke-Wulf "Kurier"—Military version of transatlantic flier

[illegible]

S-1 Soyokaze—Jap bomber
S-2 Nak. 96—Jap fighter
S-3 I-18 Russian fighter
S-4 Martin B-26 Marauder
S-5 Westland "Whirlwind"
S-6 Messerschmitt Me 110
S-7 Northrop Flying Wing
S-8 Nak. 19—Jap bomber
S-9 2 cannon Spifire
S-10 Brewster F2A-2

S-11 I-15b—Russian biplane
S-12 Army 98—Jap bomber
S-13 Bell P-39 Airacobra
S-14 Messerschmitt Me109f2
S-15 Grumman "Martlet"
S-16 Martin "Baltimore"
S-17 4 cannon Hurricane
S-18 Heinkel 113 fighter
S-19 Karigane—Jap bomber
S-20 Vought F4U-1 fighter

S-21 Curtiss Kittyhawk
S-22 British "Defiant"
S-23 Lockheed P-38
S-24 PZL "Wilc" Polish dive-bomber
S-25 Fieseler "Storch"
S-26 Yulfee "Vanguard"
S-27 Junkers Ju87b "Stuka"
S-28 Grumman "Skyrocket"
S-29 Grumman "Avenger"
S-30 Jap "Zero" fighter

S-31 Focke-Wulf 190
S-32 Russian "Stormovik"
S-33 Lockheed "Hudson"
S-34 "Mustang"—P-51
S-35 "Mitchell"—B-25c
S-36 Douglas "Dauntless"
S-37 Russian YAK-4
S-38 Republic P-47 "Thunderbolt"
S-39 Douglas A-20A
S-40 Brewster "Rocaneer"

FULL SIZE PLANS FOR FLYING SCALE MODELS

For those who like to build flying scale models, we have included these plans, all in $\frac{3}{4}$ " scale. Check off FS-501 on coupon below if you'd like to build the Westland "Lysander"—a 37" flying scale job that really flies. For the latest in military ships, check off FS-502 (Republic P-47b "Thunderbolt") or FS-503 (Grumman P-50 twin engine, tricycle landing gear pursuit). Both 502 and 503 are approximately 30" span. Only 25¢ each, postpaid.

coins, so please tape them to a card that will fit snugly in envelope. Please PRINT your name and address. Thank you.

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11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
FLYING SCALE PLANS					FS-501	FS-502	FS-503		

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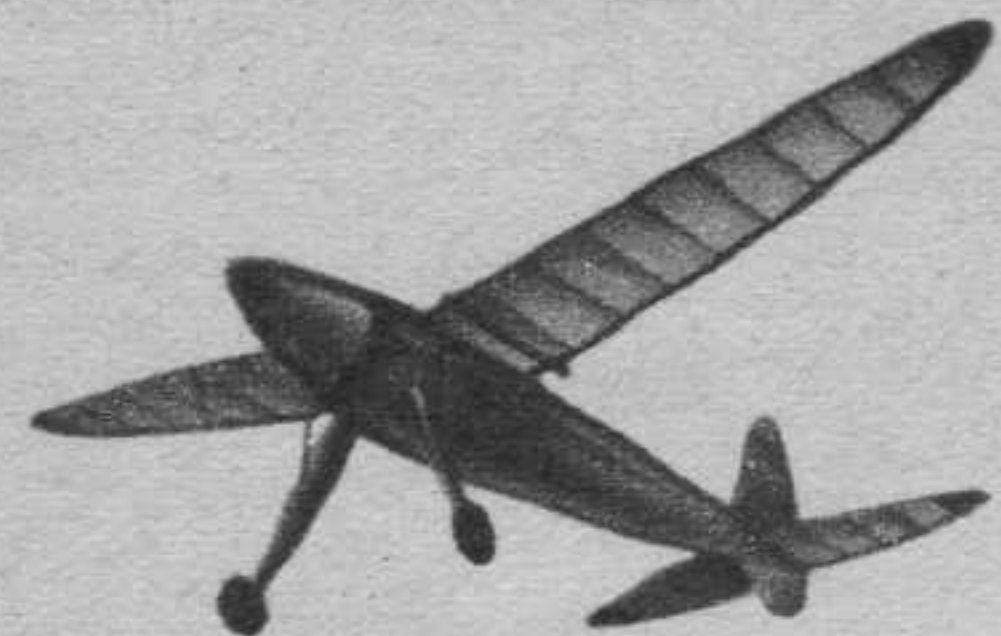
★ ★ ★ ★ ★ BUY WAR STAMPS ★ ★ ★ ★ ★

AIRPLANE KITS Flying Solids

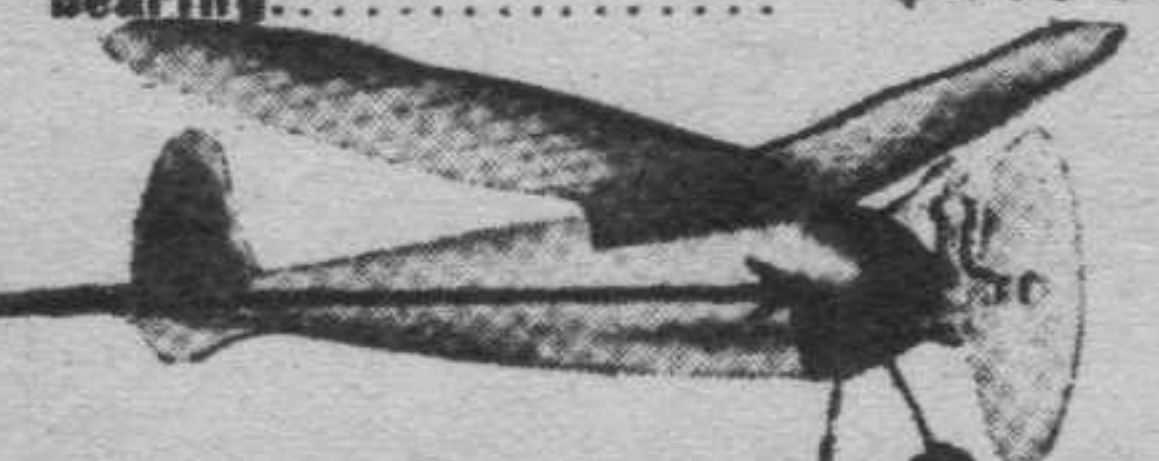
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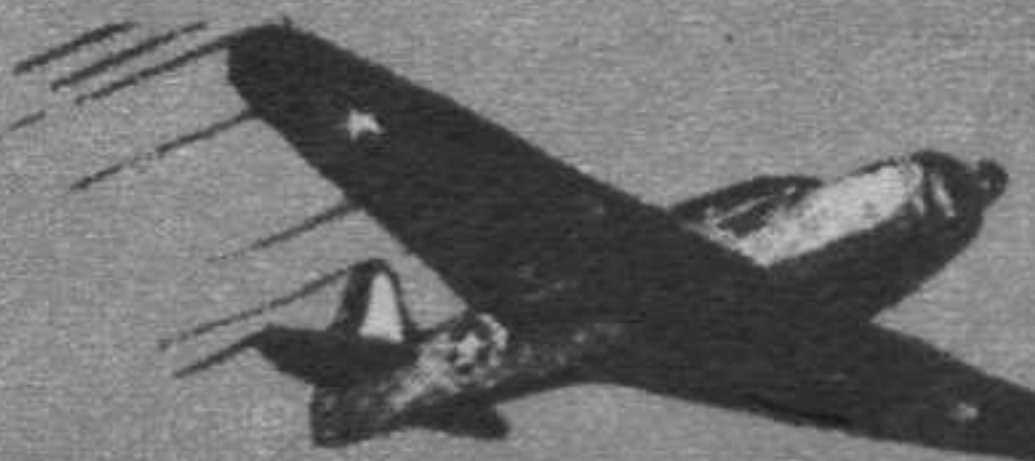
Wide selection of kits for completion of handsome SHOWPIECE Solid Models and Gliders. This is a partial list, limited by space—we have the MODEL YOU WANT!



GIANT SIZE of a timely army twin-engine design. This is an accurately scaled-down version from original plans! Standard kit includes cut-to-outline shape wings, fuselage, rudders, stabilizers. Leading and trailing edges tapered where specified. **\$2.00**



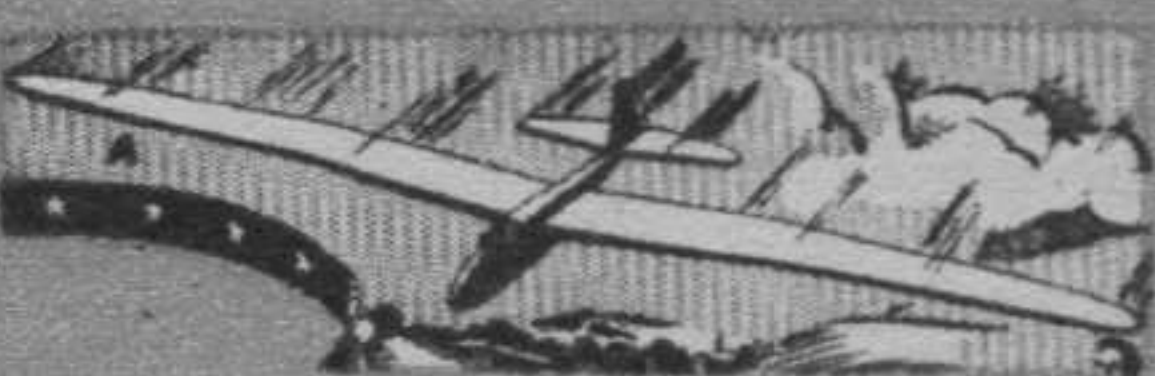
Famous British Fighter. Burkard's deluxe, super-detailed GIANT SIZE Solid model with blue-print construction plans. Cut-to-outline shape units, tail surfaces, etc. ALSO: Ryan STM-2; Curtiss P-40; GLOSTER Gauntlet; Grumman F3F-2; Messerschmitt; Curtiss Hawk; Airacobra; Hurricane. **\$1.50**



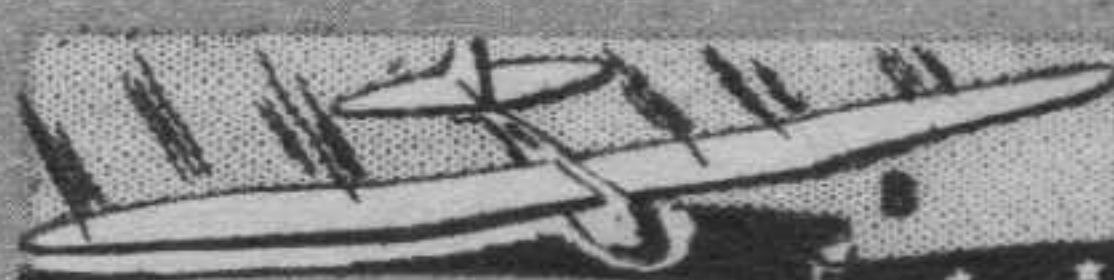
IDENTIFICATION MODELS, conforms to plans officially approved by Navy Department for this series. Choice of COMET and MEGOW lines.



Choice of best-performing gliders available to model builders who have curtailed flying activities or are anxious to acquire more practical knowledge of 'riding the thermals.'



CONDOR—7 foot, advanced soarer. Maximum lift in slightest breeze. Suitable for hand or tow-line launching. **\$1.00**



SAILPLANE—54", Class 'D'. Stays aloft for an hour or more. **\$1.25**



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Until Victory is achieved—conservation MUST BE THE WATCHWORD! From the vast stock-on-hand we've always carried, we continue to fill needs while quantities remain! We, too, are working on suitable ALTERNATES! Build more carefully—it's more fun—but primarily because it is more patriotic!

NEW AIR-O-TRAINER

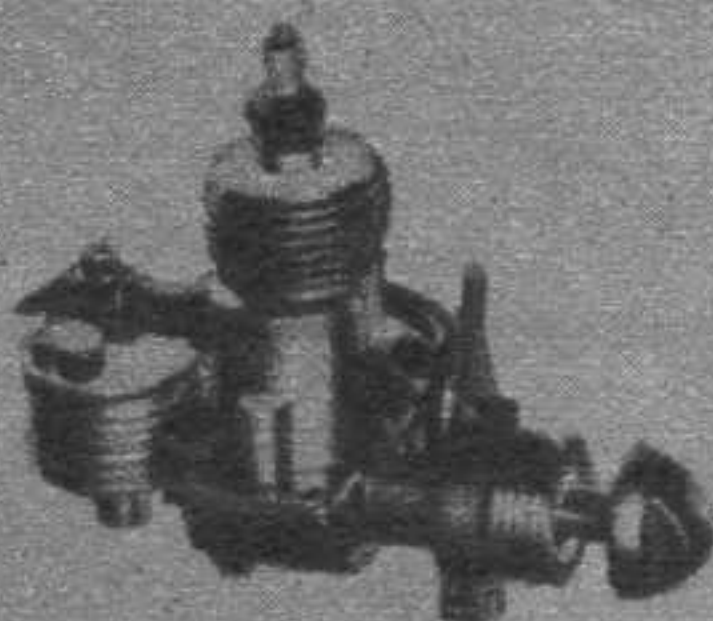
The new model with movable controls which teaches fundamentals of flying! Actual cockpit controls move ailerons, rudder and elevators exactly as in real plane! All parts finished including shaped joy stick, rudder pedals, etc. ILLUSTRATED FLYING GROUND COURSE IN EACH KIT. **\$1.50**



GAS ENGINES SUPER ATOM



Lightest, most powerful 'A' engine developed. Bore and stroke 1 1/2". Displ. .097 cu. in. Weighs 2 ozs. with coil and plug. **\$15.50**

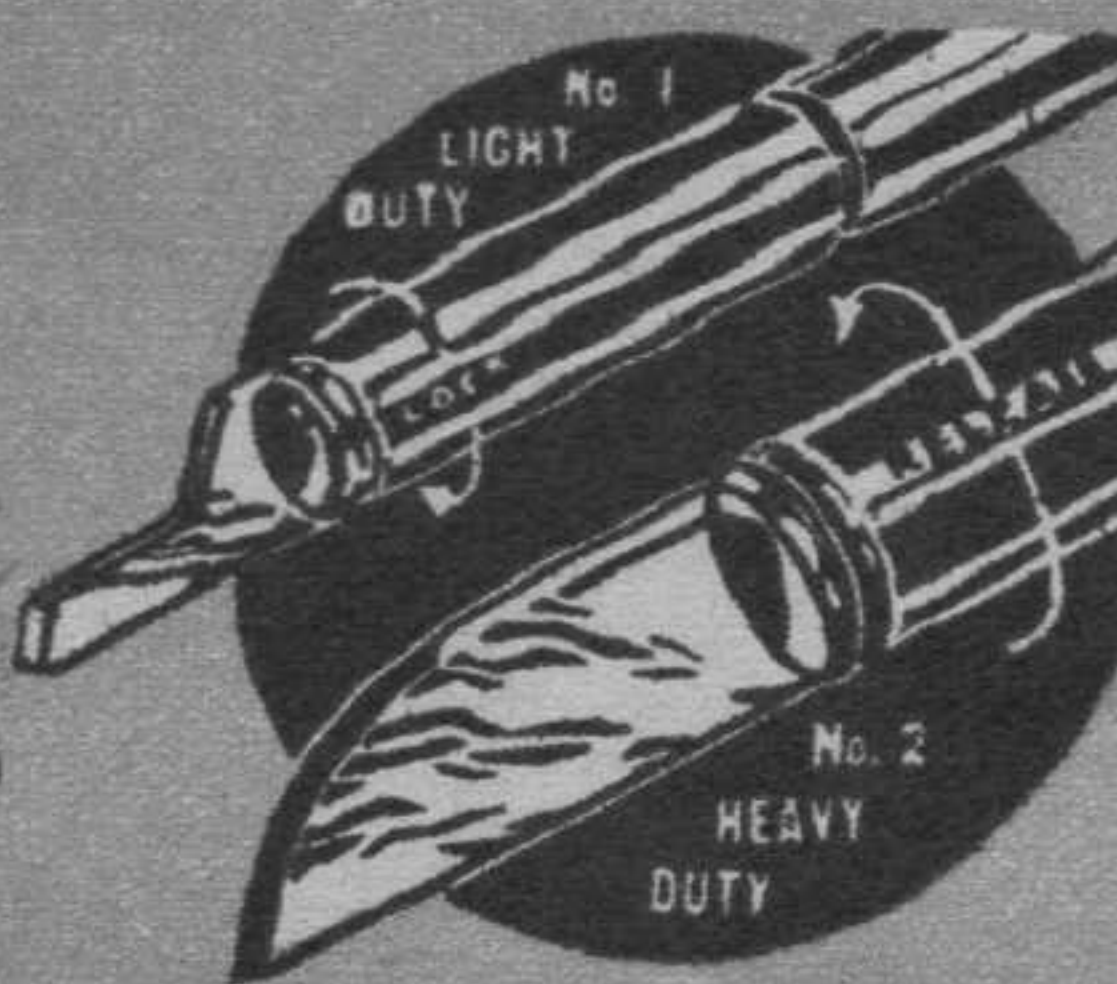
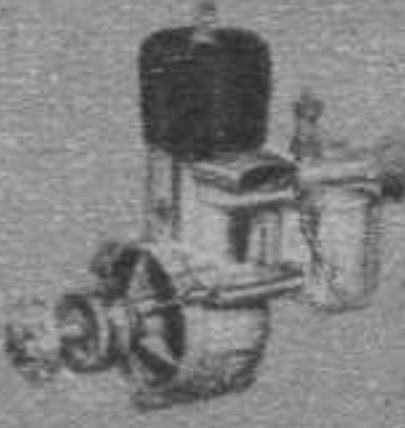


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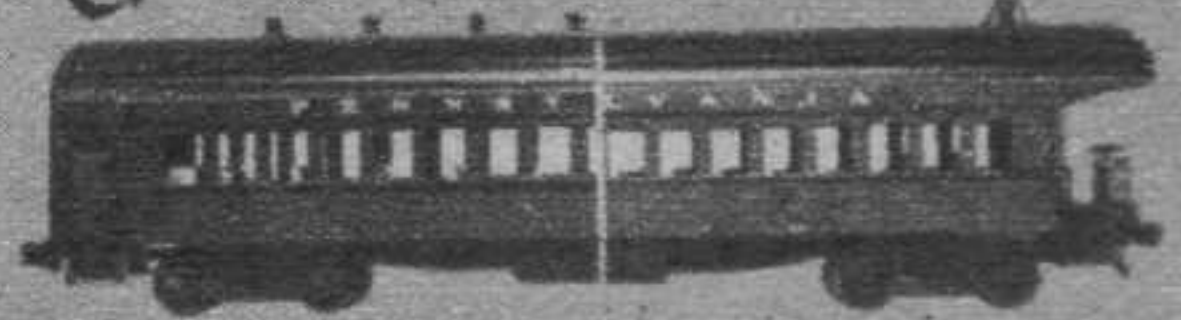
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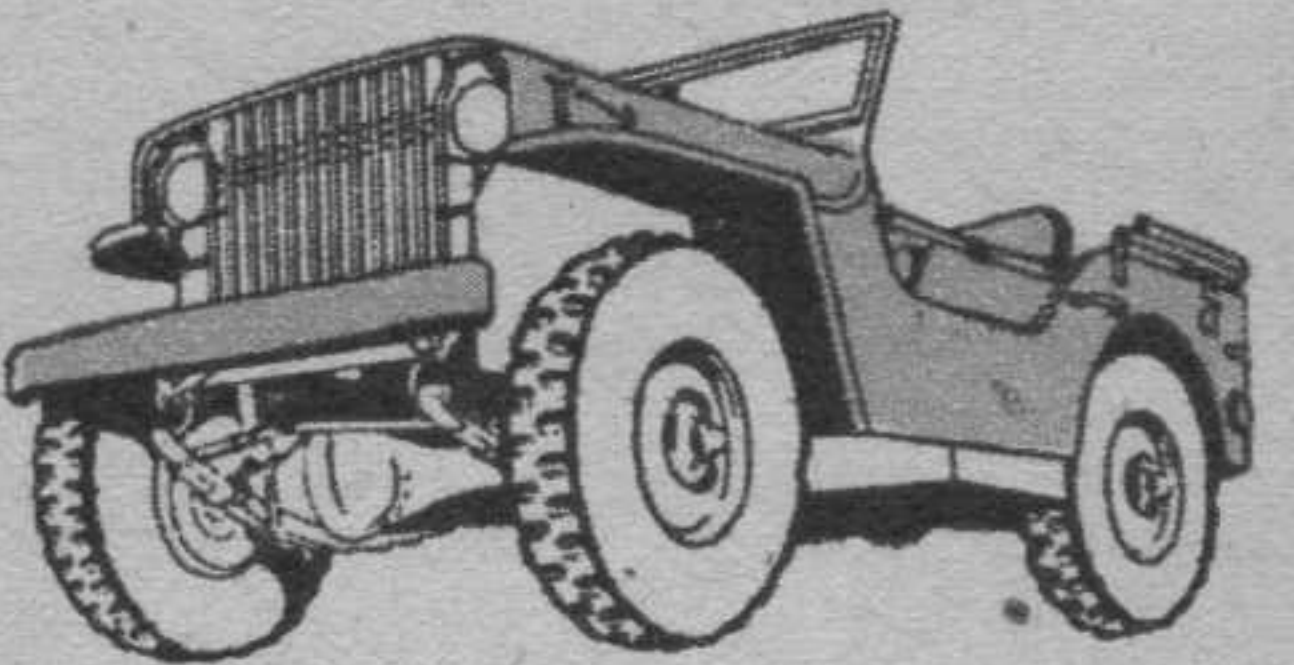
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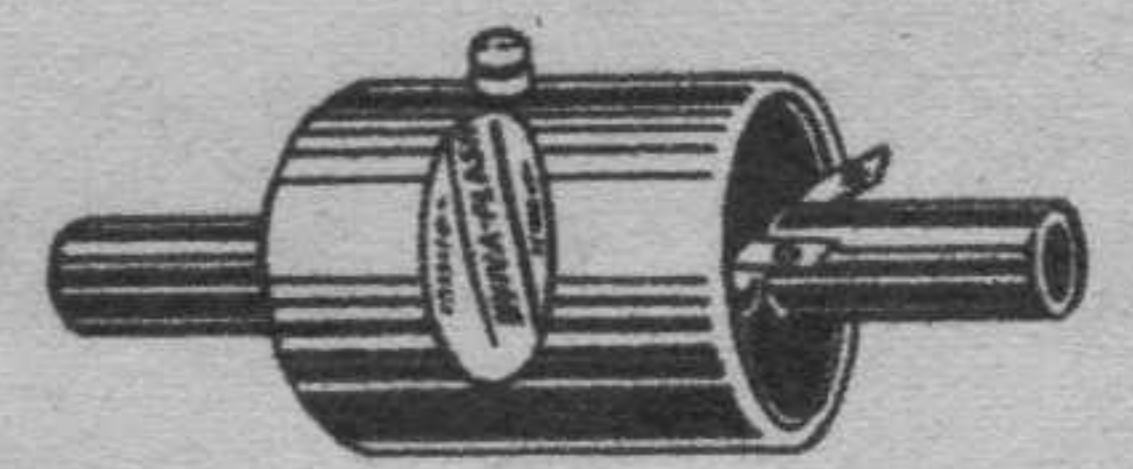
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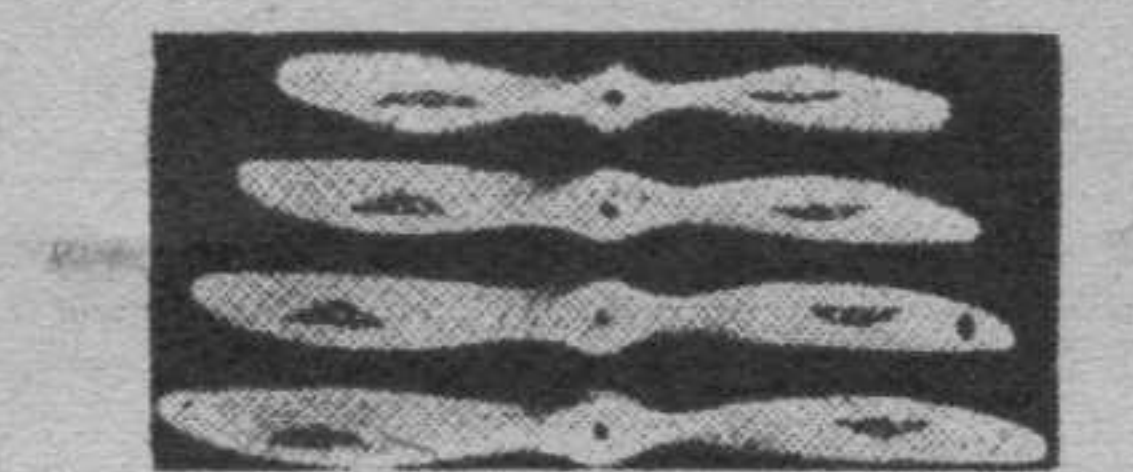
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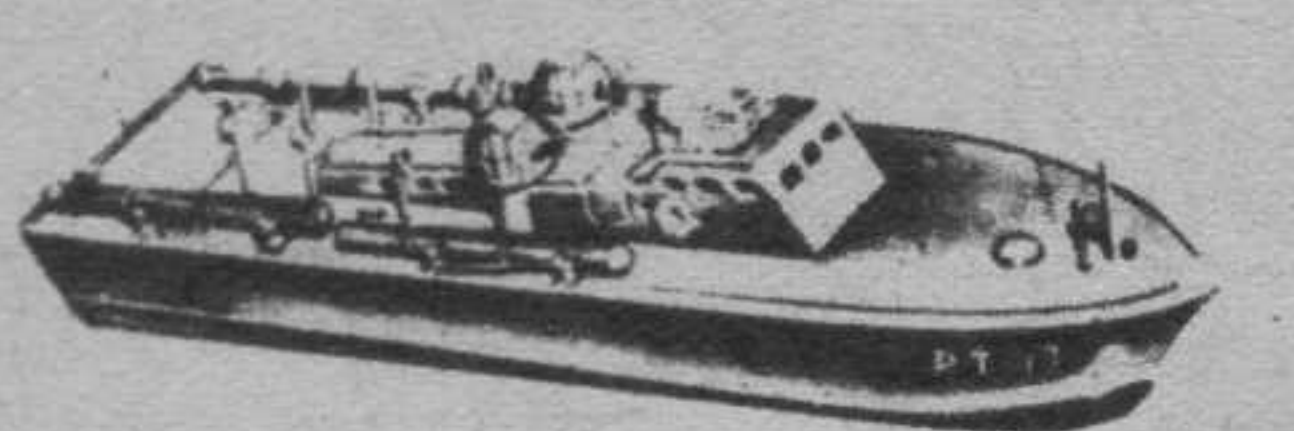
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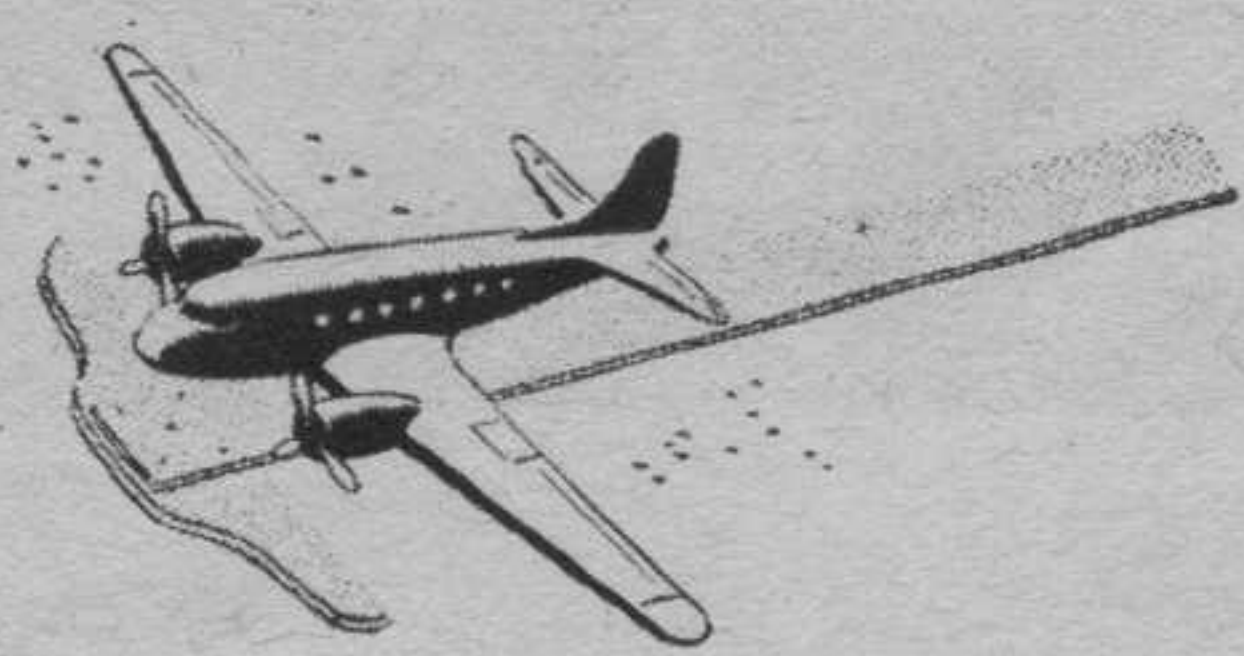
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- ☐ FUNDAMENTALS OF AERONAUTICAL ENGINEERING

Name.....Age.....

Address.....

City.....State.....

Official Air Youth News

(Continued from page 26)

the States and local communities there was still one unanswered question—What about a Federally sponsored, uniformed air-cadet league?

For a long time, and vigorously since America's entry into the war, a group of substantial citizens has been hollering its collective head off for an air-cadet training league similar to Canada's and England's. They asked that it be Federally sponsored in conjunction with the high school pre-flight courses.

Since many schools already have a uniformed cadet system, the organization, known as the Air Training Corps of America, has not at press time succeeded in gaining its goal—"all-out" Federal sponsorship. The U. S. Office of Education is interested and has indicated that some sort of a junior military group might be established, but it would have to be a feeder for all the services, not just the air forces.

While Washington observers sit and wait, progress in aviation education continues as it always has, on the home front—in the local schools, and through aëromodeling. In the meantime, the Air Training Corps continues operations under private support.

Junior Air Reserve

The good news for many a young aviation enthusiast is that officials of

educational work that make up the activities of the Junior Air Reserve. Here's how to join: Send 25 cents in coin or stamps for first year's dues to the Junior Air Reserve, National Aeronautic Association, 1025 Connecticut Ave., N. W., Washington, D. C., along with the filled-in application appearing in this issue. (You may copy the application form if you wish, but not larger than three by five inches.) You'll be signed up as a "Cadet-at-large" in good standing for one year and be sent your membership card and official JAR booklet.

And if you're one of the thousands who wrote for and received the NAA-Air Youth "air-conditioning" identification card, you're entitled to a 10-cent credit toward membership in the Junior Air Reserve. Instead of sending the 25 cents for the first year's dues, membership card, and official booklet, just send your "air-conditioner" identification card and 15 cents in coin or stamps.

As a member of the NAA Junior Air Reserve you will be eligible to receive Air Youth training bulletins, wall charts of military aircraft silhouettes, and other material at no charge, or at cost. It's all detailed in the pamphlet you will receive upon joining.

Sign up today as a JAR Cadet. Start your application on its way to Washington.

JOIN THE JUNIOR AIR RESERVE SPONSORED BY N. A. A. America's Largest and Oldest Aviation Association

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NATIONAL AERONAUTIC ASSOCIATION
1025 CONNECTICUT AVE., N. W., WASHINGTON, D. C.**

I hereby apply for membership* in the NAA Junior Air Reserve. Please send me my membership card, first training pamphlet, and full details of how I can start a J. A. R. Flight or Squadron.

Name (print).....Age.....

Address.....

City.....State.....

(This application may be copied)

AT1142

the NAA Junior Air Reserve have decided to permit air-interested boys and girls to enroll as members-at-large. This membership-at-large means that everyone can join. Up till now, the National Aeronautic Association recognized only group memberships—Reserve "Flights" and "Squadrons." You had to be a member of one of those units before you would be accepted as a JAR Cadet.

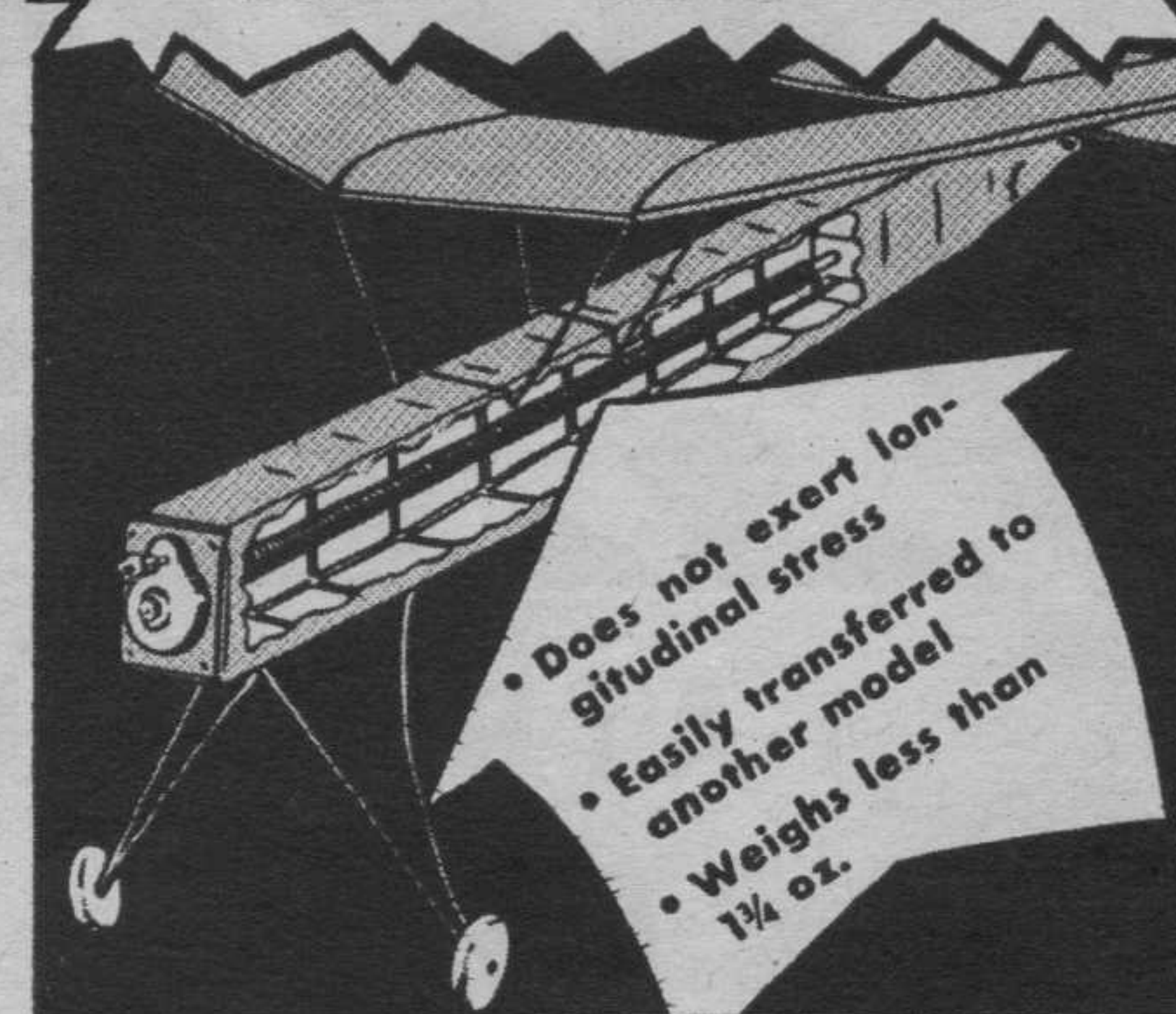
But now, and largely in response to the thousands of active junior aëronauts who applied for "air-conditioning" identification cards through this column, it was decided to permit lone enthusiasts to get in on the fun and

New AMA Records

Not only are the newest records of interest, but they reflect some of the changes that are taking place in this hobby of ours. For instance, take the outdoor glider and experimental categories—autogiro, ornithopter, and helicopter. There are six changes in these, which show that the contestants and entrants in record trials are giving more attention to these oft-neglected categories.

New glider records have been established by Sam Black of Cleveland and Bob Smith of Orange, New Jersey. In the outdoor autogiro category, John Block and Carl Goldberg,

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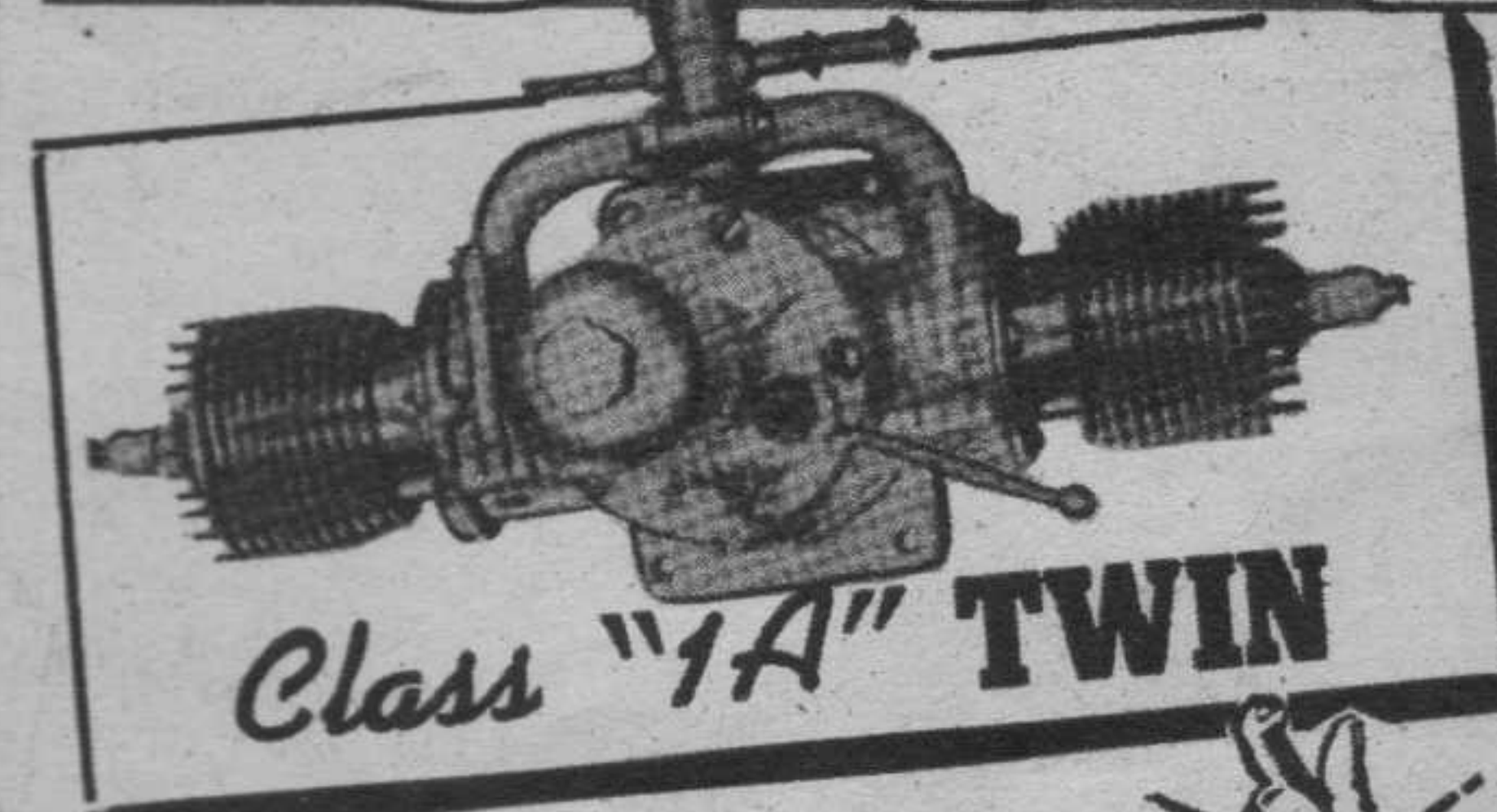
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AIR TRAILS PICTORIAL

both of Chicago, set new marks. Tony Schott of St. Louis, and Paul B. MacCready, Jr., of New Haven, both set new senior helicopter records; Schott first, and then MacCready. Finally, in the experimental class, young MacCready made a brief official flight in the senior ornithopter event during a downpour.

Not so long ago, handsome Ray Acord, of Hollywood, established a record of 1:14.9 in the Class A off-the-water gas-powered group. In the exchange of correspondence that followed, headquarters somehow got the record listed as 1:12.9, or two seconds less than the actual time. This time we were all set to list it correctly when along comes fellow Californian Joe Bilgri, of Santa Monica, and ups the official time to 1:30.1. Anyway, Ray, we're sorry, and how about showing Joe who's top man around your parts?

The fighting Romaks of Oakland, California, seem to delight in breaking each other's records. There's Earle and Bud, both excellent junior fliers. First Bud beats Earle, and then Earle betters Bud's time. The latest exchange was when Bud set his junior record of 2:04.3 in the gas-powered off-the-water Class C event, nosing out brother Earle, who had held the championship with an average of 48.2 seconds. Now we're waiting for Earle to stage a comeback.

You might say that business was sort of dull in the indoor categories, but that is the way it usually is during the summer months. New flight times recorded in the official book at Washington AMA headquarters were for Dick Everett in the Class D stick model event (howya, Dick? How are all the lads at NACA?); the upping of Dave Call's time in the fuselage R. O. W. Class B event from 6:44 to 13:13, established at the Philadelphia Model Aeroplane Association indoor championships; and for Ed Vargo of Chicago, stepping into the honors circle with a flight time of 3:53.7 in the junior autogiro event—and very good, too, Ed!

To those who wonder how they can set a new record, we'd like to give you the official lowdown as quoted from the AMA record listings: "Applications for national record are submitted by official contest directors who have been appointed by the Contest Board of the Academy. Applications should be submitted within a day or two of the record performance. Model builders who have made exceptional flights should check with their contest director to make certain that applications have been made in their behalf."

The business of setting records is a sort of three-ring circus. First the model flier has to turn in an exceptional performance; second, the contest director must complete all the official forms and mail them to headquarters; and third, the headquarters office of the Academy has to search through its files to make certain the flight is indeed a record-breaking one, and that it betters existing records or establishes a new one in a category that boasted no official "time" before.

Will your name be among the honored the next time the official records are presented in Air Trails Pictorial?

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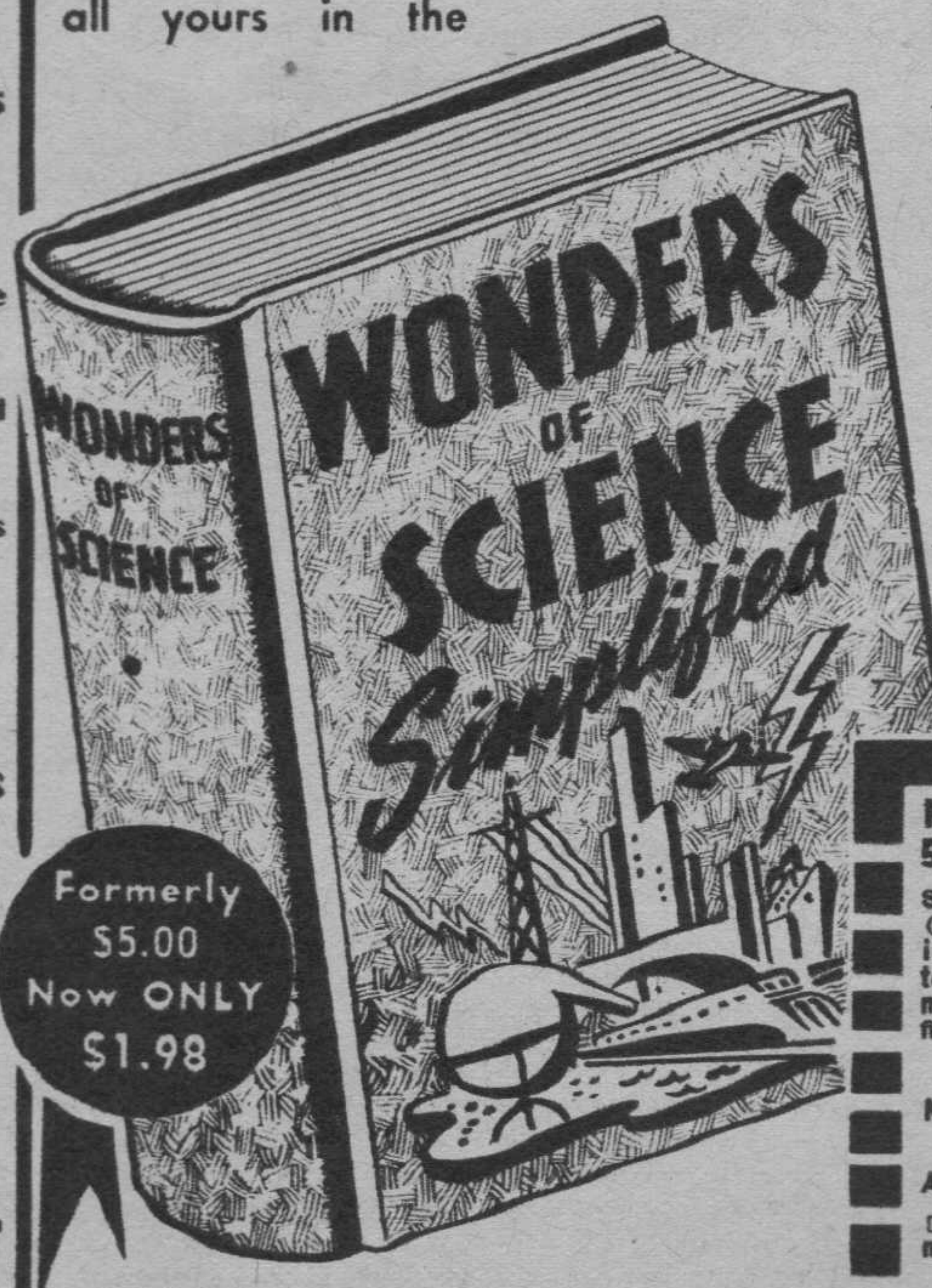
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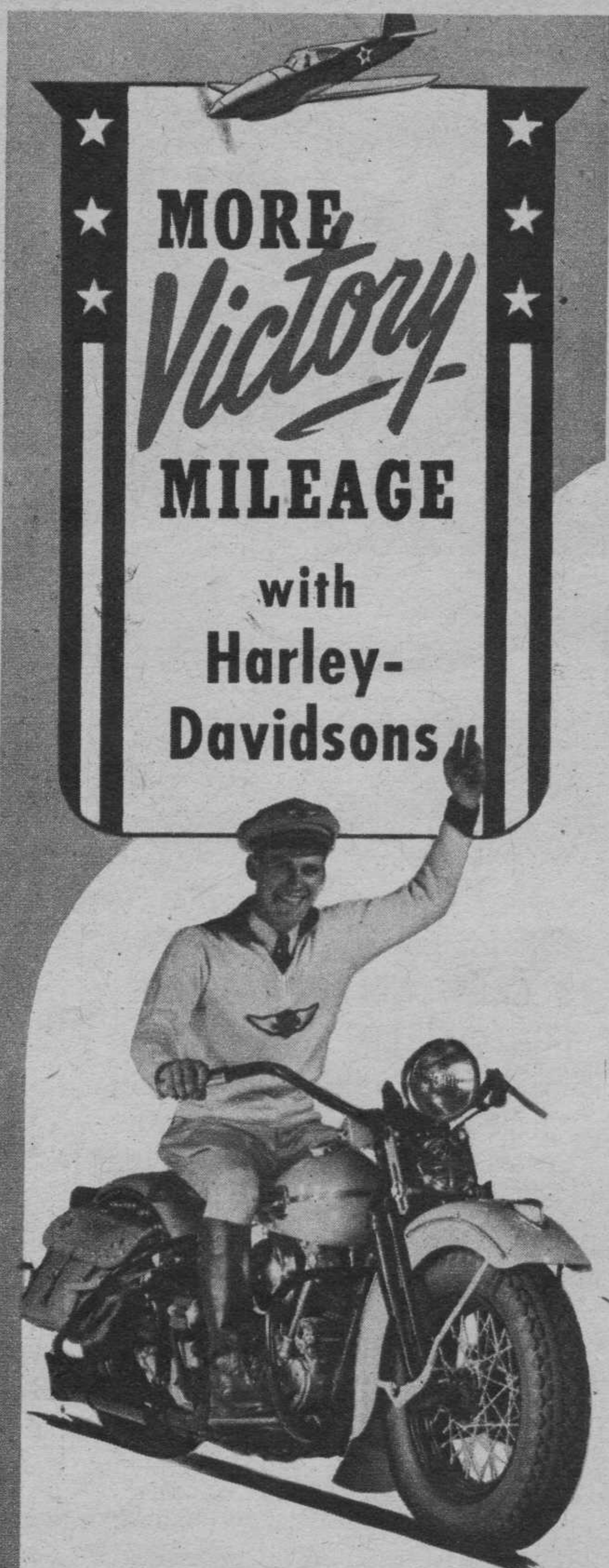
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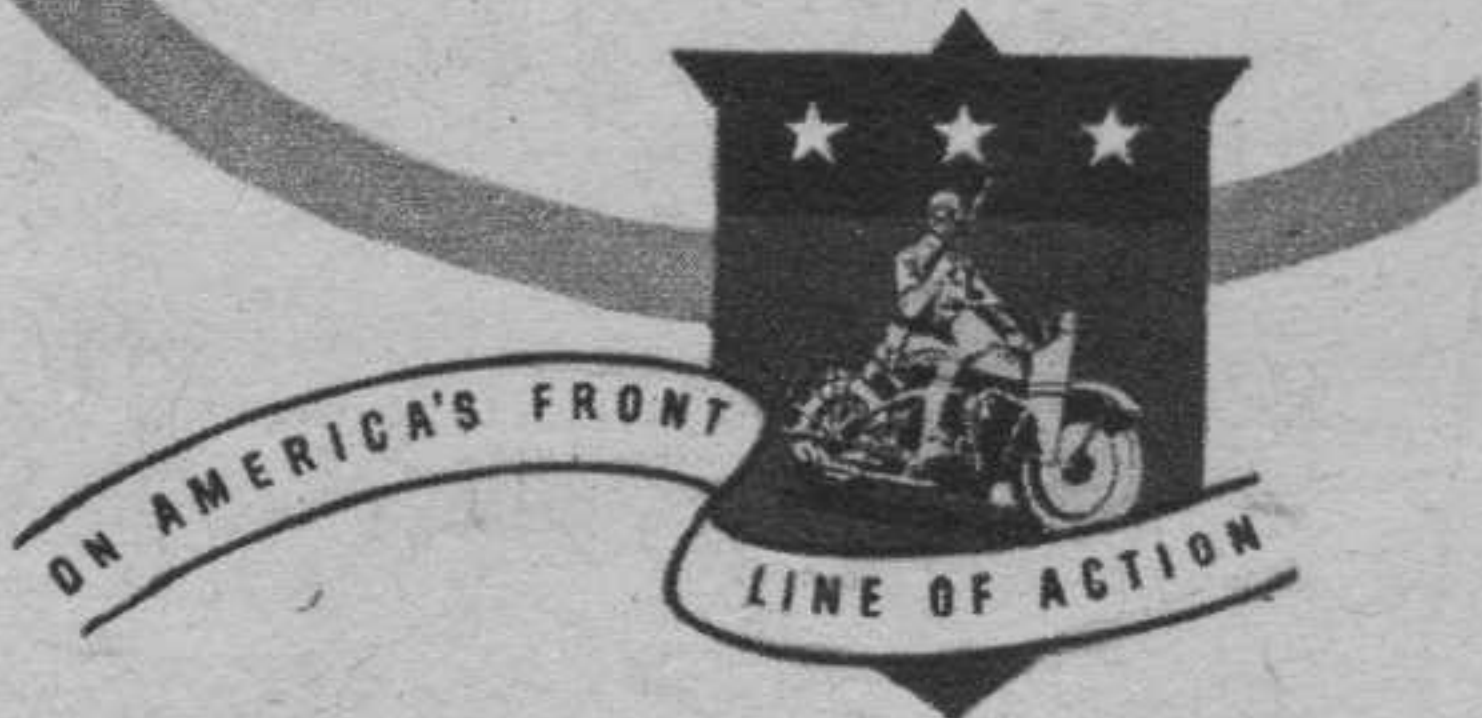
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Looking Ahead for Teachers

(Continued from page 26)



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way that when the controls are operated the proper control surfaces move, and the model assumes the same attitude it would have in full flight. For instance, should the student move the stick to the left, and exert pressure on the left rudder pedal, the left aileron would rise, the rudder would move to the left, and the ship as a whole would bank and turn toward the left.

Although in this project the controls are outside the plane, it is desirable for the student also to see them in their actual place inside, and in relation to the airplane as a whole. The project shown in Figure 2 (a kit will be obtainable from the Comet Model Airplane Co. of New York City) is a model with the control stick and rudder pedals in their actual flying positions. In addition, the controls are movable and actually operate their respective control surfaces. Probably the most valuable use of this model for preflight training comes with practice of actual flying maneuvers. Many books, such as Jordanoff's "Your Wings," explain the handling of the controls in flight. Have the students simulate take-offs, landings, climbs, glides, turns and note the position of the controls and control surfaces in each maneuver. This will be valuable both for familiarization and co-ordination.

This model will also help the student realize that actually only a very small movement of the controls is necessary for ordinary flying. Valuable instruction time will be saved by this knowledge, for one of the most common faults found by CAA instructors in beginning airmen is over-control.

When the student has familiarized himself with the actual movements of the controls, the next step is to get the actual feel of the ship in the air. Once again this will save later instruction time. The next two projects are designed with this purpose in mind. The first consists of a seat with a control stick and rudder pedals located in the conventional positions. (Figure 3—full-scale plans will be obtainable from NAA.) When the controls are operated, the seat assumes the position in relation to the ground that the actual plane would take in flight. The movement of banking, for instance, is strange to people starting to fly, and in this "ground flying" the prospective pilot

will become accustomed to being tilted at an angle to the earth. This project further impresses on the student the necessity for only small control movements in normal flight attitudes.

A slightly different approach has been made to the subject of flight movement familiarization in the next project (Figure 4—plans to be obtained from the NAA.) While the seat in which the "pilot" sits remains fixed, an artificial horizon in front of him shows him the plane's relation to the ground as he moves the controls through the different maneuvers. This is not only helpful when the time comes for actual flight training, but also gives some familiarity with instrument techniques. In modern instrument flight the relation of the plane to the ground can only be determined by the study of such devices as the artificial horizon.

In the aviation-minded world of the future, however, it will not be enough to know the mere mechanics of flying, the motions you go through to make the ship obey you in the air. Boys and girls of today will be the men and women who will design the superships of tomorrow. They want to know the whys and wherefores as well as the hows of flying. What better way to teach them the elements of design and aerodynamics than with a miniature wind tunnel, one in which they can actually check the performance in terms of lift, drag, efficiency and stability of models they themselves have built? Such a wind tunnel (Figure 5) will shortly be available in kit form from the Comet Model Airplane Co. Once assembled, the wind tunnel will teach boys and girls why planes stay in the air, what types of wings, fuselages and other parts of the plane are the most efficient in keeping them up there. They will learn just how a designer goes about building a plane which will measure up to certain specifications.

With these projects as part of your preflight program, whether it be in school or some other group activity, you may be sure that your boys and girls will have equipment which will help them to learn to keep America's wings strong.

(Note: The address of the National Aeronautic Association mentioned in this article is 1025 Connecticut Ave., N. W., Washington, D. C.)

Why the Focke-Wulf 190?

(Continued from page 8)

Luftwaffe's machines had been withdrawn to the warmer Ukraine. The winter was so severe that the glycol engine-cooling solution froze in radiators and completely ruined engines. (In the Finnish war, Russian engines were permitted to idle all night to keep them warm.) Later, the Nazis turned to heating their cooling fluid, so that their ships would be better prepared for action when needed.

The twenty-second take-off figure previously boasted as being sufficient to meet any air attack was completely blasted. The process of pouring in not only cooling fluid but also heated oil and especially prepared synthetic gasoline was such a lengthy one that Red offensive craft were able to approach, attack, and carry out their missions before fighter opposition could be put into the air in ef-

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e numbers. During those days Germans had to rely mostly on aircraft defenses, but these were very ineffective because of the hopping approach favored by an fliers.

a matter of fact, the now-obsolete single-seat Henschel Hs.123B dive bomber, which mounted two synchronized small-bore machine guns and had a top speed of 180 m. p. h. at 12,300 feet, was drawn into training schools in large numbers and sent to the Russian front for fighting purposes as well as dive bombing. This was why the ancient and Chato fighters were able to dominate the skies, even though they greatly outmaneuvered and outperformed by standard first-line German fighting types. The Hs.123B had been used for combat on a large scale since the Battle of France, because of its low speed and poor defensive armament, but it was employed in Russia because it used an air-cooled engine and was thus better able to weather the subzero temperatures, and required less preparatory servicing than the speedier and more modern fighters fitted with liquid-cooled in-line engines.

Until this writing, all of Germany's actions in this war have been defensive, with the exception of last year in Russia, but the very design of the Fw. 190 proves that the Nazis are expecting not only another winter campaign but a possible stalemate in the east, and also another front in the west, and they are accordingly preparing for these eventualities. This is shown by the statement of a British pilot who flew a Fw. 190 right down intact over England. He said: "It is a sound job of its design but it has certain limitations. What I would call a good defensive fighter. It was not built for offensive use in the sort of sweeps we are now conducting over northern France." A startling fact, considering that all of Germany's former first-combat types were built solely for blitz warfare and are next to useless in defensive action!

There is really nothing revolutionary in the design of the craft, and a study shows that, as far as external lines are concerned, it is somewhat of a cross between the Curtiss A and the Vultee Vanguard. The design is a monocoque structure and covered with flush-riveted stressed skin. All movable control surfaces are faced with fabric.

Top speed of the new Fw. is 375 m. p. h. at 18,000 feet, and cruising speed is 300 m. p. h. Specifications: wingspan, 37 feet; length, 28 feet 11 inches; height, 11 feet 2 inches; wing area, 194 square feet. From these figures the ship is in virtually the same class as the Spitfire, though with forty-eight square feet less wing area. The more lightly loaded Spitfire has demonstrated an ability to "climb" inside of the Fw. 190.

The Germans did not make any use of a makeshift job on their new liquid radial *Bayerische Flugmotoren* (formerly *Bayerische Motoren Werke A. G.*) BMW 801 engine, as might be believed, because this is almost a virgin field for their engineers; the engine was designed and constructed with the usual Teu-

tonic thoroughness. Some observers insist that the power plant was constructed by the French Gnome-Rhone concern, but while it might be true that this Paris company is building the engines under contract, it is more probable that quantity production is being carried on at the main BMW plant in Eisenach, the industrial city of Thuringia, which is more out of the reach of Allied bombers.

Germany before the war not only purchased various types of aircraft engines from France, England and America, but also received manufacturing rights on at least two U. S. types. These engines were studied minutely, and the lessons which their manufacturers had learned only through hard experience and experimentation were Germany's almost for the asking. And with this valuable and easily gained knowledge of air-cooled engines, plus the fact that under the Nazi system almost unlimited funds were available for war purposes and experimentation, the Germans were able to fabricate the BMW 801 and incorporate into it even higher horsepower than developed by the American models. As a matter of fact, in discussing this engine, the authoritative British aviation periodical *The Aeroplane* said: "Germany has stolen a march on the rest of the world by producing in the BMW 801 aëromotor the most advanced power unit at present in operation."

The fourteen-cylinder, twin-row BMW 801 develops 1,580 h. p. at take-off and 1,460 h. p. at 16,300 feet. Because of its beautifully engineered streamlined cowling it undoubtedly has the equivalent of several hundred extra horsepower over the average power plant. The engine is about the size of the Wright 2,600 cubic inch and somewhat smaller than the Pratt & Whitney 2,600 cubic inch engine.

The engine has no carburetor but uses the direct fuel-injection feed system; the injectors are in the back part of the cylinder heads between the two valves. Fuel injection, while a complicated mechanism, permits the use of lower octane fuels. Too, motors having fuel injection don't cut out in a sudden dive or other maneuvers that sometimes affects motors with conventional carburetion. The least efficient parts of the engine arrangement are the flame-damping exhausts; located under the cowling cooling flaps, the exhausts serve their purpose of eliminating all telltale flame (the Fw. 190 is also a night fighter) but have no ejector effect upon performance. This should also make the engine less efficient because of the back pressure created by small escape ducts. Warmed air not expelled through the exhausts is used for de-icing and cockpit heating.

Because of the small frontal area of the engine, a fan arrangement is used to cool the engine at idling speeds. Having twelve blades, the fan is mounted immediately behind the propeller and is geared to rotate at 3.14 times propeller speed. The oil cooler is in the leading edge of the cowl, and thus streamlining is not affected by usual arrangements.

According to British Air Ministry information, the engineering and aerodynamics of the engine are fine.



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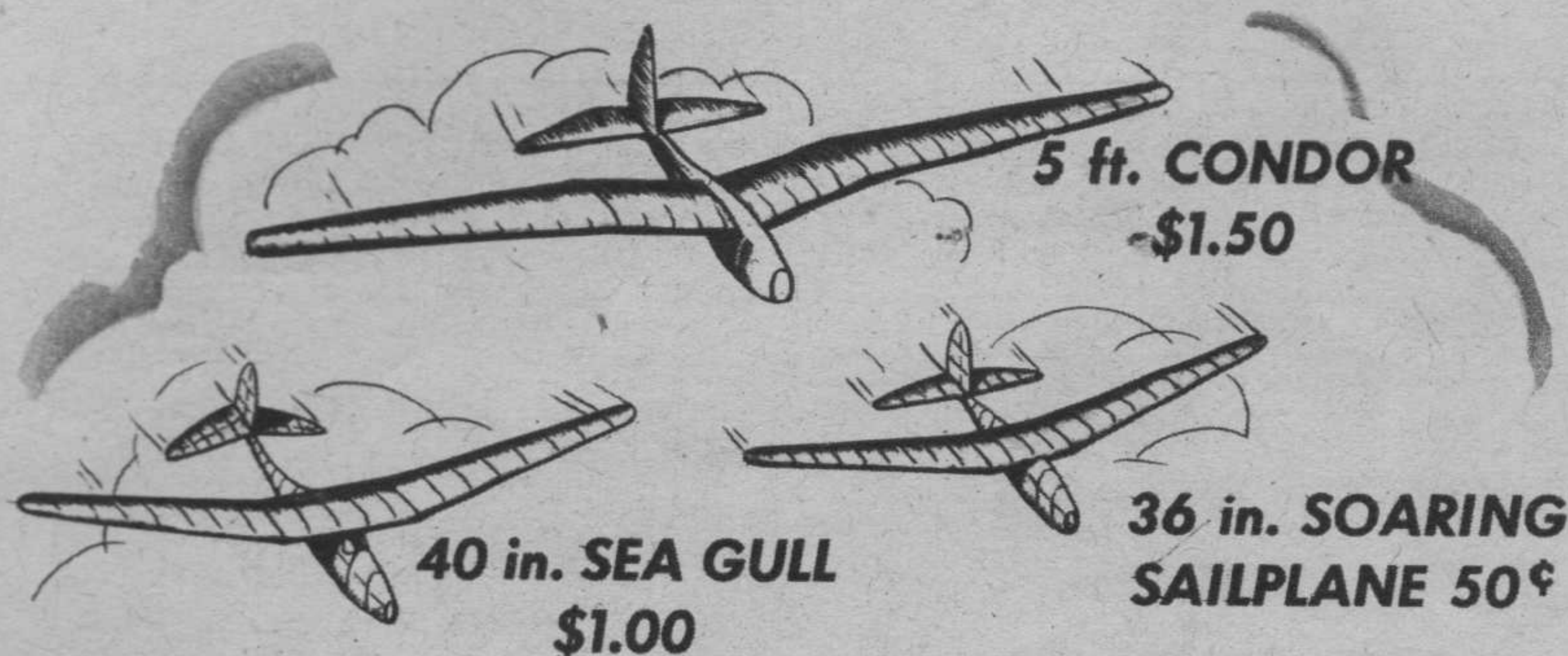
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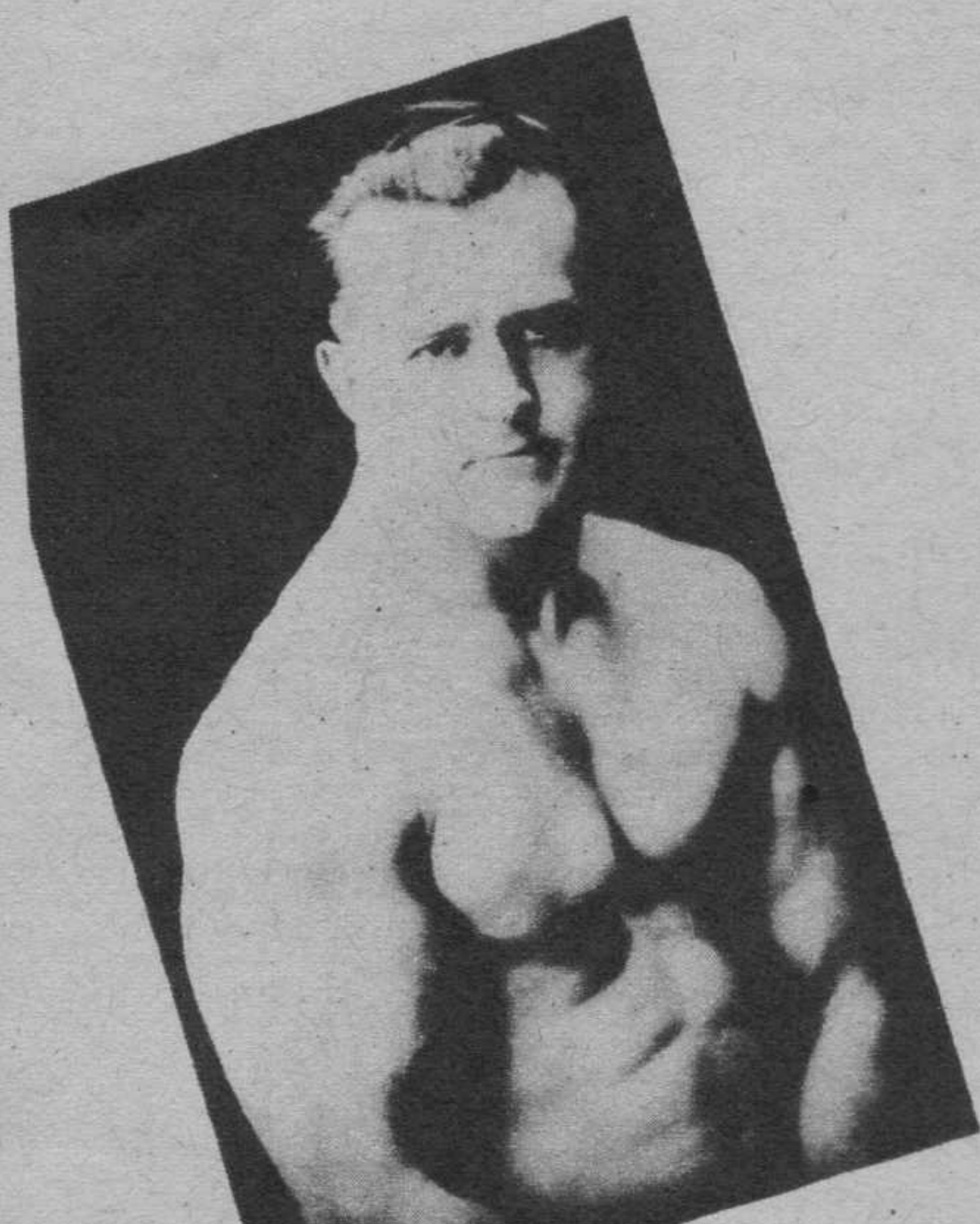
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The Man Who Saved Britain

(Continued from page 15)

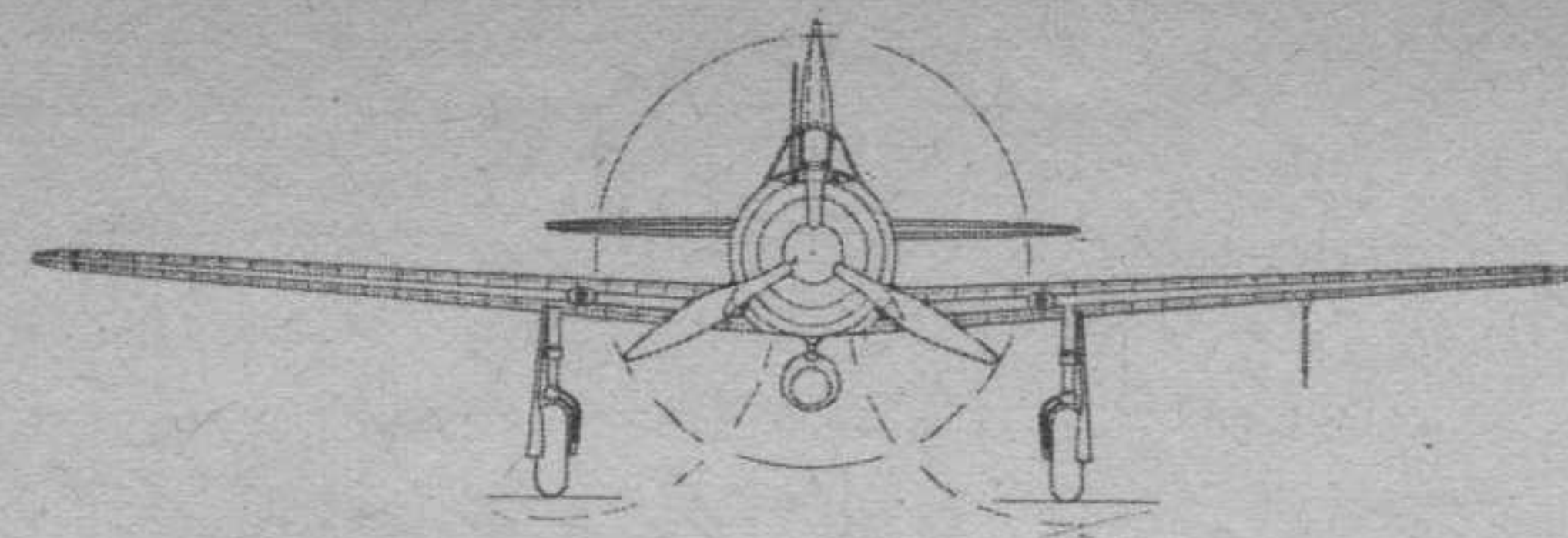
designer of the company, which had little or nothing to do. Aviation progress that had rocketed during the war days had stopped flat in its tracks.

Fortunately for him, the men who had been taken over by Vickers had enough money and sufficient enterprise to be interested in international high-speed flying. If flying was to be a sport, the directors figured, there was no reason why the British aviation industry should not be represented. Way back in 1912 a certain M. Schneider, son of the French armament tycoon, had put up a trophy for an international seaplane race. Mr. Scott-Paine, the managing director of Supermarine when Mitchell had been hired, wanted to build a flying boat to take the trophy back from Italy. He gave Mitchell the assignment, and Mitchell's Sea Lion won the race at Naples at an average speed of 146 m. p. h.

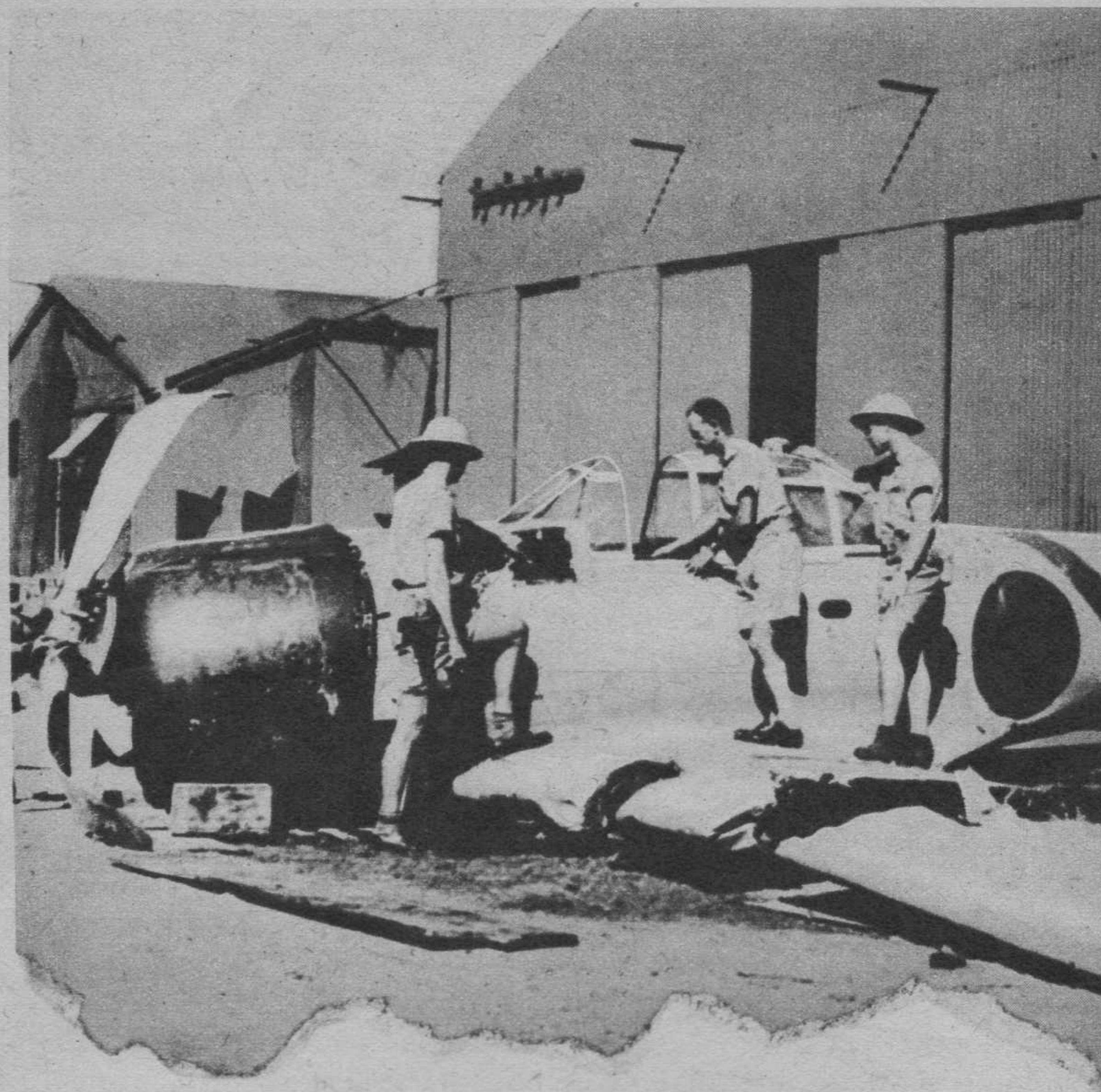
In 1923 something happened. The American navy and the Curtiss Aircraft Co. sent a team over to Cowes, England, and lifted the Schneider Trophy with considerable ease. Mitchell was an open-minded designer. His enthusiasm for learning something new enabled him to learn a lesson from the defeat. He talked with the Curtiss designers on their ideas of reducing pressure on the leading edges of the planes at high speed by giving the planes sharpened leading edges. The trim, speedy Curtiss planes, with their D-12 motors, fired his imagination. He had to be patient, however, because the Air Ministry began to call for big flying boats.

Mitchell set to work. From his board came a steady flow of big seagoing craft such as the Southampton, the Scapa, the Stranraer, the Walrus—an amphibian that could land on the desert sands of Australia as well as operate as a seaplane. His huge Southamptons were undoubtedly the best flying boats of their class ever constructed. The Supermarine workers, many of them the descendants of generations of ship and yacht builders, used to say that Mitchell knew every nut, bolt and joint that went into his aircraft. But as he worked on the big ships there was always on the shelf in front of his desk a wooden model he had made himself, the model of a fast little plane he wanted to build one day. The little model he had carved himself was his pride and joy, perhaps his inspiration. In everything he did he was an enthusiast, whether it was creating a big flying boat or enjoying a relaxation in one of those quiet country inns for which the south of England was noted. His engineering training stood him in good stead, however, as discipline. He never allowed enthusiasm to run away with practicability. He could work on two designs at the same time, a big ship and one of his speed machines.

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ing boats were tough enough to stand any strain put on them. They were more than flying boats, they were flying ships that rode safely wild winds without damage to hulls and wing structure. Mitchell, however, had the idea that the airplane must be a fast thing as well as a strong structure. He always hankered after building fast planes, and the 1923 Sea Lion was only a taste of what was to come.

One day Reggie got the chance he had been waiting for. The Supermarine Co. asked him to build a plane to win back the Schneider Trophy. How much thought and work Mitchell had put into his design, long before he was asked for it, is shown by the fact that he received the order in February, 1925, brought the aircraft to the assembly stage in the following month, and had it in the air the following August.

The machine was unusual, alarming, and an arresting challenge to the existing aeronautical design. Mitchell foresaw the day when metal would fly faster than wood and canvas. He may even have thought of fighter ships as flying "ironclads." He wanted to improve the tensile strength of steel, tubing and aluminum alloy. He wanted to put an end to the practice of lumps and bumps in airplane design, regardless of the principles of cutting down wind resistance. He knew, too, that wing flutter was the enemy of speed, that it would have to be overcome at all costs before an aircraft could appreciably increase the record he had already set up with his Sea Lion. The experts gaped and wondered at his creation. It was the first speed machine to have no external bracing wires, a cantilever mid-wing monoplane. Equipped with huge floats and a 700 h. p. Napier Lion engine, it put up the world's record to 226 m. p. h. The ship contained many new features, one of which was steel tubular construction for the center of the fuselage to which the big motor was bolted, and the wing was in one piece. Then came tragedy. When making a test flight for the Schneider Trophy competition, which was to be held at Baltimore, the craft developed wing flutter and was wrecked. The know-alls wagged their heads, but the Supermarine Co. had confidence in Mitchell.

While working on the Scapa, a giant flying boat, he also produced the S.5. This was a low-wing monoplane with external bracing wires. Mitchell crammed every ounce of his engineering genius into that craft. He built the radiators into the wings flush with the skin surface, so there was no added drag. He put the gas tank in one float to reduce the effect of propeller torque. The fuselage was all metal with a metal skin. The S.5 won the trophy for Britain at average speed of 281 m. p. h. Later, over a straight course, the same aircraft achieved 319.57 m. p. h.

I shall always remember that race at Italy's famous Lido near Venice. General Balbo, the jovial bearded Italian, was good nature personified. We had a wonderful time. After the race, a German reporter asked Mitchell if he could adapt his winning design to land use. "Yes," he said, "it

could be done, I suppose," and said nothing more.

The reporter wanted to talk. "It would be just a case of fitting wheels, I suppose," he insisted. Still Mitchell didn't answer. He never liked to talk aviation to people who did not understand it.

"But you would need an extra pair of wings," interpolated Balbo with a roguish smile.

"Oh, so you'd have to make it a biplane," commented the reporter.

"Not quite," replied Balbo, "they'd be angel's wings for the pilot—just in case he tried to land."

Mitchell, however, knew that he could design a land-based aircraft as fast or faster than his seaplanes. Back in England, he designed the new craft for the next contest. These were all metal, and were fitted with a twelve-cylinder Rolls engine. One of these machines, after it had won the race with considerable ease, put up a world's speed record of 357.7 m. p. h. Mitchell had achieved a personal victory. He had designed and built an all-metal aircraft and eliminated wing flutter.

Then came his supreme test of skill, and a preview of that supreme ingenuity that still makes the Spitfire the world's premier fighter. For some reason or other, the British Air Ministry refused to put up money for England to enter machines to win the Schneider Trophy outright. The aircraft industry lacked funds, and was hopelessly discouraged by the defeatist attitude that from time to time has marked the British government's outlook toward aviation.

Affairs were at a deadlock when into the arena sailed plump, eccentric millionaire's widow Lady Houston. She hated Ramsey MacDonald and despised Stanley Baldwin. She had moved to the Island of Jersey to avoid paying taxes to a pacifistic and chicken-hearted government, but she was willing to give her millions for national progress. An ex-showgirl, she had a mind of her own, a scathing tongue, and an admiration for young men who did things in the air. She arrived at the Air Ministry one morning flourishing a check for half a million dollars, and announced she would pay the expenses for the British team to compete for the Schneider Cup. It was a great gesture. The government refused, the press and public insisted. When it was decided to accept, there was no time to build new planes, so Reggie Mitchell, now a very sick man, tore to pieces his two S.6s and adapted them to take Rolls motors giving 2,300 h. p. This involved fitting new cooling surfaces and sundry other complications, but within a matter of months Mitchell, who worked himself on the actual construction, had the machines in the air. They were terrific. The Italians took one look at them, and after consulting Mussolini, decided not to compete. It was not fair, they said, to fit such large motors. The race was won at 340 m. p. h., and later in the year one of these formidable craft, with a Rolls engine boosted to give 2,600 h. p. for a very short time, pushed the world's speed record up to 407.5 m. p. h.

Then came the inevitable set-back. Mitchell had accomplished a design-

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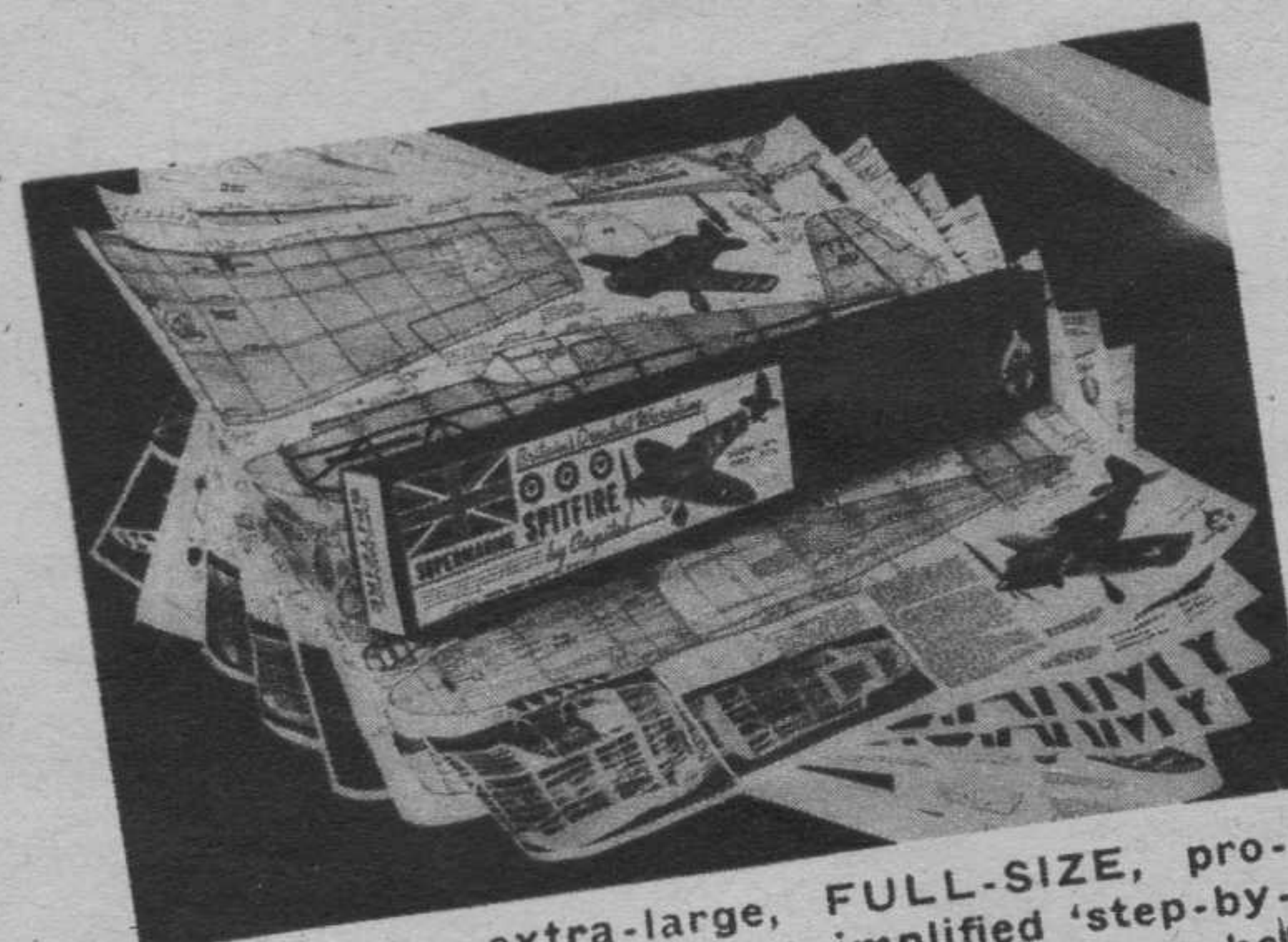
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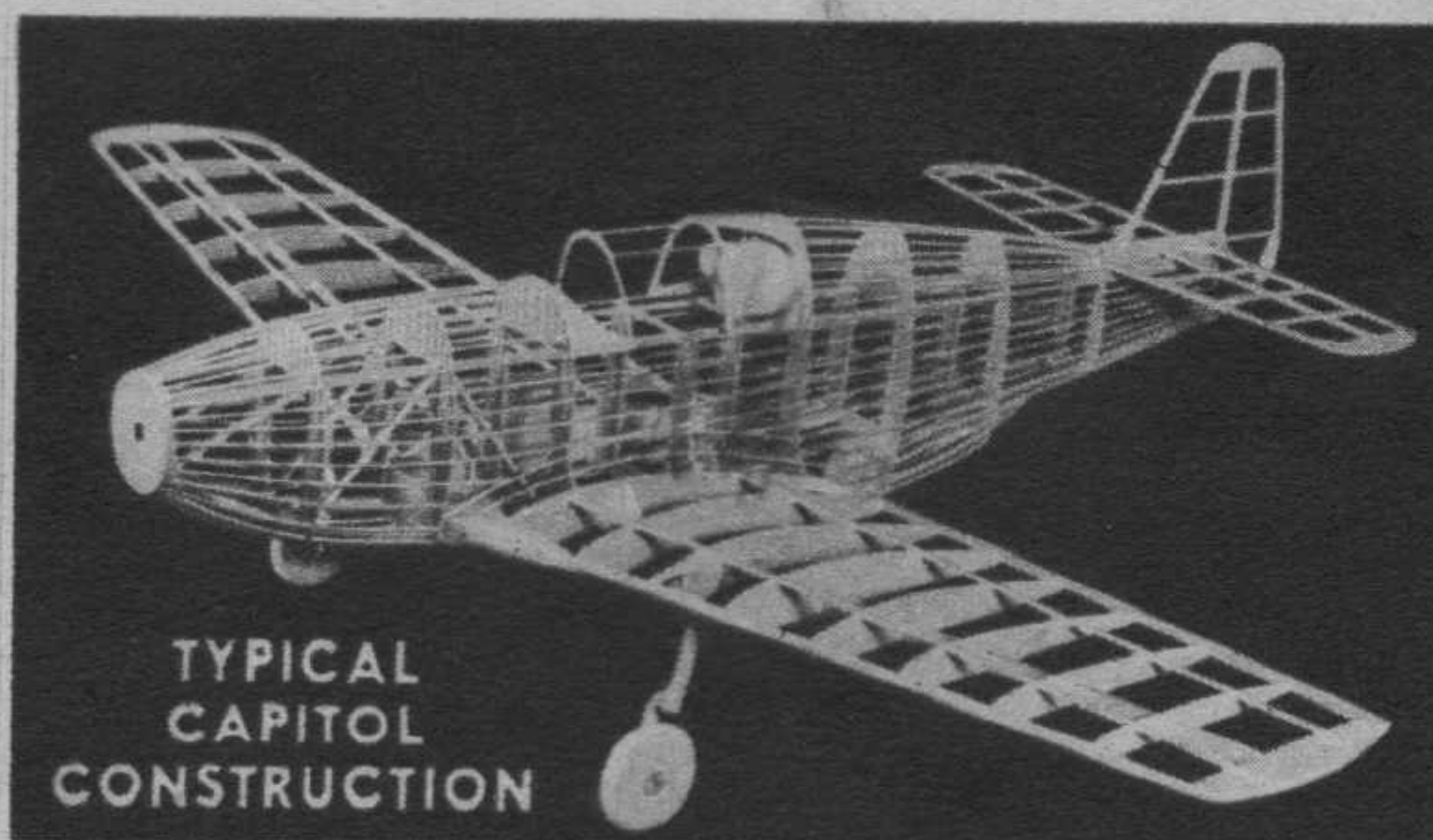
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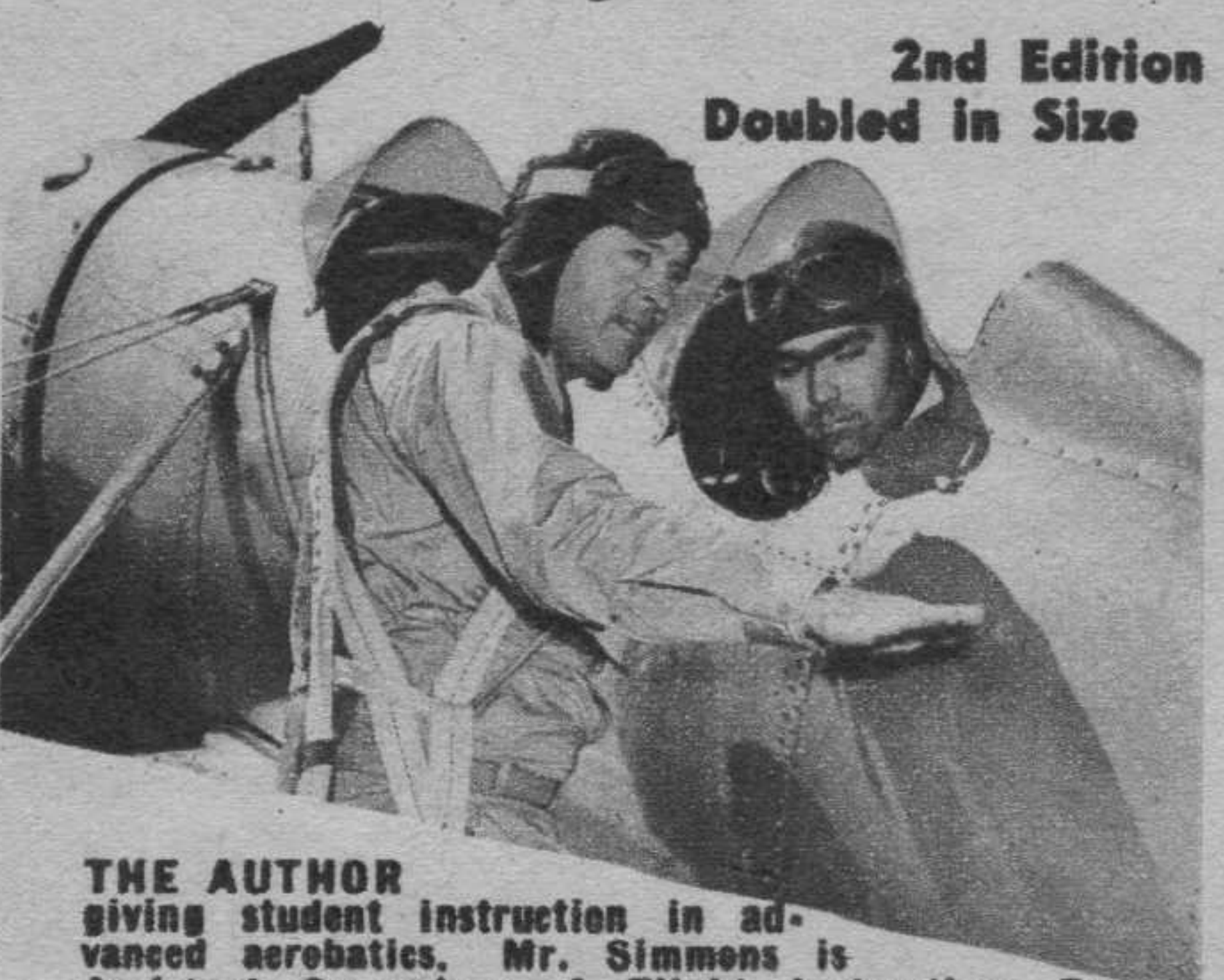
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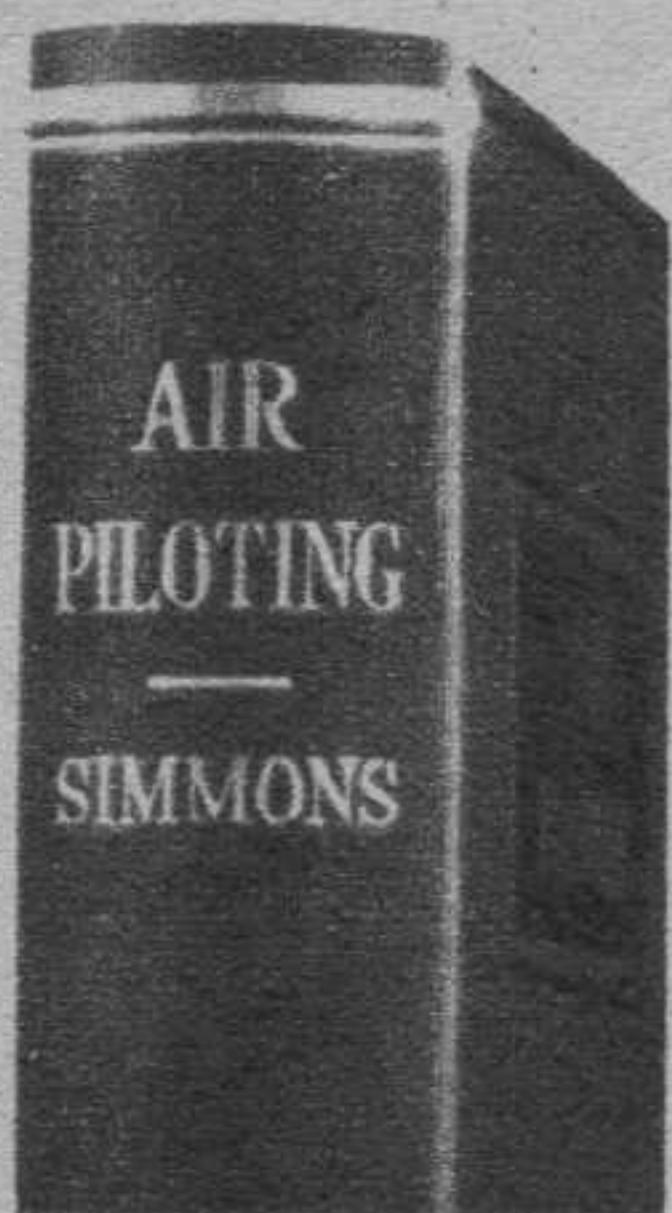
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ing miracle, but it looked as if all the skill and research put into the slim seaplanes were wasted. No one wanted fast seaplanes. The designer who had raised seaplane speed from 146 m. p. h. to 407.5 m. p. h. in nine years seemed to have little to do. Mitchell was sick then. His doctors ordered him to take a complete rest. He made a short trip abroad to Vienna and came back to work. His leisure hours he would spend driving quietly round the pleasant Hampshire lanes in his open roadster automobile. He liked to draw up at secluded spots and read. His health seemed better.

About 1935 the Air Ministry issued specifications for a single-seater fighter. They sent for Mitchell and handed him the specifications. The restrictions on design seemed to him absurd, but he did his best to adapt his treasured design to the antiquated requirements. When his new plane underwent its tests it could only make 230 m. p. h. at 18,000 feet. The restrictions, added to the low-powered engine, had done the trick, and it seemed that the breed of those Schneider Cup winners would be relegated to the aircraft museums. Mitchell was discouraged.

In the Air Ministry, however, he found a friend. Air Marshall Sir Hugh Dowding, who was in charge of the RAF Fighter Command, wanted a ship from Mitchell's design. He was fighting his own little war inside the Air Ministry. He wanted guns. He was insisting on a fighter ship more heavily armed than anything in the air. Dowding was not an aeronautical engineer, but he believed that everything could be accomplished if you tried hard enough. He went to Southampton to see Mitchell and his directors.

As a result of that conversation the Supermarine people, although they had no order from the Air Ministry and no promise of funds, told Mitchell to go ahead and build a land fighter of his own design. Mitchell got busy. A few weeks later his health began to crack and the doctor ordered a rest. The quiet man who was enduring a lot of pain these days shook his head. "Later," he said, "I have a job on." He was working with the enthusiasm of a boy, but it was the skill and experience of a master craftsman that he was putting into the all-metal elliptical-winged ship, with the toughest fuselage of any fighter yet constructed. The lights in his drawing office often burned till morning during these first few months. When he went home to lunch in his old Ford car, which had a specially heated mo-

tor with which he used to play many a joke on his friends, the pockets of his sports jacket were inevitably crammed with notes and blueprints. The Supermarine workers knew this was to be another Mitchell "nut and bolt" ship, and were eager to go to work on it. Three months later, in 1936, the fighter ship that Mitchell had designed free of restrictions, but matching up to specification, took the air. It achieved 360 m. p. h. at 17,500 feet.

It made one brief appearance at an RAF display, and disappeared. We heard stories that there were armament difficulties. Manufacturers and government departments were bungling manufacture. Mitchell took his holiday, which was really a visit to a clinic where a doctor was hoping to cure him. In 1937 he died at the age of forty-two. A year later the first RAF squadron equipped with Spitfires capable of 367 m. p. h. at 18,500 feet, and equipped with eight guns, took the air. Today American, British, Russian, Chinese, Polish, Dutch and Fighting French pilots are flying Spitfires.

The new Spitfire V with a new Rolls motor differs little from the original design of the boy who first worked on ponderous locomotives and who graduated to the design of fighter ships by the way of massive flying boats.

It is a tribute to Mitchell's craftsmanship that he produced the fastest seaplane in the world, and the fastest land fighter with very little loss of pilot life. When the S.5 took the air, experts decided that the human system would never be able to stand up to such speed, that pilots would suffer prolonged blackout periods, and that landing such craft would be an insuperable problem. As far as I know, only one life was lost on these craft, and that was when Flight Lieutenant Kinkhead, D. F. C., RAF, flew into the sea at Southampton when testing the S.5. Kinkhead was flying about 100 feet off the surface of the sea and probably flying faster than man had ever done before, because his preliminary trial had shown what seemed to be astronomical figures. Suddenly the machine dived, and was never seen again. Kinkhead may have shifted his control column a fraction of an inch in error. His terrific speed at such a low altitude gave him no time for correction. That was the only pilot life sacrificed in the evolution of the Spitfire.

After this war, perhaps the United Nations will raise a fitting memorial to the lad from England's "Potteries" who contributed so much, who gave his life that others might live.

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Grumman Wildcat

(Continued from page 41)

Curved sections of $\frac{1}{32}$ " sheet are fitted from Bulkhead D to the top stringers to form the cockpit shape. In the rear, small blocks of hard $\frac{3}{32}$ " sheet are cemented between the stringers to cradle the removable bamboo pin that holds the rubber motor.

A special bulkhead, to which the landing gear is attached, is cut in two pieces from hard $\frac{1}{16}$ " sheet. Details of the landing unit are given. Bend the main landing strut from .040 music wire and then, using needle and thread, sew it to the landing-gear bulkhead. Other parts of the gear are not completed until later; however, the wheels may be made from laminated disks of $\frac{1}{8}$ " sheet at this time. They should have washers or bearings cemented to the sides so they will revolve smoothly.

To assure the correct incidence of the stabilizer, a notch is provided in the rudder into which each stabilizer half is fitted. Construction of the tail-surface parts is so simple that little need be said. Simply build two flat frames of $\frac{1}{16}$ " thick stock over the plans and then add soft $\frac{1}{16}$ " pieces to the sides of each rib and shape as shown in the sketch. Rudder ribs are finished in this manner, too.

Construction of the wing is next. It is made in two parts and it will be necessary to make a right-wing plan. Cut the required number of ribs from medium-grade $\frac{1}{32}$ " sheet. Sand them carefully to exact shape and size and cut the notches for the spar. Spar and leading-edge pieces are cut from sheet stock as indicated, and the trailing edge is a tapered strip of $\frac{1}{8}$ x $\frac{3}{8}$ ". Tips are cut from $\frac{3}{32}$ " sheet. Assemble the parts right over the plans, using pins to hold in place until the cement has set. Finish the parts by cutting and sanding the tips and edges to conform to the airfoil's shape.

For any model to fly well it must have an efficient propeller. A 6" diameter prop is recommended for the model Wildcat. Select a hard-balsa (or white pine) block of the indicated size and shape the blank as shown. Drill the hole for the shaft and then carve a right-hand air screw; work carefully and do a good job. Round the tips of the blades and reduce the thickness of the hub—examine photos of the original model for further details. Use rough and then fine sandpaper to finish and balance the blades. Several coats of light dope with sanding between each will harden and smooth the surface. A free-wheel gadget of some sort will improve the glide if attached to the prop, thus permitting it to spin free once the motor is exhausted.

Make a propeller shaft from .040 music wire. Slip the nose plug, several washers, and the propeller on in the order given. Bend the end of the shaft to suit the free-wheeler used, but if none is being used, bend the end at a right angle and cement to the hub.

Prepare the frames for covering by working over the entire structure

with fine sandpaper. The author likes to sand the bulkheads to a scalloped shape so only the stringers will touch the covering; this makes a neater job. Regular colored tissue is used and thin banana oil or dope is the adhesive. Use a separate piece of tissue for each side of each wing half, rudder and stabilizer. Wing tips and the like require individual pieces, too. When covering the fuselage, it will be necessary to use numerous small pieces to work around the curves without wrinkles—this is especially true where the fuselage flows into the rudder. Individual pieces of tissue must be lapped carefully to the next piece for best results. Spray the covered parts lightly with water to tighten the tissue; the flying surfaces should be held in a level position so they will not warp. Clear dope is not applied until the parts have been assembled.

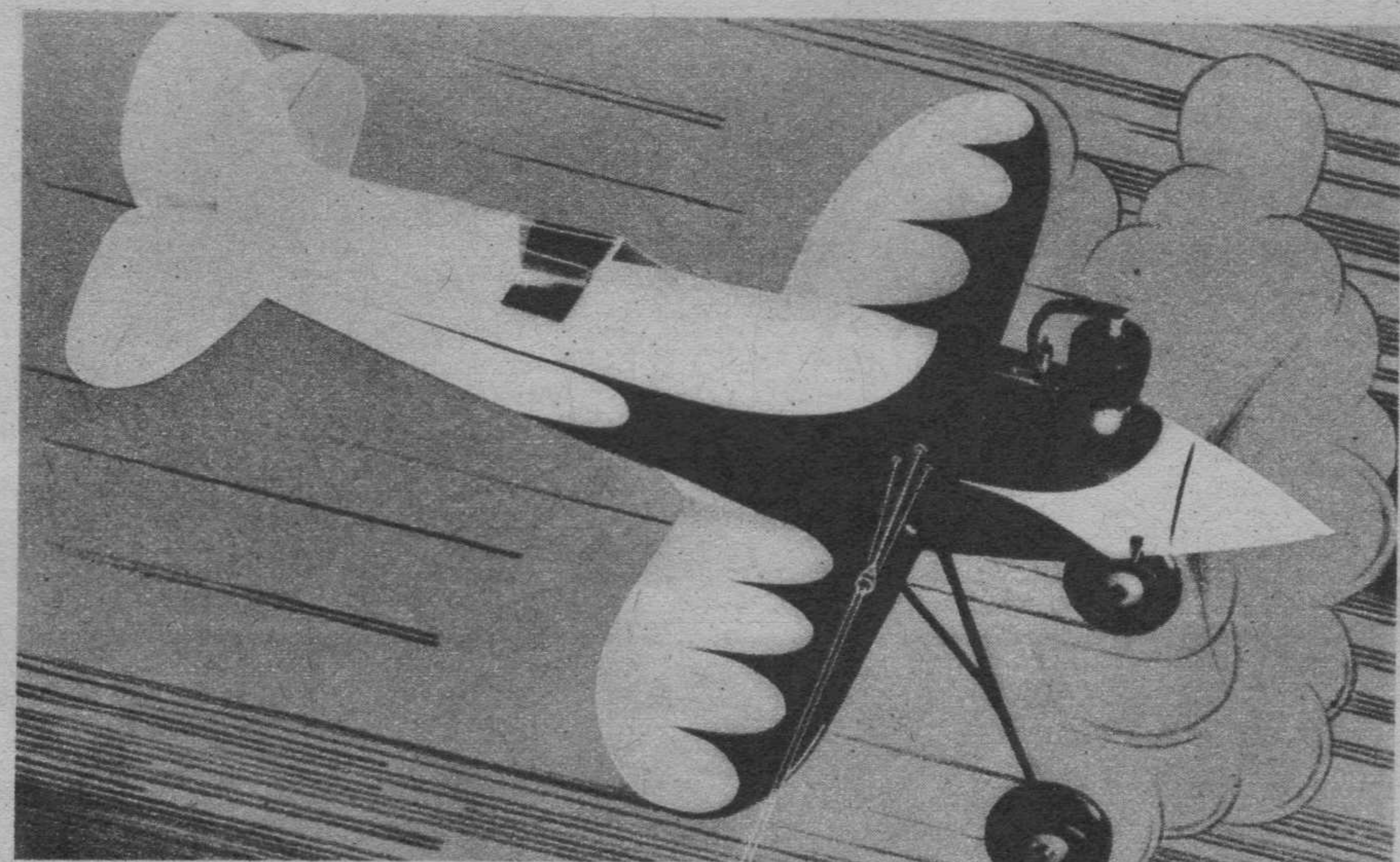
Assemble your model Wildcat in this manner: Cockpit details are finished first. Before cutting the thin celluloid, paper patterns of the parts should be made to fit exactly; use the cut-and-try method to accomplish this. Cement the celluloid to place, being careful not to smear adhesive on the inclosure. Structural details are represented by tissue strips doped to place. If the structures have been made with accuracy, wing and stabilizer incidence will be correct. Cement the stabilizer halves to the slot in the rudder, being careful to align them perfectly. End ribs of each wing half are butted against the sheet filler on the fuselage; make these joints strong. Dihedral of each wing is one inch. One or two coats of thin dope can now be brushed on the entire model.

Addition of the various minor details completes the job. Slip rubber tubing (or any other kind) of the correct diameter over the main landing-gear struts. Wells into which the undercarriage retracts are represented by black tissue doped to the covering. The four V-shaped auxiliary parts of the landing unit are for scale appearance only, and are made from rounded pieces of bamboo. They are attached to the fuselage, but are not secured to the main strut, thus permitting it to spring freely and absorb shock. Wheels are painted before being fixed to the axles by washers soldered to the ends. Thin sheet balsa covers colored to match the fuselage may be added. The tail wheel and similar items may be made from scraps. Cowling details, flying-surface outlines and even insignia may be made from colored tissue. However, the new decal insignia are neat in appearance and very convenient to use. The builder desiring most detail can install a dummy motor within the cowl without harming the flying ability. Naturally, the propeller and similar wood parts should be doped to match the color scheme.

FLYING

About six strands (three loops) of $\frac{1}{8}$ " flat brown rubber will be needed

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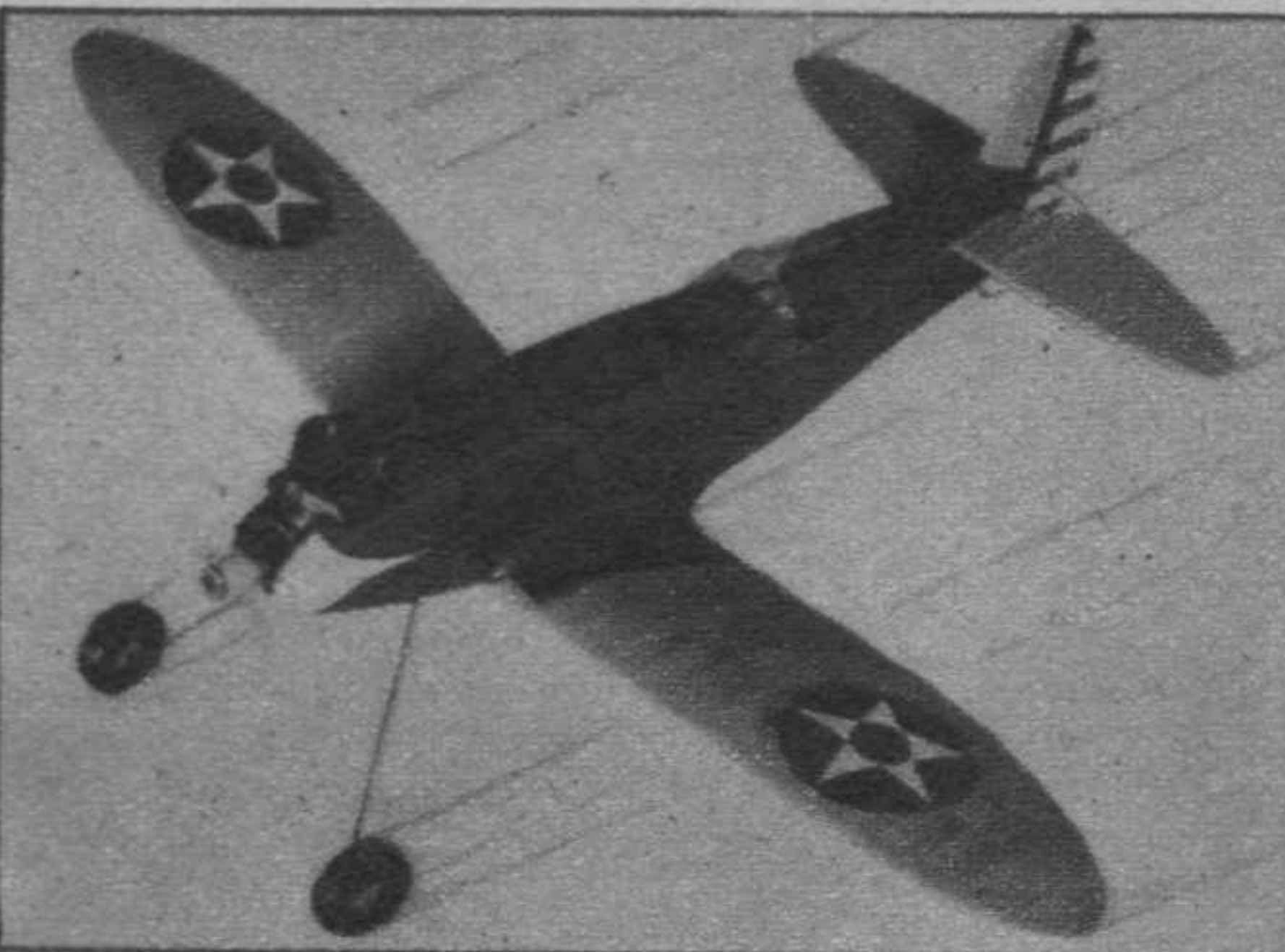
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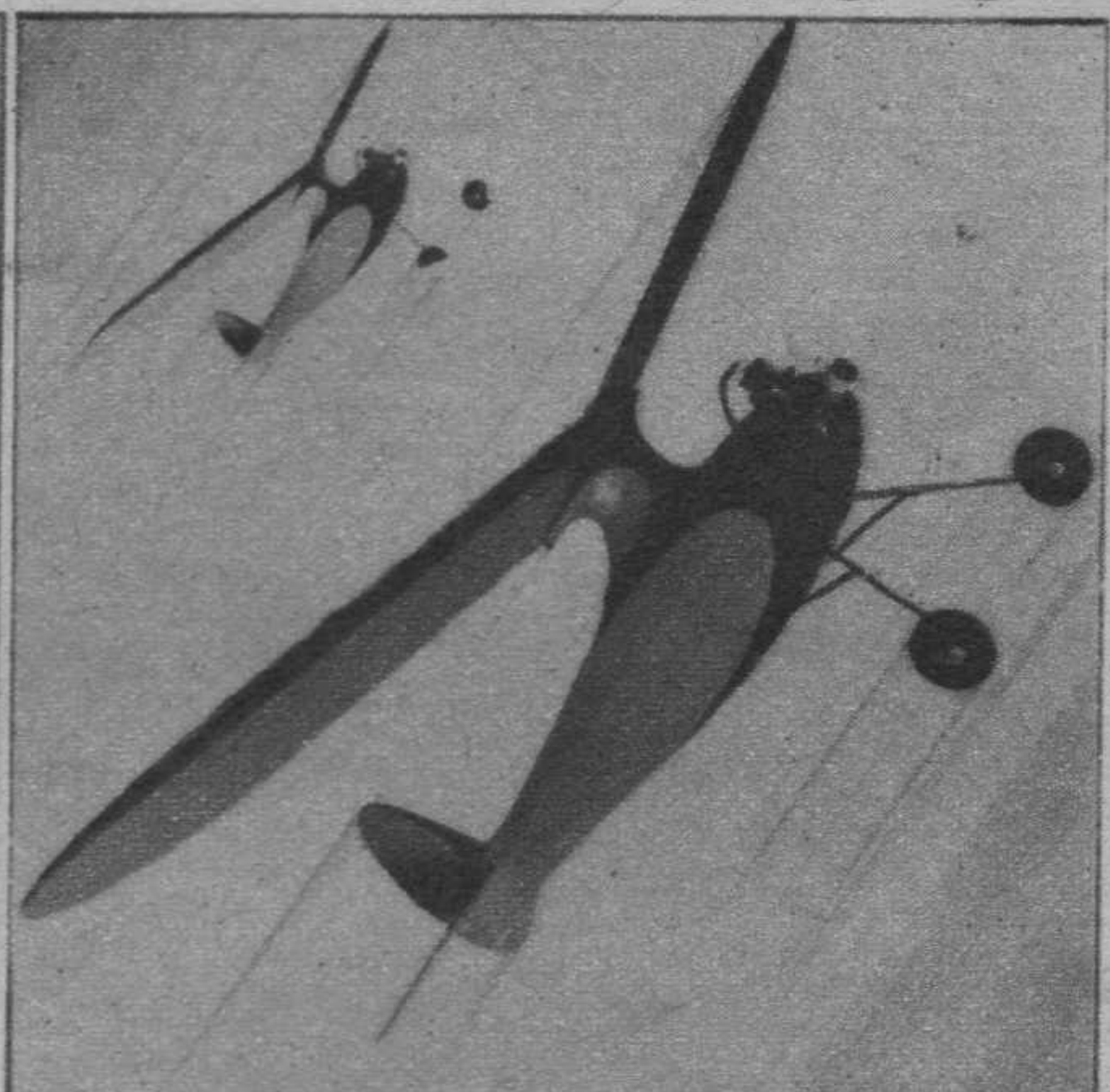
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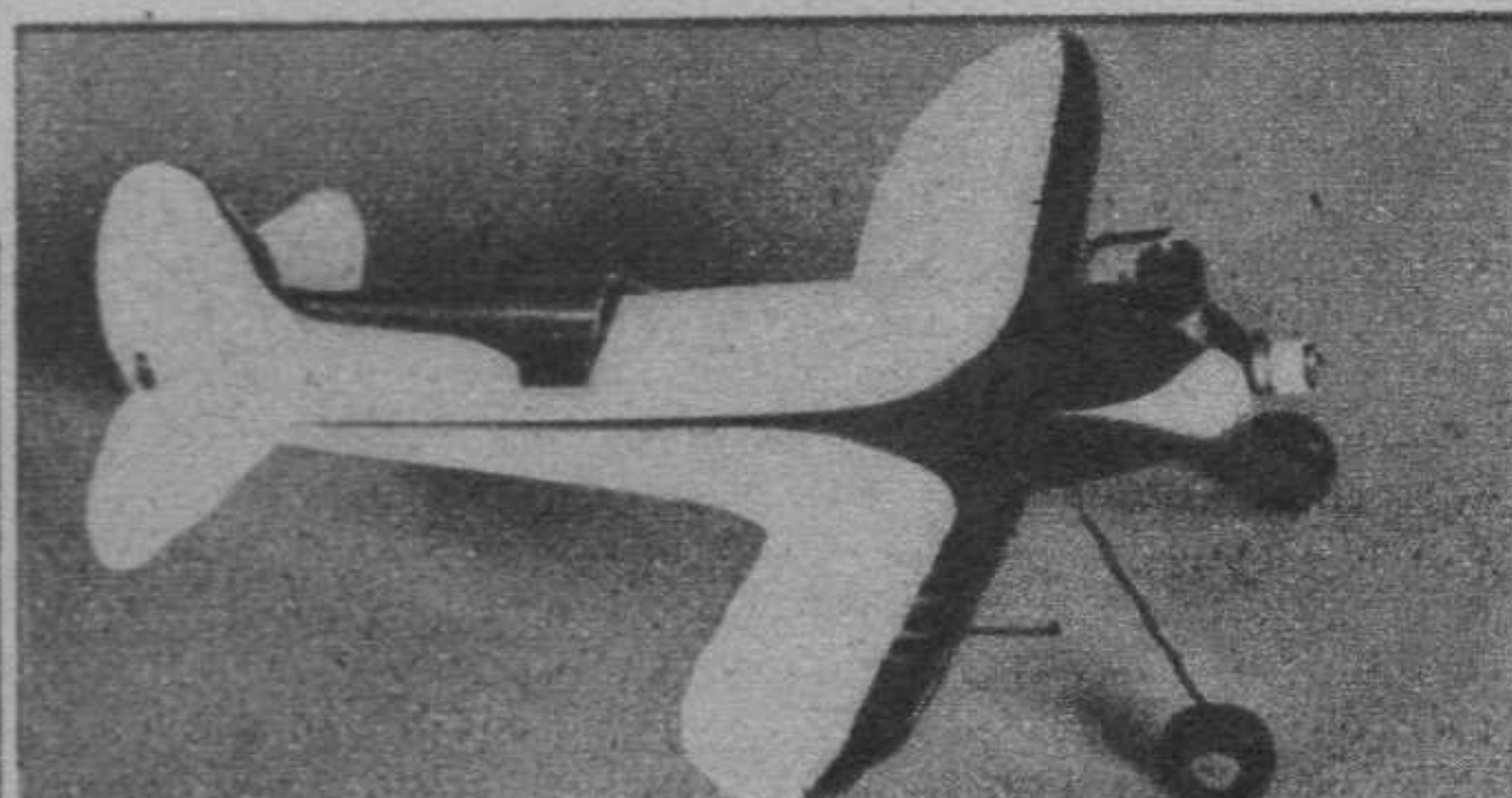


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to power your flying Wildcat. It is best to lubricate the motor before placing it within the fuselage. Attach the strands to the prop shaft and then drop the other ends through the nose; they are held by a thin bamboo pin in the rear.

The Grumman Wildcat should be made to balance at a point about halfway back from the leading edge. Add weight to the nose or tail as required to obtain this balance, as only minor adjustments are made by warping the tail surfaces. Glide the model over soft grass, making any further adjustments for a good glide. Power-flight adjustments are made

by offsetting the thrust line. Start with just a few turns and then use more as flights improve. By placing a sliver of wood between the nose plug and nose, the thrust line will be tilted down, thus helping to iron out a stall while under power. Right or left thrust will make the model circle as desired.

Once all the "bugs" that usually show up in the first tests are eliminated, use a mechanical winder to get maximum power and turns from the motor. The author's test model, in spite of its small size and light weight (1.2 ounces complete), flies as realistically as the prototype.

Pinch Hitter

(Continued from page 29)

the legs off the family piano! Almost any type of glue can be used, as parts of the original model were held together with Weldwood, Casco, and regular cement. No difference in strength has been noticed, but it should be mentioned that three coats of cement were used where formerly one sufficed.

Allow the main frames to dry by working on some other part to take up your time. The cross pieces are now cut out according to the lengths given in the top view. The two sides should be assembled directly over the top view before adding stringers. See sketch on plan for details of braces that run through fuselage to support the stringers. Odd lengths can be used here, as they will be trimmed to exact size before the stringers are added. These braces should be fastened to the cross braces and uprights with a few turns of thread and at least two coats of cement to secure them in place. Since the rudder is so simple, it may be assembled right on the fuselage once the curved sheet pieces have been cut out and the outline cemented together. All that remains is to fit the spar in place and bend the cap-strip ribs around it. Do not forget to taper the last inch of

the spar tip so that it blends into the thin curved-sheet outline above it. Wing-mount formers W-1 are now cemented in place, care being exercised that they remain flat while the cement dries, providing a smooth area for the wing to rest on.

The stabilizer is constructed next. Pin down the outlines directly on the plan and place the bottom rib cap strips in their respective positions. The spar is tapered now and fitted in place, followed by bending the top rib cap strips over it to obtain the desired camber. Cut the bottom portion of the rudder to outline shape and cement to the cambered side of the stabilizer.

The wing ribs are cut out of 1/16" sheet pine *en masse*, once a motor-driven jig saw has been located. Maybe one of your friends has a vibrator-type saw, which will be highly satisfactory. Cut eighteen sheets of wood to the necessary width and length, and after they have been lightly nailed together, trace the main rib outline on the top one. Now you can go to town with the saw, but be careful, as an airfoil with smoothly blended curves is the only type that is efficient.

Cut the trailing edge short on two

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State of New York, County of New York (ss.)

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared H. W. Ralston, who, having been duly sworn according to law, deposes and says that he is Vice President of Street & Smith Publications, Inc., publishers of Air Trails Pictorial, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit:

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of these ribs to obtain the #11 ribs. The tip ribs (#12) are now cut out, followed by cutting out the center-section ribs (three required) which are split vertically to allow space for the spar joiners. Assemble both panels on a flat surface and allow to dry well. After propping up the tips $6\frac{1}{4}$ ", the spar joiners may be added (see sketch on plan). After the cement or glue has dried, cover the center-section leading edge with two-ply bristol board or similar material to strengthen the center portion that has a "cut out."

Use colored silkspan for covering all the framework now assembled. Spray all covered areas with water and allow to dry. Pin wing and stabilizer down so that warping will be minimized while the tissue is drying. Three coats of clear dope should give the model a slick appearance and help protect it against spilled oil and gas. A wide stabilizer platform may be cemented to the bottom of the fuselage to steady the stabilizer, but it is not absolutely necessary.

The motor mount is now assembled. The sketch of the assembled mount should clear up any questions. The full-size pattern for the nose bulkhead appears on the plan. After inserting the $\frac{3}{8}$ " square motor runners in the nose bulkhead, gussets should be added to reinforce them. Fill in the bottom rear of the motor runners to obtain a platform on which the battery box is fastened later. The landing gear is bent to shape directly over the plan and should check with the full-size pattern before it is fastened in place. Drill small holes in the bulkhead and "sew" the landing gear on with fine copper wire. Cement or glue should be applied liberally now to give the nose and landing gear plenty of strength.

After slipping the wheels in place, solder retaining washers on. Follow the diagram given on the plan when assembling the ignition system. Use a hot iron and don't skimp on the quality of solder or flux, lest you let yourself in for a mess of trouble later. Although designed for the most compact unit possible, the ignition arrangement may be deviated from if desired. Only remember that moving the heavy parts, such as coil or batteries, will shift the c. g., spoiling the flying set-up.

The cowl is made by assembling a light framework of formers on the plan and covering with two-ply bristol board. After covering with silkspan, cut cooling hole and make a paper exhaust stack to direct the exhaust away from the fuselage. If an Austin timer has been used, a hole should be cut in the top of the cowl for access to the timer handle. It should be noted that the timer on the original model was trimmed on one side to allow it to be cemented nearly flush with the nose bulkhead.

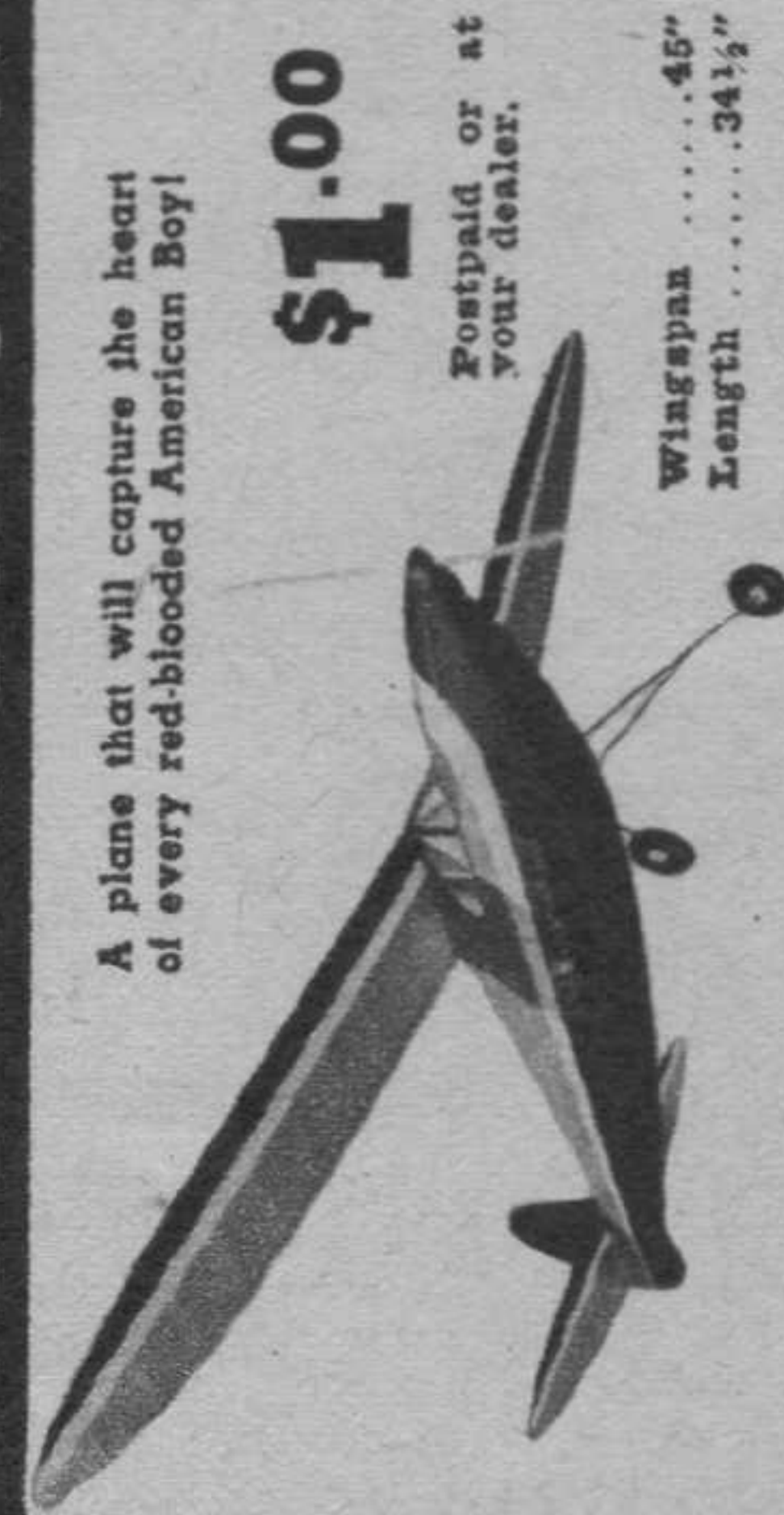
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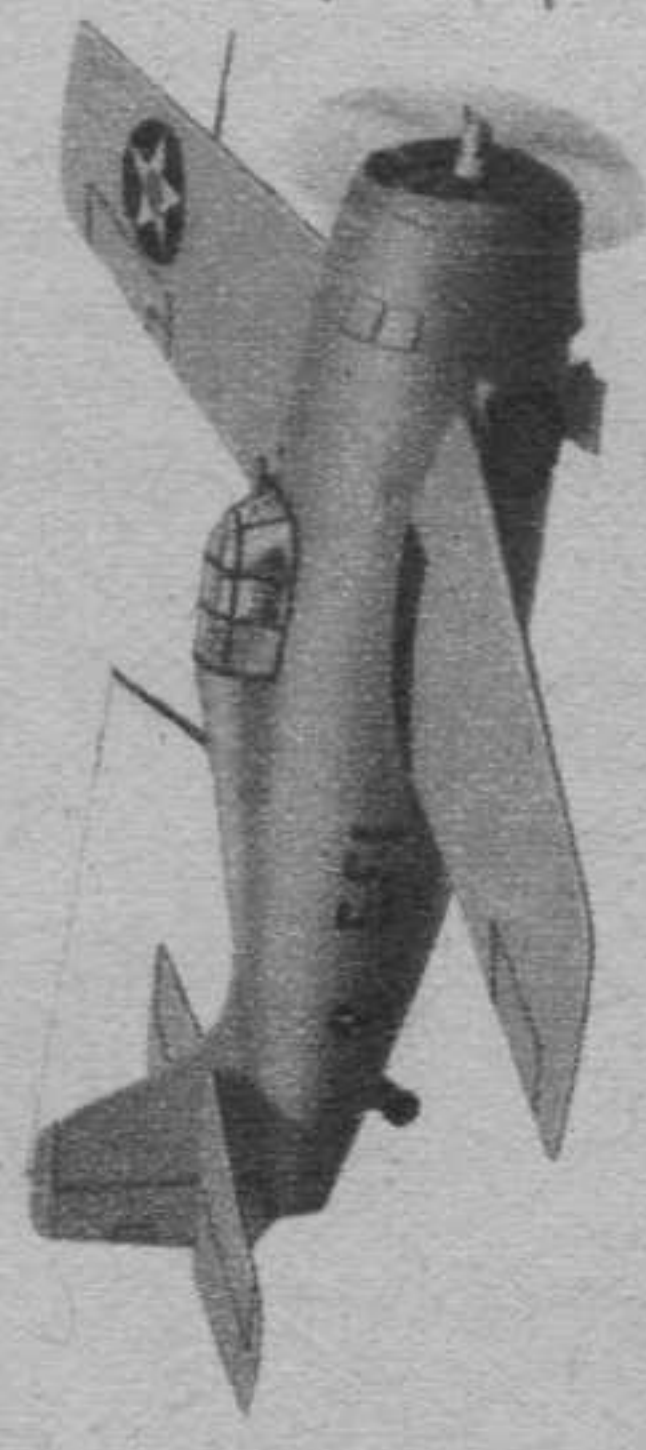
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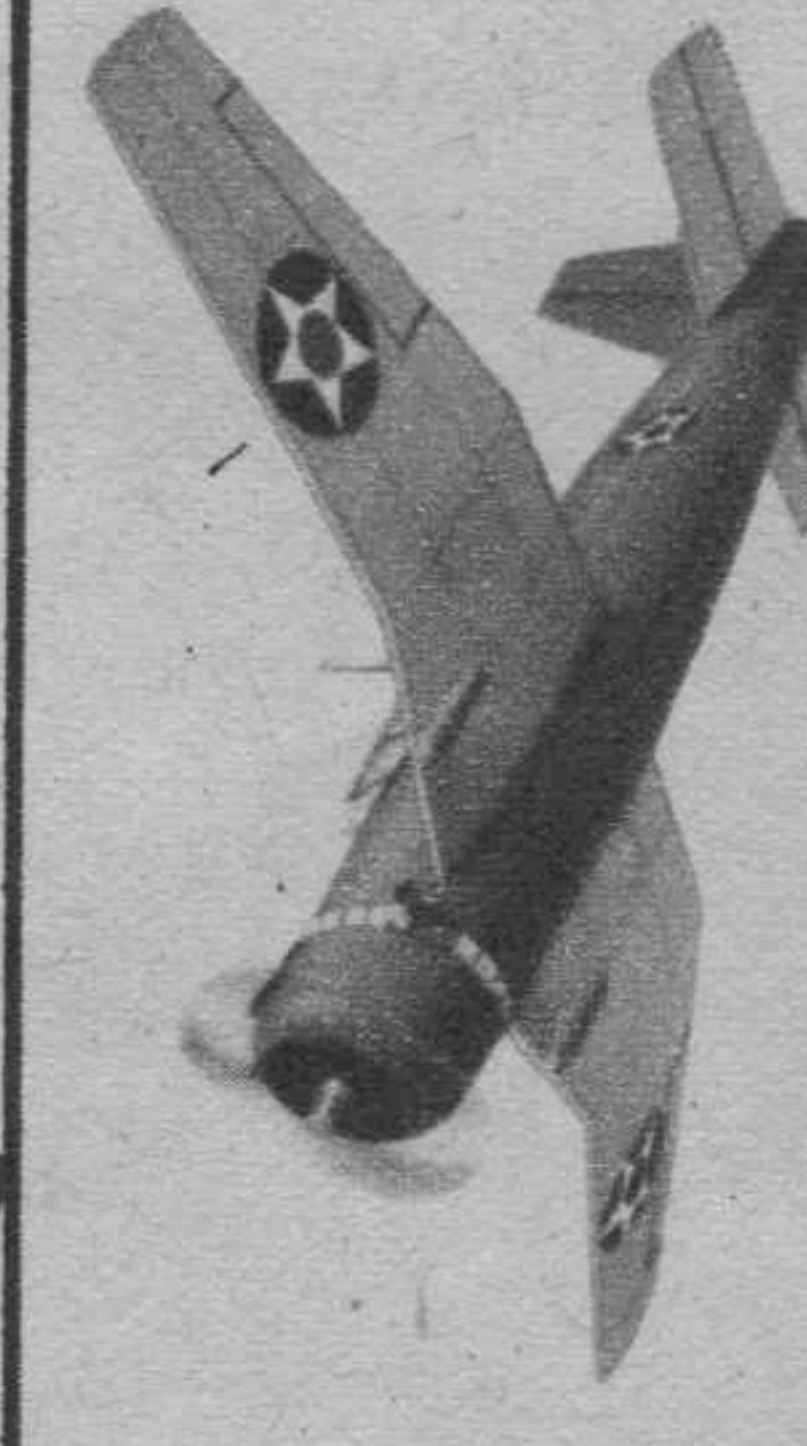
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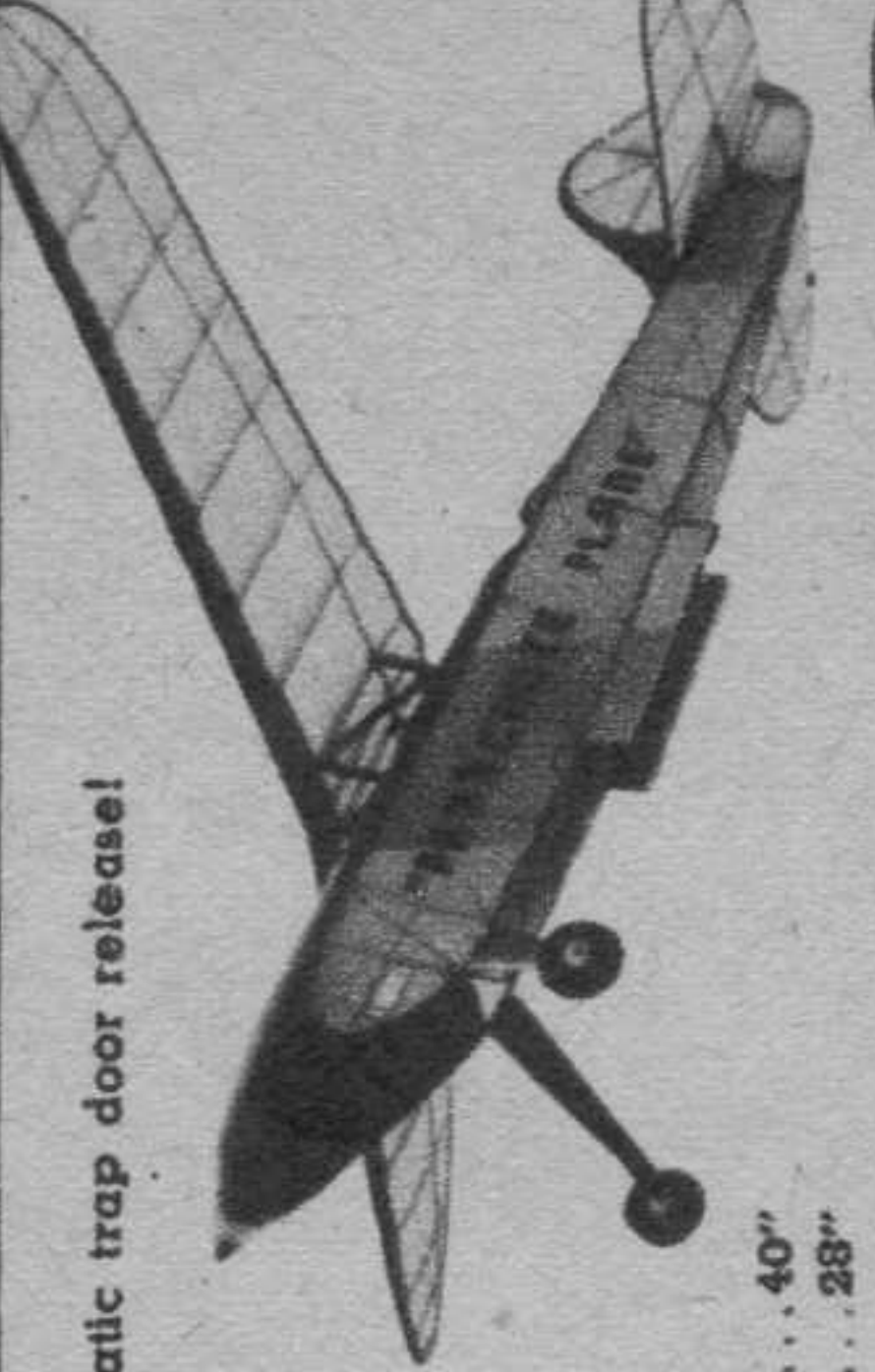


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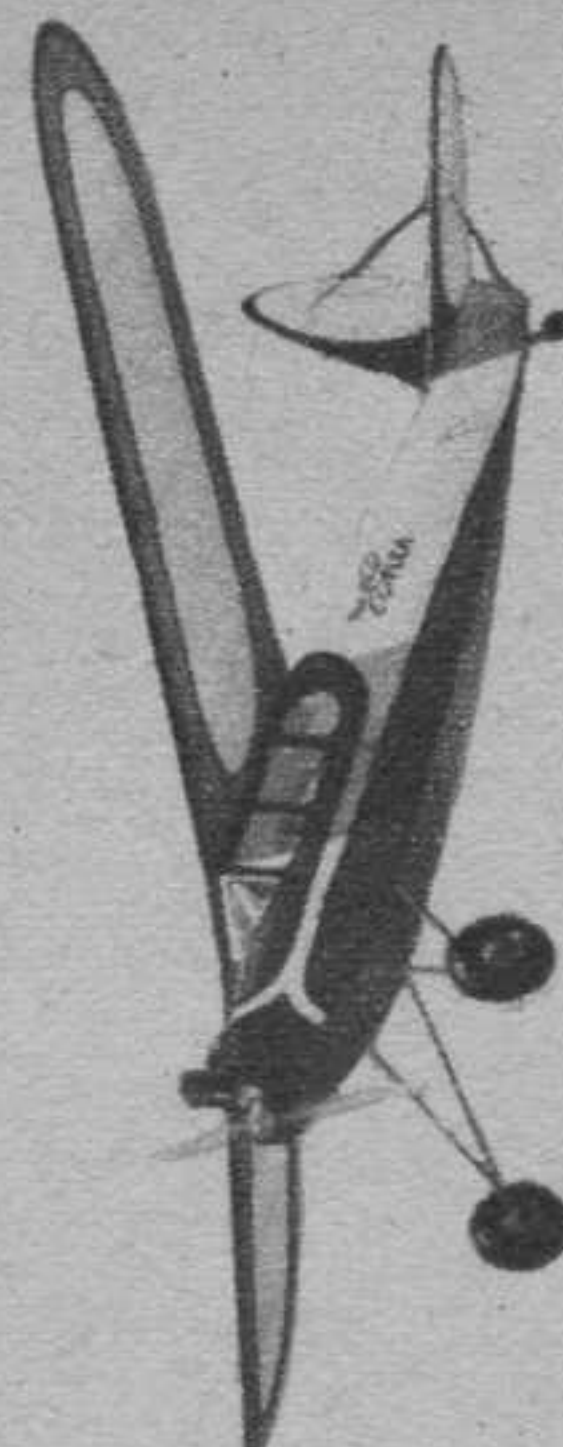
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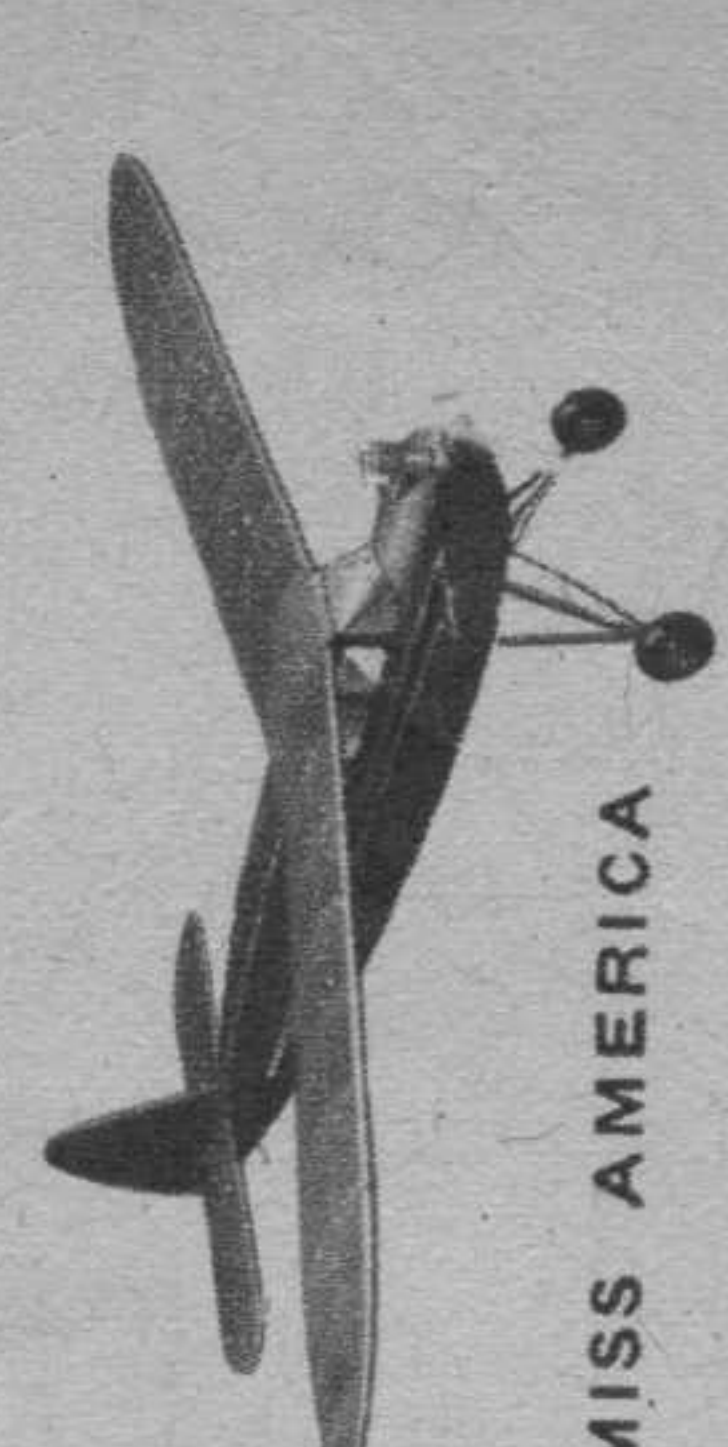
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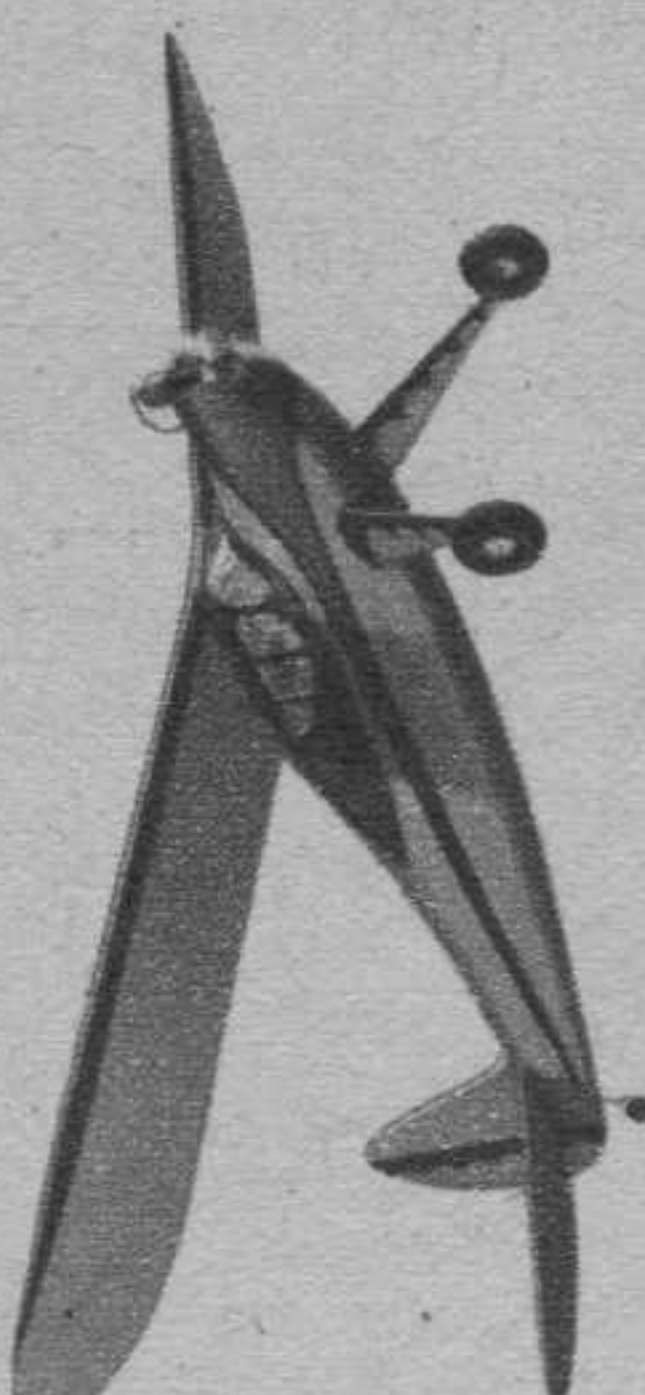
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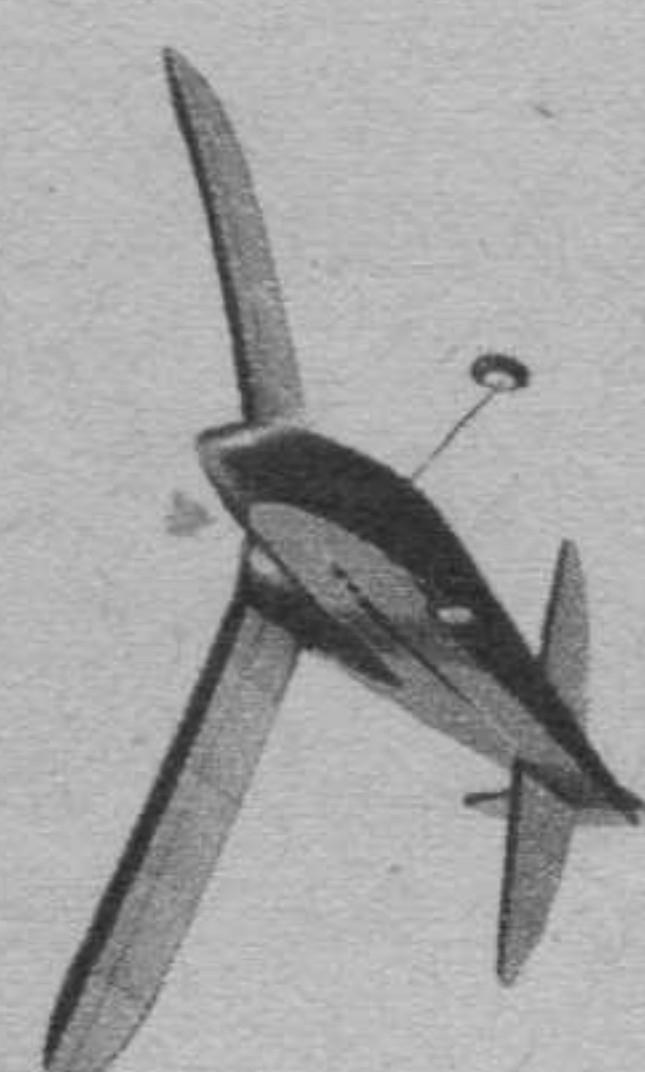


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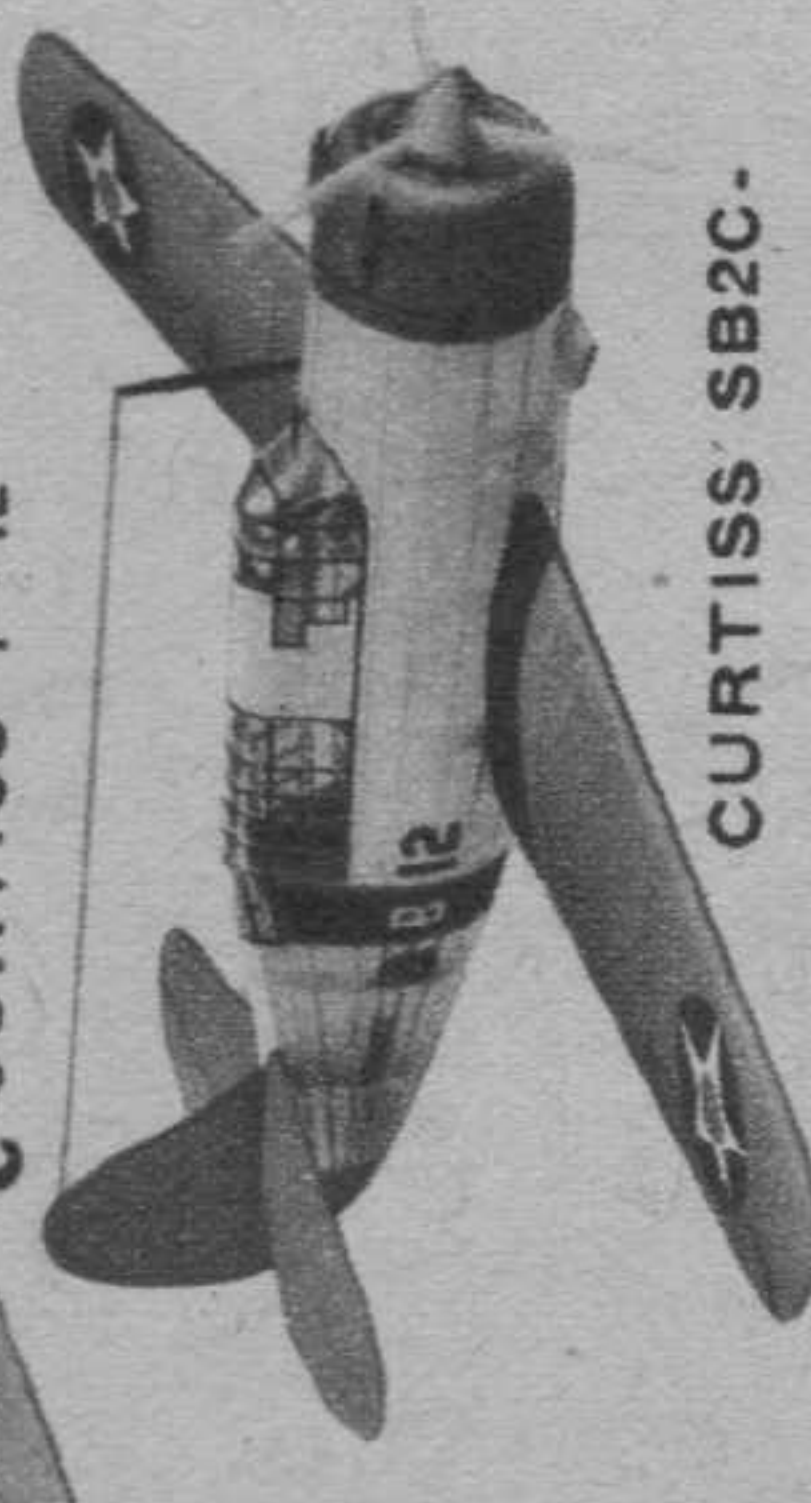
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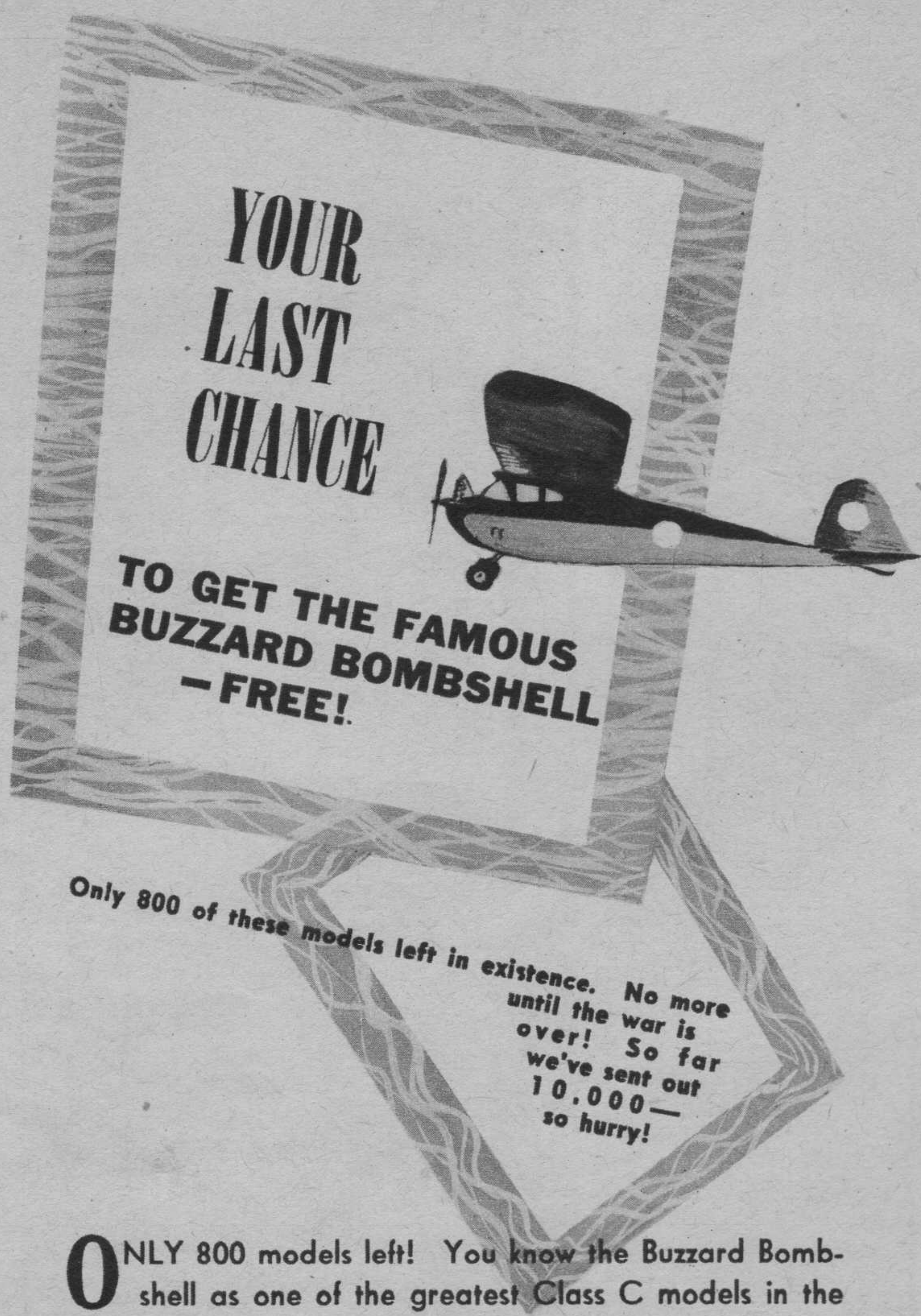
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The Dope C

BY GORDON S. LIO

EARLY in August, balsa officially went to war. The War Production Board froze all consumer stocks amounting to more than 100 board feet. (A board foot is twelve inches square by one inch thick.) Use is now restricted to life rafts, life nets, military aircraft, marine buoys, bilge keel filling, and other parts of vessels now being built for war. Restriction does not include persons who have less than 100 board feet, so the average builder can use up his stock without stepping out of bounds.

Normally, about forty percent of the balsa imported (most of it comes from Ecuador) is used by the model industry. The bulk of the remainder was being used in marine work, much of which is still permitted. Shortage of shipping space, increased demand because of shortage of cork and kapok largely accounts for the shortage of balsa. Wood not used for military purposes will be turned over for civilian use, although buying in the future will be limited to war-use grades. Slowly the hardwoods loom more important to model building. The manufacturers are not unprepared.

Chairman Bibichkow, of the Model Industry Association's Committee on Conservation, says the industry must reconcile itself to substitutes—and use them in a way most effectively to serve as preflight training for boys and girls. Substitution is no more important than conservation. We must conserve critical materials and retrieve every bit of scrap. Throughout the country, millions of youngsters will be reveling in the newly established aviation courses in the public schools. Model building will be an important part of this training. Conservation of material will be necessary to get all these newcomers started. Substitution is the manufacturer's problem—conservation is the dealer's duty. "The dealer must take it upon himself to encourage his customer to conserve. He must be farsighted enough to realize that by conserving materials and making them last longer, he will benefit himself by having his customer actively interested in model building as the transition is being made toward elimination of critical and strategic materials."

"The guy is nuts," moans William Clark, Jr., of Detroit. The "guy" is N. L. Koch, whose article on control-line flying appeared last September. Clark was irritated by his claims that tether flying takes much practice and skill. Koch writes: "Once the technique is mastered, interest in free flying will vanish." Clark says anyone can fly a ship on the end of a string. The first time their group tried it they flew all evening and went home with whole ships. He was so unimpressed he bets a fiver he can put rudders, elevator, and an Ohlsson on

his drawing board and fly it control line. Clark's idea of re is handling a Baby Buzzard Bantam or a similar hot job.

About a half year ago a group of control-line fliers organized the tle Guideliners Club to promote trolled gas flying. Speed was tive in all club meets. Record Class A—49 m. p. h.; Class m. p. h.; and Class C—78 m. Clubs in the Northwest will do if they join together in a co-op group to standardize rules for and timing, and recognition c ords. Secretary Ellis Sigmon W. Smith St., Seattle, Wash., like to hear from nearby contr fliers. Guideliners claim a few They've had all sorts of mod the string: Fireball, Shark, D-7, autogiro, Messerschmitt, tang, P-40, Spitfire, Aeronca, Stinson, Howard, Skyfarer, Stearman. Least in size but n in importance is the Atom-po 6" job which buzzes round th in fine fashion; we'll show you photos in a future issue.

Control-line speeds mount st One hundred and twenty-four m has been reported from Clev Ohio. Model is a Hornet-po Tiger Shark. The fastest H powered race car spins along at 100 m. p. h. This was the sp the last AMRCA (American I ture Race Car Association) nat in Detroit last July. Nearly a sand heats were run off without age to a single car. This could happen at a model airplane me

Two hundred and fifty dollar was the attraction at the Northwest U-Control Champio in Portland, Oregon, last A Events were A, B, and C speed cision landing, slow speed, aërial bat, novelty acrobatics, team batics, and best-appearing mod

A club newspaper is usuall first effort of a new club. M graphed headlines herald the fi sue. The second issue is usuall and with a few less pages. The is pretty sorry and usually it end of the journalistic effort. times the typewriter or mimeo breaks down. But usually the members get too bogged dov building and flying to take tim for editing. All this is a build-tell how much we appreciate News—a tried-and-true public of the Fresno (Calif.) Gas Mod sociation. Practically two year the News has earned its tit "Voice of the West Coast Mod It keeps us in touch with West activities. West coasters are u nice people, but they have two —the AMA and no publicit magazines published in the But they never told us what were doing—and that's why News has become such a vend old sheet.

of the gas contestants didn't Eaton's (department store in al) Annual Contest until was officially checked in about launched his Ohlsson-Zipper 12:20, and lost sight of it a nutes after 12:30. Canadian o not limit flight length. Most are recovered by fast ground- r by radio announcements if avel too far. Marshall Green Super-Cyclone Zombie 11:20 He was using a Davis No. 4 Climb was about the snap- on the field. The Blumer s are smoothies with gas ent. They come out to the nker for a few minutes, and eir Ohlsson 23 starts to whine. long until they've flown a out of sight. Joel Isenberg's Montreal" was another top- model. He flew it steadily out the day without a scratch a was routine, since the ship's ing it for almost three years. al New Jersey State Cham- ps were held as usual this Linden Model Aircraft Club ed the meet. Russell Hiltz nior championship and Ray- O'Connell won Junior champ. one contestants from New and nearby States made the the LMAC's best. Frank M. k has been directing model ef- Linden for many years. Men ank are really the ones who ubs alive. Boys come and go. embers replace old ones. But ard workers can be counted r after year to keep the club es functioning. Not all the rs can spend all their time g. Somebody must take time rganize. It's a thankless job. re no prizes. You are the last e the field after a meet. You weeks getting ready for it. ou dash around tying loose gether and shooting for the ble goal of making everybody The meet is over and people e. But there's still a truck- odds and ends to be taken o town. Stop watches and ust be returned. Paper must ned off the field. Sunburn is and your feet are killing. ay is Sunday and you'll be sleep late. But a pouring all that will save you. Nice r and the boys will talk you iving them out to the field unday morning.

rio Model Aircraft Co. is now Craft Hobbies, Ltd., of Tor- Frank Lucas explains that his s has grown beyond the stage the name of a province is e. In 1928, when Frank he used one and a half gal- cement, 150 feet of balsa the ar. In 1941 he used 60,000 balsa. The one and a half of cement would have lasted y three working hours. national Model Co. of New as added three sheets to their ne. One will cover the latest insignia, the second has all the Nations, and the third con- e Axis symbols. On this Axis s printed: "For use on model only—buy war bonds and and keep these away."

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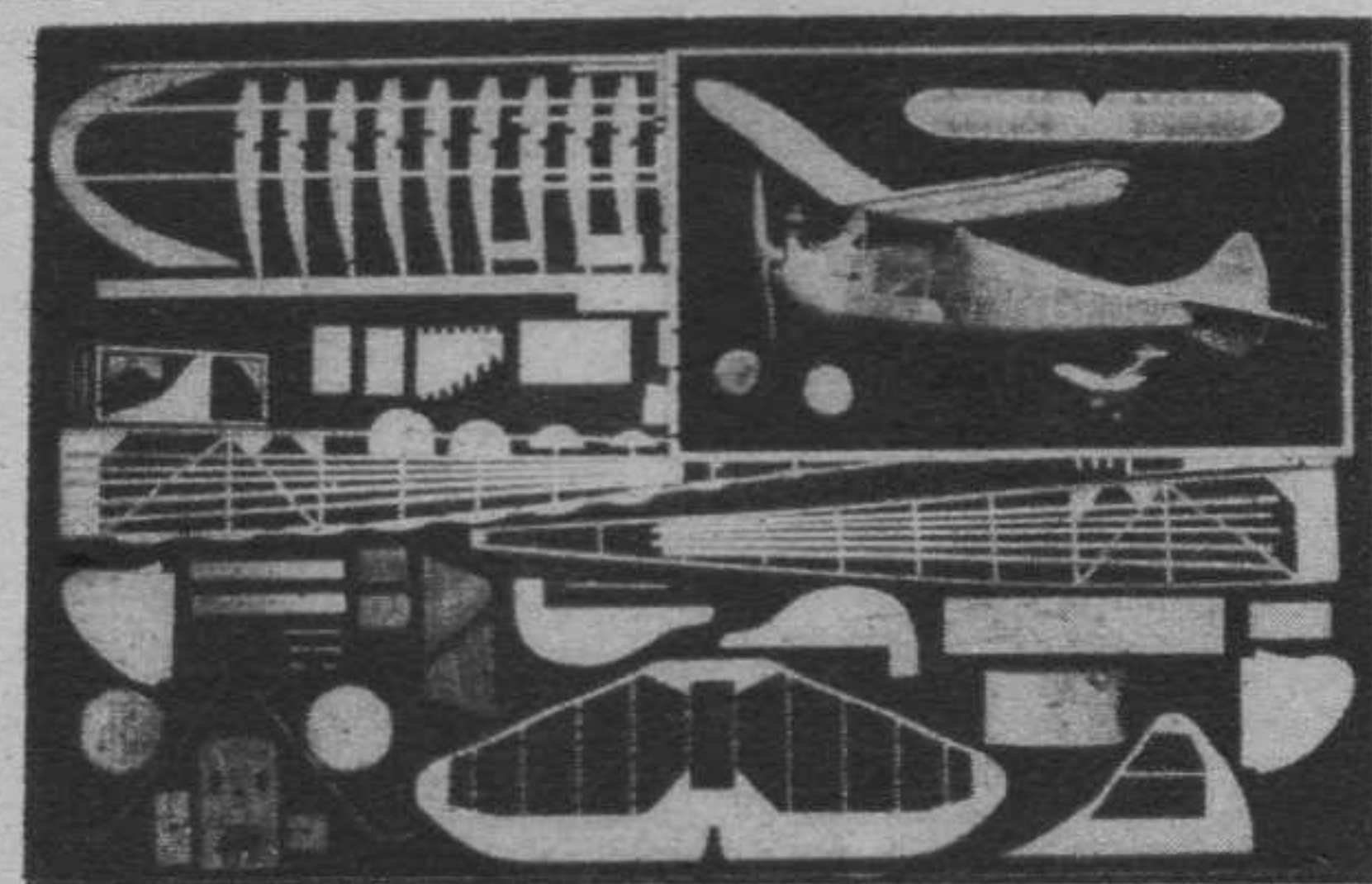
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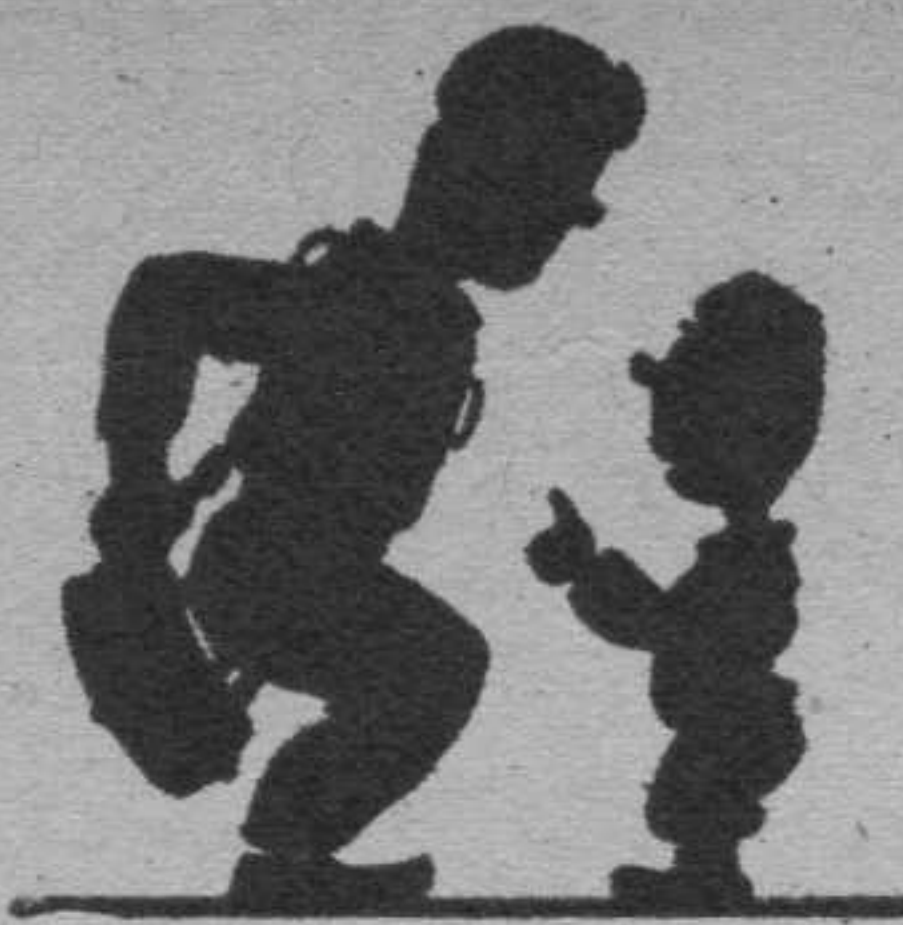
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What's Your Question?

W. G. M., Truckee, Calif.—For all information regarding the construction of rocket ships, write to the American Rocket Society, 50 Church St., New York City.

R. B., San Francisco, Calif.—The Langley plastic airplane is not for sale. We do not know the price, as it is the first model built. It is manufactured by Langley Aircraft Corp., Port Washington, N. Y.

R. K., La Mesa, Calif.—Squadron insignia of military air services can be obtained at some model airplane stores and manufacturers. We do not know prices. Polk Modelcraft Hobbies, 429 Seventh Ave., New York City, carries quite an assortment of them.

B. Y., Victoria, Can.—The B-17 carries a crew of nine, the B-19 a crew of fifteen or more. No official performance figures on these two ships are available. The B-17 has a wing spread of 103 feet, while the B-19's wings are 212 feet long. The Chinese air force has some American P-40s, Vultees, Curtiss Hawk biplanes, also Russian bombers and pursuits. We have no definite information on the type of ships used by the Chinese.

A. W. L., Jr., Holyoke, Mass.—Information on the jet-propulsion airplane was published in our July issue of *Air Progress*. More will appear at a later date. Send 25 cents to Mr. Clifford of our circulation department for a copy of the magazine.

H. W., Pittsburgh, Pa.—Sorry, we have no pictures or drawings of aircraft used in the World War I. Regarding books on this subject, suggest that you write and inquire from the Aeronautical Chamber of Commerce, 30 Rockefeller Plaza, N. Y. C., or the Paul Kollsman Library at the same address.

P. W. V., St. Paul, Minn.—Information as to height, weight and other physical requirements to enter the U. S. army air forces as a cadet can be obtained from your local recruiting office.

A. D., Milo, Me.—Sorry, we have no information regarding the school mentioned in your letter. Undoubtedly it is approved by the State of New York. It is supposed to be good.

H. P., Clarksburg, W. Va.—There are no such planes as the .PBY-24, PBY-27 and PBY-40. But there is a B-24 four-engined bomber built by the Consolidated Aircraft Co. and P-40 pursuit plane manufactured by the Curtiss-Wright Corp.

W. O., Flint, Mich.—For list of government-approved schools in the States mentioned in your letter, write

to the U. S. Office of Education, Washington, D. C.

H. R. C., Indianapolis, Ind.—Sorry, we do not know of any plans for intermediate gliders which sell for less than \$15. Most plans for such ships cost between \$35 and \$50. The drawings for the Grunau Baby are very reasonable for \$15.

D. R., Bay City, Mich.—The Italian Fiat G-50 has a span of 35 ft. 2 in.; length, 25 ft. It is powered by a fourteen-cylinder air-cooled Fiat engine of 850 h. p. Top speed is 299 m. p. h.; landing speed, 80 m. p. h. The armament consists of four machine guns located in the wings. ATC means Approved Type Certificate. It is issued by the Civil Aeronautics Authority, Washington, D. C., and shows that the airplane or engine has been built and tested according to rules laid down by the authority and is eligible for license and can be used for transportation.

M. G., Jr., Monroe, La.—For a list of ranks in the Royal Air Force, try writing to the British Air Commission, Washington, D. C.

W. G., Boston, Mass.—The Bell Airacuda was manufactured by the Bell Aircraft Co., Buffalo, N. Y. It is the same company which builds the famous Airacobra. The Airacuda is not being used by the army air forces. Only a few have been built.

W. G., Jr., Clinton, La.—The two objects which you have circled on the picture of the Lockheed P-38 are turbo-driven superchargers, which are used to give its engines good performance at high altitude. Some reprints of color photographs of military aircraft can be obtained from us.

W. H., Elizabethville, Pa.—The eyesight of a navigator, bombardier and machine gunner on military aircraft has to be as good as that of a pilot. Applicants with one bad eye and one good are not accepted for pilots.

A. C., Charleston, W. Va.—Here are the names and addresses of aircraft manufacturers and schools located in California as requested in your letter. Consolidated Aircraft Corp., San Diego, Calif.; Douglas Aircraft Co., Inc., Santa Monica, Calif.; Lockheed Aircraft Corp., Burbank, Calif.; North American Aviation, Inc., Inglewood, Calif.; Northrop Aircraft, Inc., Hawthorne, Calif.; Ryan Aeronautical Co., San Diego, Calif.; Timm Aircraft Corp., Van Nuys, Calif. Schools: American School of Aircraft Instruments, Glendale, Calif.; California Flyers, Inc., Inglewood, Calif.; Ryan School of Aeronautics, San Diego, Calif.; Aero Industries Technical Institute, Los Angeles, Calif.; Curtiss Wright Technical Institute, Glendale, Calif.

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★ THE WAR ★

... and Model Airplane Building A STATEMENT FROM BERKELEY MODELS, INC. TO THE MODEL BUILDERS OF AMERICA

Many reports, press releases and rumors have been circulated regarding model airplane building during wartime. In fairness to our friends and customers of the past nine years, we have prepared this statement of conditions, our future policy, and how you can help us.

William L. Effinger, Jr.
Founder, President & Chief Engineer.
BERKELEY MODELS, Inc.

From the day that Lindbergh flew from New York to Paris in 1927 until Dec. 7, 1941, model airplane building, designing, and flying has moved forward by leaps and bounds. In 1934, one gas model flew in the National Contest. In 1941, there were nearly 2,000 entries. In 1935, Berkeley Models introduced the first commercial gas model kit and sold several hundred that year. In 1941, Berkeley Models produced over 50,000 gas model kits. During the same time great advances were made in all other forms of Model Aviation. But during this time what were our present enemies doing? Model Aviation was government subsidized in Japan and Germany. You had to build model airplanes. The government paid for the materials and contest winners were given military recognition.

Thank God that in America you could build models because you wanted to build them. You could design them to satisfy your "Yankee Ingenuity" and you could choose from several reputable companies when making your purchase.

Unlike in foreign countries, in the United States only a relatively few public officials ever heard of model airplanes, still fewer thought of their military and educational value.

Yet some of the most dramatic pages in America's history were written by two men whose training for future service to their country began as model builders. Their names, Colin Kelly and "Butch" O'Hare will live as eternal tributes to American heroism and model building training. The celebrated Davis Wing, which has so revolutionized the flying world because of the startling advance it has made in airplane efficiency, was a product of a model builder's work bench. Although many model parts are no longer available because of the essential material they contain, model aviation is forging ahead, making the best of what is still available, happy and proud of its contribution to victory and freedom.

Immediate war needs must be served. Recently, the use of balsa for other than life saving equipment was prohibited. Although everyone was allowed to appeal to use up stock on hand, Berkeley Models, without losing any time, turned over the entire stock to a life raft contractor who needed the material badly. Berkeley is now building kits from a combination of pine, poplar, and basswood, using short ends of balsa, left over from life raft production, for small blocks and printed sheets. Kits using a combination of woods prove to be stronger and more durable than all-balsa models with a weight increase of only 8%.

BERKELEY'S WARTIME POLICY

At the start of the war we agreed that all prices would be held as low as possible. We considered it our patriotic duty to supply America with the materials it needed at the lowest possible cost. While average kit prices have advanced 25% to 50%, Berkeley prices are the same today as in 1940. We intend to maintain these prices as long as possible. You can help us keep costs down by avoiding unnecessary correspondence. We always welcomed your questions, but now must ask you to refrain. Furthermore we suggest that you patronize your local dealer as much as possible. Only when your dealer cannot supply you, order direct.

WHAT YOU CAN DO TO KEEP YOUR MODELS FLYING

The main problem today is power for your model whether it be rubber or gas. Take care of whatever rubber you have. Only a very limited supply of stock is still available. Keep rubber in an air-tight container. Do not wind the rubber more than 2/3 of its limit. At all times remember sunlight is injurious to rubber. Even when flying your model keep the rubber out of the direct rays of the sun. Only ten minutes of direct sunlight will change the chemical composition of rubber thread.

Your gasoline motor will last longer if you remember these things:

1. Use heavy oil and the best oil you can buy.
2. Do not test run your motor on the flying field. Sand is generally blown by the propeller into the intake manifold.

3. Do not try to get the last ounce of power from the motor every time you fly.

4. Use oversize propellers. They hold down the r.p.m. and give better cooling.

5. Clean your engine with gasoline after every day's flying. When clean, give the entire motor a coat of oil, inside and out.

If for any reason you do not need your motor, sell it to a friend or arrange with your dealer to sell it for you. If there is no dealer near you, write to Berkeley Models, giving the details and we will give you an offer. Particularly needed at this time are O. K. Twins and Forster "99" Motors for government experimental work.

THINGS TO COME!

After victory, a whole new field of model building will open. Motors will be improved, kits will include many new materials, and "Precision Flying" will become the real sport. Think of it, models that will take off, fly a predetermined course and land at the take-off spot, all without the use of radio! But first, let's win the war.

BERKELEY



MODEL and AIRCRAFT CATALOG No. 42

\$500 IN WAR BONDS TO BE AWARDED BY BERKELEY TO LUCKY CONTESTANTS

No American could ask for a grander prize than a United States War Bond. Berkeley has been proud to contribute \$500 worth of War Bonds as part of the prizes to be awarded in the A. M. A. sanctioned model meets now being held throughout the country. Good luck to all contestants, and here's hoping that you earn a War Bond!

COPIES OF THE NEW 48 PAGE BERKELEY CATALOG STILL AVAILABLE!

Packed with illustrated facts about new Berkeley kits and hard-to-find equipment, this beautiful catalog is being demanded by model fans everywhere. We don't know how long the supply will last, so get yours today. 10c AT YOUR DEALERS OR BY MAIL.

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real ocean-going ships with wings, their hulls built with all the cunning and handcraftsmanship which only generations of shipbuilders could possess.

Not so very far away, other families who had been in shipbuilding for generations were working on the hulls of the big Supermarine flying boats that came from the drawing board of Reggie Mitchell. The hulls of these craft were built exactly as the hulls of racing yachts, by men who had built the luxury crafts. The Supermarine company was so named because previously its owner had been engaged in the manufacture of boats.

A quick glance around the rest of Europe reveals the same circumstances repeating themselves. In 1910 the great German shipbuilding company of Blom and Voss decided to make aircraft, and today there are numerous types of their seaplanes doing duty for the Luftwaffe. Their flying boats made forty crossings of the South Atlantic in 1936. Similarly the Piaggio company, one of Italy's prominent shipbuilding corporations, turned to the aircraft industry in 1916 and has never stopped producing aircraft. Add to this the Fairey company at Hamble which started operations in a vacant shipyard on Britain's south coast, and put to work the men who had been constructing ships most of their lives, and it would seem Mr. Kaiser is about right when he says a shipyard is seventy-five percent ready to build aircraft.

Once, during a visit to the Supermarine works at Southampton, England, I asked an old man who was working on the hull of a giant Southampton flying boat if he felt very strange working on an airplane. He had, in his time, laid the keel of one of the world's most famous passenger liners. He was old and wrinkled, and getting on toward his seventies. "Bless you, no," he said in that soft southern English drawl. "A man that has built ships can build these durned things with his eyes shut." But his eyes were full of pride as he applied his ancient art to the great boat-built hull, as we used to describe them in the technical journals of those days.

Somehow I think Mr. Kaiser can build his cargo ships, whether they be land-based or flying boats.

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Page 6—T.R., Rudy Arnold.

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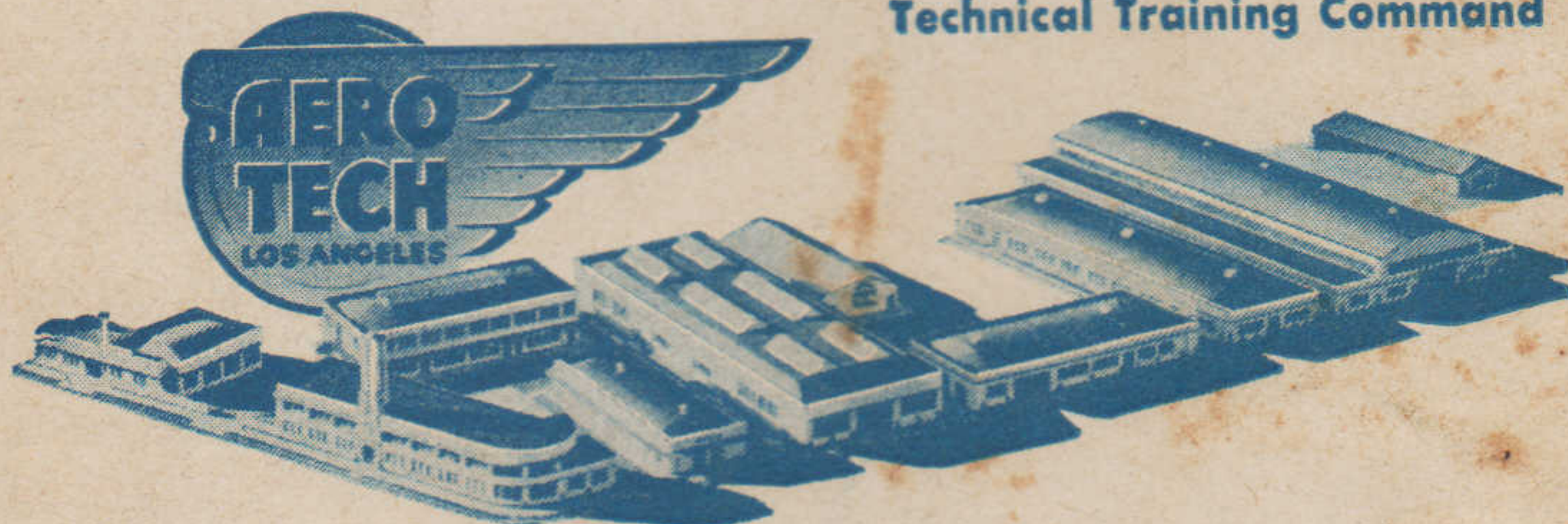
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