AIR TRAILS

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JUNE
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AIR TRAILS

JUNE, 1942 VOLUME XVIII NO. 3
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A STREET & SMITH PUBLICATION

CONTENTS

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You TOO, MUST TAKE THE OFFENSIVE TO WIN SUCCESS!

Aviation has JOBS for thousands, but CAREERS only for trained men!

Defense cannot win a war! America is building 185,000 planes in two years for ATTACK to win ultimate victory. Aviation offers jobs to thousands of men, but it is not enough for you to crawl into a "defensive" single-phase job through cheap "quickie" courses. You must take the offensive and obtain the proper training to fit you for vital supervisory positions—to establish yourself as a career man in aviation. Only the career man with long-range training is essential to aviation's tremendous war production . . . and ONLY he will continue to be essential through the readjustments that must follow when America's production shifts back to peace time schedules.

The executives who have made aviation THEIR career want men with the intelligence and sincerity to select aviation as a life work and to prepare themselves for it by proper training. They know that the value of each man is largely determined by the ability and experience of those who train him for his career. And they know that Curtiss-Wright Technical Institute graduates are — and for many years have been — precisely trained to fill the industry's exacting requirements.

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This school has never guaranteed positions for its graduates, but practically every graduate has obtained immediate employment and is advancing rapidly. The demand for our graduates far exceeds the supply, and we honestly believe that every student who enrolls here will be able to obtain, with our assistance, immediate employment upon graduation.

WARNING!—"Don't miss the boat." The greatest opportunity in your lifetime exists today! There never was such an opportunity in aviation for you; there may never be another. A position awaits you. Insure for yourself a steady income and independence for life. DON'T FOLLOW—LEAD! Send in your enrollment before you "miss the boat."

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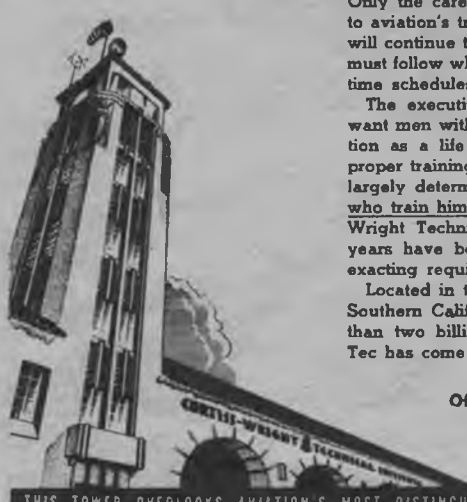

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Reviewing Stand

How to Do Aircraft Sheet Metal Work. By Carl Norcross and James D. Quinn, Jr. (McGraw-Hill Book Co., Inc., 330 West 42nd St., New York City, $2.20.) The metal airplane of modern times demands the services of thousands of skilled metal workers. The student worker or apprentice will find many answers to puzzling questions in this book, along with descriptions of equipment and their correct and incorrect uses. Beginning with simple blueprint reading, the reader is carried through all the various essential steps to the final chapters on skin fitting and spot welding. Questions at the end of each chapter enable the reader to check his progress. A difficult subject mighty well covered.

Women and Wings. By Charles E. Planck. (Harper & Brothers, 49 East 33rd St., New York City, $2.75.) The distaff side of aviation has never been adequately covered with the exception of a few stellar personalities whose deeds have caught the public fancy through the years. Hundreds of other women figures in aviation have been also worthy of recording, and here an author does the job. The more than three hundred pages, many of them in pictures, present a parade of women's achievement in aviation that will amaze its readers. The latter portion of the book contains lists of records and year-by-year accomplishments for ready reference. Certainly a recommended book for libraries and women interested in flying.

Youth Must Fly—Gliding and Soaring for America. By E. F. McDonald, Jr. (Harper & Brothers, 49 East 33rd St., New York City, $2.50.) With the exception of some technical books there have been mighty few works dealing exclusively with motorless flight. This new work is a very complete and comprehensible treatment of a long-neglected phase of aviation. The author, long an enthusiast for gliding and soaring, has compiled a remarkably complete case for the furtherance of this important activity. Had this country recognized the implications and possibilities of glider training when Germany did, and later Russia, we might not now be frantically training pilots for the future—we'd have them by the thousands. The eleven chapters cover the various training methods, types and characteristics of equipment, while the appendices cover such concrete information as club operation, licenses and regulations and data on the ships currently available. A fine coverage of an important side of flight.

The Blue Book of American Aviation. (The Aviation Statistics Institute of America, Ashville, N. C.) This publication, dealing with the "who's who in the aviation industry," will be particularly valuable to those wishing to contact members of the industry or for libraries interested in a reference work dealing with the various aviation organizations, publications, State aviation officials, air lines, aviation schools and colleges, airports, and aviation officialdom in Washington. All of these headings are covered in detail plus a detailed list of manufacturers and a buyers' guide listing the producers of various types of aviation supplies and material. This book will be an important addition to aviation libraries.

Adventure Was the Compass. By Alma Heflin. (Little, Brown & Co., 34 Beacon St., Boston, Mass., $2.75.) Proving that there is still adventure just around the corner even if the corner be several thousand miles from home and covered *(Turn to page 46)*

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

What's Your Question?

D. A., Washington, D. C.—The American designation of the Martin Baltimore is 187.

C. M., Liberty, Miss.—On take-off, the propeller is set at low pitch and the mixture at rich; after the ship has gained altitude, the pitch is changed to high and the mixture leaned out; coming in for a landing, the propeller is again reset to low angle and the mixture control to rich.

Staff Sergeants T. B. G. and F. P. S., Luke Field, Ariz.—Plans for gliders can be obtained from Volmer Sailplanes, 1010 Mariposa Ave., Glendale, Calif., and the Soaring Society of America, Box 71, Elmira, N. Y.; glider kits from Bowlus Sailplanes, Inc., San Fernando, Calif.

D. D., Erie, Pa.—The Lockheed P-38 is supposed to be faster than the Bell P-39. We do not know how the Grumman Skyrocket compares with them, as no official figures on its performance have been released. The Bell Airacobra is powered by a 12-cylinder Allison engine.

E. J. H., Lincoln, Nebr.—The Douglas DB-7 and the A20-A are essentially the same airplane. The DB-7 was powered by two 900 h. p. Pratt & Whitney engines, while the A20-A has two Wright double-row engines of 1,600 h. p. each.

T. W., Coldwater, Mich.—We cannot supply you with all the information you want on the Consolidated PBY-3 as most of it is restricted. The span of the ship is 104 ft.; wing area, including ailerons, 1,400 sq. ft.; overall length, 65 ft. 2 in.; height, 17 ft. 11 in.

E. C., Philadelphia, Pa.—Sorry, we do not know if there is any literature issued on parachute troops. Suggest that you write to the War Department, Washington, D. C.

C. G., East Keansburg, N. J.—The Republic Guardsman and the AT-12 are the same airplane. The book, "War in the Air," is published by Random House, Inc., 20 East 57th St., New York City. The British Fairey Fulmar is equipped with rear machine guns. The Focke-Wulf 187 is not as fast as the Messerschmitt Me.110, and the Junkers Ju.87 has been in the service of the German air forces since the very beginning of the present war.

P. J., New York City—Regarding your inquiry on a book dealing with different methods of soldering, we suggest that you write to Pitman Publishing Co., 2 West 45th St., New York City, and ask them to send you a list of books on this subject.

H. V., Warren, Mich.—The best way to have your plans enlarged from quarter to full size is to have them photostated to the required dimension.

D. E. J., Lacombe, Canada—For information regarding requirements to become an aerial photographer in the United States army, write to the Adjutant General of the Army, Washington, D. C. You must be a United States citizen to qualify.

Miss L. M., Narrowsburg, N. Y.—Formerly an applicant as stewardess on an air line had to be a registered nurse. Lately, however, this requirement has been withdrawn. The physical requirements are: maximum height, 5 ft. 5 in.; weight, between 100 and 120 lbs.; age, between 21 and 26. The air lines train stewardesses in their own schools. For further information, write to the Office of Education, Washington, D. C., which publishes a booklet on how to become an air hostess.

V. B., Ida, Mich.—The ship pictured on the clipping which you sent us is a Bell YMF-1, otherwise known as the Airacuda. It's a multiplace convoy fighter mounting two 37-mm. cannons and a number of machine guns. It is supposed to have a speed in excess of 300 m. p. h. and is powered by two Allison 12-cylinder liquid-cooled engines developing 1,110 h. p. each.

S. H., Washington, D. C.—The drawings of the bomber noses which you sent us are: top, Douglas B-18A; bottom, B-18. Both ships are alike except for the noses. *(Turn to page 65)*

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- *Production Mechanics (Aircraft sheet metal)* ☐
- *Aircraft Drafting* ☐
- *Instrument and Radio Beam Flying* ☐
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- *Instrument Technician* ☐

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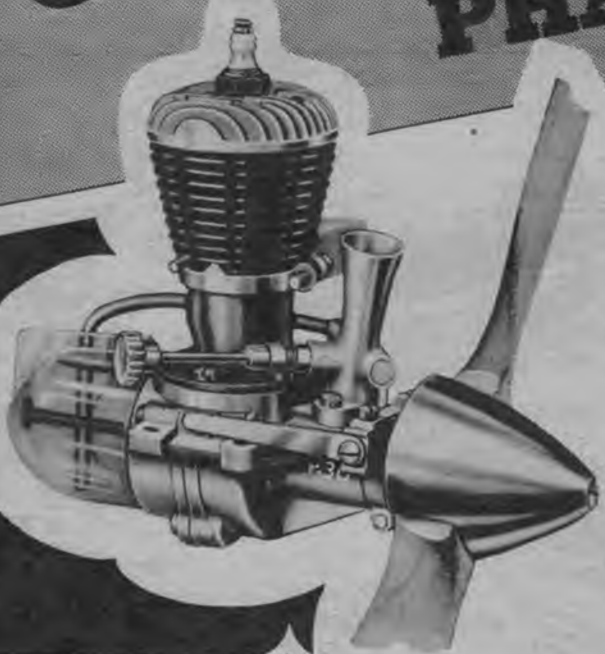

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Without obligating me, send details of course checked:

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☐ MASTER AIRPLANE & ENGINE MECHANIC

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AT-JUNE, 1942

Orville Wright Today

BY DOUGLAS J. INGELLS

Prelude to powered flight. This test glider built by the Wrights flew very well.

O. Wright and certificate awarded at unveiling of Dayton Wright Memorial.

What's he like, thirty-nine years after he helped found the airplane? Exactly what does he think of aviation—now?

THIS is the story of a modest, unassuming American who gave the world its wings, watched them grow big and strong, span continents and oceans, but who sits alone today and sees them trying to destroy themselves.

His name is Orville Wright.

The beginning was on the windswept sands of Kitty Hawk, North Carolina, one cold, gusty day in December, 1903, when man first flew. Here on this isolated spot where only a life-saving station marked the location off Cape Hatteras, this war's most potent weapon was born—a heavier-than-air flying machine which made a sustained flight under its own power. Few heard about it then and those who did scoffed it down. But we hear it today in the whine of the Nazi Stukas. It is typified by Dunkirk and Coventry, Moscow and London, Pearl Harbor and Manila, Java, Burma, Australia. Yet Orville Wright, who made that initial flight, hates to think of these things which are happening every hour in this world he lives in. *(Turn to page 42)*

The army's first airplane. Uncle Sam bought this Wright catapult-launched ship in 1908. Speed 40 m. p. h., range 125 mi., weight 826 lbs. Wright taught officers.

Come to SPARTAN for Training that Fits You for a Lifetime Career

EVERY month more and more young men are coming to SPARTAN for training which enables them to play an important part in the nation's great victory program today, and which equips them for a lifetime career in the great commercial aviation industry to follow. Striking evidence of why SPARTAN is the first choice of so many young men is shown in the above photograph of 22 of the school's 27 modern buildings, providing a total floor space of over 10 acres.

REMEMBER a "Quickie" course can leave you out in the "cold" after this emergency. You need thorough, complete training to be one of the skilled aviation technicians who will enjoy a *prosperous permanent career* during the peacetime years to come.

SPARTAN'S TWO-MILLION-DOLLARS' worth of training facilities assure you advantages available at no other aviation school in America. The Civil School has 38 modern training planes—six flying fields. The SPARTAN Repair Station is 100% approved and has facilities for servicing the great training fleets now used in Civil and Military flight instruction. Completely equipped shops and laboratories for every type of aviation training are here for you.

SPARTAN is Government Approved and recognized by leaders of the industry as the outstanding aviation school in the United States. That's why SPARTAN graduates step into good jobs in the $25,000,000 Douglas Assembly Plant at Tulsa. That's why hundreds of SPARTAN graduates are now employed in the Spartan Aircraft Factory (contractors to the U. S. Army and U. S. Navy). That's why employment managers of great factories and airlines visit SPARTAN to personally select graduates.

Serve Where You Will Be Most Valuable to Your Country - and to Yourself - If you are fitted for the armed forces, enlist at once. But if you have a skill that makes you more valuable for technical service, then give that where it is needed. If you do not have the needed skill, SPARTAN will train you.

Next Semester Starts August 3rd.

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SCHOOL OF AERONAUTICS

DIVISION OF SPARTAN AIRCRAFT COMPANY

Spartan School of Aeronautics—Captain Maxwell W. Balfour, Director, Address Dept. AT-62, Tulsa, Oklahoma

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- ☐ Commercial Flight Instructor
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- ☐ Aircraft Assembly Mechanic
- ☐ Airline Service Mechanic
- ☐ Airline Communications
- ☐ Private Pilot Course
- ☐ Weather Forecasting
- ☐ Instrument Technician
- ☐ Women's Instrument Technician

Engineer of the future. This engineering student at the Casey Jones School of Aeronautics works on an actual plane design from specifications. First-term students review math, geometry, drafting, shop work.

After elementary subjects are reviewed, wind-tunnel models and their reaction are studied.

Design Your Own

At most air schools the engineering student must design a plane from specifications. Here: Casey Jones.

From the reaction of tunnel models, data is obtained for designing actual planes. Each student works from individual specifications given him by instructor. Many of these classroom-blueprint planes show promise.

During the junior year Casey Jones students study advanced aerodynamics, calculus and kindred subjects needed for complicated flight formulae. In this tunnel this data goes into actual use on test models to scale.

In the shop, test ribs designed by students are built and tested for the indicated strength. If they fail to stand up, the student redesigns them until they do. Thus actual work proves the student's design theories.

Some of the student designs show such progress and merit they are developed further. This light seaplane, designed by Ray Applegate, was completed in the school shop. Aviation designers have rosy future.

You CAN'T zoom into an AVIATION CAREER!

YES! Aircraft builders need trained men. . . .

Yes! Aviation demands skill and knowledge and trained intelligence.

But! U. S. aircraft manufacturers want, and want badly, key-men—not "bolters and nutters," who have to ask "where does this little bolt go, Bill?"—the type of men who, in the words of Svend Pedersen, Director of Education and Public Relations of the Lockheed Aircraft Corporation, "make up the backbone of such an organization"!

By what yardstick are these key-men measured at Lockheed? Four years' apprenticeship! There isn't any "zooming" into aircraft careers at Lockheed, or any other important aircraft plant!

There is just as much skill and knowledge and intelligence demanded of "aircraftsmen"—those men on whom rests one of the greatest responsibilities ever handed to industrial workers—as on the men who make up the backbone of any other industry.

There has been too much loose talk about "Aircraft Production Training Courses," and "Aircraftsmen Trained in Four Weeks," and "Zooming into an Aviation Career." We've got to be honest about this matter.

"Aircraftsmanship," the knowledge and skill that must predominate among aircraft workers, is not something to be obtained "overnight," or by reading a few short articles.

It is unfortunate that only those connected with the aircraft industry appreciate the absolute necessity of special training of all aircraft personnel.

And here's how I. C. S. handles the problem:

I. C. S. has paid to specialists in the past three years $34,740 for the data only, from which training for Aircraft Mechanics and Aviators is provided . . . $6244 for one subject only—"The Aviation Engine"; $2552 for "Sheet Metal Work"; $2843 for "Measuring Instruments"; $1536 for "Aviation Engine Ignition."

That gives you an idea as to how "Specialists" do the job.

If you're looking for a "career" in aviation, if you're aiming to become a key-man in the aircraft industry, if your objective is more than to be a "cog" in the machine or a "number" on the assembly line, don't be mistaken: You've got your work cut out for you. You can't reach these objectives by any quicker process than have those select few who are the "backbone" of the industry today. They worked, they studied, and they studied from authoritative instructional data, and under the guidance of a competent faculty.

I. C. S. Training is designed and conducted to make these objectives possible. It is not an educational Irish stew . . . a conglomeration of unrelated facts. It is real . . . thorough . . . practical and approved by unquestionable acceptance.

If you're a man with a definite objective in the Aviation Industry, we will be glad to send you the truth about a Career in Aviation. A letter or a post-card will bring information . . . or use the coupon.

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LET'S GO! U.S.A. KEEP 'EM FLYING!

NOTE TO AN AXIS AIRMAN*

Remember this lad? That's right, he's one of the guys you strafed on the ground somewhere East of Suez. He didn't stay on the ground? That's just too bad, but that's not an American habit. ☆ ☆ ☆ American pilots are performing the splendid two-fisted job we've learned to expect, but they must have first-class equipment to win the ultimate victory. ☆ ☆ ☆ Aeronca has dedicated itself to an "all out" pledge in devoting its energy and resources to the Armed Forces of the United States in order to assure victory in the shortest possible time. ☆ ☆ ☆ The Aeronca Aircraft Corp., Middletown, Ohio, U.S.A.

***SINCE DECEASED**

AERONCA

The Aeronca Victory Award

The Aeronca Aircraft Corporation pledges its entire resources of equipment and experience to produce only the finest in material and manufacture for the men who are privileged to fly for their country. ☆ ☆ ☆ ☆ The — Aeronca Victory Awards — presented to employees for skill that develops better products or creates time-saving operations— is our dedication of an "all out" pledge to win the war in the shortest space of time.

AERONCA

We built the first sub actually to hold a plane, back in 1925. Have our enemies, since then, developed undersea carriers of giant dimensions and possibilities?

THE telephone connected by direct wire to the interceptor command rang at 21:38 that night. It was no ordinary telephone bell, but a gong that clanged a loud rattling alarm which could be heard through the entire hangar. The twenty-five interceptor pilots on the night alert rose instantly from their chairs and cots. They stood in silence, their eyes fixed on the major at the telephone. He took notes rapidly, then asked for a repeat, which he checked. "Right. . . . Right. . . . Right. . . . "

Heard above the officer's sharp staccato was the sound of men running. They were the mechanics, reporting the planes on the apron. They opened the "greenhouse" hatches, and when the pilots arrived they helped them into the cockpits, checked their safety belts and parachute harness and handed them their oxygen masks. Then the mechs saluted: "Good luck, sir." The pilots nodded solemnly.

Two hours later, with fuel dwindling to a critical point, the formation returned from a futile search. The ephemeral planes had vanished as completely and mysteriously as those that startled San Francisco into two blackouts December 8th, the night after Pearl Harbor, and last January 3rd.

In both forays the planes came from seaward. Apparently they set their course by radio co-ordination, using the beams of the commercial broadcasting stations. But when the stations were put off the air by the blackout, the invaders lost their way and scurried back to sea. But not before they had been detected by the army authorities, who described them as "undoubtedly enemy aircraft."

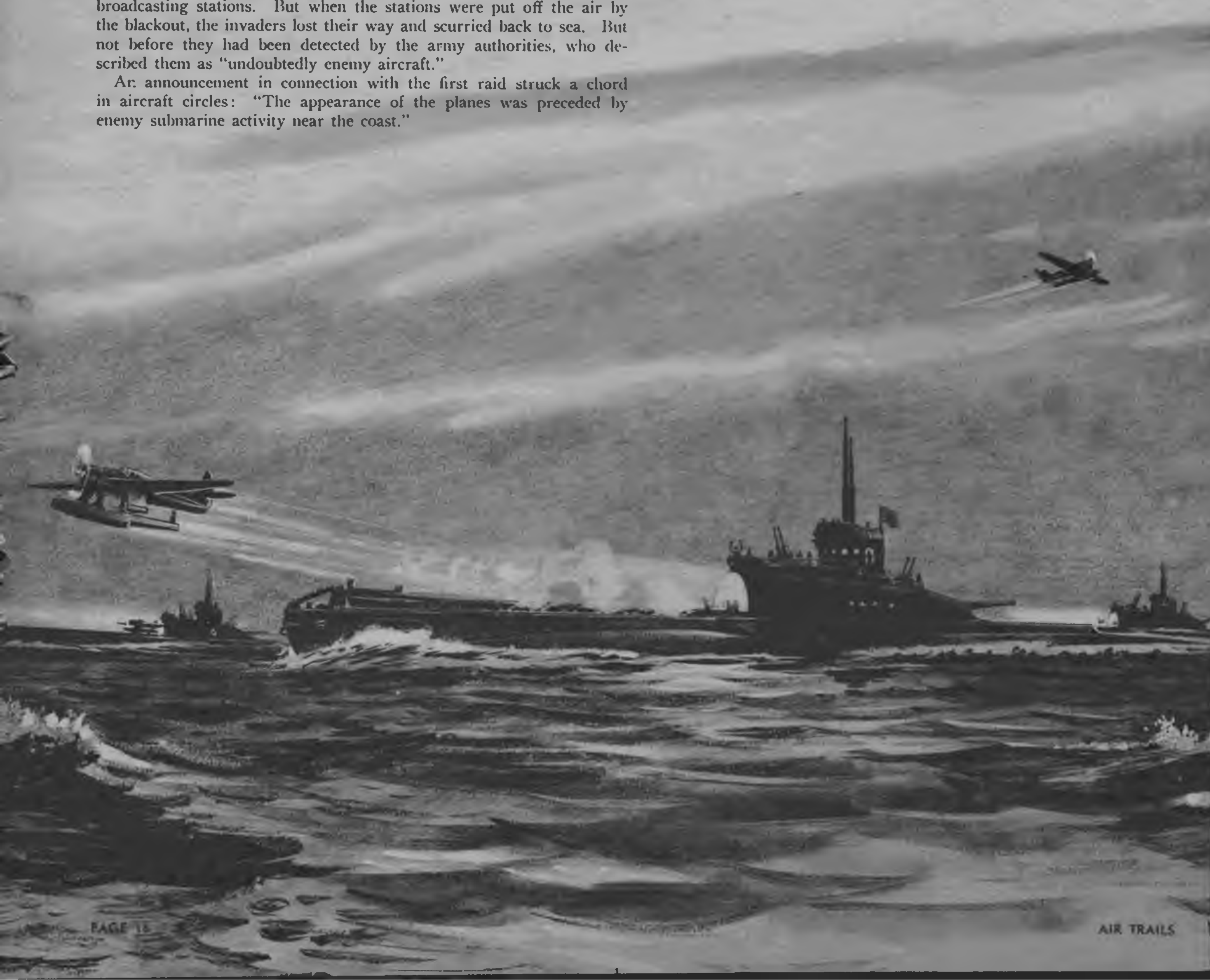
An announcement in connection with the first raid struck a chord in aircraft circles: "The appearance of the planes was preceded by enemy submarine activity near the coast."

"Could it be," speculated several officers, *"that a submersible aircraft carrier is out there?"*

The theory of a submarine aircraft carrier is not as fantastic as some might think. In 1925, the Glenn L. Martin Co. built a small seaplane scout for the navy to experiment with on an S-series submarine. The little scout was built so it could be dismantled and stowed in a deck hangar aft of the conning tower. It was launched by submerging the stern until the scout rode on its pontoons. The tests were successful, but the parsimony of congressional appropriations caused further development to be abandoned. England, however, followed the American experiment by building a deck hangar on the submarine M-2. The British scout had folding wings and the hangar was forward of the conning tower. The plane was launched by catapult.

The next step in submarine aircraft development was taken November 8, 1929, when the French launched *le Surcouf* at Cherbourg. It was at that time the world's largest submarine, and had a deck hangar aft of the conning tower. *Le Surcouf*, named after Robert Surcouf, famous French privateer who raided British shipping in the Indian seas early in the 19th Century, mounted an armament worthy of its namesake. There were two eight-inch guns directed forward from the deckhouse, two 37-mm. antiaircraft guns, and four machine guns on deck. It had

Submarine



ten torpedo tubes and carried twenty-two torpedoes. The giant sub had a cruising range of 12,000 miles and speeds of eighteen knots on the surface and ten knots submerged. It could dive in two minutes and go down to a depth of seventy fathoms. In tests, it remained submerged for sixty hours. Length of *le Surcouf* was 361 feet; beam, 29; and height, 23. Gross displacement was 4,304 tons. Power plants were Sulzer Diesels of 7,600 horsepower for surface operation and electric motors of 3,400 horsepower for undersea work.

The craft, like its American and British predecessors, had a deck hangar for one small plane fitted with folding wings. Its method of launching still is a military secret, but there were no signs of a catapult, so it may be assumed that the American method of launching may have been used. From last reports, *le Surcouf* was in a harbor at Martinique, a French possession in the West Indies, still under control of the Vichy government.

Simon Lake, American inventor of the modern submarine, told this writer he did not "know" whether the Axis nations have submersible aircraft carriers, but that it was "extremely likely." Mr. Lake pointed out that Germany demonstrated effectively the possibilities of long-range cargo transportation by submersibles when the *Deutschland* made two trips across the Atlantic and docked here during the other war. He also cited the fact that the *Deutschland* got through the British blockade with "complete ease." The advance Germany has made with submarines, in size, power and range, since the *Deutschland* would enable her to send out sub carriers with as many as ten scout planes, or, perhaps a couple of light bombers in their holds, Mr. Lake said.

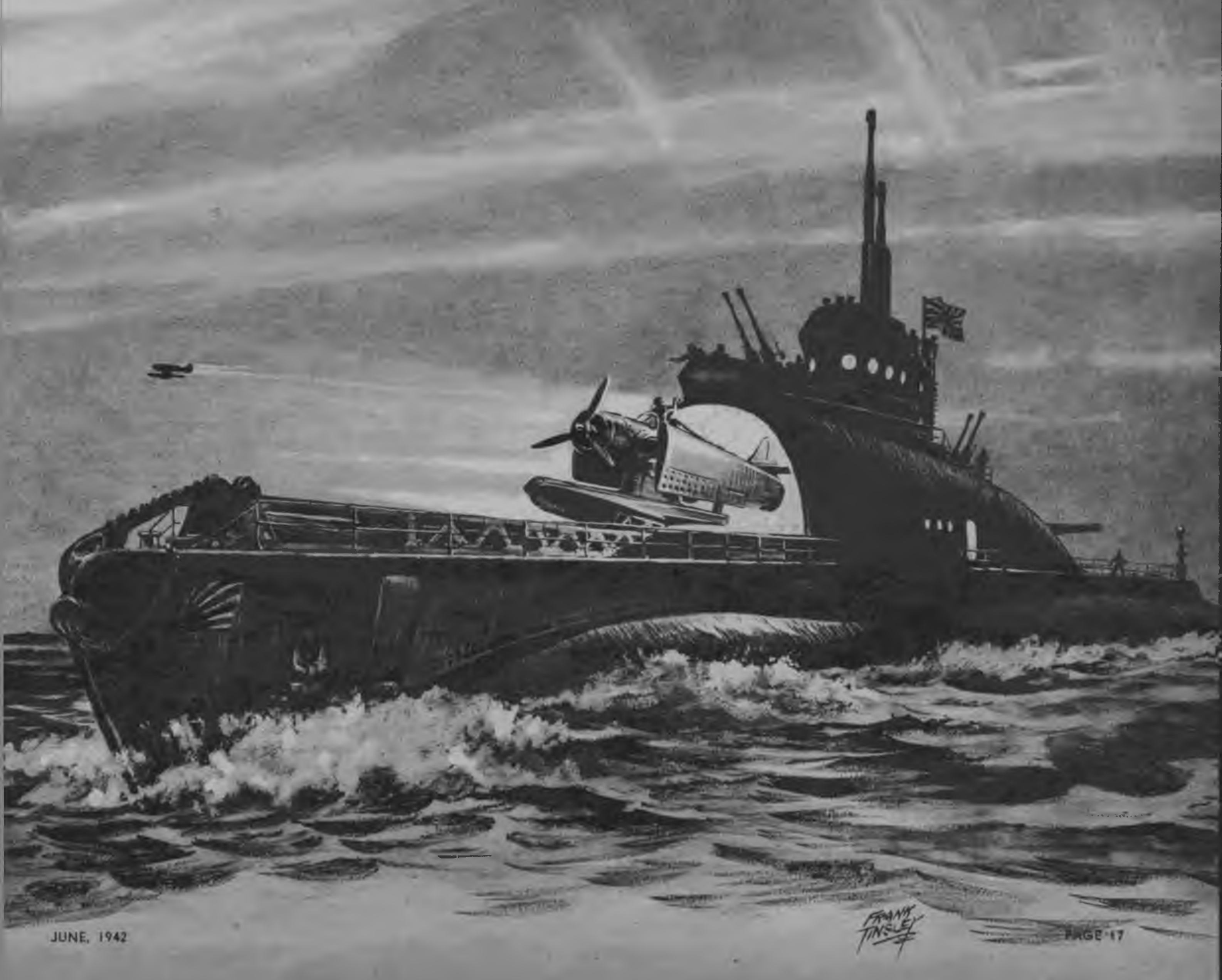
The aircraft would be hoisted to the deck by a collapsible mast, assembled on deck and launched with a cargo boom, he added. Mr. Lake favors the American method of using aircraft that can be dismantled, instead of the folding-wing types. "The wings could be stowed up-end or sidewise for space economy," he said, "thus increasing the carrier's aircraft capacity. . . . Submarine aircraft carriers," he continued, "could slip up to within twenty-five miles of their objectives. They could rest under the surface, snug as a bug in a rug, and carry out the assembling and launching at night."

In addition to having carriers, the Axis nations could have auxiliary subs with fuel and replacement parts, he said.

Another advocate of submarine aircraft carriers is Major Alford J. Williams, famous super-speed pilot and former navy flier accredited with developing dive bombing. Recently, in his syndicated newspaper column, he said: "Why don't we build one giant submarine, the same

Aircraft Carriers

BY SLOAN TAYLOR



France, too, has experimented with the plane-carrying submarine. The giant Surcouf, said to be the largest submarine in the world, carries one scouting plane with folding wings.

Not so many years after the close of the first World War there appeared the first plane-carrying submarine, the U. S. S. S-1. This tiny Martin seaplane was assembled on deck and launched by submerging rear of submarine.

England's contribution to the plane-carrying submarine was the M-2, which launched its two-seater scouting plane from a catapult afterdeck assembly.

tonnage as a light cruiser (in other words, build a submarine cruiser, and probably also one submersible aircraft carrier), develop the hit-and-run principle and beat the daylights out of the rest of the world with the daring and engineering brains of which America holds a plenitude?"

Perhaps Major Williams' earnest and appropriate suggestion will be heard as a voice in the wilderness. So, let us look frankly upon the prospect we face in accepting Mr. Lake's wary but seemingly accurate résumé.

The vision of the possibility of an attack by these monsters, especially when they are in the hands of monsters, is not a lovely one. Already, submarines have shelled and torpedoed United Nations' ships within sight of our Atlantic coast. With a flotilla of submersible aircraft carriers, supported by mother ships cruising safely two or three hundred miles at sea, the enemy could penetrate the country too deep for comfort.

If the mission were purely reconnaissance, one or two of these ships with a range of at least one thousand miles would be launched just off the coast, making it difficult to detect and intercept them before the ships were far inland. At night infrared photos could be taken, transmitted to the waiting sub by radio or television, in case the plane feared interception, and then return to be picked up by the submersible at a prearranged spot at sea. If the planes do not return, the sub commander has his pictures and information. For this sort of work, probably, special small black planes might be carried, or special radio-photo-equipped planes.

A *bomber* attack by a sub-borne fleet carries a vastly impressive set of implications. With a range of at least one thousand miles and a bomb load of roughly a thousand pounds each, this fleet could operate with what looks like very worth-while effectivness. For example, should such an attack be launched from close inshore off New York, the fleet might split up into various units, with the planes from each submersible aimed at a different target. Get out your map of the United States and with the point of a compass just off New York swing a five-hundred-mile semicircle around this launching point. The area it incloses will amaze you! For example, it will reach from the lower part of New Brunswick to the lower end of North Carolina along the coast and far enough inland to include all of Lake ***(Turn to page 60)***

Axis Bombers—U. S. Bound

BY JAMES L. H. PECK

Let's take a load-and-range look at the various types of ships that would bomb us—considering, also, the likely methods.

Enemy bombers attacking America will have to elude the 24-hour watch of more than a million volunteer observers of the Aircraft Warning Service.

TO what extent Axis bombing of American soil takes place will depend largely upon, first, how expensive we can make it for the venturesome Axis raiders; secondly, the available quantity of their bombers that are capable of negotiating the distances; and, thirdly, the bombing scheme Hitler and his partners intend to carry out against America.

During the epic debacle of the Battle of Britain, Adolf lost probably the last chance he'll have to get on English soil simply because the Royal Air Force took greater toll of Nazi craft than the Luftwaffe could afford to lose—the damage they did notwithstanding. Luftwaffe losses were so great during attempts at bombing Moscow last summer that Goering's boys soon gave it up as a bad job. The efficiency of American naval, aerial, and ground antiaircraft defenses—together with the public's psychological preparation and condition—will determine for the Axis commanders whether or not the efforts of attempting raids on continental U. S. are worth the effort. If our defenses cost them too many men and machines and if there is little or no hysteria and confusion on the part of the populace, we can make it too costly for repetition. But Hitler must, and will, try to bomb us in order to find out how much the effort will cost him.

Because of the greater distances involved in crossing the Pacific, we may reasonably expect Axis raiders to favor the shorter Atlantic approach. There is still another reason why the East may be chosen. Although there are several aircraft factories and naval establishments along the Pacific coast, there is a greater concentration of war industry and of population along, or near, the Atlantic coast. There are several methods by which attack might be launched, and, in most of these cases, different types of planes would be used for each method because of the varying distances to be negotiated and for other reasons which will become apparent.

Recent reports from British sources which have proved accurate in the past reveal that the Luftwaffe has available several hundred long-range bombers, most of which are of new type, and of which only relatively few have been used to date. This ties in with other reports that the Nazis have redesigned a number of their newest transports and seaplanes to function as bombers; these, of course, are in addition to several known new bomber prototypes.

Among these new long-range bomber landplane prototypes are the Gotha Go. 155, Junkers Ju. 96, Focke-Wulf 200K2, Heinkel He. 116 and 177, and the Blohm & Voss 142—all large four-motored ships.

The Gotha Go. 155 has been in design for more than three years and has undergone several modifications; it is reported to be Germany's fastest long-range plane, having a top speed of 340 miles per hour and a range of more than 4,000 miles with reduced bomb load. It is powered by four 1,375 h. p. Daimler-Benz motors, is armed with two power turrets, and carries a crew of seven.

The Junkers Ju. 96 is better known. It is an improved model of the Ju. 89 and is powered by four Junkers Jumo 1,200 h. p. engines. It has a wing span of 95 feet and is 64.5 feet long and has a useful load of 20,000 pounds. Speed is about 300 m. p. h., and the ship has a range of 3,300 miles. *(Turn to page 50)*

From the ever-rolling production lines of the Vultee plant come these basic trainers for our cadets. All that is lacking now is the engine cowling, which is added in test pe

Valiant Production

With a unique production system, Vultee is turning out Valiant trainers in record-breaking fashion. Watch 'em come off the line.

The skeleton of a basic trainer starts down the line. To this sturdy welded cockpit section are added the various parts and subassemblies that complete the ship.

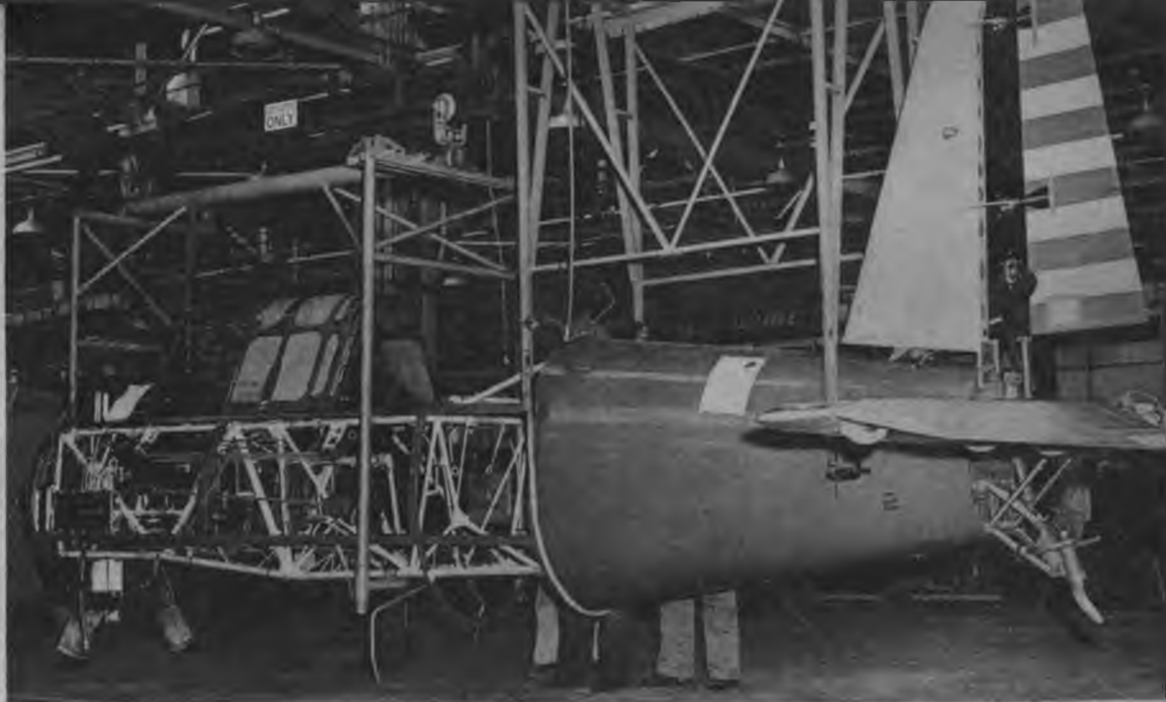
To this first section are added cowlings, wiring, seats and other details as it trav along the overhead conveyor track. Each step adds new accessories to its fram

Fitting instruments and wiring. Inverted V strut above instrument board protects crew in turnover.

Tail assembly when finished goes to paint room, then is added to original cockpit section on line.

Women, too, contribute to Valiant production. Here they s fabric to control areas. More and more women join aviati

Vings finished in another department receive amous army insignia and are added to the ship.



Tail assembly complete with elevators and rudder joins the fuselage section. The tail and fuselage conveyors meet each other.

Movement of tail sections is checked for perfect adjustment and ease of operation.

he body grows wings. Here the wing section complete, with the exception of outer pan-s, is added to the plane's fuselage. This inboard wing section will contain the landing gear.

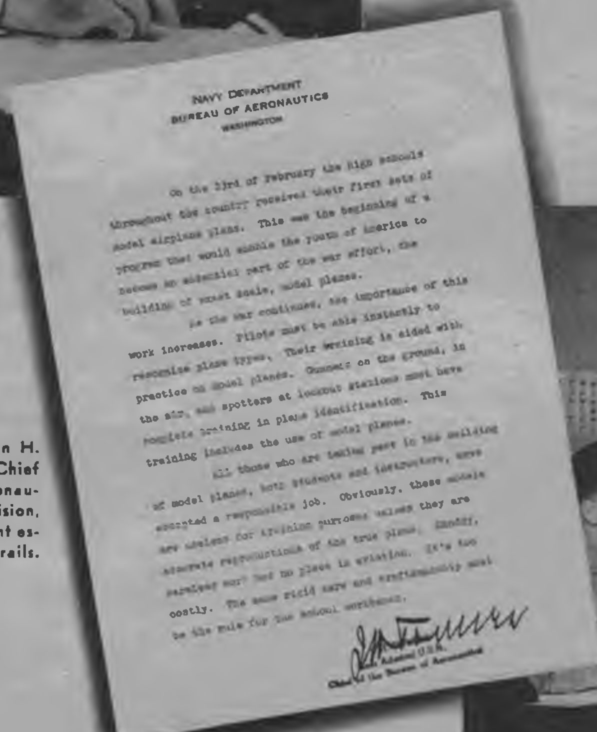
Final company O. K. is applied after rigid inspection. Here hydraulic line to brake is approved. Later, army inspectors also give ship a complete check.

Vith the wing section added, the landing gear and engine are attached. Such details as fire all, landing lights and prop are also attached at this point before the last-minute checks.

Down the final line and out through the door to flight. Here the trainers get final parts, wing tips and various last-minute details. Keep 'em rolling!

Some of the men to thank for job. Com. Flores, charge navy model project; Al Lewis of Air Youth, Academy Model Aeronautics; Paul Garber, U. S. National Museum, who drew up original plans.

Sanctioned By



NAVY DEPARTMENT
BUREAU OF AERONAUTICS
WASHINGTON

On the 23rd of February the high schools throughout the country received their first sets of model airplane plans. This was the beginning of a program that would enable the youth of America to become an essential part of the war effort, the building of exact scale, model planes.

As the war continues, the importance of this work increases. Pilots must be able instantly to recognize plane types. Their training is aided with practice on model planes. Gunners on the ground, in the air, and spotters at lookout stations must have complete training in plane identification. This training includes the use of model planes.

All those who are taking part in the building of model planes, both students and instructors, have accepted a responsible job. Obviously, these models are useless for training purposes unless they are accurate reproductions of the true plane. Shoddy, careless work has no place in aviation. It's too costly. The same rigid care and craftsmanship must be the rule for the school workbench.

Rear Admiral U.S.N.
Chief of the Bureau of Aeronautics

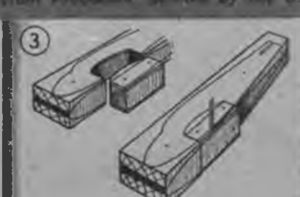
Rear Admiral John H. Towers, U. S. N., Chief of Bureau of Aeronautics, Navy Division, made this statement especially for Air Trails.

Right—What model builder doesn't see. Cadets (Naval Air Station) learn to identify friend and foe. Can you identify teacher's ship?

Drawings reproduced from the booklet "Scale Model Aircraft Construction Procedure" printed by the U. S. Office of Education. Captions condensed from booklet.

Trace the side and the top body outlines with templates.

Saw to top outlines, then replace all the pieces with pins.



A tip. When cutting out side view, leave space for wing.

Pins pushed through template holes will guide center line.

Use templates to check carving. Leave oversize for sanding.

Shape block to guide lines. Trailing edge 1/32 in. thick.

Trim wing to airfoil shape, cut and bevel for the dihedral.

Glue panels together at proper angle. Rest on wax paper.

Push pin through template to indicate outlines of controls.

Motor nacelle positions outlined with templates, then cut out

Dr. Robert Hambrook, senior trade and industrial specialist, Office of Education, is credited for the idea.

Dr. Wright, who heads Board of Education building program, and Dr. Studebaker, Com. of Education.

Special step-by-step method permits the inexperienced to do an expert job. Model on board is the Kittyhawk.

Uncle Sam

Aviation comes to the public schools! Thanks to the navy's request for 500,000 models and work of Dr. Hambrook, the nation's school system has become officially interested in model building, that basic course in air youth training.

WHEN Dr. Robert W. Hambrook, senior trade and industrial specialist in the Office of Education, got word that the navy needed 500,000 accurate scale models of war planes for purposes of aircraft recognition training and gunnery sighting practice, he envisaged a way of providing that immense number of models and putting aviation into more than 26,000 schools throughout the nation. Long a champion of model building as an aid in aviation training for American youth, Dr. Hambrook called in a committee of experts and formulated a program whereby pupils in grade and high schools would build the majority of models needed.

Accurate plans for fifty different models, fifty accompanying template sheets and how-to-do-it charts were volunteered by a model manufacturing company long experienced in such work. To place the project in the hands of school teachers throughout the country, the Office of Education decided to do the material up in kit form. The decision as to what schools were to build the models was left up to the superintendent of education in each State. After due consideration of shop facilities in schools of his State, each State superintendent made his allocation.

Stuyvesant High students, New York, indicate interest in modern subject.

TEXT BY AL LEWIS ★ ★ ★ PHOTOGRAPHS BY HAROLD KULICK

Rasp, coarse sandpaper block or bumps. Finish fine paper.

Tapered wings marked clearly.

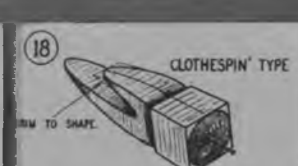
Shave away surplus wood, sand.

Mark wing outline by template, cut out with jig, coping saw.

Guide lines on top, front of wing insure proper shaping.

Nacelles carved like fuselage. Trial-fit, mark wing outline.

Carve nacelle as shown, leave untouched part that fits wing.



Clothespin-type nacelle cut out to fit wing. More difficult.

Clothespin nacelle sanded thus to fit over wing. Good trick.

Cut out stabilizer, fit in body slot, mark the outlines shown.

Only trusted students, instructors handle power tools. Ships: PBY-5s.

Sixty girls in aviation club at Girls Commercial High, B'klyn, do their part.

You do it this way. Perspective drawings help instructors and students.

With thoroughly worked out template system it is virtually impossible to make mistakes.

To make certain that the navy training centers received only absolutely accurate models, each school was obliged to set up an inspection committee composed of model-plane experts, woodworking craftsmen, aviation technicians and others. As each modeler (the participating student) completed a model which met the rigid requirements, he became a Cadet Aircraftsman. This is an honorary rank conferred by the navy's Bureau of Aeronautics. The certificate of rank bears the signature of Admiral John H. Towers, chief of the Bureau of Aeronautics, and the local superintendent.

After having any three types of models accepted, including a scout bomber or an observation plane, the student advanced to the rank of Ensign Aircraftsman. More models, including additional types, qualified the builder in turn for Lieutenant, Junior Grade, Aircraftsman; Lieutenant Commander; Commander, or Captain. The last required the specified types of plane models of five nations.

Any wood that can be whittled and sandpapered was O. K.'d for the project. Woods such as pine, ash, poplar were most widely used. Many schools made permanent templates for the use of the model builders—some of the more ingenious using straightened tin cans to conserve the metal supply. Many modelcraft dealers throughout the nation contributed technical advice to their local schools.

Obviously this project would focus national attention on aeromodeling and result in an impetus to the activity. Even before the project was well under way, many schools had written NAA's Air Youth Division in Washington asking for information on continuing programs in which students could participate—programs to include the building and flying of models, aviation theory and experiments. Not only has the entire field of model aircraft building been stimulated to even greater activity, but hundreds of thousands of new recruits will continue on in aeromodeling. The schools will realize what vast interest in aviation exists among our youth, and, like Britain, Canada and Russia, will foster that interest with active courses and progressive instruction.

To insure exact dihedral, pupil uses wing jig. Wing is of Heinkel 111.

Dull black paint is used so reflections won't distort outline from distance.

Start it right! Accurate alignment gives correct view to the observer.

"Yep, that looks right." Famed Spitfire is shown here step by step. Appears simple.

21

Next draw center line around thin edge of the stabilizer.

22

Shape tail to streamline by cutting away wood, then sand.

23

On low-wing model trim body to fit wing. Glue wing in place.

24

On midwings remove bottom section, fit wing; glue, trim.

25

When stabilizer is glued fuselage, line up with win

26

On multimotored jobs, glue any nacelles in special cut-outs.

27

Post-card-weight paper fillet is glued on low-wing models.

28

Fillet top made with plastic wood. Several applications.

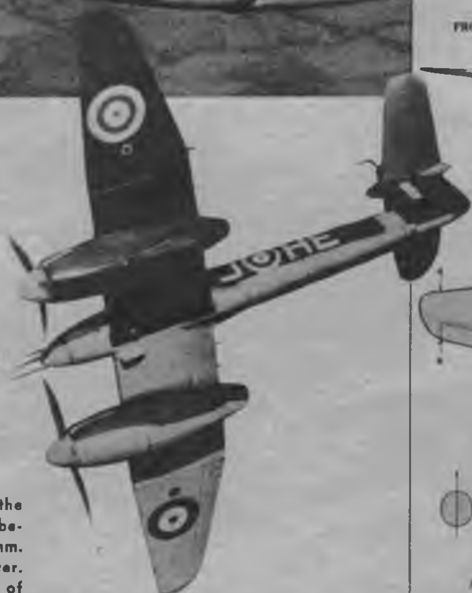
29

Now we are ready for all final details, spinners, exhausts.

30

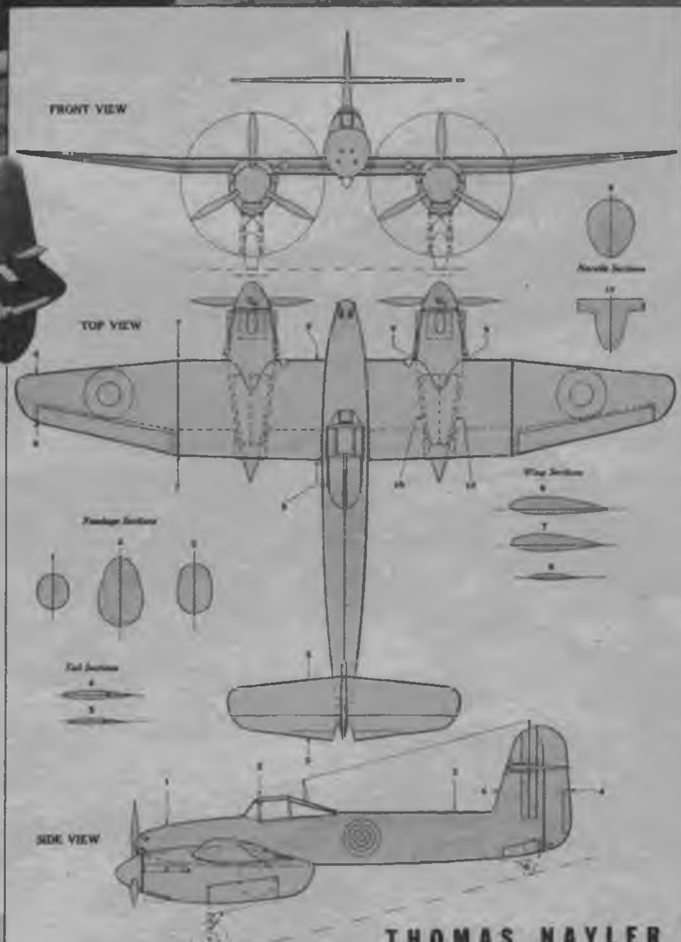
Now comes the flat black pa For own home use paint ga

Westland Whirlwind



BRITISH FIGHTER

Best-kept secret of the war was the Westland Whirlwind, first tested before the war. Armed with four 20-mm. cannon, it is a long-range fighter. Whirlwinds were part of the escort of the first great daylight raid on Cologne, when they protected the bombers as far as Antwerp. Engines are Rolls-Royce Peregrines of 850 h. p. each. Span is 45 feet, length 32 feet 3 inches, height 10 feet 5 inches. The stabilizer is set high on fin, clear of the slipstream from the twin propellers.



THOMAS NAYLER

Pinch-Hit Materials

Hardwood and other "substitutes" are an old story, balsa a luxury, to Russian and German model builders. Construction follows real plane practice quite closely.

Though we need vital priorities on model materials, government approval had not been given when we went to press. Meantime, if you run short, here are real tips from old-timers.

"SOAK all strips for fifteen minutes in boiling water," the directions sheets used to say when you started the fuselage sides. That was prior to 1928. Now, thanks to Hitler and Hirohito, there is a strong possibility that we will once again be using hardwood and wire nails and gosh-knows-what—if we want to go on making models. Please don't think this means you should become a balsa hoarder. 'Tain't patriotic and, for quite some months, such doings won't be worth the time and thought.

Most manufacturers have ample stocks of that good old balsa and the makings of many a swell model are on the production line. Everyone in the know believes that those all-important priorities will be forthcoming now that the schools are becoming interested in model airplane building courses as a starter for aviation training of American youth. But just in case the pinch begins to hurt in the meanwhile, let's face realities and see what we are going to do about this challenge to the traditional ingenuity of you modelers.

"We did it before and we can do it again" might be our motto. Pine and bass were used, without a squawk, with widespread success in the past, and models so built weren't difficult to make. Yes, and they flew, too. Flew *well,* in case you're asking. At the risk of giving away his age, the writer recalls his first model, built from kite sticks. (Will the gentlemen in the back rows please keep their seats?) Before a model dealer put in an appearance at a nearby town, our local carpenter shops were haunted by model builders with pine planks fresh and hand-picked from the lumber yards. The carpenter charged two cents per each for ripping the plank into strips. Then, as now, fuselage sides were made by pinning strips directly onto the plan. Crosspieces were fastened in place by pushing thin wire brads—ten cents a box at the hardware store—through the longerons into the crosspieces. Outside of such tricks as not putting top and bottom crosspieces at precisely the same station as the side pieces—the nails would meet—the idea was pretty much the same. Perhaps you older fellows remember trying paper napkins, brown wrapping paper, and regular household tissue; shellac and varnish; reed and bamboo.

Above—Paul Guillow recently talked before model manufacturers on his use of varied materials. Pine strips, cardboard formers worked beautifully. Below—Hardwood and small nails were all we had in 1927. This picture of a Los Angeles contest was taken that year. Second from right is Bill Atwood, noted motor designer, "Lindy" of the meet.

Scale models look like a splendid out when the rubber shortage begins to hurt. This interesting photo taken in a British toy factory shows almost all German, English types.

BY WILLIAM WINTER

With the experience every modeler has today we should be able to go on till doomsday building top-notch models no matter what happens. Paul Guillow puts it this way: "So far as we can see, modelers need have no fears about being able to obtain good flying models. And as for the manufacturers, they need not worry too much. All this is predicated on acceptance of the substitutes *(remember, we are considering the long chance that balsa, et cetera, may become scarce—The Editor)* by our customers—the modelers." There you are, you guys. It's dumped right in your laps.

Mr. Guillow passes along some interesting dope for new ways and means of doing all sorts of things. For instance, he's tried cardboard formers on some of his experimental versions of standard kits. A little Republic flying model we saw was a wow, thin pine strips (glued together) and cardboard formers regardless. Joe Ott, too, specifies cardboard formers. Such formers work particularly well with crutch-type fuselages or when slipped over square foundation fuselages. Just remember to reinforce these ersatz formers by gluing to them a thin strip of wood. Cardboard wing ribs are a cinch and have all the strength in the world when reinforced with a thin strip glued along the side of each rib between the leading and trailing edges. There's a tip, men. Conserve that sheet balsa.

One possibility will be kits that substitute pine, bass, ash, or some other similar wood for longerons and spars. Wing ribs, wing tips, and similar parts will be stamped on balsa, as always. Cardboard can be used to advantage for bulkheads—and wing tips as well, for that matter. As a guide to the size hardwood strip to use for longerons, one twentieth to one twenty-fourth-inch square is about equal to one sixteenth-inch square balsa. The regulation cement may not work out too well with hardwoods, but you can trust cement manufacturers to do something about this in plenty of time—if we ever do use hardwood. However, there are some possible glues on the market that might work well with hardwood. But more of this anon.

When you get into three-foot models with one-eighth squares of hardwood, razor blades don't do so well. It's a much better idea to use a coping saw for cutting crosspieces. Ribs, too, are cut out in jig time with a saw. The saw blade should be removed from the saw frame and turned around so that the teeth cut the wood when the saw handle is pulled down. Otherwise, the teeth catch on the upstroke and buckle the blade. We know it ain't right, but it works better.

We asked our friend the Traveling Salesman to give us the low-down on this material business. Followed a flock of earnest telephone calls between said Salesman and sundry unidentified persons (sources heretofore considered reliable). And this is where we began to learn the inside stuff. Did you know there is a Mexican balsa? Well, there is. It's called Bomba wood—we heard ten different spellings—or monkey wood. It's hard, strong, very light. Seems to be a cross between white pine and balsa. We'd say it should do well for longerons and wing spars. (Some kits already use it this way.) When we heard this we figured we had foiled the cargo-space problem. But, alas, there's a shortage of railroad cars, or something, from Mexico. However, we are still counting on getting the usual balsa.

How about paper? Silkspan is available in white only. You model dealers should be interested to know that reports of there being no silkspan aren't necessarily so. Delivery is slow—like everything else these days—taking about five to six weeks. Of course, there is no Jap tissue—hurrah! Whitfield says there is an American bamboo paper which is better anyway. And it comes in colors. It's a little heavy, though, which might limit it to large gas jobs. Asked about this, Whitfield said it doesn't absorb as much dope as the usual Jap tissue, hence might be used on smaller gas jobs as well without a harmful increase in weight. There is an "American tissue," white, which is adaptable to rubber-powered models—if we had the rubber. We can use it on gas jobs by double covering; that is, by using two layers of paper. If we remember correctly, Henry Struck pioneered double covering. Covered once, sprayed with water but not doped, then covered again, running the grain of the second layer at right angles to the first.

Straight from the feed box we got this tip. Air Associates, Bendix Airport, Bendix, N. J., have an airplane cloth that is O. K. for large gas models. It's made from cotton. As we go to press (the Salesman ran out of nickels for the phone) we are not sure how plentiful this cloth is. Individuals and dealers might drop Air Associates a line to check on this. For small models Christmas-grade wrapping tissue and household tissue can be pressed into service.

All this sounded interesting, so before the Salesman (getting hoarse

(Continued on next page)

(Continued from preceding page)

by this time) had a chance to hang up, we demanded all the gory details. "What do you want to know?" says he. "O. K., smarty," we came back. "Suppose we do have to use pine. What do we do for glue? Maybe cement won't hold so well."

"We won't be using hardwood, anyway, but if it will make you guys feel better, I'll get the dope on glue," he told us. More phone calls, more busy executives (he knows them all) rudely awakened at their desks.

LePage's—yes, the glue-and-mucilage LePage's—has a special cement for model airplanes. It will do the trick on pine or balsa. Price for one and one half ounces is ten cents. Comes in tubes. It's cloudy in appearance but dries clear. Then there is Ambroid, costing a quarter for one and one half ounces. Old-timers will remember Ambroid quite favorably. It's thickish and amber in color. Dries strong and has all the qualifications of the regular model cement. Works well on pine, better on balsa. Your Salesman even tried Weldwood. Sure, you can use it on models. Pressure is required in drying, which makes it preferable for gluing up blocks. Frank Zaic once told us that he used Weldwood for a certain item and that it could be used widely, if time was allowed for drying. Retails at ten cents for about one and one eighth ounces; twenty-five cents for three and one half ounces. Buzz your local hardware store about all these items—if you have trouble getting cement. (Weldwood is made by U. S. Plywood Corp.)

Here we should assure you that there seems to be plenty of dope and cement. Some manufacturers are selling wholesale lots. Speaking of dopes, not necessarily liquid, we know of one chap (he fancies himself an authority) who pulled a prize boner with one of those prebalsa buggies. It seems white shellac was the rage for covering at that time. The technique was to coat the tissue with the shellac and then drape the moist paper over the frame. Once it had dried, the *(Turn to page 57)*

Ersatz Model

BY H. A. THOMAS

The proof of the pudding. Built from substitutes, our Ersatz job flies with the best of them. Balsa is easier to work with, but from any other standpoint pine is better.

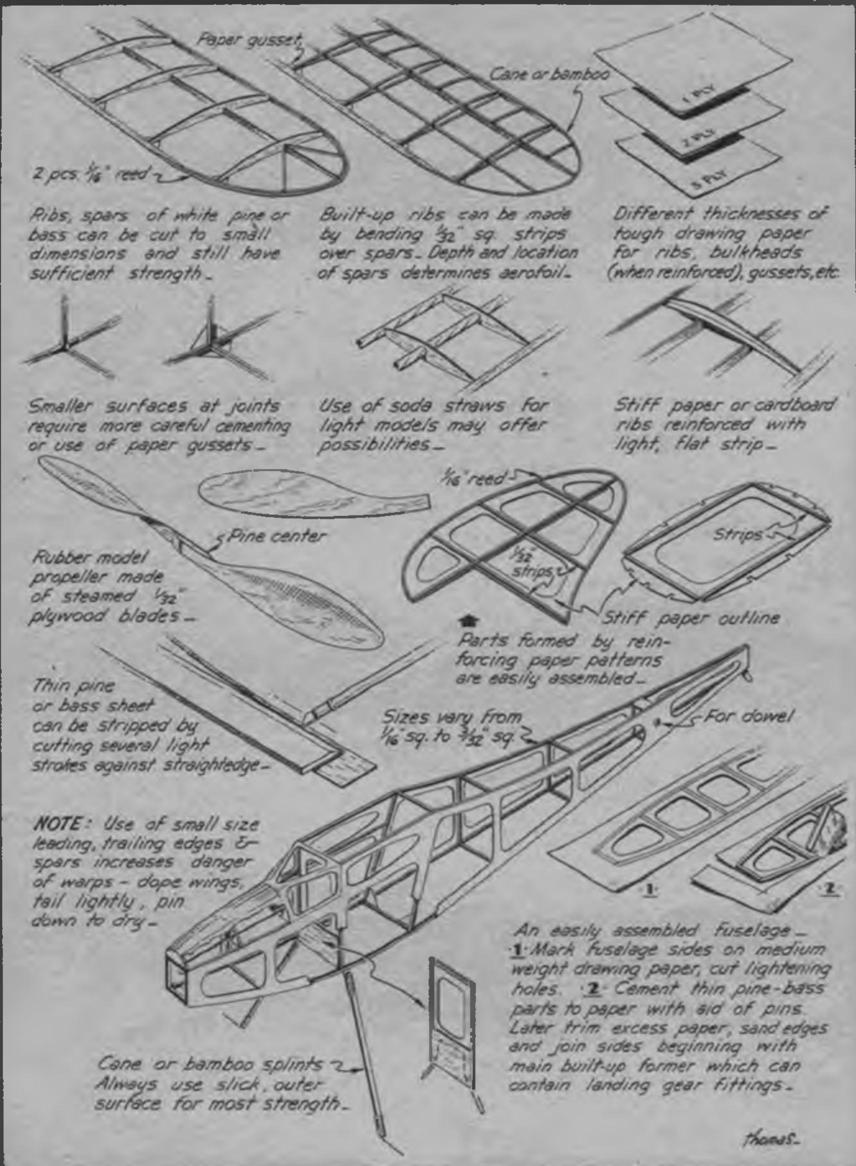
Facts talk. Here's a little job with standout performance, though made from drawing paper, cane, wire, white pine. Some things we must have, but examples like this help.

WHEN faced with serious shortages of essential war materials, German scientists have startled the world with their success in discovering or creating "ersatz" or substitute materials. These products range from synthetic rubber and gasoline made from coal to substitute foodstuffs. Somewhat similar conditions have made it necessary for the United States to launch a huge program of synthetic rubber production, with the prospect of many other heretofore plentiful materials being replaced by others.

A glance at the NAA's estimate of the amount of balsa required by model aviation for 1942 not only indicates the extent of model building today, but also shows how dependent we have become upon this unusual material. Although the great improvement made in design and performance is largely due to the use of this light but strong wood, at the same time it is causing us to build more hastily and carelessly without much regard for the strength-weight ratio of parts. We have always been assured our models would be strong and light if we built them of balsa.

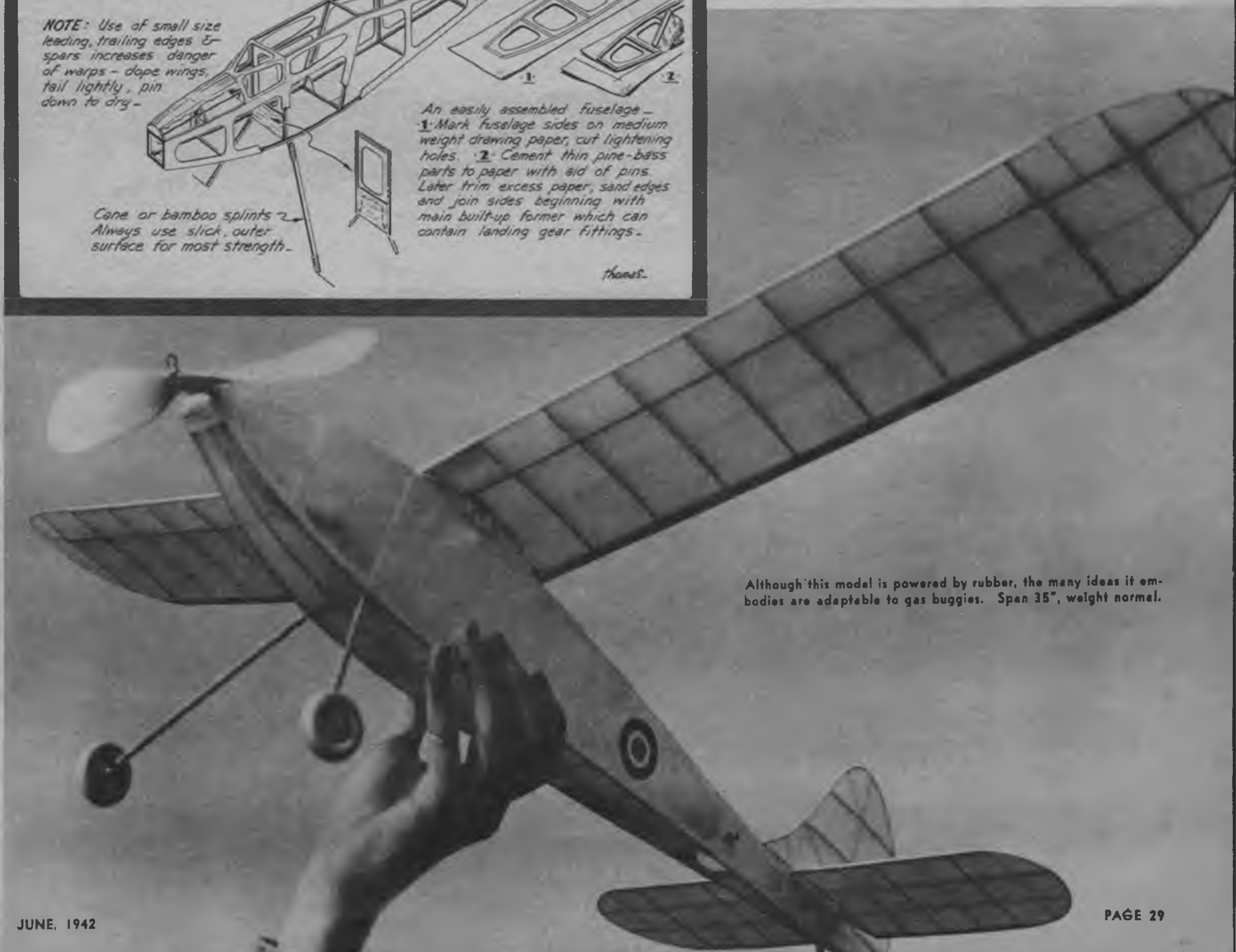
War conditions may never prevent us from getting enough balsa for our needs, yet the possibility affords us an opportunity to see what might be done without it. We can start with materials used in the earliest successful models: reed, spruce, pine, bass, paper, bamboo and others. By applying our knowledge of design and flight adjustments, by determining the dimensions of parts with respect to the strength required, we can build models of reasonable performance and exceptional strength with these materials. In addition, there are no doubt many other satisfactory materials close at hand which have not been "discovered" because balsa has been so plentiful and convenient to use.

Our experimental model was built entirely from bits of drawing paper, cane, wire, and assorted sheets and strips cut from a 1 x 3 x 36" white pine board. The propeller was carved from a block of the same wood. Most lumber mills handle supplies of white pine, which is usually of even texture, is straight-grained, and can be cut, stripped, or carved without too much effort. Most of the substitutes for balsa will naturally be heavier but at the same time much stronger and can consequently be used in much smaller dimensions. These smaller sizes reduce the cementing surfaces at the joints and as a result these must be more carefully cemented and in some cases reinforced *(Turn to page 53)*



The author made fuselage from thin hard strips, glued on sheets of paper. Then the paper was trimmed, lightening holes cut.

Nothing the matter with this job. Looks neat and is far stronger. Hard strips will become available when, and if, balsa goes.



Although this model is powered by rubber, the many ideas it embodies are adaptable to gas buggies. Span 35", weight normal.

Maybe rubber IS scarce, but you can double the life of what you've got. Listen to the tricks of an old Wakefield winner!

THERE is one horrible sound that can be heard at every rubber contest without fail, and that is a sheared rubber motor tearing a fuselage to bits—with the resulting cries of "you can fix it!" That sound is going to be very expensive this year, not only in terms of money, but in the loss of precious rubber that cannot be replaced. Yet so many of these motors would not have broken had they been properly taken care of in regard to proper lubrication, handling, and breaking in. But the one thing that takes the biggest toll is the flier's willingness to take a chance on a motor that has been damaged through a collection of grit, cuts and improper lubrication. Here are some of the things that should be doné, starting from the time rubber is purchased from the dealer until it has made its final flight of the day.

First of all, if it is to be stored for any length of time, put rubber in a coffee can or jar and keep it in a *cool,* dark place until ready for use. Then make up at least two motors for each ship, shake off all the grit and dust that may have accumulated, and lubricate with fairly thick lube about the consistency of sirup. Before putting the motor in the plane, check over the rear hook and prop hook or bobbin for any sharp

Stretch that Rubber

BY DICK KORDA

edges that will cut the rubber. If you use a bobbin, put a rubber band around the motor and pull the band against the bobbin after the motor has been hooked on. This will keep any odd strands from twisting off and getting pinched between the bobbin and prop shaft.

The main use of a bobbin is to keep the rubber running true and keep it from climbing up a regular prop hook and rubbing on the inside of the plane. The majority of the cuts at this point come from sharp edges on the prop hook, left by pliers when bending, and by having the lube rubbed off from handling when winding up the motor.

When breaking in the motor, which is the most important step in preserving rubber, always start off with *less* than half the turns it is capable of holding, then slowly bring the amount up with each flight until you have *almost* reached capacity turns. Save winding to capacity turns for contest flights where it is really needed. After breaking it in slowly this way, take it out and relube it once more. After all, you can excuse a fellow for taking a chance with a weak motor, but anyone who uses a motor without proper lubrication deserves anything that happens—and it will happen.

If the motor has been stored away between contests—never leave it in a plane any longer than it takes to complete your *(Turn to page 50)*

Down The Runway

CONDUCTED BY AL LEWIS • EXECUTIVE DIRECTOR

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

Pvt. Robert Yandergrift's guide-liner shows military influence. Novel four-blade prop.

The Wakefield Trophy, most famous modeling cup. Last won by Dick Korda, it's out of circulation till war ends.

AMONG the many Academy chapters which are turning to and aiding in America's "air conditioning" program is the Oklahoma City Gas Model Association. Members of the OCGMA instruct classes every Saturday morning from 8 a. m. until noon in the nine junior high schools of the city. The club is working in conjunction with the school board and the expert modelers instruct and assist in the building of model airplanes of all types as well as give practical lessons in aerodynamics.

★ ★ ★

It took a war to do it, but at last the gal modelers are officially recognized! The National Advisory Committee for Aeronautics wants to hire expert feminine model airplane builders and fliers to work in the NACA laboratories at Langley Field, Virginia. Girls between the ages of sixteen and twenty-five are eligible and can obtain complete information from William R. Howell, Special Representative, Civil Service Board, Fort Munroe, Va. Their duties will consist of building and testing various types of models and assisting in many research projects under way at this government laboratory.

Whenever the Civil Service Commission is called upon by the NACA to obtain more model aircraft makers, they just get in touch with Academy headquarters and in a matter of an hour or two, several thousand announcements are in the mail on the way to clubs and leaders throughout the country. (Turn to page 64)

★ ★

Ask Balsa Butch

Questions of general interest to model builders will be answered on this page; all others by mail. Inclose a three-cent stamp to insure receiving a reply.

Norman Vaty, Brooklyn, N. Y.—As for that wind tunnel, we suggest you build a model that will not be too large for tests. See the May, June and July Air Trails. Nothing much else we can say except that once you have built it, you're "on your own" as far as tests are concerned. If you're entering high school, Norm, fill your schedule with science and math courses. Follow the regular requirements to the best of your ability—but take algebra, intermediate algebra, plane and solid geometry, and trig, if possible. Also include biology, chemistry and physics. They'll all help you in your aeronautical future.

J. W. Meyer, Harvard, Ill.—Joe, we're going to stick our neck out and put ourselves right on the fire. Taibi had two flights with the Pacer and one with the Zomby at the Nationals. His last flight was with the Zomby, and was not appreciably better than his second flight with the Pacer. However, he lost his original ship on the second flight, and having a Zomby at hand he flew it to complete his flights. After all, Sal designed the Pacer and—well, Leon and Sal fought it out in Sky-Scraper contests all summer (1941) and at the end of the tests the club members pronounced the ships a toss-up. So take your choice.

R. E. Shanahan, Buffalo, N. Y.—Sorry, there's no kit on the new Korda design. However, it isn't a hard job to scale up the magazine plans and build this swell ship that way. After all, it's not hard to build, and you'll learn twice as much about your craft if you follow this suggestion.

Jay Ocken, Minneapolis, Minn.—Write to the Promotion Department, inclosing 15 cents, and ask for the plans of the Aeronca Tandem, shown in the February issue of Air Trails. It's a swell ship for any Class B engine.

Pvt. Harold L. Thompson, Pendleton, Ore.—Hiya, Harold! Glad to hear from you again. We remember that day we met—you were in training at mechanics school and we were trying to fly in the face of violent police objections. Anyway, glad to see you've a little time to build, and I'm sure Snuffy will fill the bill and probably give good honest P-40 pilots a few lessons in "getting up there." We're sorry about that idea of yours, but we tried it once with dismal results. Nuff sed. Most of the gas modelers in the New York area are pretty busy with defense jobs or in the air forces. However, with your address listed, we know you'll receive a batch of letters soon. (How about it, boys? Drop Pvt. Thompson a line at Pendleton Field, 34th Bombardment Group, 7th Bombardment Squadron, Pendleton, Ore. He's a modeler from way back, and is much interested in Class A and B gas jobs.) Write us again, Hal, and give us more dope on how Mr. Snuffy performed.

Raymond Schroeder, Sturgeon Bay, Wis.—Ray, we suggest as your first step in gas modeling you build a simple, conservative box-type model—something easy to make and adjust. It should preferably be slow, not tricky, and rugged. Oh, yes, we are told that in rubber autogiros, the rotor is not power-operated, but turns as the ship moves forward, by windmill effect.

W. A. K., Jr., Gardner, Mass.—Trim tabs are used for adjustment. When on a rudder they serve to give turn without turning the rudder proper.

(Turn to page 46)

The Nightmare

BY ROBERT L. BROWN & DALE IRWIN

Don't fret about wartime limitations on flight times. Get spin-dizzy with this control-line terror. It's patterned after the Manta fighter and has a Davis wing. Sensational!

Dale Irwin, designer, with Tiger Aero-powered Nightmare. Two wheels optional.

HERE'S a U-control racer that is causing unusual excitement among West-coast modelers. At the first appearance of the Nightmare in a local contest, the line of competing models was practically deserted. No, it wasn't a sudden Jap raid; it was because all contestants were crowding about to see Dale Irwin's spectacular new ship, a Davis-wing racer, equipped with the new "fluid" foil.

In flight, the job proved that it had a lot more on the "line" (instead of on the ball) than just looks. It was a flying demon.

Dale found a few available pictures of the Davis pursuit in a copy of Air Trails. Using these as a basis, he designed this racer. The drawing includes many improvements of design that should improve performance as well as looks.

The fuselage is quite unusual in construction. It combines some usual methods with some not so common. Cut out keels and formers; build the upper removable portion of the fuselage first. When finished it will help to jig and line up the remainder of the fuselage structure. Always cut the notches in the formers, keels, bulkheads, ribs and so forth a little too narrow rather than too wide. It is much easier to slice off a little than it is to build up the notch with splinters carefully glued and cut. (This latter process often assures a perfect covering job. Remember this the next time you begin to get sloppy in trimming ribs and formers.)

Notice that the shallow-notched keels, when pressed into the notched formers, automatically align the structure. The first step is to slide the two side keels into all the formers. Complete alignment with the top keel. Check vertical alignment of formers with a triangle.

Slide $^1/_{16}$" flat base piece Z through slots provided in Formers No. 6 and 7. To this base attach formers 4A, 5, and 5A. Carefully line up the pilot inclosure.

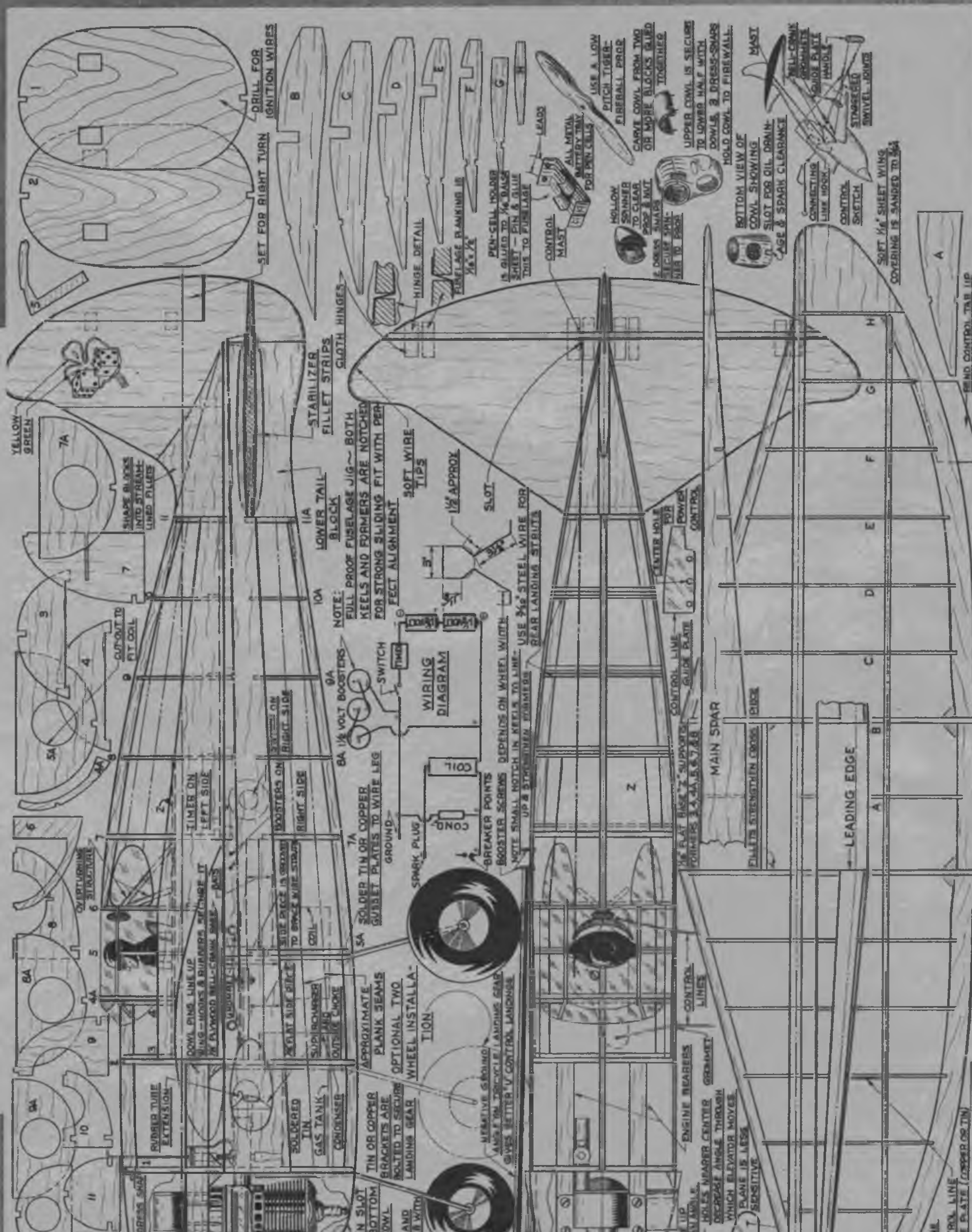
Glue the first plank along the bottom of each side. *(Turn to page 55)*

Below—Meet Robert L. Brown, draftsman. Tricycle-gear irons out bumpy landings.

The peculiar planform of Manta gives added efficiency. Nightmare copies this.

15c **FULL-SIZE PLANS** of this model may be obtained by sending fifteen cents to

AIR TRAILS FULL-SIZE PLANS, 79 Seventh Avenue, New York, N. Y.



Ideas for Radio

Beauty of radio control is realism of the model in the air. This job is built like a real ship, has hardwood longerons, plywood nose covering, is assembled with screws and nails.

FIG. 1

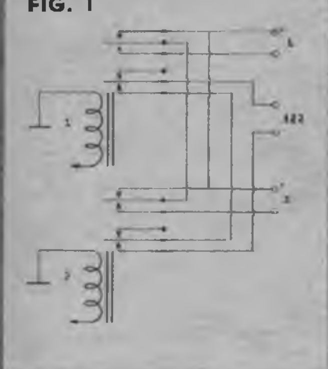
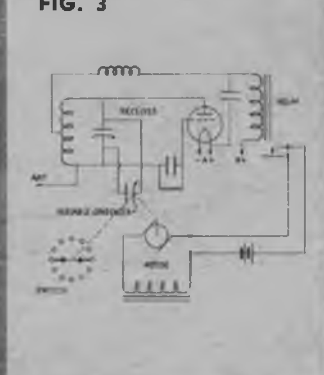


FIG. 2

FIG. 3



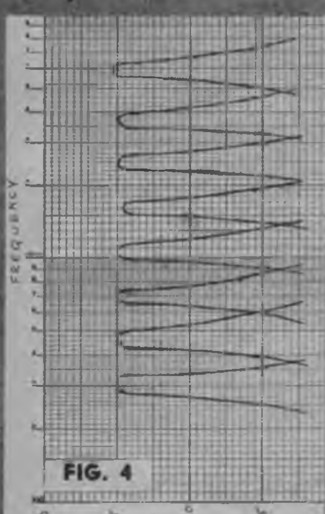
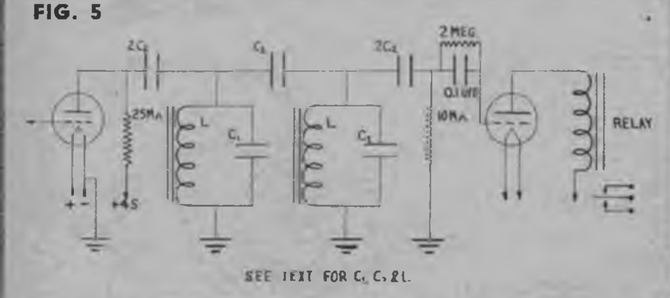


FIG. 4

FIG. 5



THE purpose of this series on the basic elements of the radio-control system is primarily to present an idea or two for you to think about. It is well known that one idea begets another. Through the presentation of these ideas we hope to start you thinking—thinking along lines of improvement, or perhaps on an entirely new tangent.

This time we're going to talk about selectors. No other element of the radio-control system offers wider scope for ingenuity or a greater variation in method. Numerous concepts have been advanced at one time or another—some brilliantly simple, others fiendishly complex. Because of weight, bulk or other considerations, however, only a fraction of these are applicable to model control.

The function of the selector is to sort out the various control operations in accordance with instructions picked up by the receiver and to call the appropriate driving circuit into play. There are several kinds of selectivity. Some are in practical use at the present time; others offer interesting possibilities for speculation. Among the former are frequency, amplitude and pulse selection. Included in the latter are time (speed) and phase selection.

Parenthetically, in this discussion "selectivity" is limited to selection between operations, rather than the manipulation of an individual control by means of a selective element. That comes under the head of control drives, which are a separate subject.

The simplest kind of selection—and at present the most common—is the use of a separate radio-frequency channel for every control operation. Everyone should know how the basic system works by now, for it has been described often enough.

There's nothing much new that can be said about the basic method, but Fig. 1 shows how two r. f. channels can be used to control three operations. For simplicity, the relay circuits alone are shown. Double-pole relays are required (or two single-pole relays in series in each plate circuit—total resistance not more than 12,000 ohms for RK-62s). When either relay alone is closed, the corresponding control operates. The third control is accomplished by closing both relays simultaneously. Still more controls can be obtained by adding additional channels. Because of the common connections, care must be used in selecting the circuits to be used with each channel.

Of course, the transmitting equipment must be arranged so that two signals can be transmitted simultaneously, with the power supply capable of handling both units at once.

Another way of using r. f. selectivity is shown in Figs. 2 and 3. This is a variable-frequency method. It is actually a receiver with a motor-driven tuning unit that automatically tunes itself to a transmitter anywhere within the band. The receiver is mounted on a small d. c. motor and reduction gear train assembly, to the shaft of which is coupled (a) a rotary selector switch and (b) a small variable condenser in parallel with the receiver-tuned circuit. The relay on the receiver

Fig. 1—Three controls with two channels for "doubling up." Fig. 2—Self-tuning retunes automatically to transmitter frequency. At the same time sets a selector switch. Fig. 3—Circuit of variable-frequency selector. Fig. 4—Response curve of multichannel filter for audio selector. Fig. 5—Band-pass audio-filter diagram.

ontrol-Selectors

BY CLINTON B. DESOTO

Though radio control is out for the duration, you'll find this series of authoritative articles a fine reference for the future.

FIG. 6

FIG. 7

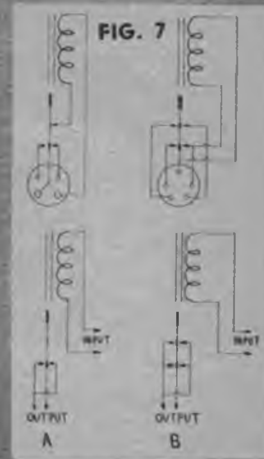
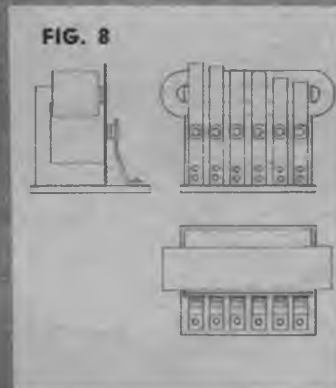


FIG. 8



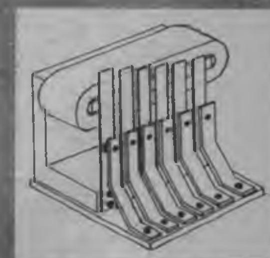


FIG. 9

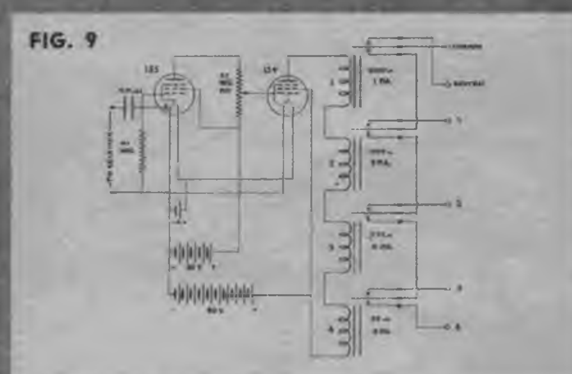


FIG. 10

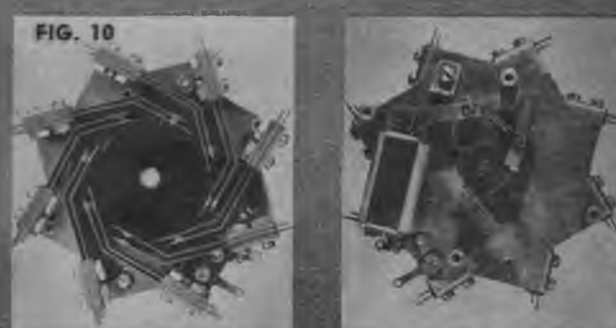
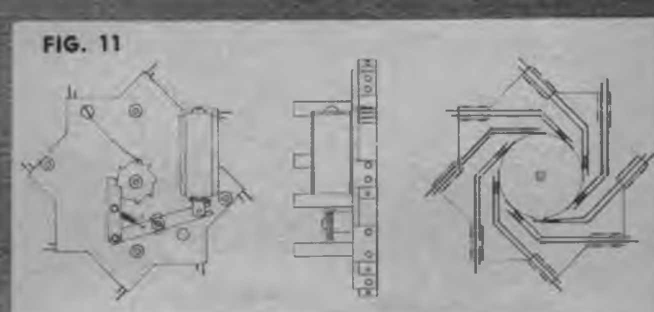


FIG. 11



closes the motor circuit whenever the tube's plate current is high; i. e., when no signal is being received. This causes both the variable condenser and the switch arm to rotate slowly. When the condenser reaches a point where the receiver is in tune with the transmitted signal the plate current drops, the relay opens and the motor stops.

By providing several selectable transmitting frequencies and arranging the switch arm with respect to the motor-condenser drive so that the contacts close at the equivalent receiver tuning positions, multiple-circuit selection can be accomplished with only one transmitter and receiver.

A number of applications of this device have been made. In the model shown, a standard manufactured receiver as well as motor and gear train were used. The variable condenser is a Cardwell ZR-10-AS with one stator plate removed and the rotor plate spaced away from the remaining stator until it just tunes the 50-60 megacycle band. An insulated flexible coupling connects the condenser and gear train shaft. The selector switch is of the bridging type, the circuit between any two contacts 180° apart being completed by a double wiper arm. Small tinned rivets (not eyelets) were used for contacts, spaced 30° apart on a 1¼" circle around a piece of 1" bakelite.

AUDIO SELECTION

Up to now audio selection has been pretty well confined to full-scale work or to models other than aircraft where the extra weight involved is unimportant. Recent developments in ultralight transformers and inductances by such manufacturers as U. T. C. and Inca have brought renewed interest in the tuned-filter method of a. f. selection, however. One simple system was described as a complete two-channel receiver in the first article of this series, last month.

When more than two channels are used, more elaborate filters are required. Experimental units using two-section top-coupled tuned circuits have been built with from five to nine channels, having adjacent-channel discrimination varying between 10 and 25 db. For ordinary work, with the input to the filter held reasonably constant, 10 db skirts are adequate.

Fig. 4 shows the performance of a typical experimental filter of this type using special inductances. (Commercial units should give comparable performance, however.) The total weight was slightly over one pound.

The basic circuit is shown in Fig. 5. The fixed values shown are based on the use of a standard triode such as the 1G4GT for the coupling (input) tube. As shown, the tube is operated without external bias other than that supplied by the filament. A high-mf. tube could be used with an increase in sensitivity, but this would require more inductance in the filter, increasing its weight. (Con- *(Turn to page 60)*

Fig. 6—Tuned-reed filters are converted auto-radio vibrators. Fig. 7—Connections for converted vibrators. Top, vibrator; bottom, filter. Fig. 8—Arrangement of multichannel tuned-reed filter. Fig. 9—Amplitude-type selector. Fig. 10—Rotary switch. Contacts, left; rear view, ratchet, right. Fig. 11—Rotary selector switch.

Carve This

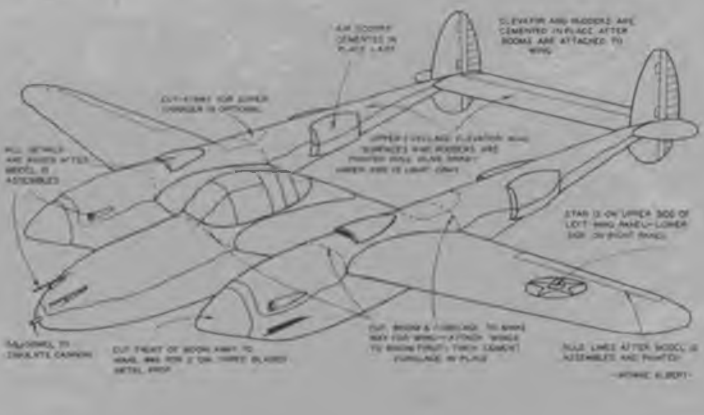
THIS solid scale model is an eleven-inch replica of the army's most highly powered and heavily armed fighter now pushing the enemy around at the battle fronts—the P-38, known to the British as the Lockheed Lightning. The two Allison engines are supercharged for high-altitude work and turn out slightly over 2,700 horsepower—which to you and me means a speed of well over 400 m. p. h.

Because of the unusual construction characteristics—that is, the two booms—this model will present a more difficult problem in construction than is true with most single-seater fighter scale jobs. Start the construction with the carving of the two booms. Since the plans are reproduced full size, merely trace the side view of the boom on the correct size block of medium-grade balsa—obtain all dimensions by direct measurements from the plans—and proceed to cut out the boom by sawing along the lines with a coping saw. If you haven't a saw of this type a knife can be used, but make certain that you leave at least a $^3/_{32}''$ margin. After the side view is carved, trace the top of the fuselage on the block and cut out in the same manner as the side.

In shaping the boom, first cut out the boom templates from two-ply Bristol board, making certain that the curves are absolutely smooth and not bumpy. After you have your templates, start carving the fuselage roughly with a sharp knife, cutting off small slivers at a time. When you feel the boom *(Turn to page 57)*

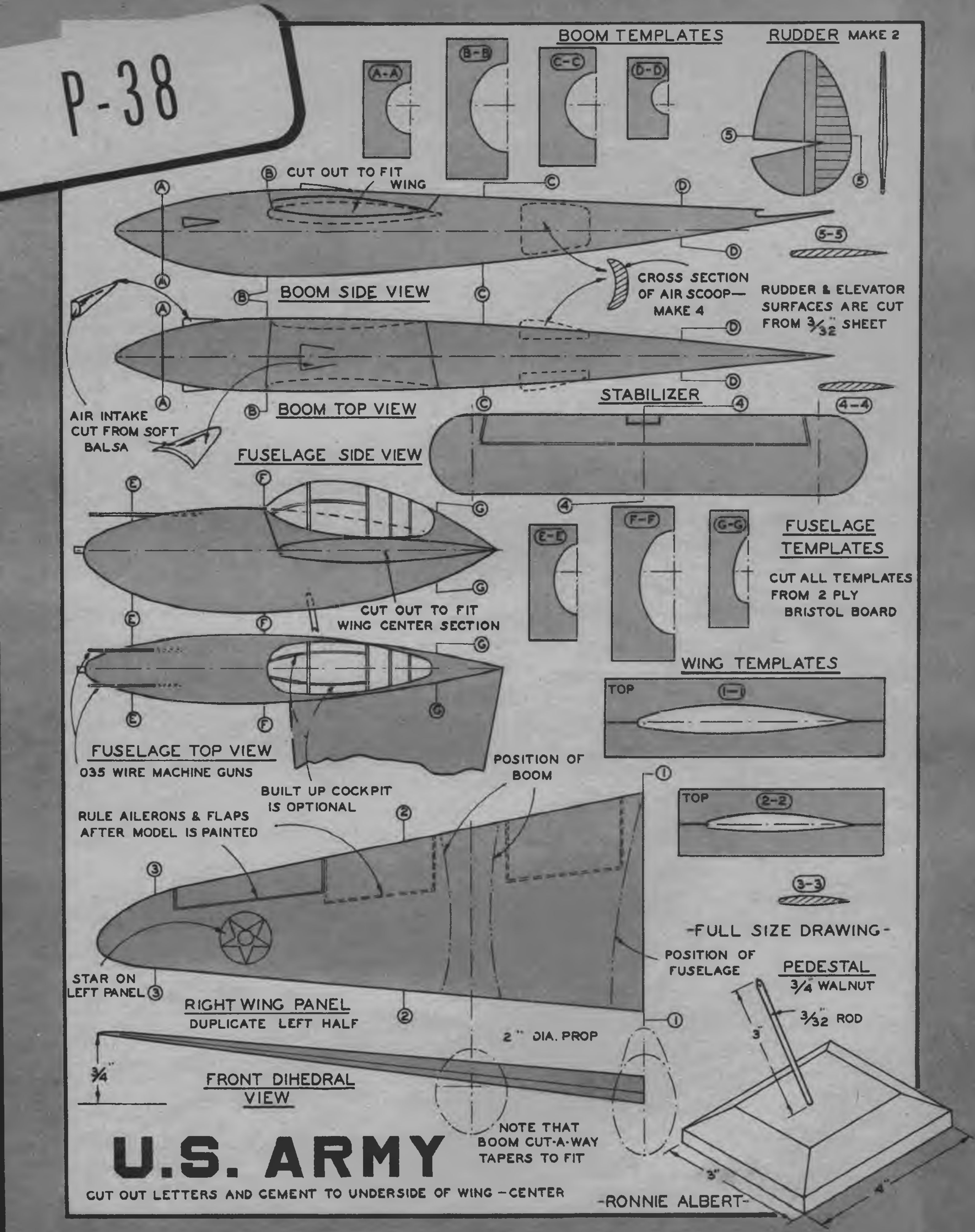
BY RONNIE ALBERT

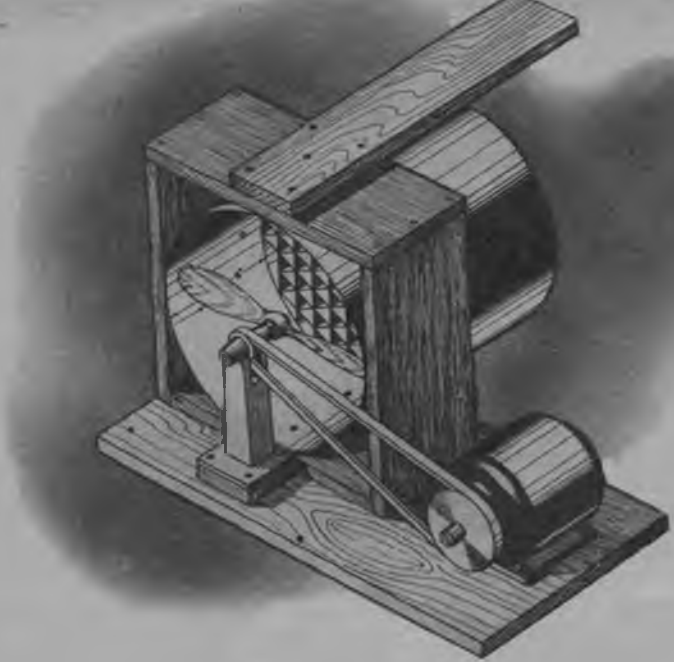
Don't let shortages of rubber, or even cement or balsa, spoil your fun. Make this famous warplane your first solid scale model. Balsa or pine will do.



Lethal tricycles. No need to synchronize four machine guns, cannon, in nose.

For better detail, study this photo carefully. All the wheels retract rearward and upward


P-38
BOOM TEMPLATES
A-A
B-B
C-C
D-D
RUDDER MAKE 2
5
5-5
CUT OUT TO FIT WING
CROSS SECTION OF AIR SCOOP— MAKE 4
RUDDER & ELEVATOR SURFACES ARE CUT FROM 3/32" SHEET
BOOM SIDE VIEW
BOOM TOP VIEW
AIR INTAKE CUT FROM SOFT BALSA
STABILIZER
4-4
FUSELAGE SIDE VIEW
E-E
F-F
G-G
FUSELAGE TEMPLATES
CUT ALL TEMPLATES FROM 2 PLY BRISTOL BOARD
CUT OUT TO FIT WING CENTER SECTION
WING TEMPLATES
TOP
1-1
FUSELAGE TOP VIEW
035 WIRE MACHINE GUNS
POSITION OF BOOM
BUILT UP COCKPIT IS OPTIONAL
RULE AILERONS & FLAPS AFTER MODEL IS PAINTED
TOP
2-2
3-3
-FULL SIZE DRAWING-
STAR ON LEFT PANEL
POSITION OF FUSELAGE
PEDESTAL
3/4" WALNUT
3/32" ROD
3"
RIGHT WING PANEL
DUPLICATE LEFT HALF
2" DIA. PROP
3/4"
FRONT DIHEDRAL VIEW
NOTE THAT BOOM CUT-A-WAY TAPERS TO FIT
U.S. ARMY
CUT OUT LETTERS AND CEMENT TO UNDERSIDE OF WING —CENTER
3"
4"
-RONNIE ALBERT-

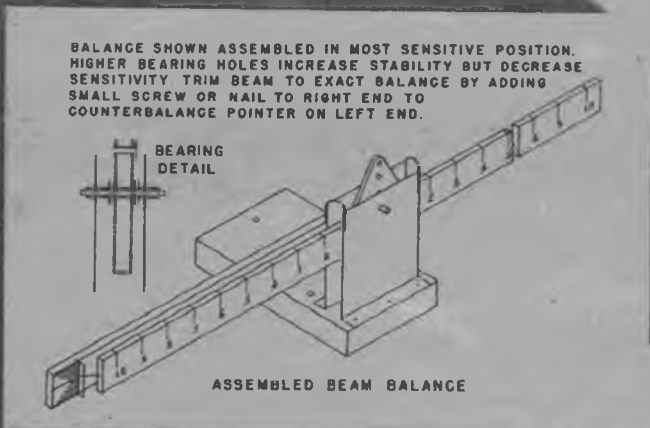


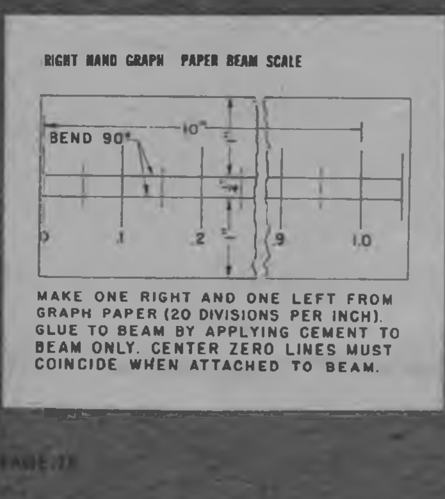
Home-Made

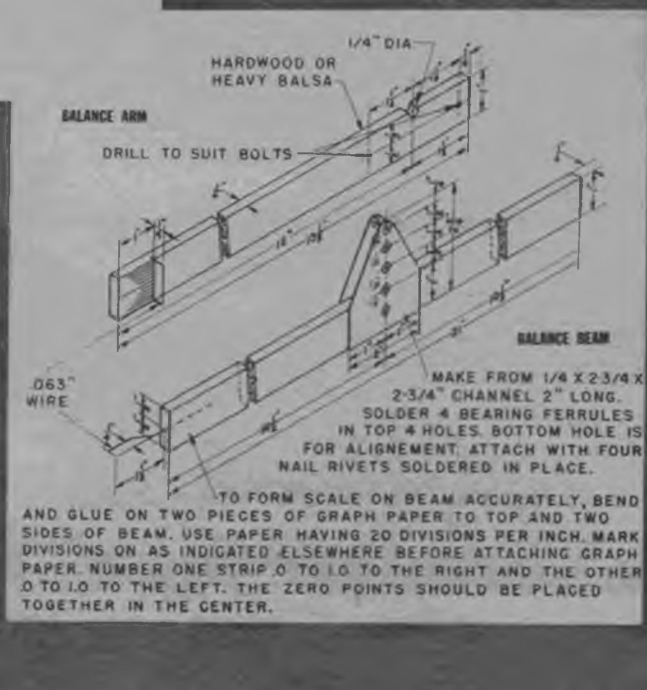
Last month the author presented plans of a practical wind tunnel. Now he provides the beam balance and drag balance for testing of parts and models. The second article of a series.

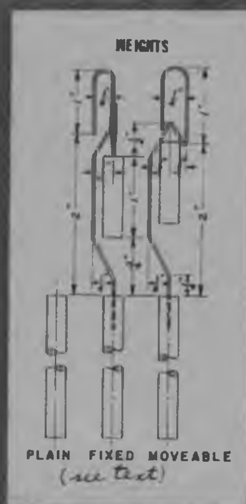
A WEIGHING balance is required for use with the tunnel air balances. If one is not available, the simple beam balance shown is easy to make and ideal for wind-tunnel work. As most chemical balances weigh in terms or grains or grams instead of decimal parts of an ounce, the beam balance will be found more convenient to use than any pan-type balance that might be available.

A set of sixteen one-ounce weights is necessary to give results at one-ounce intervals, and the beam balance is used to get the decimal part of the weights. The ten inches of graph paper having twenty divisions per inch will give 200 divisions, each representing $^1/_{200}$ ounce, or .005 ounce. A table is provided which gives the length of various shapes of steel bars that weigh one ounce. The material should be cut slightly long. The co-operation of a high-school chemistry teacher, a high-school physics teacher, or a druggist is necessary to get the use of a pan-type balance to finish the steel weights accurately down to one ounce in weight. A one-ounce laboratory weight is placed on the right pan of a chemical balance and the left pan is filled with weights until the balance is accurately trimmed. Then the laboratory weight is replaced with a steel weight and its excess weight is filed off until the pans are again in balance. Repeat for all the steel weights. If, when through, the one-ounce laboratory weight can be replaced on a "balanced" balance with









Wind Tunnel

BY R. C. CLIFFORD

each of the steel weights without changing the trim of the balance, then the steel weights are just as accurate as the laboratory weight plus or minus the sensitivity of the balance. The sensitivity of a balance is the largest weight that can be added to the pan without changing the trim. It is negligible for a commercial chemical balance designed for weighing up to one pound. When weights are provided with a wire handle, the weight of the whole assembly must be one ounce.

The beam swing scale is a small piece of heavy drawing paper with parallel inked lines accurately spaced 1/8" apart, as shown, and glued on the end of the balance arm. The lines provide a convenient means for observing when the beam is in balance and swinging equally on both sides of the long horizontal center line.

Bearings in the balance beam bearing channel are ferrules 3/32" in diameter by 5/16" long soldered in holes drilled on a vertical center line. The channel is attached on the beam after the paper scales have been glued on and allowed to dry thoroughly. The center line of the bearing channel must line up accurately on the zero line of the scale as observed through the bottom hole on the channel. After final assembly, the beam must be balanced by adding weight to the light end (in the form of small nails or screws) or by cutting off some material from the heavy end.

The two bearing ferrules in the base angles should be soldered in place after final assembly of the base while they are held in line with a straight, tight-fitting wire threaded through the holes. Allow about 1/64" for end play over the width of the bearings on the beam. Use a bearing wire for final assembly that is a loose fit in the ferrules. Upon completion, the beam should oscillate freely when balanced. All friction caused by tight bearings, no bearing end play, poor bearing line-up, et cetera, must be eliminated. A drop of fine oil will help matters.

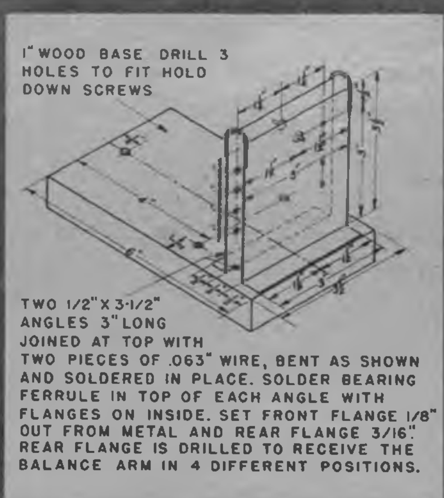
The beam balance is shown assembled in its most sensitive position. The stability of the beam will be increased and its sensitivity will be decreased slightly by using the higher bearing holes. Beam must be trimmed to balance without load. (The wire pointer in the left end of the beam will need a small screw or nail in the right end to balance the beam.)

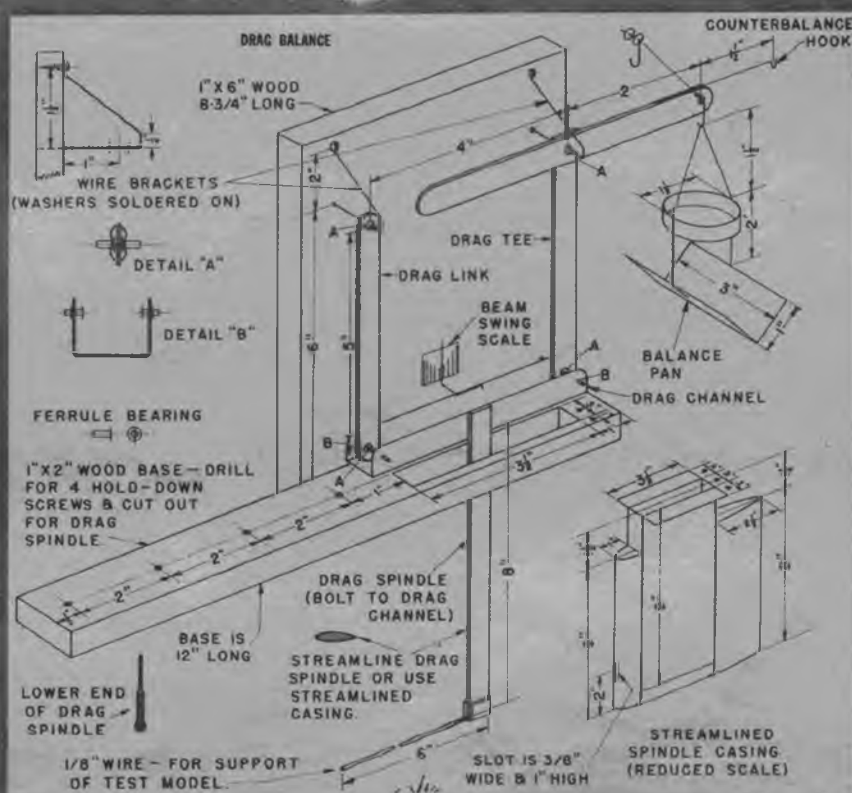
DRAG BALANCE

The drag balance is a fairly simple affair. The horizontal base consists of a 1" board 2" wide and 12" long. Four holes are drilled to receive hold-down screws and a rectangular hole 3/4" wide by 3 1/2" long is cut to receive the streamlined drag spindle casings. If the casing is not used, the hole should be made 1/2" wide by 1 1/2" long. The vertical board of 1 x 6" wood 8 3/4" long is attached to the side of the horizontal base as shown with three long woodscrews. To keep the wood from splitting, pilot holes should be drilled to receive the wood screws. After assembly, a line is marked accurately on the vertical board 6.00" above the horizontal base (dimensions given in hundredths should be accurately maintained). Two holes 5/32" in diameter should be drilled on the line 4.00" apart to receive the ends of the wire brackets.

The bearings of the balance are made of brass ferrules 3/32" in diameter and 1/4" long soldered in place. The partially closed end of the ferrule must be filed off or opened up by forcing it on a 3/32" rod and sliding it up and down on the rod until it can be moved without friction.

The front drag link is a piece of iron bar 1/16" thick, 1/2" wide, and 5 1/2" long with two 3/32" holes drilled accurately 5.00" apart on the centerline of the bar. The ends are rounded off with a (Turn to page 40)





The Traveling Salesman

Your favorite "don't quote me" coverage of the model industry, new products and developments. Dealers, this is your page!

Wild-and-woolly motor claims are showed up by thrust and torque indicator made by Bill Halper, Flo-Torque.

THE best attended Eastern meetings of the Model Industry Association were held in New York during the recently held Toy Fair. The board of directors named the following nominating committee: Jay P. Cleveland, chairman; Richard W. Mair, Nathan Polk, Clyde Austin, Wm. K. Walthers. This committee has nominated the following members for election for a term of three years: Gordon Varney, Varney Railways, Chicago, Ill.; Paul Guillow, Paul K. Guillow Co., Wakefield, Mass.; E. B. Miller, Eastern Mgr., Comet, New York City; Harvey Johnson, Hobbycraft Model Supply, Detroit, Mich.; William Walthers, William K. Walthers, Inc., Milwaukee, Wis.; Fred Megow, Megow's, Philadelphia, Pa.; Robert Mercer, Brooklyn Novelty, Brooklyn, N. Y.; Niles Testor, Testor Chemical, Rockford, Ill.; Pat Morrissey, Ace Model Airplane, St. Louis, Mo.; J. F. Strombeck, Strombeck-Becker Mfg Co., Moline, Ill.

Only five are to be elected from the above list for the three-year term. Independent nominations for the office of director may be made from the floor at the annual meeting in Chicago, July 28th-August 1st.

Also nominated for a one-year term were Dan Frisoli, Scientific Model, Newark, N. J., and Fred Van De Pitte, Airco Model, Detroit, Mich. Irwin Ohlsson of Ohlsson & Rice, Los Angeles, and Charles Brebeck, O. K. Motors, Herkimer, N. Y., were nominated for two-year terms. Two of the four nominees are to be elected.

With the list of nominees thus made available early by the Traveling Salesman, opportunities for lively political campaigns become possible and it is hoped that members will rally behind their favorite candidates and come in full strength to the Chicago convention to vote.

Welcomed into the association fold among many others were "The Three Holdouts," Dave Newmark of Ideal, Ward Harman of Marine and Lewis Barnett of International Models. We look for a great deal of activity from this trio!

In order to conserve present and unreplaceable stocks of parts, Atom engine repairs and replacement parts will be obtainable only direct from the factory for the "duration." Atom owners are asked first to contact their local dealers, since many of them have sufficient stocks of parts to last for several months.

We hear that the CAA will receive a $15,000,000 appropriation for instituting aviation courses in the nation's high schools. Natu- *(Turn to page 62)*

★ ★

Clubs compete for Megow trophy at Nats., awarded on point basis and distance traveled.

The Dope Can

BY GORDON S. LIGHT

MODELERS suffering from balsa shortage, take a deep breath, close your eyes and imagine a place where balsa is so common it's used as firewood. This isn't modeler's Valhalla, but the mountains of Peru. Balsa grows freely, and the natives consider it worthless. That's where Arnaldo Yipmantin of Lima gets his wood. He's a member of the Jorge Chavez Club—the pioneer model club of Peru. Membership is sixty-eight. There's no national organization, but other successful Peruvian clubs are in Huacho City, Lima (Relampago Club), and Huancayo (Students Model Club). There was an intercity meet February 1st between Lima and Huancayo for rubber-powered fuselage models. G. Aleman of the Jorge Chavez Club was first with 4:38. Arnaldo was fourth, flying a Korda Wakefield design for 2:37½.

Caption underneath a photo of Frank Hernandez and his model autogiro in the April issue was incorrect. Frank works at Kellett, and *not* Pitcairn. Frank's model 'giro has a six-foot rotor diameter, twenty-eight inches' length, and is powered with a Mighty Midget. First trial flights ended in crack-ups. Trouble seemed to be in the rotor head. But Kellett engineers were sufficiently interested to help design a new one. With *(Turn to page 53)*

Bill Salmon's Ohlsson 23 Lysander. You can conserve materials by spending time on detailed jobs like this.

Steel City Model Manglers: front—Elliott, Oglesby, Frey; rear—Piper, Morgan, Wetzel, Burrus, McClusky.

This dignified portrait shows three presidents, past and present, Tacoma Air Screws. Engle, Cole, Sather.

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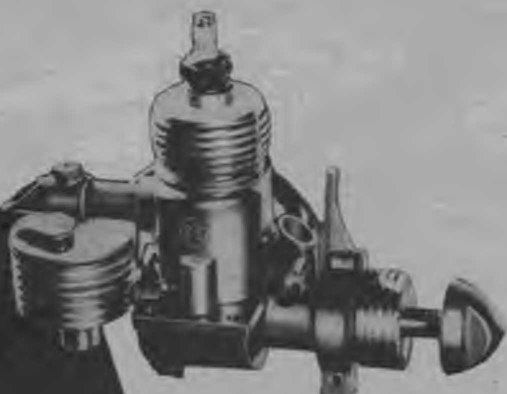

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Orville Wright Today

(Continued from page 10)

He is a peace-loving man who lives alone in a big white house atop a hill in the peaceful village of Oakwood, three miles south of Dayton, Ohio, where in a small bicycle shop forty years ago he and his brother, Wilbur, pieced together the first successful power-driven flying machine. They meant it to bring harm to no one. The experiment was a sport. They put their own money into it just as a man spends his money for golf. They little realized that it would ever bring them a fortune and often thought of giving up their experiments because of the high cost. So it is that when you talk of the war, Orville Wright will turn away, sad and hurt.

"Although we thought of the military application of the airplane," he told me once at a banquet, "we believed that it would be used in the main for scouting over enemy territory. If planes were to be utilized for warfare, we felt they would bring the fear of war to the very back yards of the warring nations by bringing the actual combat closer to home. In this way we believed the airplane would tend to bring about a lasting peace by creating a terrible fear in the hearts of all peoples."

That same night I walked to his car with him. With us was Griffith Brewer of the British Royal Aeronautical Society and Orville Wright's first English pupil. At the banquet we had seen a motion picture entitled "Conquering the Air."

"Interesting picture, wasn't it?" I queried.

"Very entertaining," replied Mr. Wright.

He turned to his friend, Griffith. "Griff, they've certainly made great progress with the movies since the early days, haven't they?"

"Yes, indeed," Mr. Brewer answered, "and with the airplane, too."

"I ' wonder," murmured Orville Wright, climbing into his car.

On the nineteenth day of this August the inventor will begin his seventy-first year. His hair is a silver-gray and there are deep wrinkles in his hands and face. When he laughs there are several gold teeth which are very obvious. Quite often he has to lie down to rest. He is troubled with rheumatism. Those seventy years are catching up.

But this aviation pioneer is still active. Almost every day he drives down to his office on North Broadway Street, which is only a stone's throw from the spot where the old bicycle shop was located before it was moved to Henry Ford's Greenfield Village museum. His quarters in this office building are a simple affair and serve as a laboratory for the inventor. What he does here is a secret and only a select few know, although there are many varied guesses. Mostly it's just "puttering around." But his creative mind is still turning out new and useful things.

Last year he made several toys for his late brother Lorin, who was in the toy business before his death. One of these interesting playthings is a toy airplane, which after a short flight releases itself from a wire and descends by a parachute. Another is a tiny doll which is shot out of a small cannon and lands with perfect synchronization atop a trapeze wire. This gadget particularly is indicative of the same precision ingenuity that helped make possible the first airplane. Moreover, Orville Wright has designed small machines for turning these toys out in mass production.

There are mechanical things about his home, too, and in his summer camp at Georgian Bay in Canada where he goes every year there is not even a telephone to keep him in touch with the outside world. In his home, for instance, is a unique phonograph machine which Orville Wright rigged up with an automatic record turner long before the modern juke boxes came into being. It is crude but it works. He also invented an electric toaster which probably was one of the first to come into use. At the camp there are trick windows and doors, even a movable roof on one of the houses.

Many evenings he spends alone reading. For this he has made a special pair of horn-rimmed glasses. There is only a single loop to the frame which hooks over one ear. He reads many scientific journals and is especially interested in foreign books. But, strange as it seems, if you ask him what he thinks about aviation today he will reply: "Truthfully, I'm much too far away from it all."

"We didn't foresee the great planes of today because of the dangers of motor failure at that time," he says. "Nor did we believe that landings at night ever would be possible. . . . It has been said that the airplane evolved because of the progress in motor design, but this is not true."

There are three distinct phases in aviation that account for its rapid growth, he points out: 1. The importance of pioneering in the science of aerodynamics which dictated the design of the first plane and all to follow. 2. The motor and structural improvement and navigation aids. 3. The revival of aerodynamic experiments and their practical application.

"Right now experimenters are seeking to eliminate surface eddies to avoid any slight project that hinders the airflow," he explains. "Even a protruding obstacle of hairline slimness causes a major waste of power." According to Mr. Wright, the future application of this method of eliminating all obstacles from the airflow of the plane will aid in attaining unbelievable speeds. "We didn't worry much about streamlining in the early days," he says with a chuckle. "Our only problem along this line was lying down instead of sitting up against the ocean gales."

He firmly believes that the radio echo device which enables the pilot to determine his actual height from the earth's surface at all times is one of the outstanding aeronautical developments of recent years.

Orville Wright doesn't fly. He has made only a few flights since he was so seriously injured at Fort Myer in 1908 when Lieutenant Selfridge was killed. One of these was in the big Barling bomber in 1925, and the latest was aboard the Douglas DC-4 in 1939 when it was flown around the country on a tour of various cities. Mr. Wright flew in it over Dayton, and when he came down made the remark: "It's a wonderful airplane. I can't believe that there is so much money wrapped up in a plane of this size—more than $2,000,000."

He is splendidly co-operative in civic functions. Once he went out to the municipal airport at Dayton to dedicate the inauguration of TWA's east-west service. He posed for a picture with a pretty hostess and grinned as he told newspapermen: "We always hoped that the airplane would be used as a great commercial transport and help bring the peoples of the world closer together. This is a great step toward that goal."

The inventor has many friends, but only a few are real intimates, these being his neighbors. There are Colonel E. A. Deeds, president of the big National Cash Register Co.; Charles F. Kettering, vice president in charge of General Motors research; former governor of Ohio and the 1920 Democratic presidential candidate, James M. Cox, newspaper owner and publisher; Griffith Brewer and a host of others.

Orville Wright tells this one on Governor Cox. It seems that the governor was toastmaster at a banquet being held in honor of Mr. Wright and related some interesting facts about the early trials at Fort Myer when the Wrights were testing their military airplane built for Uncle Sam.

"I believe I can safely say that I am the only one present here tonight who saw that memorable flight," he said proudly.

A man seated next to him tugged his coat tails. "Governor, I was there."

"Where were you?" came the reply.

"I was in the airplane."

That man was General Folois, one of the first army officers to fly.

"That's the first time I believe I ever saw the governor get flustered," laughs Orville Wright.

Another time, with Big Bill Knudsen (Lieutenant General William S. Knudsen today), while they were inspecting the great Wright engine plant at Cincinnati, Orville Wright remarked: "If we had been able to get one of those powerful engines we'd probably have done a better job." He got a big kick out of the remark. So did everyone else.

But to understand him today you have to go back to the early days of his life. The Wrights lived a simple life and a secluded one. Their father was a United Brethren bishop and a kindly soul. He never forgot to bring his four sons—Orville, Lorin, Reuchlin and Wilbur—some little gift after each day's work was done. One night he came home with a small gyroscopic top and gave it to Orville

(Turn to page 44)

Orville Wright Today

(Continued from page 42)

and Wilbur. There was a little metal propeller on it, and Orville cut himself many times until finally he and Wilbur fashioned a small wooden propeller for the device and found that worked much better. They sold their own toy to neighboring kids. This was the beginning of their mechanical activity. Later they made large kites and became so adept at it that all their chums in the neighborhood came to them to have kites built. They flew their kites from atop Hawthorne Hill in Dayton, and even as youngsters learned many helpful facts about the various wind currents.

Bishop Wright published a small church weekly newspaper. Orville and Wilbur were in charge of the folding and distribution of the papers. Every Friday night they had to work long hours getting the papers ready to be delivered to the members of the congregation. One evening Orville got the idea that it would be easier to design a machine that would fold the papers, and he told Wilbur about it. The older Wilbur (he was sixteen then) saw merit in the idea, and together they invented a folding machine that won recognition from even professional printers who came to their shop to see it.

With a neighboring chum they started a weekly newspaper and a small print shop. The paper was called the *West Side News* and was highly successful until they tried to turn it into a daily, which proved a complete financial failure and caused them to give up the newspaper business for the bicycle trade. The Wrights were both famous for their bike riding in the early days of their careers. Wilbur was an expert stunt rider and thrilled many of his townsfolk at picnics and outdoor gatherings, while Orville went in for speed and entered the many bike races held in various parts of the State, on some occasions matching his prowess against some of the best riders in the country.

Tired of just riding other people's bicycle designs, the Wrights thought they knew enough about the two-wheelers to design one themselves, so they started their bicycle manufacturing and repair business. Two of their models, the Van Cleve and the Wright Flier, became nationally known. Today they are so valuable that Henry Ford—before the war—offered to give anyone a new Ford car for one of the Wright originals.

It was during this period that they became ardent followers of Lilienthal and Chanute, and they read all the data then published about the gliding experiments of both these aviation pioneers. Gliding, they thought, would be an interesting sport. They studied carefully the various methods that had been in use, then devised one of their own which proved highly successful and much better than any of the previous methods. Lilienthal and Chanute had guided and balanced their gliders by moving the operator's body from place to place on the craft as required. The Wrights tried a new system of warping the wings, which probably was the first introduction of the aileron and ultimately led to their success.

After many experiments with gliding they decided they could put a motor on their glider and make it fly under its own power. They wrote to many automobile and motor manufacturers seeking a motor that would develop about "eight brake horsepower with a weight, complete, not exceeding 200 pounds." Unfortunately they didn't find what they desired. However, Orville Wright says today that they could have used some of the engines, but decided that they would rather build one of their own design.

"As a matter of fact," he points out, "once we had solved the aerodynamic principles of flight and had decided upon our methods of control for the airplane, we believed the plane might have flown successfully even with a steam engine."

The most difficult task, according to the inventor, was creating the propellers. Here they ran into many troubles. At first they tried contacting all the boat builders to see if they couldn't design a propeller for the airplane. They found the boat builders had no set formula for their propellers, but had created them by trial and error. This was a good method, but the Wrights went to work on paper and after long and tedious hours that grew into days and weeks of mathematical computations, they evolved the right propeller for their machine. There was a violent argument between them as to whether the first machine was to have one or two propellers. The double-propeller idea won out because they decided, logically, that it would be too hard to offset the torque of a single propeller.

The rest of the story is history. How they went to Kitty Hawk, assembled their flying machine and waited for favorable weather in which to fly it. How they tossed a coin to see who would be first to fly and how Orville won. Then the history-making flight which lasted for twelve seconds and saw the airplane rise off the ground of its own accord and land on a point that was as high as that from which it started. The flight covered forty feet in all, but there were more that day, and in the late afternoon Orville made a flight that lasted fifty-nine seconds and covered approximately 870 feet. Actually this was not the first time they had flown, this day of December 17, 1903; once before Wilbur had piloted the plane and it had risen into the air for about two feet and skimmed along over the ground for several yards distance. But the Wrights never counted this as an actual flight and it is seldom mentioned. It is true, however, and applicable to the records of flight.

If you ask Orville Wright today if making that first flight was the greatest thrill of his life, the answer will surprise you:

"I believe the greatest thrill was lying in bed the night before and thinking about how wonderful it would be when it actually happened."

"I attribute a great part of my 90% average in my Course here at Randolph Field to Building and Flying Model Aircraft"

writes an Instructor in the Air Corps at "The West Point of the Air."

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Continuing, he says:

"Especially during the time I was studying theory of flight and aero-dynamics did I appreciate the hours I had spent 'doping out' the tricks of one of my 'midgets.'"

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Reviewing Stand

(Continued from page 6)

with tundra and mastodon bones, the author of this highly entertaining book of adventure and flight takes you with her and her partner to the more or less wild but always different acreage of Alaska. Thanks to a sense of humor, good equipment and a reliable plane (convoyed by a fleet of horseshoes) these two feminine Marco Polos get away with feats that will amaze you. Highlighted with wild tales by sourdoughs, tall tales, and ghost stories—as if the adventures themselves were not enough—it makes highly entertaining reading.

Wings of Defense. By Capt. Burr W. Leyson. (E. P. Dutton & Co., Inc., 300 Fourth Ave., New York City, $2.50.) This book has done an admirable job of presenting the total picture of America's warplanes and their uses. From the author's wide experience and intimate knowledge of aviation he has drawn material to give added interest. The chapters cover such planes as fighters, bombers, naval aircraft and their uses, bombing, paratroops, training, antiaircraft defenses and civil air defense. The latter chapter will be especially interesting to those interested in defense against air raids.

Clouds, Air and Wind. By Eric Sloane. (The Devin-Adair Co., 23 East 26th St., New York City, $2.50.) Mr. Sloane's work is well known to readers of *Air Trails* through his Anatomy of a Summer Storm, Cloud Chart, and Anatomy of Winter Skies, which have appeared in the past. This book, a collection of similar charts, cloudscapes and brief text, should be entertaining and informative to all interested in meterolgy and air travel. The many full-page illustrations show various types of aircraft in action amid the various types of cloud formations, making the book doubly interesting.

Needed—Women in Aviation. By Dickey Meyer. (Robert M. McBride & Co., 116 East 16th St., New York City, $2.) With the aviation industry accepting more and more women in its ranks, not only to replace men who have joined the armed forces, but for the excellence of their work, this book should point the way to many would-be recruits. It is written by one who has been familiar with the industry for years and has counseled thousands of the fair sex regarding opportunities in this field. The many chapters and pictures explain the various positions and trades to be found open to women and describe with wit and understanding the things a woman will most want to know.

Aircraft Handbook. By Fred H. Colvin. (McGraw-Hill Book Co., Inc., 330 West 42nd St., New York City, $5.) The title of this book is familiar to thousands of old-time aviation mechanics, for it first appeared in 1917. This, the fifth edition, has been brought up to date and expanded to cover all modern equipment. Designed to aid the engine-maintenance mechanic, the book covers all modern engines, propellers and kindred subjects. A "must" addition to technical libraries and for student mechanics.

Ask Balsa Butch

(Continued from page 31)

When used on wings, they either make a wing lift or tend to depress. Of course, only one is needed on the whole wing. It stands to reason if the left side of the wing goes down the other half will go up. On large planes the trim tabs are needed to compensate for such things as the lessening of weight due to fuel consumption, or the changing of angle of attack of the elevator due to the peculiar flight characteristics of the plane. That is, if a plane flies better with the elevator in a slightly diving (negative) position, and does better landings with the tail positive, the pilot so sets the trimmer tabs.

Peter Shawinsky, Stamford, Conn.—Pete, there are about seven million "favorite" ways to get a high gloss on a model, and here is one of them. After covering, water-dope the ship and let dry thoroughly. Then give it a coat of clear dope. Next, when this is dry, sand the ship with 10/0 wet or dry sandpaper. Give it another coat of dope, sand it again, then still a third coat of clear dope. After still another sanding, apply a coat of color dope, sand down, another coat of color dope, sand down, and finish with a coat of clear lacquer. That gives a shine like nobody's business. Clear lacquer is also called liquid celluloid, and is really a superclear spar varnish. Some modelers go even further, Simonizing the entire ship when the last coat is applied. As to your gas, sometimes gas gets stale, despite the chortles of experts. However, you may have a dusty workshop and in between the times you were looking for gas your motor took in some dust, particularly at the needle valve. Wash the entire assembly with clear gas. Clean the points, and if there is still trouble, take your condenser to your nearest garage and ask the mechanic to check it on his analyzer.

Jack Crum, Raleigh, N. C.—You may obtain the plans (and kit) of the Super B Zomby from Megow, Philadelphia, Pa., for $1.95. There is, as yet, no kit for the C Zomby. Perhaps you could "scale up" the Class B plans.

James M. Cob, Chilhowie, Va.—There are no plans for the 61½"

(Turn to page 48)

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Ask Balsa Butch

(Continued from page 46)

Zomby, as far as we know. You might enlarge the plans for the 44-inch job, which is put out in kit form by Megow, Philadelphia, Pa.

Sidney Miller, Kingsport, Tenn.—You might write to Aircraft Plan Co., Box 115, Steinway Ave. Station, Long Island City, N. Y. They may have the plans for the ships you list.

Jack Schneller, Fort Worth, Tex.—The only concern making and marketing a Class B amphibian kit (as far as we know) is Burkard Model Engineering Co., 3079 Third Ave., New York. Write them and ask for details.

Francis Bivens, Lenox, Ia.—Fran, we sympathize with you. A lot of our first models didn't fly, either. However, we found a few secrets which made our ships hit for the blue sky, and they were so simple we laughed at ourselves. In the first place, you can learn more principles of flight from an ordinary glider than any built-up ship. Build not one but several of them. Study their characteristics, and you'll learn more about the big ships you have built or are building. First, however, get this straight. Just about the hardest ships to fly are scale models. Those beautiful North Americans which look so swell are distinctly *not* good fliers in the real flying sense. They flutter around, and maybe glide a bit, but ordinarily they are poor performers. Pick a contest ship—a Korda type, for example. Follow the designs in this and you'll get better results. Models should balance at a point one third of the distance back of the leading edge of the wing. That is, if the wing has a 6-inch chord (depth from leading to trailing edge) the ship should balance at a point 2 inches back from the leading edge. The wings should be balanced. Hold the wing on your finger and check to see that it is not heavier on one side. Bill Winter's book, "Model Aircraft Handbook," would answer most of your questions. The rest is just experimentation. Don't make your ships too heavy, and don't expect rubber models to take off like a big ship. Most of them have to be hand-launched.

R. E. W., Detroit, Mich.—For information on the Rogers motors, we suggest you write direct to Rogers Motor Co., Philadelphia, Pa. We have never heard of a Rogers P-40, but recent Rogers ads have noted that a "big motor" will shortly be marketed. Write them and ask about it.

Martin Bernard, Bronx, N. Y.—Class A motors are few and far between, these days. However, we believe one of the new Super-Atoms is readily obtainable. We might also recommend a Marvin. Either one will fit the ship very well. As for second-hand motors—well, there just aren't any in the small-engine field. You might shop around among your friends, or inquire at Polk's in New York City.

Harold Lowe, Bloomsburg, Pa.—For information on microfilm, write Model Research Lab., 3531 North Western Ave., Chicago, Ill., or Junior Aeronautical Supply Co., 100 E. 10th St., New York City. They'll give you the answers.

Howard Buehler, Belleville, Ill.—You can easily compute the cost of building the Vultee Vengeance. Look over the plan, estimate the amount of material you will need, and check with any one of the many supply advertisements.

Roger Newton, Conrad, Ia.—Perhaps the first thing you had better get is some experience on gas motors and models, and no kidding. Honestly, we advise your study of mags a long time, absorbing the lore of the hobby, then when you feel you've absorbed enough, consult the ads in Air Trails. Don't pick a superstreamlined or involved ship for your first attempt; rather, take a boxlike type. Get a good, substantial motor in the ten or twelve-dollar class. Study your ship carefully, your motor carefully, and consult a good builder for information regarding first flights. Best of luck to you when you get rolling.

Home-made Wind Tunnel

(Continued from page 39)

file to a radius of ¼" centered on the drilled holes. Two ferrules are soldered on each end of the link as shown in Detail A. A 3/32" wire should be threaded through the ferrules when soldering to assure proper alignment.

The top bar of the drag tee is made exactly like the drag link. The vertical bar is also similar to the drag link, except that the top of the bar is left square. The vertical bar is soldered to the middle of the top bar at right angles to it as shown. Drill a 3/32" hole through both bars at the intersection of their centerlines. Drill a 3/32" hole on the centerline of the vertical bar 5.00" below the first hole. Drill a 3/32" hole on the centerline of the right arm of the top bar 2.50" from the first hole. Solder two ferrules on each end of the vertical bar as shown in Detail A. Make a balance pan hook for the third hole as shown by the detail. The washers should be soldered on the 1/16" wire hook to give about 1/32" of end play over the thickness of the bar.

The drag link and drag tee are supported by two wire brackets. One end of the wire is a force fit into the drilled holes on the top of vertical board base. The other end of each bracket fits around a wood screw. One washer is soldered on each bracket to bear up against the wood and hold the wire in position. Two other washers are soldered on each bracket to locate the drag link and drag tee 1" away from the wood. The distance between the washers should allow the top bearings of the drag link and the drag tee 1/32" of end play. Use the largest size of wire for the brackets that will give a free, frictionless fit in the bearing ferrules.

The drag channel is made from light gauge tin as obtained from a five-gallon oil can. It is made ¾" high, ¾" wide, and 4½" long. Two holes 7/64" in diameter are drilled in each side ½" from the back of the channel and 4.00" apart. To drill them opposite, locate the holes on a line at each end that is scribed around the three sides of the channel with the aid of a square. Solder a bearing ferrule in each hole with the flanges toward each other as shown in Detail B. The distance between flanges should be 1/32" more than the width of the bottom bearings on the drag link and the drag tee. Have a 3/32" wire through opposite ferrules when soldering them to keep them lined up. Solder a 1/16" wire pointer on the rear side of the drag channel as shown so that the vertical end is about 1/16" in front of the balance swing scale. The swing scale is a piece of heavy drawing paper about 1" square with vertical lines ⅛" apart drawn as illustrated. It is glued to the vertical board to show when the forces on the drag channel have been balanced. With lines marked as shown, it is easy to tell when the channel is in balance and swinging an equal distance each side of center.

The vertical drag spindle is a piece of steel bar 1/16" thick, ½" wide, and 8¾" long. It is bolted to the middle of the outside leg of the drag channel by four small model bolts. A piece of tin ½" wide and 1½" long is bent as shown and soldered to the bottom of the spindle to give a tight-slip fit over the ⅛" diameter wire that extends 6" forward to support the models being tested. If the drag spindle is not inclosed in a streamlined housing, it should be filed to a streamlined cross section as shown in one of the detail sections.

The basic part of the streamlined housing is a metal channel ¾" wide, 3½" deep, and 9" high, with two ¾" legs on top bent over at an angle of 90°. After slipping the channel into the rectangular hole in the horizontal base and attaching it with wood screws to the base, the bottom of the channel is plugged with a piece of wood ¾" wide, 1" high, and 3" long with its bottom end rounded off to form a cylindrical surface ¾" in diameter. The nose piece is shaped to a streamlined form from a wood block ¾" thick, 1" wide, and 8" long. The bottom of the nose piece has a vertical slot ⅜" wide by 1" high (channel has similar slot) for the ⅛" wire which projects forward through the slot to support the test models. The tail piece completes the streamline form and is made from a block of wood ¾" thick, 2½" wide, and 8" long. The bottom of the nose piece and tail piece are rounded off to streamline into the bottom piece of wood. Use wood screws to attach the nose, tail and bottom pieces to the channel. The tail piece should be easily removable.

A counterbalance hook is soldered on the top of the drag tee as shown. Make it of 1/16" wire.

The drag pan is made of a light gauge angle 1 x 1 x 3", a light tin pan about 1½" in diameter and ½" deep, and some 1/16" wire bent as shown and soldered to the pan and the angle.

When completed, the balance must oscillate freely when in balance. Any friction caused by pressure on the ends of any bearing, by any tight-fitting bearing, or by poor alignment and binding of any bearing must be corrected by reworking or by making new parts.

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Make sixteen plain 1-ounce weights; a ¼, ½, and a 1-ounce movable-type weight; a ¼, ½, and a 1-ounce fixed-type weight.

Length of Cold Rolled Steel Stock Weighing One Ounce

Size	Rd.	Sq.	Size	Length
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5/16"	2.88"	2.26"	½ x ½"	0.38"
⅜"	1.99"	1.57"	½ x ¾"	0.585"
½"	1.12"	0.88"	½ x 1"	0.441"
⅝"	0.72"	0.565"	1 x 1"	0.22"
¾"	0.50"	0.392"		
1"	0.28"	0.22"		

Stretch That Rubber

(Continued from page 30)

flights—it is a good idea to make a few test flights the day before the next contest to sort of loosen up the motor in order to get top efficiency from it the next day. Never put your rubber into your ship at home and transport it for any *long* distance to a contest. It will be exposed to too much grit, sunlight and heat on the way. Rather, carry it in a can and install just before flying. *Always* carry an extra motor and never take a chance on one that becomes full of cuts or grit; change it and save the cut one for repairing when you get home.

To repair a cut motor, first wash it free of all lube and grit in warm water, then tie each cut together with two knots which should be pulled close together. Then wrap thread *between* the knots and *around* the *outside* knot; do this with two separate pieces of thread. If done properly, this knot will not come loose even if wound to capacity.

This method of repairing rubber was used as far back as 1939 when all the new rubber I took to the Wakefield event was shearing, but these motors all were held on a doorknob when they broke, so the only damage done was to Frank Zaic's beauty rest. Frank was sleeping in an easy-chair and the only convenient doorknob was about two feet from his nose. After the third motor broke, he partially woke up and murmured something about getting good rubber at Jasco.

The forty-three-minute flight was made with an old motor with a *dozen* thread-tied knots in it.

One other weak spot that rubber has is its tendency to lose power and get weak when wound to capacity too soon during breaking in or during very hot weather at a contest. Then is when an extra motor may mean the difference between winning and losing.

After summing up the whole situation as it stands, the most likely answer is that the next summer and especially the summer of 1943 will see models drop to the 100-150 square inch variety. These smaller models use only one third to one half the rubber required of the bigger 200 to 300-inch planes, and will not fly out of sight so easily under the new weight rules.

Another step in preserving rubber is the use of a dethermalizer to bring the plane down out of a thermal when it is headed for an out-of-sight flight.

It's hard to describe the kind of feeling a builder gets when he follows his plane several miles and knows it is well out of the timer's sight, and yet refuses to land and is usually lost for good. But it sure is a swell feeling to have the dethermalizer kick in and bring both plane and rubber to earth.

Axis Bombers—U. S. Bound!

(Continued from page 19)

The Focke-Wulf Kurier is an example of the conversion from transport to bomber. The newest version, the FW-200K2, is said to be somewhat longer-winded than the FW-200K that gained note through the long-distance raiding of American and British convoys in the Atlantic. The FW-200K had a wing span of 108.3 feet, was 78.2 feet long, and carried a 6,000-pound bomb load. The ship was powered by four 1,000 h. p. B. M. W. radial motors that afforded a 265-mile-per-hour top speed. The new modification may be slightly faster. Depending on the load, range is from 1,180 to 3,490 miles.

The Heinkel He. 116 is a four-motored, long-range plane of which little is known. No data are available. Heinkel's other four-motored bomber, the He. 177, is not so secret. The ship is 103 feet in wing span and is 74 feet long. Gross weight is approximately 45,000 pounds, which should afford a generous bomb and fuel load. It is powered by four 1,325 h. p. Daimler-Benz engines, has a top speed of 340 m. p. h. and a service ceiling of 36,000 feet. Its range with reduced bomb load is about 3,500 miles, contrary to earlier reports.

The Blohm & Voss 142K is a military conversion of the BV-142 troop transport that has been widely used—and abused by the Red airmen—on the Russian front. This heavy bomber has a wing span of 97 feet and is 63.11 feet long with a gross weight of 35,993 pounds. Powered by four 880 h. p. B. M. W. radial motors, it has a top speed of 248 m. p. h. and a 2,732-mile range with full war load. With reduced bomb load, it should have a range of almost 3,300 miles. Crew: six men.

The Nazi bombers are notable for the clever design which permits excellent load disposibility. It is fairly certain that, in the cases of all six of these mentioned bombers, the range can be extended at the expense of bomb load. Four other landplane bombers may be available in quantity. These are the Italian Piaggio P-23R, Savoia-Marchetti SM-82, and Cant Z-1007 and the Vichy French Bloch 162-B5.

The Piaggio bomber has a wing span of 95.1 feet and is 77.1 feet in length. Its gross weight is 42,345 pounds and useful load 15,435 pounds. The three 1,000 h. p. Piaggio radial motors afford a 272-mile-per-hour top speed and a range of 2,360 miles. Its ceiling is 23,626 feet and a crew of five is accommodated.

The Cant Z-1007 is also powered by three 1,000 h. p. Piaggio radials and has a speed of 280 m. p. h., a service ceiling of 31,000 feet, and a 3,100-mile range. The ship's gross weight is 28,260 pounds and its useful load, including a five-man crew, is 9,260 pounds.

The better known Savoia-Marchetti 82 is slower and shorter-winded, having a speed of 230 m. p. h. and a range of 2,480 miles. It has a wing span of 97.6 feet and is 73.6 feet long with a gross weight of 38,000 pounds and a useful load of 16,000 pounds. With three Ala Romeo 950 h. p. radial motors, the monoplane carries a generous bomb load and a crew of six.

How might these craft be used to bomb us? Let's look at the distances. From Nazi-held Brest to New York, it is 3,425 miles flying a great-circle course; the distance from Brest to Boston is some 200 miles shorter. According to the figures of the bomber ranges, which are believed to be reasonably accurate, New York and Southern points are within the range of three German craft which are known to be in large-scale production. The Heinkel He. 116 may or may not be capable of the trip. The Junkers Ju. 96 and Blohm & Voss 142 ships could make it to Boston, possibly to New York with reduced bomb load.

What would happen once these craft reached and bombed our Northern Atlantic cities? Such raids might be one-way-ticket affairs; this method would prove expensive in planes and flying crews, and whether they could do damage commensurate with loss of men and machines is conjectural. This, mistakenly, has been referred to as a "suicide method" because the planes would be out of fuel by the time they had reached and finished bombing their objectives. It is no such thing, although it would mean the loss of the planes which are mighty valuable to Adolf just now. The majority of the venturesome Axis airmen—those who survived our interceptors and antiaircraft—would simply make forced landings on the flat country of Long Island or New Jersey, and, if surrounded, step out of the cabins of their planes with hands upraised in surrender. Under international law—which we Americans practice more conscientiously than the Axis gangsters—the flight crews would be treated as prisoners of war and interned with perhaps more comforts than were available where they came from.

According to reliable reports, however, the one-way, one-punch raids may not be the method of attack, for the very good reason that a means might have been found whereby the planes can make the round trip. This wrinkle is strategically probable and tactically sound, and it has almost revolutionary implications for the Allies as well as the Axis. As is now well known, Germany has been building very large gliders in quantity for some time. One of these types is known to have been adapted to carry large fuel tanks instead of armed troops—it is, literally, an aerial tank car. (Our air forces have a similar tank glider under development at Wright Field, and Russia is known to have tested a craft of this sort.) The German tank glider is said to be almost as large as a four-motored bomber; it would have to be, since the highest efficient wing loading for a glider of this design would be about eleven pounds per square foot.

Such a glider could conceivably

carry as much as 1,900 gallons of fuel and oil; this amount, in addition to that already carried in the bomber's tanks, would be sufficient for the round trip with enough to spare for some margin of safety. The tank glider is, of course, towed by a cable and there is also a hose running between the bomber and the glider's tank outlets through which the required fuel or oil may be pumped into the bomber's tanks. The tactics to be followed in a raid of this sort would probably be for the bomber to draw fuel from the tank glider periodically—as its own supply diminished 100 gallons or so—so that by the time that the American coast was being approached, the glider would be emptied and the bomber's tanks full. The now-useless glider could be cut away and dropped, and the bomber could go on unhampered and free to maneuver to drop its bombs and reach occupied France.

It has been said that only sporadic raids could be carried out against the U. S. because of the great distance, and this is true except for this glider method. The tank glider attack could be conducted by large numbers of craft, and operations could be sustained sufficiently to do any amount of damage to life, industry and private property.

There are other ways in which the U. S. coasts can be attacked. One of the most probable methods is the use of the Axis' long-range flying boats such as the Blohm & Voss 139, Dornier 24, Dornier 18K and 26, or the Cant Z-508. Craft such as these might take off from a French, Spanish, or Portuguese coastal port and make rendezvous with one or two refueling vessels or submarines waiting at strategic spots along the way. Such spots might be a remote inlet of the Azores, the Bahamas, or other West Indies isles; or, taking the northern route, along the rough coasts of Greenland, Labrador, or on one of the many lakes in northern Quebec province. The flying boats could refuel on the way over and on the way back. Of course, this method of attack is dependent upon the element of surprise and good fortune, and sustained operations could hardly be carried out.

Of these boats, the military version Dornier Do.26 is capable of flying a longer distance nonstop than any of the others, or even any known Axis land-plane bombers. The ship has a 5,600-mile range, has a useful load of 21,590 pounds, and a gross weight of 44,040 pounds. The wing span is 98.6 feet and the overall length 80.6 feet. Powered by four Junkers Jumo 600 h. p. motors, the plane carries a five-man crew at a top speed of 208 m. p. h. The gull-wing boat should accommodate a bomb load of several tons.

The Dornier 18K is smaller and slower, but has a generous range. Powered by two 600 h. p. Junkers Jumo motors, it has a top speed of but 161 m. p. h., but the range is 3,220 miles. A newer model, the Do.18K2, uses two 850 h. p. B. M. W. radial engines and is probably faster.

The Blohm & Voss 139 B is powered by four 510 h. p. Junkers Jumo motors, has a 202-mile-per-hour top speed, and a range of 3,230 miles. Wing span is 96.9 feet and length is 64.6 feet. The ship's gross weight is 38,610 pounds.

In addition to the overwater flights with stops for fuel, these boats could be used for another method of attack. Catapult ships have been in use by the Nazis for several years; they reportedly have five in operation now, but there may be more plus converted vessels that can be used for this purpose. The vessels that launched the famous *Nordwind* and *Nordmeer* can accommodate planes weighing 40,000 pounds or more. Ships of this sort could release their deadly brood 200 miles or so from the coast, and those successful in getting through our protective screen of air and naval craft could carry sufficient war load to do damage aplenty.

There is the probability of attack launched from aircraft carriers. This method, too, would depend upon surprise and elusiveness in order to escape detection, but it might well be carried out successfully under cover of darkness. Germany is known to have available at least two heavily armed carriers capable of handling from forty to sixty planes. The Japs have at least eight—two have been sunk at this writing—carriers, several converted merchantmen-carriers, and several seaplane tenders and carriers. The Nazis would probably employ the fast Junkers Ju.88 Stukas, if they could be adapted for off-deck operations, which should not be difficult.

The one method of attack that is improbable, but within the realm of possibility, is that delivered by small seaplanes that are stowed aboard submarines. Under concealment of darkness, subs could sneak up to within a mile or two of the coastal cities to release their charges. The limitations are that of a plane small enough to be borne by even the largest sub cannot carry much war load. A whole flotilla of plane-carrying subs would be necessary if the raids were to be worth the risk and effort.

Perhaps the most risky method, but one of the best, is the outright seizure and occupation of insular bases or Latin American territories which could be used—temporarily, of course—as bases of operation against the U. S. in general and the Panama Canal and Atlantic seaboard in particular. It is technically and strategically possible for an Axis "commando" force to establish itself and move in the necessary supplies, et cetera, by air transport with long-range flying boats. Such a force would, we hope, be smoked out within a week or two, if not sooner, but within this time the base might be kept in operation, at least in part—meaning an airdrome from which heavily laden bombers could be launched.

Whatever the method of attack, success will depend upon our defenses and our people's reaction and the material damage to our war effort that can be accomplished. Our defenses are far from being airtight, as the air forces and naval air service men are the first to admit. But our planes, pilots, and antiaircraft quality makes up what is lacking in the way of quantity. To what *extent* they make up for this discrepancy will determine for Adolf whether it will be too expensive for his Luftwaffe.

Ersatz Model

(Continued from page 28)

with paper gussets. Pine or bass stringers, longerons, and spars, reduced to slightly more than half the cross section of the balsa parts they replace, have adequate strength except for a greater tendency to sag between points of reinforcement. This can be easily remedied by more closely spacing ribs and crosspieces.

By endeavoring to utilize ordinary materials instead of always relying on those which have been developed or imported especially for model airplane construction, we can make the hobby more interesting and even more instructive. Advanced modelers will find the design and construction of a nonbalsa model to be a challenge to their ability, and will also bring about a fuller appreciation of some of the problems which concern the designers of real aircraft.

The Dope Can

(Continued from page 40)

this background it's reasonable to expect a successful model 'giro. Hernandez has promised to publicize his work in Air Trails just as soon as the bugs are removed. There are three respectable indoor autogiro records of several minutes each. Outdoor rubber-power 'giro records are crummy—27, 11 and 4 seconds. There are no gas-powered records, so the first successful gas 'giro will make model history.

The last gas contest at Hampton (Virginia) was the sixth consecutive event won by Curt Martin. His average ratio (total flight to engine run) of 19.4 to 1 was unusually high. Motor run was limited to 10 seconds, and no ships were lost. Corser and Parmenter spread their ships over the field in a high-speed midair collision with both engines wide open. The club has been flying indoors in a glorified match box with a thirty-by-fifty foot floor space and a twenty-foot ceiling. Even so they're doing well over seven minutes, with Dick Everett, Hewitt Phillips, and Dave Call battling for first. Modelers at the NACA are making gas models for coast artillery targets. Extra-large tanks will be used to keep the Ohlsson 60 turning in long flights—bringing back the memory of the unlimited fuel days in the early '30s.

Assembly-line production methods for making 5,000 (half of the State's quota) models for military identification purposes is the goal of the Minneapolis Model Aero Club. Public-spirited citizens provide the material, school-age boys do the work under supervision of qualified adults. Schedule provides for two weekday shifts of 4 to 6 p. m. and 6:30 to 9 p. m.; Saturday's shifts are 9 to 12 a. m. and 1 to 5 p. m. Workers punch clocks, wear identification badges, and are graded on efficiency and ability with promotions to more responsible jobs based on these marks. Work is broken down into layout, cutting, shaping, assembly and finishing, and inspection. It will be interesting to follow the quantity of work turned out by this program.

The boys in Forrest City, Arkansas, fly box kites when the wind is too rowdy for models. Their designs have about 900 square inches area with No. 8 thread for a line. Modelers shouldn't be too dignified to try their hand at this sport. You can always launch a glider from a kite if straight flying proves too dull.

But above all, make sure you're away from all military and civil airways before you fill the air with high-flying kites.

1941 marked a revival of model building in Ireland. Activities had been rather haphazard, with no organized control. The first Irish National Model Aeroplane Contest was held in 1941. It's scheduled again for 1942. Much of the model activity originates in the Dublin Model Flying Club, Dublin Aero Modellers Club, Irish Junior Aviation Club, Ulster Model Aeroplane Club, and the National Agricultural and Industrial Developments Association. From all signs, 1942 should be even better for model aviation in Eire, with greatly improved design and performance.

Tri-State Association Model Airplane Clubs (western Pennsylvania, West Virginia and Ohio) start the 1942 season with a chip on their shoulder. The association is determined to use the 1941 rules intact except for a reduced motor run of 15 seconds in the gas events. They'll have none of the 3-minute maximum-flight idea even if they're tossed out of the Academy. They hold that pure duration is the greatest factor of advancement in model aviation, and that model fliers shall make the changes in the rules in person. And so the rat race goes on—proving that no rules please all the modelers any of the time.

Balsa being scarce, it's more than likely new model builders will grow up as they did twenty years ago—on a diet of hardwood exclusively. . . . Another bouncing Baby Buzzard Bombshell is the one George H. Loeb, Jr., of Norfolk built from his AT kit. The BBB is an exceptional model—large or small scale. . . . With only a 6-second motor run, Emmitt Sherron of Raleigh, N. C., logged a 42-minute flight with his Ohlsson-powered Sailplane early in March. (He lost the model.) . . . Jim Braddy of Hampton (Virginia) now refers to rubber as "flexible gold." More flights on fewer motors should be the goal of all rubber modelers. . . . Don't forget to give Defense Stamps instead of cash at all contests this season. . . . Note from Ray J. Embick, Jr., of Lebanon, Pennsylvania: "We haven't been chased off the Indiantown Gap Military Reservation, but fly there Wednesday evenings and Sunday afternoons. Your information in the April issue was incorrect."

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Boyd Anderson and Leo Koenig organized the Greeley (Colorado) Propbusters last September. All the members are experienced fliers. The problem is to get new members as fast as the army takes the old ones. Winters are long and cold, and the club did its winter flying on a nearby lake. Koenig's address is 1206 7th St., Greeley, Colorado.

The second Annual Northwest Ohio Model Aviation Meet is set for May 17th at the Telegraph Airport north of Toledo. Five events will be Class A, B and C gas; flying and solid scale. The Toledo chapter of the AMA is sponsoring the meet. More than seventy-five prizes will be awarded.

Chicago leads the nation with twenty recognized records. Philadelphia boys have only ten—all indoor records. A newcomer is Oakland, California, with eleven—six of which are hydro records. Individual record-holding honors belong to Paul MacCready, Jr., of New Haven, Connecticut. He holds six junior records. Proof that he is a capable builder was his performance at the 1941 National meet. Flying in the junior division, he won firsts in the flying scale and outdoor stick, third in indoor cabin, eighth in outdoor.

Warren Finch is the covering genius of Rapid City, South Dakota. Albert Hansle is the one-blade prop specialist (gas and rubber models) and stunt king. (His Cloudster did ten consecutive loops for a local record.) Robert Johnson is the glider and scale-model authority. Blaine Nash specializes in bad luck. He wrecked a Baby Cyclone when his Red Zephyr piled into a hangar. He rebuilt the model and promptly tried to fly it between the cab and body of a dump truck. Eventually the model did some good for itself with a 10-minute flight during a rain on 30 seconds' engine run.

Tether flying should stimulate speed contests. National records should include this category. Contest results we've heard about indicate speeds about 60 m. p. h. for Class C—about 35 for Class B with Class A a few miles per hour lower. Stories of 100 m. p. h. speeds are hard to believe. Seattle Guide Liners have been holding regular contests.

In England, R. T. P. (Round The Pole) flying is popular. All types from indoor microfilm jobs to Wakefield designs are flown round the pole. The model is anchored with a single line—there's no elevator control as in most of the tether flying done in this country.

The San Diego Aeroneers held a gas contest recently on Kearny Mesa, in which top honors were taken by Dennis Davis, with a total of 21:34. His ship, a Comet Sailplane with an Ohlsson 60, was easily the top performer of the day. Bill Noonan was first in the A-B Class, using a ship of his own design powered by a Forster 29. Whitey Glines won the Flying Macs trophy for the highest score attained in six months of model competition. Davis, who was our reporter for the meet, reports that his Class B (Phantom P-30) ship of 54" span was lost at the contest after doing over an hour on a 15-second engine run.

The Nightmare

(Continued from page 32)

Rubber bands and small model-making pins will help to hold them till dry. Little difficulty should be encountered if the balsa planking is rather soft.

Put in $^{1}/_{16}$" square canopy framing strips. Finish covering this upper structure with $^{1}/_{16}$" x $^{1}/_{2}$" planking. Cut out rear windows. Carve a pilot from balsa or soap and color realistically. Install seat back, instrument panel, throttle, overturning structure, and head pad. The cockpit interior, as well as the whole plane, is painted black on Dale's model. Paint your model to suit your own taste.

Begin lower fuselage construction by cutting out the two $^{1}/_{16}$" main side pieces. Cut them at least $^{1}/_{16}$" to $^{1}/_{8}$" longer than shown in the side view. To be perfectly accurate, bend a strip around the contour of the side piece in the *top view.* Mark the position of Former No. 1, No. 11, and the end point. This gives you the true length to use in laying the piece out on the balsa sheet. The lower line of this piece was made straight from No. 1 to No. 11 to simplify layout.

Cut the $^{3}/_{16}$" square crosspieces which brace the top of the side piece. Pin the two side pieces on edge over the top view. Glue and pin the $^{3}/_{16}$" square crosspieces into position. Mark all lower formers as to how deep they fit between the side pieces. Before these dry thoroughly, place this partial assembly in position to insert the bottom keel. Use small model-making pins to secure till dry. Before laying this aside, check the structure for proper alignment.

Remove structure from over the top view and glue in plywood firewall and bulkhead, No. 1 and No. 2. Before inserting these last two pieces don't forget to drill one hole for the three wires, the ignition, breaker-points, and ground-wire leads; also, another hole for the gas-intake pipe. Pin bulkheads securely and apply glue generously. When dry, slide in engine bearers and add gussets. Bend wire landing struts as per drawing. Bend copper or tin holding plates and drill for small bolts. Install the $^{1}/_{4}$" flat pieces which are grooved to strengthen the landing gear and also act as a seat for the bell crank.

Put in the battery tray, coil, condenser, timer, switch, and boosters. Brackets, bolts, and glue secure these solidly. Experience has shown that a simple booster made by soldering the wires to two short bolts stuck through at right angles to the fuselage side piece is best. Clamps are used to connect the booster to these bolts. They have been found to make a better contact than any other method. Glue and pin in place the $^{1}/_{8}$" plywood seat for the bell crank. Use a wood screw to hold the bell crank.

Carve and sand the horizontal stabilizer to shape. Install the strip leading edge in the elevator. Glue in place the control mast. Assemble the two parts, using the cloth hinges as shown. Fit this unit to the lower side of the fuselage side pieces, and glue solidly in place. Pierce the fuselage side at the position shown near the rear and insert the piano-wire control rod. Drill the side of the fuselage for the control cords and strengthen them with a plate or preferably a grommet or a regular shoelace eyelet.

Complete planking the entire fuselage with $^{1}/_{16}$ x $^{1}/_{2}$" planks except between Bulkheads No. 1 and 2 around the upper section. Do not cover this till after engine is installed. Only two sheets should be used here, from the side up to the upper keel, on each side. Alternate the remaining planking, first on one side and then on the other to keep the fuselage from warping. Notch or pierce planks where the landing gear protrudes. Carefully fill in any holes around this point. Slip a washer on the landing-gear wire and glue to planking. This will help to keep the balsa from tearing during a hard

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landing. It is advisable to cut a small door between Bulkheads No. 1 and No. 2, have the upper side removable, or install the engine, gas tank, and supercharger before covering with sheet.

Bolt the engine lightly in place until the cowling is carved. This may be carved in two pieces, the upper and lower half; or in three pieces, the bottom made from two blocks glued together, and the upper half made from one block. Cut the lower-half blocks wide enough to include material from which to carve the louvers to let out the hot air. Efficient circulation is very necessary to a high-speed racer. Cut the blocks to side and top view; use a template for the circular front, and the shape of the firewall for the rear template. Leave the block flat at the point where the front cooling aperture is to be cut. This does not look streamlined while carving, but looks swell when finished, giving a perfectly contoured side view without the cupping appearance often seen.

Hollow out with a cupped chisel or carving tool. Make cut-outs for timer arm and drain, and test-fit over engine. Sand smooth, dope, install pegs to attach upper half, and glue dress snaps in place. These latter are best secured by roughing the surface slightly, covering with one coat of glue, leaving until fairly dry, and then gluing in place with a generous coat.

Bolt the engine solidly to the mounts. Solder up a rectangular gas tank (to increase capacity), including some simple L mounting brackets, and bolt to Bulkheads No. 1 and No. 2. Use an oilproof rubber intake tube bent to the right inside of the tank. Solder in place the leads to the ground and breaker points.

Carve and install the lower tail block. The upper tail block is made in three pieces, the center $^3/_{16}$" flat piece which is also the fin, and the two blocks on each side which are carved to fillet the fin into the fuselage. Cut the rudder loose, hinge with sheet metal, and glue the whole joint solid again. Adjust by bending and breathing on joint. Streamline the *upper* fin before gluing into position on the fuselage. Leave the base rectangular where it fits between the two side blocks. Carve out notch in rudder to clear elevator strip. When these three pieces are glued securely and dry, carefully carve to shape, sand smooth, and clear-dope to a finish.

Solder a wire extension to the needle valve. Slip a rubber tube on the rear of the intake tube and bend in a circle so as to come out through a hole cut in the left side or, if you like, in the right side. Let this extend ¼" beyond the funnel-shaped block which catches the air, directing it into the tube. This hops up your engine. The rear of the block is streamlined as shown, and a front piece with only a small hole in its front should cover this funnel except when a record run is desired. Otherwise your engine would get too hot, and be ruined in a short time. Keep the front plug from falling out by using dress snaps, rubber bands and hook-and-eye hooks, or short dowels. Cover the canopy with celluloid, gluing black paper strips along the edges and joints.

Begin wing construction by sliding ribs into notches on main spar. Notch in the trailing edge, line up with your eye or pin to table top with the assistance of small balsa blocks (jig blocks). Glue on the leading edge, taking care that there is material for trimming. Don't undercut the leading or trailing edges. Carve, plane, and sand carefully to shape. Slip in the ⅛" square spars. Center the edges of the $^1/_{32}$" sheet covering on these spars. The solid tips are shaped before the wing is covered with sheet. Secure the control-line plate to Rib E on the left wing. Cut a slot in the sheet covering to let the plate protrude. Don't forget the center-section piece (short spar) that fits against Bulkhead No. 2 on the ship.

Roughly carve the spinner to shape, not coming near the final dimensions. Drill a hole in the end, attach to a motor shaft with glue, and leave to dry thoroughly. Turn on the motor, bring to shape with a chisel, knife, and sandpaper. Remove from shaft and carve out inside to fit a Tiger Fireball propeller, nut, and lock screw. Glue on dress snaps and dope to a finish.

Hook up about a thirty-five-pound fish line to the bell crank; pull through eyelets. Secure wing in position. Pass the control lines through the guide plate on the wing, attach to the two fishing-tackle swivel joints, and finally to the hooks illustrated. Be sure to make one lead about three inches longer than the other to keep them from interfering with each other. Four of these wire hooks are needed. Two are for the long lines which go to the control handle. Length of line varies from 25 to 50 feet.

Balance the model by shifting or adding weights. There can be no test glide with this ship. It can't be thrown fast enough to attain flying speed. Start with a power flight, hang on to your hat, and before your hair turns gray you will experience the "whirl-dizzy" performance that made us decide on the name Nightmare.

BILL OF MATERIALS

$^1/_{32}$" sheet, wing covering
⅛" plywood, firewall and bulkhead
⅛" flat balsa, formers, keels, trailing edge, ribs
$^1/_{16}$" flat balsa, formers, side pieces, planking, piece Z, ribs
⅜ x ½" hardwood engine bearers
Cowl blocks, supercharger block, tail blocks, spinner, pilot block
¼" flat tail surfaces, wing tips, main spar
$^7/_{16}$ x ¼" tapered leading edge
Clear dope, glue, and black dope
$^1/_5$ h. p. engine (preferred)
Celluloid, fishline, tin, fiber bell crank, soft wire, piano wire, swivel joints, dress snaps, bolts, cloth hinges, rubber bands, hardwood dowels, timer, booster batteries, switch, flashlight cells, wood screw, eyelets, battery tray, propeller, booster clamps, hardwood handle, and wheels.

Pinch-hit Materials

(Continued from page 28)

fringes were trimmed with a razor blade. (Sounds familiar.) Anyway, this chap—er, authority—stood the model out in the sun to dry. Ten minutes later the covering had all but disappeared. He had used linseed oil by mistake and the heat of the sun had burned off the paper. Ah, those were the days!

But we bet these old-timers have many a valuable tip we could put to work if hardwood becomes the vogue. Carving balsa props is a cinch. Not so with hardwood, even pine. Most trouble comes with the sanding of a hardwood prop. A favorite trick, which could be put to use again, was to break a discarded china cup. Odd-shaped fragments made excellent tools for scraping and simultaneously smoothing camber.

Wheels should be no trouble at all. Even the rubber-tired ones. We heard of at least one manufacturer who has enough rubber-tired wheels on hand to last for the next two years. Even so, wood wheels are plenty good enough. Hardwood wheels are better than balsa ones, in our opinion, especially on gas models. The bearing holes on hard wheels are less apt to become elongated and wabble. We hear that Victor Stanzel, for one, is now including nicely streamlined hardwood wheels.

When it comes to substituting other materials for sheet-balsa wing tips, stabilizer and rudder outlines, the picture isn't quite so favorable. Trouble is that we need substitutes for the substitutes. The nasty dwarfs from Nippon have cut off bamboo and reed from Malaya and China. But we don't see why curved pieces can't be cut from white pine sheet with a coping saw, jig saw, or what-have-you. Instead of making the curved segment one half inch wide, for example, make it one quarter or even less. Pine will be rigid when pared down.

Steel wire will be increasingly difficult to obtain. The Salesman's phone calls got two kinds of answers to his queries on wire. A: There isn't any. B: There is plenty. Suppose we assume it will be scarce. That looks logical, with tanks and ships being built faster than you can shake a stick. But do we need steel wire? We wonder. There are all sorts of softer wire that could be used in a pinch. Double-strut landing gear would again be the vogue, and each flight might mean a bent chassis. We are sure gas modelers won't mind in the least having to twist the landing gear straight. There is plenty of old wire of all descriptions a-wasting around the country. If you find an old piano, though, better hide it in your attic.

Well, men, now that we've looked at the dark side of things, let's keep the brighter side in mind. As we said, we still have the regular materials. But while we are hacking away at balsa we should be mighty careful of both rubber and gas engines. We don't know offhand just how many engines there are in the field, but we'd guess several hundred thousand. Given the proper care, the old mill should give us many a flight.

Older model builders will call this sissy stuff. Considering the troubles they had, we can't say we blame them. We remember one "expert" who hit on an improvement over the old flour-paste covering technique—see, we knew you never heard of that. (Incidentally, it isn't a substitute.) The boys used to lay a sheet of white tissue, from the ten-cent store, flat on the table and then coat it quickly with flour paste, then "wrap" the paper around the wing and tuck in the loose edges. Oh, boy, and when it dried! Wings were as stiff as a board —unless the weather got damp, with obvious results. If you made the paste too thick, you watched your nice wing curl up like an autumn leaf. Anyway, this chap was too impatient to wait for moist covering to dry. He put it in the oven. . . . And this is where we came in.

Carve This P-38

(Continued from page 37)

is taking shape, check the contour by setting the templates in their respective places. After the boom is shaped, sandpaper the surface with No. ½ sandpaper. Since our model has two booms, make the other in exactly the same fashion, and after completion check each against the other.

Set both booms aside and start carving the fuselage. This is carved in exactly the same manner as the booms. The cockpit of the original model was built up from pieces of $1/32$" square bamboo slivers, but this proved a bit difficult, so it is recommended that you leave the cockpit solid and mark off the panels with black lines against a gray background.

Carving the wings is next. Since lack of space prevented our presenting both wing panels, it will be necessary for you to trace the right panel on the correct size balsa, and then duplicate the left half. After the top outlines are traced, cut along the lines, leaving a $3/32$" margin which should later be sandpapered down. With reference to the front dihedral view, shape the wing taper, with the aid of a small plane, wood rasp or knife. After you have the taper, cut the wing templates from Bristol board and proceed to form the airfoil. Check the contours by placing the templates in place frequently and finish off the surface with No. ½ sandpaper. Both rudders and the stabilizer are cut from $3/32$" medium-grade balsa and sandpapered so the airfoil is symmetrical. When sandpapering these surfaces take extreme care, else the edges will become too thin and warp when the model is painted.

Now that you have all major sections, you are ready for the assembly steps. Before assembling the surfaces, dope each section with three coats of thin clear dope, sandpapering between each application. Since balsa is very porous, and a good finish is what "makes" any solid scale model, provisions must be made to fill the pores. We have found through actual experimentation that the best method of insuring a good finish is to cover the surfaces with ordinary tissue paper, the kind used in rubber-powered construction. Soak the surface with clear dope and apply the tissue as if you were working on a rubber-powered model. After the dope is sufficiently dry the surface should be sandpapered with 00 sandpaper and doped a few times with very thin dope.

Now you are ready for the actual assembly steps. With the aid of the dihedral view, cement both wing halves together and reinforce the center joint with plenty of cement. After the dihedral joint is dry, the booms should be cemented in place. You will note that the top of each boom is cut to make way for the wing. When cutting out these sections take extreme care, since the success of your model is directly dependent on how accurately these cuts are made. (An error of even $^1/_{16}$" will be very obvious when the tail surfaces are added.) You will note that the cutaway in both booms tapers to fit the dihedral angle of the wing. Thus a left and right boom are required.

After you have both booms accurately cut and checked, cement the wing in place, and while the cement is still dry attach the stabilizer to the ends of both booms. Next add the top removable sections of the booms and then cement the rudders in place.

The fuselage is now glued to the center of the wing. In exactly the same fashion as the booms were cut to make way for the wing, cut the fuselage. Cement the main section in place and after the cement is dry attach the top portion representing the cockpit. Now that our model is assembled, apply another coat of clear dope and sandpaper the joints carefully. Next cut from medium balsa the air-intake units and cement in place on the fuselage. Add the machine guns, which are merely sections of piano wire rammed into the fuselage nose. The "cannon" is represented by a section of $^3/_{32}$" dowel, or preferably a length of tubing with the same diameter.

Like tires on an automobile, a model wouldn't be complete without the propellers. Both props are commercial products, since experience taught us that making small three-bladed units is too difficult when you can take a jaunt down to your favorite model hobby shop and purchase an accurate unit for a few cents. (Haven't you heard? Hobby shop owners also must eat!) A two-inch-diameter metal prop will serve our purpose, but should you be unable to obtain this size a slightly larger diameter air screw can be adapted by cutting the tips down. When doing this don't forget to shave the blades proportionately. The prototype P-38 has the propellers revolving in opposite directions, which calls for a left- and right-handed unit. To make way for the propellers, cut the front portions of both booms away and cement the hub to the spinner section. Of course, you must cut into the spinner slightly, but make certain that the joint between the blades and the surface is not noticeable. If a few cracks do appear, a sliver or two of balsa plus a bit of cement will do the trick in filling up the crevices.

Both propellers are cemented to the booms, and the model then is ready for its war paint. The undersides of the wing, fuselage and stabilizer are painted light gray. The upper sides of these sections and both rudder sides are painted olive drab. All colors are dull and usually labeled on your hobby dealer's shelves as "sand and spinach." If you can't get these colors, dark green and light gray will pass, but the surfaces should be rubbed down with pumice to remove the gloss. Three coats of each color will result in a nice finish.

To obtain the effect of ailerons and flaps borrow a draftsman's ruling pen and practice drawing a few lines before you attempt to rule in your sections. The ailerons and flaps should be ruled off on the wing, and the elevator separation and rudder ruled off on the tail surfaces. Since our model has its wheels tucked away (to make building simpler), the bottom of the booms directly beneath the wing should be ruled off and the front portion of the fuselage given the same treatment.

With no wheels to rest on, we must mount the job on a pedestal. Making a pedestal is simplicity itself. Merely borrow a section of walnut or similar hardwood and cut as the perspective view shows. The post is a $^{3}/_{32}$" diameter section of wire, lollypop stick or what-have-you cemented in place. Insert the post in the fuselage, as shown in the side view of the fuselage, making certain that the model is mounted level or in a slightly upward position. Gee—it's finished!

Submarine Aircraft Carriers

(Continued from page 18)

Erie and Ontario, and reach nearly two hundred miles into Canada. Just think of the targets within *that* area. Every defense plant and supply base of the Eastern coast would be inside the deadly circle with the exception of a few in South Carolina, Georgia, and Florida, and, by moving the launching point a few hundred miles southward to miss the less important targets in Maine, these, too, could be reached.

With a fleet of giant mother ships hovering at sea or in unknown harbors to replenish the sub carriers with fuel, bomb load and bombers, these invaders could be a constant and terrible menace, for their losses would be replaced at once. How would these bombers return to their carriers? Perhaps they wouldn't. There might be empty sub carriers at an entirely different place along the coast, waiting to pick them up. A duplicate set of carriers might work in unison, furnishing bases for a nightly shuttle service of bombers across the target area, each flight originating from and terminating at an entirely new rendezvous each time.

These raids might be staged in a variety of ways, and with Hitler's penchant for the sensational and blitz tactics, we could be sure they would come in a variety of patterns, never the same.

Let us look at another way in which these sub-borne bombers might be used. Visualize a ship convoy with its protecting escort of destroyers and armed smaller craft. Could not one of these sub carriers be detailed to attack such a convoy? Thus, fast convoys too speedy for the usual submarines might be overhauled by torpedo-carrying planes from these sub carriers while smaller fighter planes from the same submersible acted as their protection. Even the blimp, successful hunter of submarines, might be easy prey for a few fighter seaplanes launched from over the horizon from a sub carrier.

Ideas For Radio Control—Selectors

(Continued from page 35)

densers are lighter than iron-core coils!) The relay (output) tube can also be a triode, but a beam tetrode or pentode such as the 1Q5GT or 1S4 will give better sensitivity.

The values of L, C_1 and C_2 will depend on the frequencies to be passed. After selecting the approximate frequencies to be used, the values can be calculated as follows:

$$L=\frac{160}{f}$$

$$C_1=\frac{32}{0.2\,f}$$

$$C_2=\frac{2\,f}{0.125\,f^2}$$

where L is in henries, C is in mmfd. and f is in cycles.

The values derived with these simplified formulas are only approximate. However, they will be sufficiently close to enable selection of the nearest commercially available values. It is best to consider the design frequencies as only approximate in any case, and adjust the frequency of the tone-generating source at the transmitter for maximum amplitude through the completed filter. A further adjustment can be made by replacing the 10,000-ohm output resistor with a variable of slightly higher value and setting for maximum selectivity under operating conditions.

In constructing such a filter, use only high-grade *oil-filled* paper or mica condensers of good Q. Powdered-iron-core r. f. chokes can be used as inductances above about 1,200 cycles (125-millihenries and smaller). Mount the chokes and condensers so as to avoid mutual coupling.

TUNED-REED SYSTEMS

Another interesting possibility in audio-frequency selection is the use of electromechanical filters. The simplest form is the tuned vibrating reed, used as a selective switch. Its use in full-scale work is rather common, but so far as is known no one has yet successfully applied reed selectors to model control, although a few experimenters have made the attempt.

In the tuned-reed system a thin vibrating reed is mounted near a small electromagnet. The reed is of steel or a special magnetic alloy; in some cases it is made of nonmagnetic spring material with a small piece of soft iron attached to the free end. When an alternating current is passed through the magnet coil, the alternating magnetic field that is set up causes the reed to oscillate at a rate corresponding to the frequency of the current. The vibration attains its maximum amplitude at the natural resonant frequency of the reed, determined by its length and stiffness. The reed is provided with an electrical contact, and opposite it another contact is mounted on a bracket. The spacing between the two contacts is made such that they touch only when the reed is vibrating near its maximum amplitude. Thus if several reeds, each having a different natural resonant frequency, are connected to the output of an audio amplifier receiving various audio tones from the control source, each reed will vibrate when its matching tone is transmitted, closing the control circuit assigned to it.

In the past it has been a hard job to find suitable reeds. There is a logical source of supply that has been little exploited, however, and that is the defunct auto-radio vibrators to be had from auto-radio servicemen. If not burned out, a vibrator unit provides not only the reed and contacts but the electromagnetic coil and core as well.

There are dozens of different types of vibrators—in fact, over a hundred—so many that no single method of procedure can be used in converting them. The best thing to do is collect a quantity of them from the repair shops—especially the older types, for the frequencies were not standardized then and units resonant at various frequencies, such as 60, 85, 115, 130, 165 cycles, et cetera, were used. Now most vibrators operate at 115 cycles, and it is necessary to alter one considerably to change its frequency. Of course, as many different frequencies must be used as there are channels.

The easiest way to check the vibrators for this job is with a calibrated audio beat-frequency oscillator, if one is available or can be borrowed. First of all, check the coil to make sure it isn't burned out; if so, it must be rewound, using the same size wire. Then connect the coil across the secondary of a 200-ohm output winding (using a tube-to-line step-down transformer if necessary). About 2 or 3 watts of audio should be available. By varying the frequency of the oscillator, the point of maximum vibration amplitude can easily be found.

Fig. 6 shows a pair of typical vibrators, one of which operates at 85 cycles and the other at 165. In use the vibrator is, of course, removed from its container and stripped of all excess weight. The construction of individual units will determine exact procedure. When installing use a cushion mounting to avoid transmitting vibration.

The internal connections must also be changed and the contacts adjusted. Keeping the air gap small, separate the center and outside contacts on both sides. Determine the most sensitive location for the free end with respect to the electromagnet core. The vibrator contacts must be rewired to separate the coil from the contact points. Fig. 7 shows typical connections. At (A) is shown a non-synchronous vibrator with series-connected coil, and at (B) a synchronous unit with shunt-connected coil. The bottom diagrams show how they should be wired for filter use. The coil is disconnected from the contacts and separate leads brought out. All outside contacts are connected in parallel, to reduce contact resistance.

Even with paralleled contacts the apparent contact resistance as measured on an ohmmeter will be high, however, because current is actually being passed only a fraction of the time. This "resistance" can be reduced by connecting a condenser across the output to store energy between pulses. The optimum value of this condenser will depend on the nature of the circuit being controlled and must be determined experimentally; for low-voltage circuits use high-capacity low-voltage electrolytics of 10 to 50 mfd. (observing polarity).

By careful adjustment the sensitivity of the vibrating reeds can be boosted considerably, but even so appreciable power is required to operate a bank of them. A Class B stage using a 1G6G or similar tube is probably the most logical source for this power. The output transformer should have a 50 to 500-ohm output winding (depending on the characteristics of the electromagnet, number of units, et cetera).

A suggested arrangement for a multichannel tuned-reed filter is shown in Fig. 8. This assembly would actuate six reeds from a single electromagnet, the coil of which could be wound to match the output of the driving tube directly. The core could be a U of soft iron, although the performance would be better if it were laminated. The mounting of the reeds should have great mechanical stiffness with respect to transmitting vibration to the coil and core.

AMPLITUDE SELECTION

You've heard of frequency modulation versus amplitude modulation in broadcasting. Well, so far we've been talking about *frequency selection*, both radio and audio, but now here's a system of *amplitude* selection.

Take a look at Fig. 9. You see four relays connected in series in the plate circuit of the relay tube. These relays each have the same power sensitivity, but since the resistances are different, a different value of current is required to close each relay. These values are shown in the diagram.

In operation the transmitter carrier is modulated (the frequency doesn't matter much), and the resulting modulation in turn rectified in the receiver by the diode of the 1S5. The d. c. component is used to bias the 1S4 relay tube through the pentode section of the 1S5 which serves as a d. c. amplifier, its idling plate current creating a bias voltage sufficient nearly to cut off the plate current of the 1S4. When the modulated signal is received this bias decreases and the relay current rises. By varying the percentage of modulation it becomes possible to vary the plate current of the relay tube, therefore, and thus to select the desired circuit by means of the relay closure characteristics.

The percentage of modulation on the carrier can be controlled by a four-point switch and a fixed voltage divider in the modulator. Successful use of this system requires a reasonably constant carrier level. This is best achieved through automatic volume control at the receiver, of course. A superregenerative receiver has an inherent automatic leveling action that serves to compensate for moderate field strength variations.

As shown, four relays are used, based on the assumption of a 50 percent drop-out ratio. If relays having a drop-out ratio of 75 percent or better are used, six or even seven channels are feasible; e. g., individual relays could be set to close at 1, 1.5, 2.25, 3, 4.5, 6 and 8 ma. It will be seen that the circuits are so arranged that no succeeding "work" circuit can close until the preceding one has opened, and vice versa. Only one circuit is operative at any one time.

A system of this sort is particularly useful for an operation like throttle control, where a multiple step-by-step control is required with no particular need of accurate indexing or synchronizing with the ground control.

PULSE SELECTION

The greatest remote-control system devised by man—the automatic telephone exchange—is a fruitful source of ideas. The type of selection used almost exclusively in telephone work is pulse selection, and it is also popular among advanced radio-control builders. In fact, where instantaneous operation is not an essential, the use of pulse-operated stepping or sequence relays has become standard practice. The pulse-operated rotary switch is probably the lightest and least cumbersome type of multicircuit selector.

Construction of a suitable stepping relay is an intricate task, however. Suitable devices are available commercially, and it is always possible to copy or adapt telephone equipment, but this often represents prohibitive cost or requires materials or equipment not readily available.

A type of rotary stepping switch that can be built quite readily by the experimenter with ordinary materials and tools is shown in Figs. 10 and 11. Leaf-spring contacts operated by an insulated cam cut from $^1/_{16}''$ bakelite sheet require a minimum of power in comparison to wiping contactors of the usual kind. The springs are made of .010″ phosphor bronze, with bakelite-strip pile-up insulators. Silver contacts $^3/_{16}''$ in diameter are provided to handle the high current required to run motors and power solenoids.

On the other side of the .032″ sheet aluminum (17S-T) mounting plate the driving mechanism is mounted. A plunger-type solenoid works a rocker arm on the end of which is a pawl that operates a ratchet wheel. As shown, eight teeth are provided in this wheel, corresponding with the eight contact assemblies. This number could be fewer or greater, as required. Light coil springs are used to return the solenoid plunger following each pulse and to keep the pawl engaged with the ratchet. A light spring detent also assists in locating the ratchet accurately—although the design is such that a locating error of 5 to 10° will not interfere with operation.

The solenoid contains a $^3/_{16}''$ diameter soft-iron plunger sliding in a polished bakelite cylinder which forms part of the coil form. The coil is wound with approximately 300 turns of No. 20 enamel-covered wire.

In common with some of the other types of selectors, the pulse-operated rotary selector requires special circuits or auxiliary devices to keep the "work" circuit open until the desired position has been reached. There are a number of such devices and circuits —so many, in fact, that they will have to go over until another article.

For that matter, selectors alone are a big enough subject to spark ideas for a long time to come. Here's hoping those you get will be good ones!

The Traveling Salesman

(Continued from page 40)

rally, model aircraft building and flying will provide the elementary knowledge, since there's nothing like model building to teach the principles of aëronautics in an interesting and understanding manner. We fear, however, that many teachers with no knowledge of aëromodeling might endeavor to pass over this phase of air education because of their own lack of understanding of the field. Seems you can't teach aëromodeling from a book! Therefore model builders who are in the schools now must come to the fore and act as junior instructors or assist their teachers in the instruction of building and flying model aircraft.

———

"I cannot too strongly emphasize the importance of this training for our future fliers," stated Canadian Air Minister C. G. Power when he announced that the Royal Canadian Air Force would assume administration and supervision of the Air Cadets of Canada. "It is my sincere hope and fervent prayer that they may fly the airways of peace. But I know, too, that if the time comes when they must take the places of their fathers and their brothers in defense of the cause of freedom, they will be staunchly true to the traditions which those fathers and brothers are daily establishing in the sky."

Aëromodeling is an important phase of the Canadian Air Cadet program. If and when our own air cadet organization gets going, we must be sure that model building plays an important part in its activities!

———

The crying need is for trained model aircraft instructors. Air Youth division of the NAA can do nothing more important than to prepare and give two-week courses in model-airplane building and flying instructions in State normal schools and for manual arts and other grade and high-school teachers. Why not get together a few of our mental giants such as Hewitt Philips, Herb Weiss, Carl Goldberg, Frank Nekimken, Art Vhay and a committee from the U. S. Office of Education, lock them all up in a hotel room for a week, and we'll wager that the best possible teachers' course for aëromodeling will be forthcoming. This course could also be used in training scout masters and interested civilians, club leaders and social workers.

This column has repeatedly urged action on the matter of teacher instruction. Time's a-wasting. Let's go, AYA!

———

The humorous highlight of the MIA New York convention was the periscope gag. A few days prior to the meetings, Polk's Model Craft Hobbies started getting inquiries for Polk's periscopes. Thinking that some error in one of their advertisements accounted for the inquiries, the Polk brothers disregarded them, since nothing could be more remote from models than periscopes. When the Toy Fair opened, practically everybody in the business made inquiries about periscopes from the Polk boys. Out-of-town visitors and buyers kept pressing them for details. Periscope patter was bandied at meetings and throughout the Hotel McAlpin, the convention headquarters. The climax came at the annual dinner when the astonished Polks received from the master of ceremonies a catalogue-booklet featuring Polk's periscopes described in humorous rhyme. The entire gag was perpetrated by Richard Mair, Rogers' Motors' Midwest salesman, who in his travels East got everyone hopped up on the farce.

But the pay-off came when Polks sent invoices and phony bills of lading to several of the jokesters who had placed orders. Imagine their chagrin when these were received and they thought huge shipments of periscopes were on the way! And did Dick Mair find himself on the spot when his fellow pranksters got after him to help dispose of the coming periscopes and the expensive freight bills!

Jaco-Lac Decal Corp. of Chicago has placed on the market brightly colored squadron insignia. The one-inch kind sell six pairs for 10 cents, and the one and a half inch, 15 cents. . . . Ohlsson & Rice have discontinued the manufacture of the Custom 60. The Ohlsson 60 Special turned out so good it neatly filled the shoes of the more expensive job! . . . The Burkard Engineering Co., under new management and in greatly increased quarters, has just enlarged their productive capacity by expending real money to get additional equipment that will guarantee their position in the field for a long time to come. The present line of $1.50 half-inch-scale solids with cut-out parts will continue in production. Balsa wood, should it get scarcer, may be replaced with pine. A super deluxe series with ready-carved fuselages and shaped parts, including metal foil covering, is being readied and will sell for $2.95.

Are Aircraft or Hawk, the manufacturers who had the solid-scale field to themselves for many years, going to produce identification models? How about some of the other scale-model manufacturers? There ought to be sufficient business for the models the navy wants to warrant greater interest by many model manufacturers besides Comet. . . . Scientific is about to launch three new gas-model kits for spring and summer flying. . . . The X-acto Crescent Co. has a new pocket knife which sells with two blades for $1. . . . One of the Midwest model firms is about to announce a line of model jeeps—we wondered how long it would be before someone woke up! . . . The Hurleman line of gas engines and accessories is back in production. The .48 cu. in. displacement Aristocrat which was a deluxe engine at $21.50 now becomes available for $16.50, complete with coil and condenser and Hurleman style carburetor.

E. B. Miller, chairman of the MIA recognition and conservation committee, certainly deserves a lot of credit for the Gargantuan task he and his committee have been performing. Of late he has been shuttling between New York and Washington at such a pace that about the only sleep he gets is on the plane. The MIA nomination committee took cognizance of his ability in nominating him as director. If he is elected to the board, many feel that he would make good presidential timber. . . . Master Model Craft is moving to larger quarters.

Some model builders are screaming their heads off about the new gas-model rules. In talking sensibly to adult and more sober modelers we find that sane regulations, considering the times, even though they may work some hardships, are necessary, and these modelers welcomed the new rules. Some fliers don't realize that unless such rules are adopted and inforced, model flying may be banned altogether! . . . What troubles the model industry more than the lack of rubber for powering models is the shortage of balsa wood. For quite a while there was none available, and now the navy uses most of what arrives for life rafts. The big difficulty is that due to war precautions we never know when a ship bearing balsa leaves for the States and can never tell when it will arrive. Planning production under such conditions is pretty difficult.

The greater increased demand for Master Modelcraft kits is resulting in this firm moving to a new and much larger plant which will facilitate increased production. . . . Sol Toubin's Midtown Model Airplane Shop, New York City, has organized a club, and new members are welcome. . . . Here is good news for the gas builders. A well-known Eastern manufacturer has taken over the Perky engine and we can look forward to having the new Perky in a few months. . . . Raymond Barnett, son of Louis Barnett of International Models, was accepted by the U. S. air corps due to his knowledge of aviation gained through building of model airplanes.

Had an interesting chat recently with Frank Lucas and Ray Smith of Ontario Model Aircraft. From a total production of 1,500 kits in 1928, they're banging out 90,000 monthly now. The boys tell us that German prisoners at a certain great camp in Canada are taking their imprisonment especially hard. The reason? They're model builders and want material! Incidentally, Canadian dealers, drop a card to Ontario Models for information about the Skyway knife they're handling. . . . Ontario has a great new gas kit named the Commando.

The Scientific Model Airplane Co. announces that it is working on a new series of flying scale models of America's most popular pursuits and bombers. It will be called the "Victory Squadron," is being introduced in June. Also in work is a new gas model, suitable for either Class A or B, which is understood to be revolutionary in design and ease of construction. This model also is being introduced in June.

Down The Runway

(Continued from page 31)

The Cheyenne Gas Model Club, way out there in Wyoming, is never fazed by a record snowfall. If they can't fly their models, at least they can run their engines. And that, they decided, was basis enough for a contest. According to George Beaudry, the friendly little fracas is started off by "the boys bringing the fuselages of their ships down to a club meeting. Each fuselage is just as if it were all set to take off, with the exception of having no wing. Then we appoint an official timer and the boys get their batteries ready to hook up to the ship, and stand up to let the timer know when they are ready.

"At the command, 'Go,' the contestants hook the batteries up and start their motors as quickly as possible. To be official, the engine has to run at least five seconds. The record to date is eight seconds. We think this is a national mark, and would like to hear of anybody doing better."

★ ★ ★

Elveron Hoyt of Tuckahoe, N. Y., thought he was just another gasoleer until his interest began leading him to think more and more of flying. Mr. Hoyt ended up with private license No. 69782 and his own light plane, a Luscombe "50."

He is not the only one, either, and to prove the point, the Academy has compiled a brief showing the defense value of aëromodeling. It has been circulated widely among the government and aviation officials and through the co-operation of various publications, including Air Trails, carried much factual data showing that many ex-aëromodelers are now in key positions in the aviation industry and the air crews of the army and navy.

★ ★ ★

Every once in a while we get a little down in the mouth because we are not always able to do everything we want to, but a chap like Bob Kesler of Quincy, Ill., can make us feel good when he writes, "I wish to say that I think the Academy is the best thing that ever happened for model building. The majority of us will do our best to support the Academy."

Thanks, Bob! A little praise goes a long way with us.

★ ★ ★

There are always a few folks who are ever ready to criticize everything and who can see no good in anyone.

Take the matter of model airplane dealers. On the whole, they are a grand bunch of guys. Yet some alarmists feel that dealers are commercializing the hobby. To those we would like to say, "Not a bit of it." A dealer acting as a center of distribution for model merchandise and plans, information, and news is an asset to any air-minded community.

Sometimes the dealers themselves are rather hesitant of participating in local activities, for fear someone will think they are trying to wring the last penny out of the youngsters. This was exemplified in Columbia, Pa. There a club of model builders were so desperate for assistance and sponsorship they asked the Academy headquarters to write the local dealer to hold some contests.

Maybe it is all the other way—maybe the dealers are afraid that they will be accused of commercializing the activity if they lend a helping hand to the enthusiasts.

★ ★ ★

Ever since the Academy got set up on its own two feet with headquarters in Washington, people have been urging that the head office set up some sort of a file for lost motors and planes. In many instances, headquarters has been instrumental in having lost ships returned to their rightful owners. Donald R. Lewis of Greenville, Iowa, was one of the many who have written in this connection.

It remained for Harry Vogler, Jr., of Pittsburgh, to get the jump on headquarters and set up his own motor registry. Harry's plan calls for enthusiasts to register their motors with him in an effort to show ownership in case said motors were lost and turned up somewhere else later on.

Long a leader in aëromodeling activities in the tri-State area (western Pennsylvania, eastern Ohio, and northern West Virginia), Harry set up the service at no cost to the modelers of his area. AMA has been urged to do the same in a national manner, and will probably utilize penny post cards which will be filled out by licensed modelers and sent to headquarters for the official file.

★ ★ ★

Most of the modelers down West Virginia way know Carl Hopkins quite well. In addition to being AMA vice president for District III, Carl is State organizer for model aviation under a unique plan originated by the Works Projects Administration.

Last fall, Carl ran a training school for prospective aëromodeling leaders which is still being talked about and which has been providing much food for official thought in Washington. Held at Jackson's Mills, West Virginia, the training conference was a week-long affair and schooled the "students" rather thoroughly not only in the art and science of building and flying model airplanes, but also in running contests and conducting clubs. In order to graduate, the recreation leaders enrolled in the school, the first State-wide one in the country, had to conduct a regular meet themselves which was well attended by aëromodelers.

In Milwaukee, Jim Custin, a member of the AMA contest board for District VII, has been conducting similar city-wide training classes under the sponsorship of the Milwaukee Model Airplane Council.

What's Your Question?

(Continued from page 6)

In the B-18A the gunner is located below and the bombardier is above him, while in the B-18 the bombardier acts as a gunner.

Question: What is the horsepower of the Junker Ju.87, the Focke-Wulf 198, and the Nakajima 96, the Junkers Ju.88-A-1? Is the Curtiss P-37 still used by the army? Could you tell me where could I enter a Class E model sailplane in a contest? What is the name of the fastest racer in the world? R. W., Youngstown, Ohio.

Answer: The Ju.87 is powered by a 1,000 h. p. Junkers Jumo 211, twelve-cylinder liquid-cooled engine; the Focke-Wulf 198 by a 1,500 h. p. Daimler-Benz DB-603 inverted twelve-cylinder liquid-cooled engine; the Ju.88-A-1 by two 1,200 h. p. Jumo 211-B engines. We do not know what engines are used in the Japanese ships. Regarding the entry of your Class E sailplane, write to Al Lewis, c/o Academy of Model Aeronautics, 718 Jackson Place, N. W., Washington, D. C. The German Messerschmitt 109 R in which the last world's speed record of 469 m. p. h. was established, could be considered the fastest racing plane in the world, although it was not built for the sole purpose of racing.

Question: Would you please give me the span, length and the height of the Gregor fighter? Where can I obtain photos of it? J. E. W., Buffalo, N. Y.

Answer: The ship was an equal-span biplane, upper and lower wings being 28 ft. long each. The overall length was 21 ft., height 9 ft. 4 in., the wing area 194 sq. ft. You may possibly obtain photos of the ship from Rudy Arnold, P. O. Box 60, Sheepshead Bay Station, Brooklyn, N. Y.

Question: What are the specifications of the Focke-Wulf FW-198? Where can I get a picture of it? J. P., Poughkeepsie, N. Y.

Answer: The FW-198 has a span of 41 ft., length 31 ft. 6 in., weight empty 4,696 lbs., fully loaded 7,188 lbs. It has a top speed of 324 m. p. h. You may obtain photos of this ship from Airpix, Box 195A, Toronto, Canada.

Question: What is the span and overall length of the Grumman Skyrocket? A. N. K., Hicksville, N. Y.

Answer: The span of the ship is 42 feet, overall length 28 ft. 6 in.

Question: Can you tell me from the inclosed picture what type of plane is shown on it and how many engines it has? It's supposed to be an Allied plane shot down in combat at Hongkong. C. P. R., Curtiss Field, Brady, Texas.

Answer: Judging by what is left of the airplane, we would guess that the ship was a trimotored Junkers Ju.52, which type has been used as a passenger plane in the Far East. We doubt that the ship was shot down—it looks more as though it had been hit by a bomb while standing on the ground.

Question: After reading about the Davis airfoil in the January issue of Air Trails, I began to wonder if it would be more efficient on a utility sailplane than the modified Goettingen the plans call for. Also, from information given, is it possible to make a full-size wing using this airfoil? M. B., Picton, Ontario, Can.

Answer: We would not suggest changing the airfoil section as it would require pretty complete re-engineering of the glider. Besides, with this airfoil the landing speed of the ship will be some twenty percent higher. Information printed in our magazine is sufficient to build the wing.

Question: Could you tell me the price of the book called "Aerodynamics of the Airplane," and the address of its publishers, John Wiley & Sons, Inc.? E. P. M., Philadelphia, Pa.

Answer: Sorry, we do not know the price of the book. John Wiley & Sons, Inc., are located at 440 Fourth Ave., New York City.

Question: Will you please tell me the specifications of the Brewster F2A-2? Do the British have any of these planes? If so, what do they call them? B. N., Greensport, N. Y.

Answer: The span of the ship is 35 ft., overall length 25 ft., speed in excess of 300 m. p. h. All other data on the ship is restricted. The British have a number of them; they are called Brewster Buffalos.

Question: Would you please name all the colleges in New York State which offer aeronautical engineering courses? Which one is considered the best? J. La R., Bronx, N. Y.

Answer: One of the best in the country is New York University. Other colleges offering engineering courses are Polytechnic Institute of Brooklyn, Brooklyn, N. Y., and the Rensselaer Polytechnic Institute, Troy, N. Y.

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Page 21—All by International.

Page 22—TopL., U. S. Navy photo; rest by Harold Kulick.

Page 23—All by Harold Kulick.

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Page 25—British-Combine.

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Page 27—Top, Harold Kulick. TopR., British-Combine.

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