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NOV. '41

Phil Powers

I DESIGN BOMBS

By Air Commodore Huskinson, R. A. F.

NOVEMBER
1941

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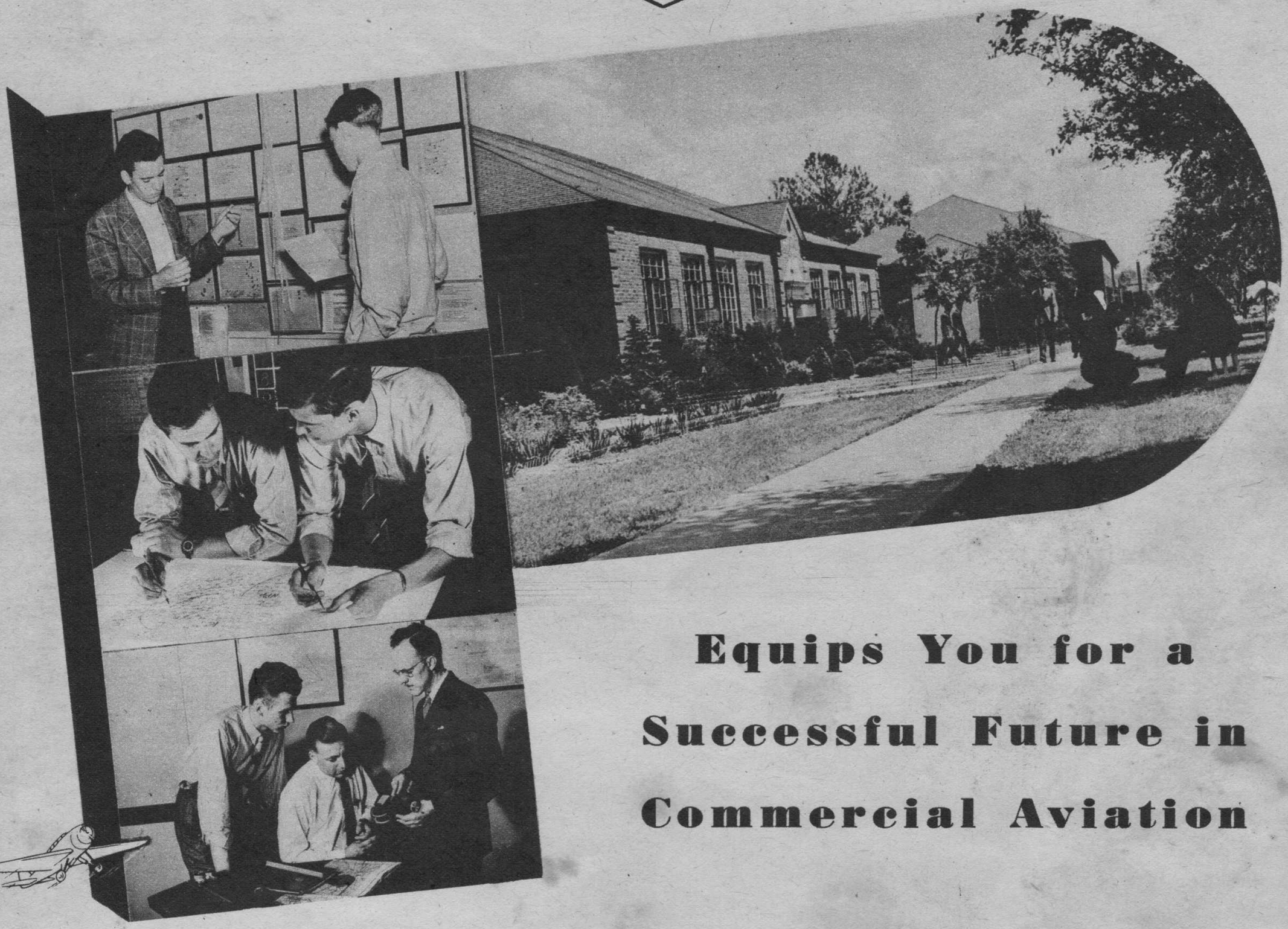

Equips You for a Successful Future in Commercial Aviation

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Plan your course for the future right now. The coupon below brings you complete information on each of Parks four courses: Professional Flight and Executive, Aviation Operations and Executive, Maintenance Engineering, and Aeronautical Engineering. As entrance to Parks is selective and restricted, and as class quotas are often filled in advance, send the coupon or a post card *today*.

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Graduates are qualified educationally for appointment as flying cadets in the U. S. Army Air Corps and for flight training in the U. S. Naval Air Reserve.

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Curtiss-Wright Tec's career training is carefully designed to do just one thing:—TO MAKE MONEY FOR YOU, so upon graduation you can be independent and self-supporting for life. Our thousands of successful graduates have proven that Curtiss-Wright Tec training gets results and always pays, since it trained them in advance for the highest position they could ever expect to occupy. It can do the same for you.

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.

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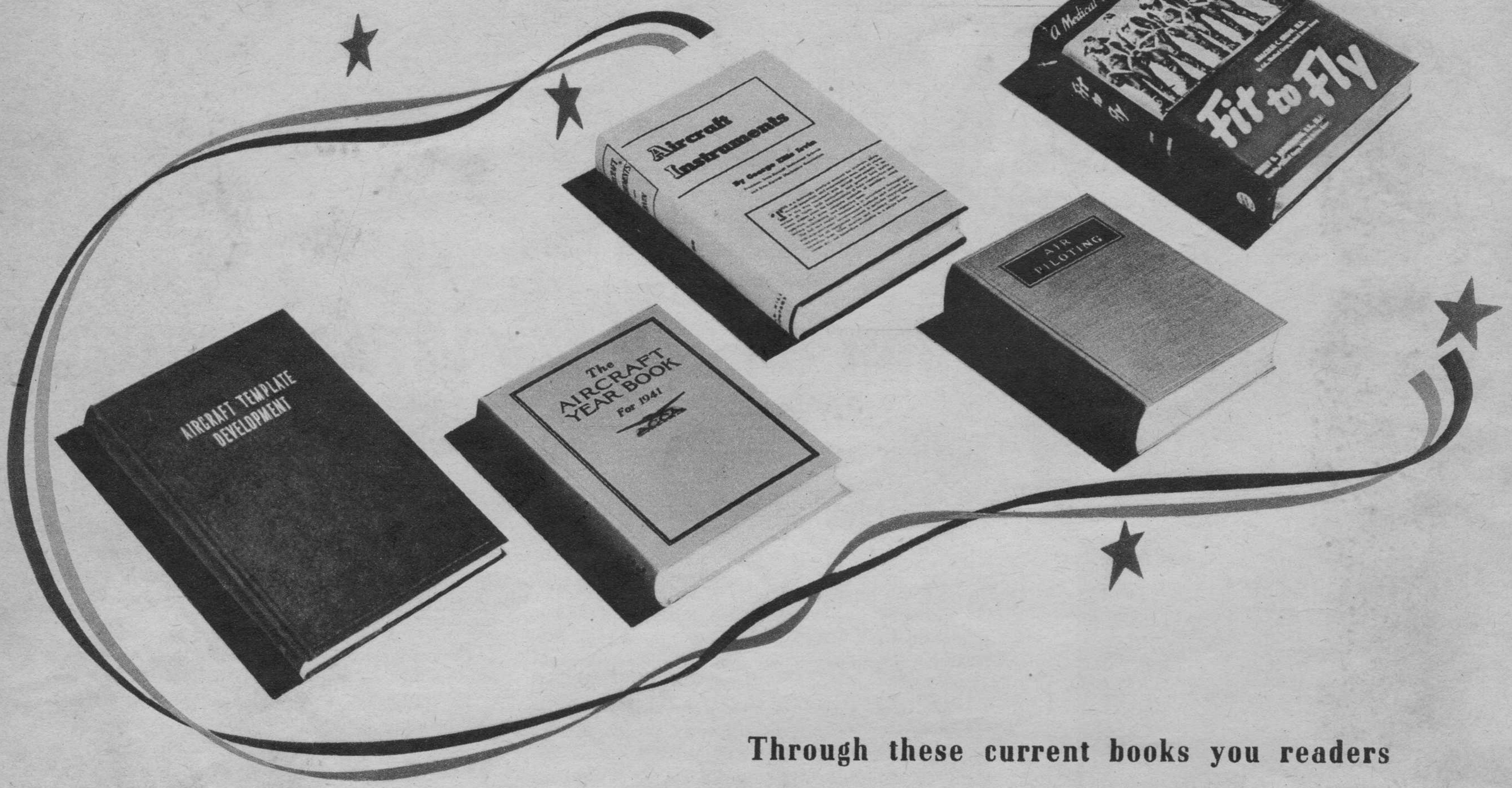

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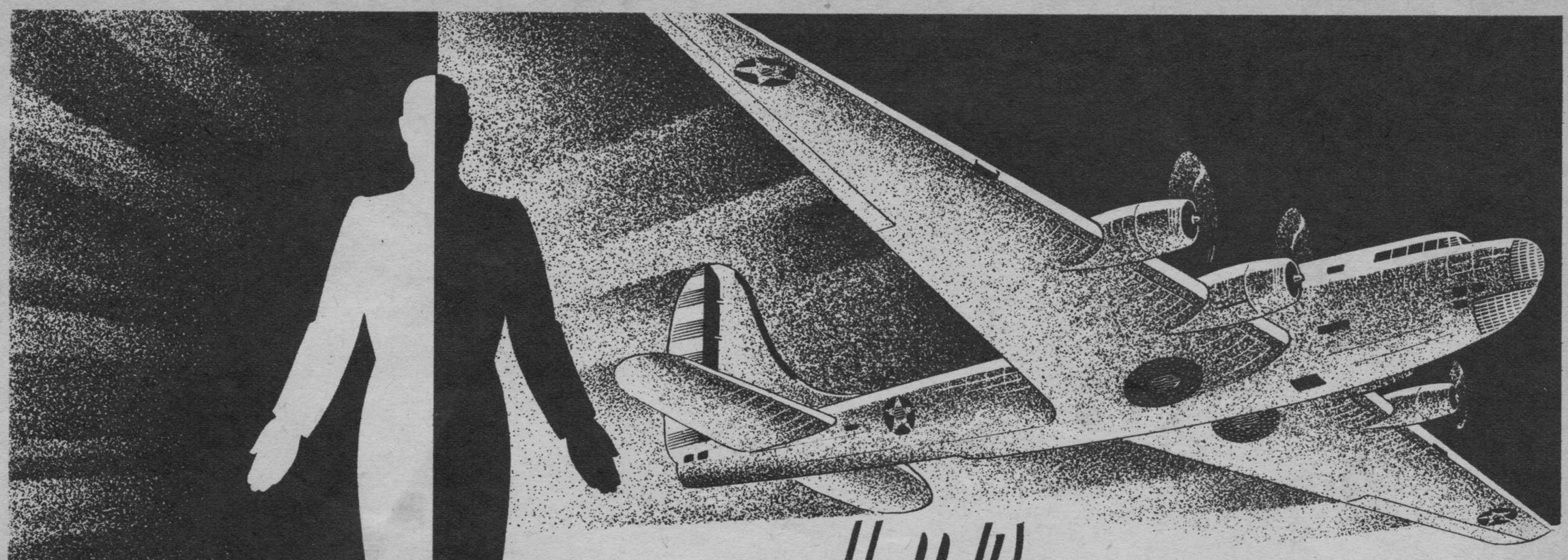

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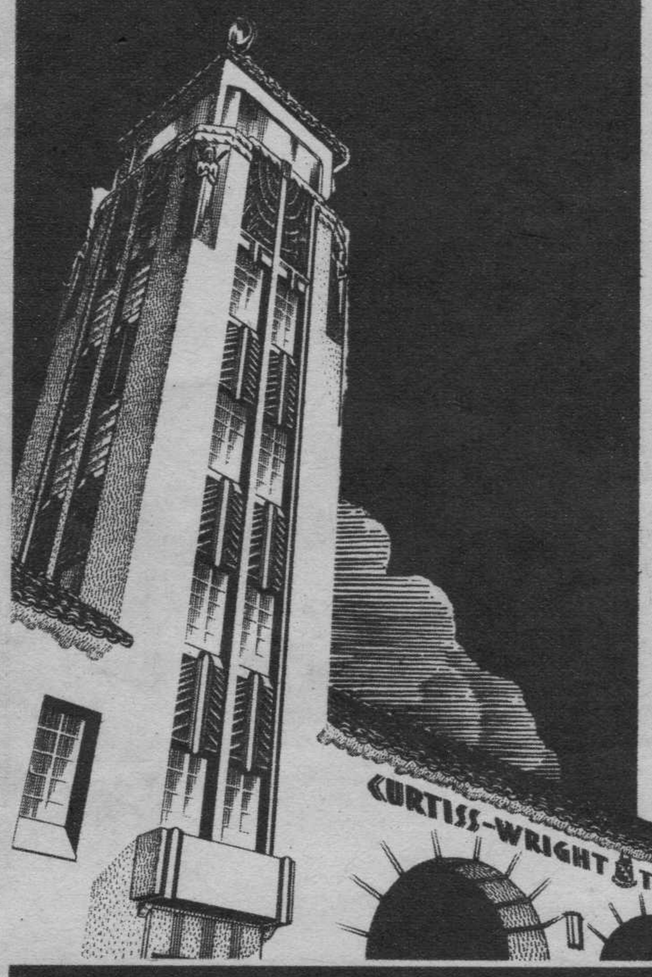

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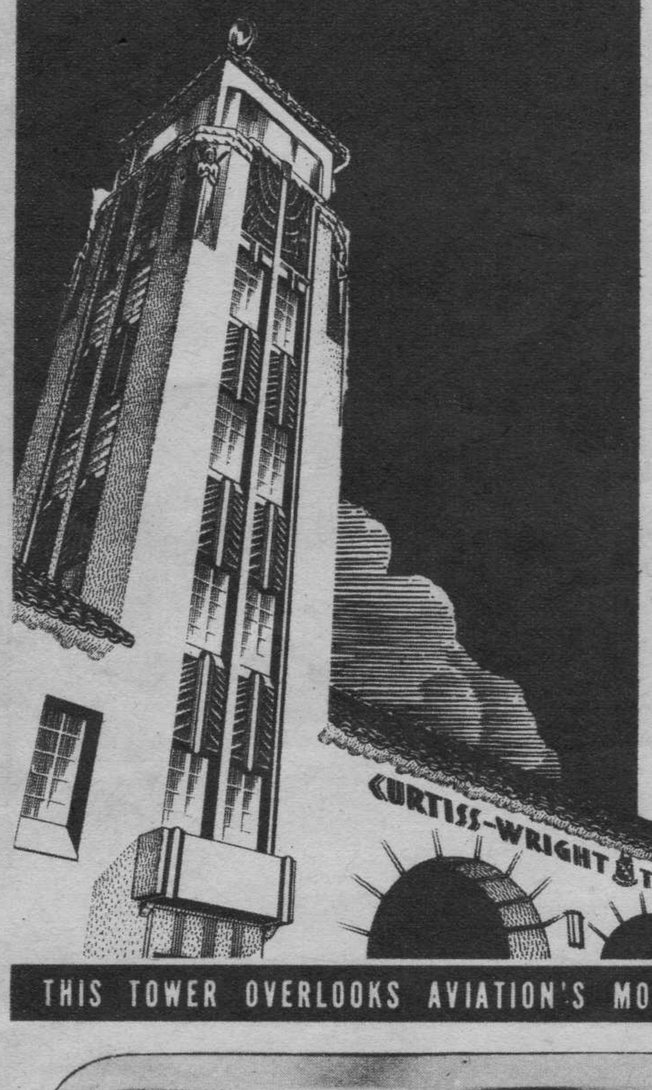

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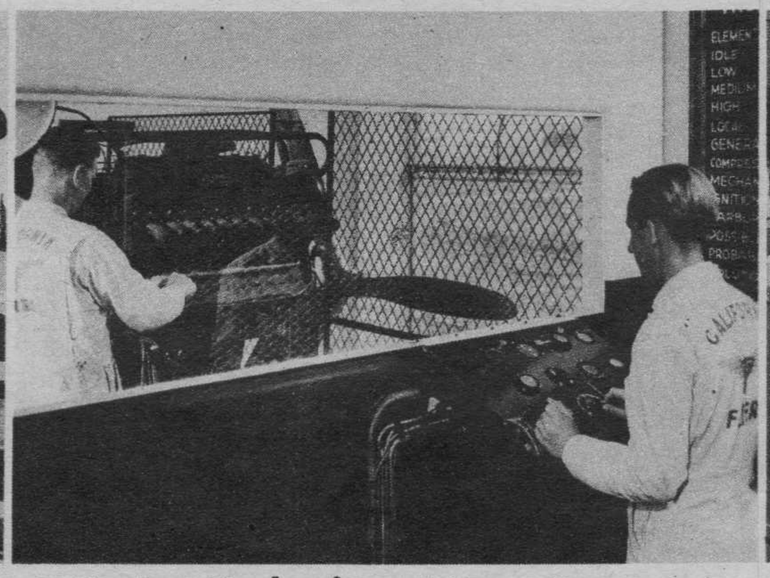
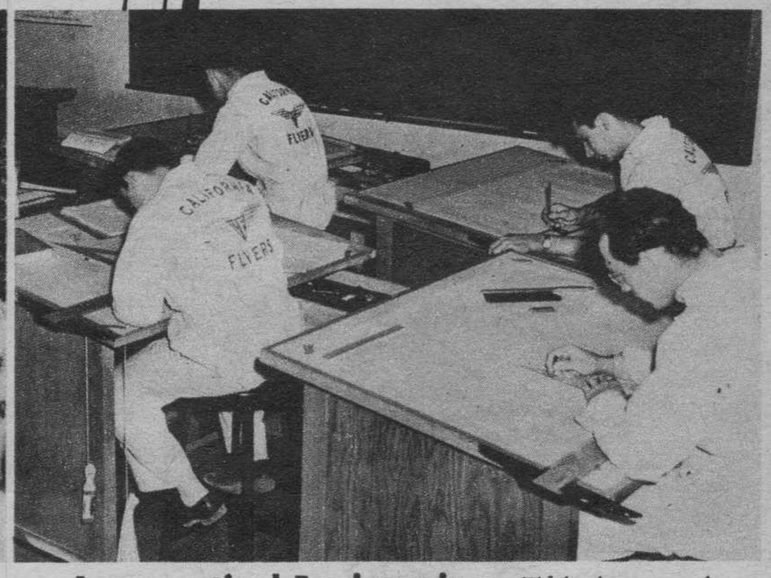


Master Mechanics—*Airlines, Airports and Aircraft Plants everywhere need the man with this training. High starting salaries, rapid advancement and an opportunity to be in business for yourself, is the reward of the graduate.*



Aeronautical Engineering—*This is one of the most highly respected of Aviation careers and offers an unlimited future. California Flyers graduates stepping into splendid positions in companies of their choosing.*

Aviation Careers Offer a Permanent Future at *HIGH STARTING SALARIES*

The future of an Aviation *career* does *not* depend upon the National Defense Program—but the future of a *"job trained"* man does. Secure the proper training now, prepare to step into a good salaried position and face the future knowing that there will *always* be a place for *you* in Aviation.

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Consider what Government Approved and Industry Approved California Flyers training is doing for others—*and can do for you.* Graduates are receiving $200 to $250 a month and more to start. And as a result of sound, practical and concise courses, Maintenance and Master Mechanics graduates are stepping *directly* into positions after only 8 to 12 months of training. Instructors and Airline Pilots in 10 to 24 months and Aeronautical Engineers in 14 months. In only 4 months California Flyers graduates are earning the ever-increasing salaries being paid Production Mechanics and Aircraft Draftsmen. *Why accept less?*

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Do not accept *unapproved* or job training when it costs no more to attend one of the nation's oldest and most highly respected aeronautical schools—a school with the highest Government Approval in every division in which approval is extended—a school selected by the U. S. Army Air Corps to train its aviation mechanics, and by the CAA to train pilots and instructors—a school with shops and laboratories among the finest equipped in the nation—operating one of the country's largest, modern civilian training fleets—and located directly on the famous Los Angeles Airport, test field in the Nation's Aviation Capital, the very center of America's great aviation industry. Yes, California Flyers School of Aeronautics is one of the nation's great aviation schools—*Check with any authority.* Get the complete story of Aviation as a career now,—mail this coupon today. →

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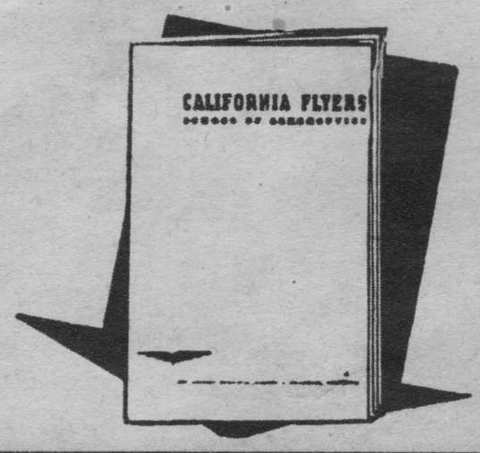

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Production Mechanics (Aircraft sheet metal) ☐ *Aircraft Drafting* ☐
Instrument and Radio Beam Flying ☐ *Master Mechanics* ☐
Instrument Technician ☐ *Airplane Engine Mechanics* ☐
Airplane Mechanics ☐

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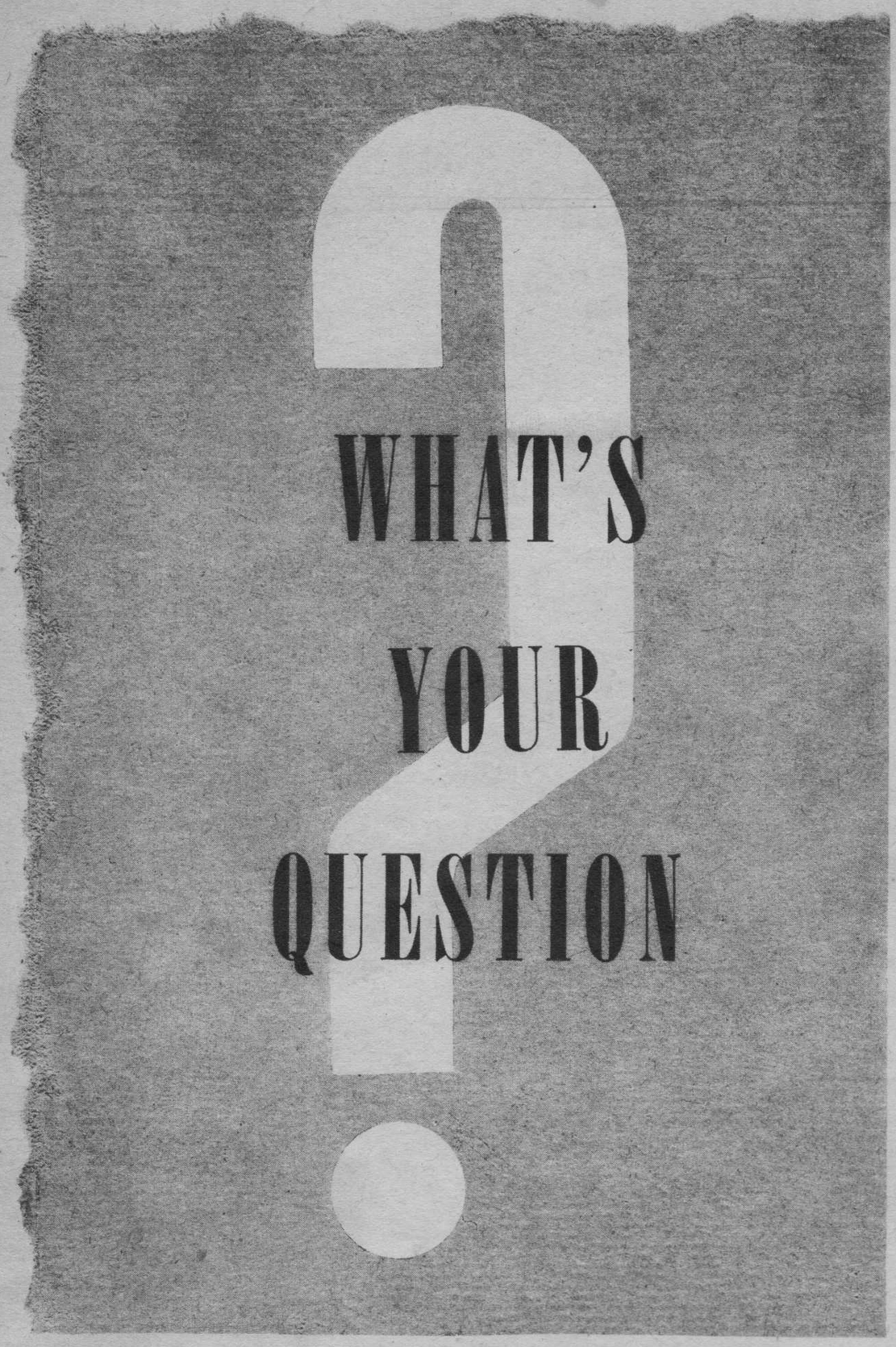

QUESTION: Could you tell me where I could get plans for an airplane powered by a motorcycle engine? W. B., Trenton, N. J.

Answer: Try writing to the J. W. Peterson Aircraft Co., 1139 Veto, Grand Rapids, Mich.

Question: Could you give me the minimum price of a glider, single and two-place? Does one have to have a license to fly them? G. D., Manchester, N. H.

Answer: A single-place glider can be bought new for around $650, a two-place ship for $1,200. You must have a glider pilot's permit or license to fly them.

Question: Do you recognize the airplane from the inclosed picture? It looks like an Ercoupe with a high wing. P. B. McC., New Haven, Conn.

Answer: The ship is manufactured by General Aircraft Co., Lowell, Mass. It is called the Skyfarer.

Question: What are the performance and specifications of the Vultee BT-13 and the Fairchild XPT-23 trainers? E. A. K., Detroit, Mich.

Answer: The BT-13 has a span of 42 ft., length 28 ft; weight empty 2,976 lbs., fully loaded 3,981 lbs. The top speed is 182 miles per hour, cruising speed 170 m. p. h., landing speed 52 m. p. h. It is powered by a 450-h. p. Pratt & Whitney Wasp engine. The Fairchild XPT-23 has a span of 35 ft. 11 in., length 27 ft. 8 in. and is powered by a 240-h. p. Continental engine. As this is a brand-new airplane we have no further information regarding it.

Question: Have three-view drawings of the Messerschmitt 109 and Blackburn Skua been published in Air Trails? If so, in what issue? E. A. K., Ozone Park, N. Y.

Answer: These plans were published in 1938, but the issues are not available any longer.

Question: Could you let me have the specifications of the following planes: Boeing B-17, Curtiss P-40, Bell Airabonita, Lockheed P-38 and the Vultee Vanguard? H. M., Corona, N. Y.

Answer: The Boeing B-17 has a span of 103 ft. 10 in., length 67 ft. 10 in.; weighs empty 31,150 lbs., fully loaded 47,500 lbs. It is powered by four Wright Cyclone engines of 1,200 h. p. each. The maximum speed is supposed to be 300 m. p. h. or better. The Curtiss P-40 has a span of 37 ft. 4 in., length 31.7 ft.; weighes empty 5,381 lbs., fully loaded 6,789 lbs. It is powered by a 12-cylinder liquid-cooled Allison engine developing 1,150 h. p. The top speed is 365 m. p. h., cruising speed 315 m. p. h. The Bell Airabonita has a span of 34 ft., length 29 ft. 9 in. It is powered by a 12-cylinder Allison engine of 1,090 h. p. The top speed is in the neighborhood of 400 m. p. h. It is almost identical with the Airacobra, the only difference being that the Airabonita has a two-wheel undercarriage. The Lockheed P-38 has a span of 52 ft., length 38 ft.; weighs fully loaded 13,500 lbs. It is powered by two Allison 12-cylinder engines of 1,150 h. p. each. The top speed is in excess of 400 m. p. h. Service ceiling is 35,000 feet. The Vultee Vanguard has a span of 36 ft., length 28 ft.; weighs empty 4,841 lbs., fully loaded 6,182 lbs. The top speed is 360 m. p. h., cruising speed 300 m. p. h., service ceiling 33,000 ft. It is powered by a Pratt & Whitney R-1,830 engine of 1,200 h. p.

Question: Could you give me the address of the Pitman Publishing Co.? I would like to buy their books, "Elementary Aerodynamics," by D. C. Hume, and "Preliminary Airplane Design," by R. C. Wilson. R. J., Norwalk, Calif.

Answer: The address of the Pitman Publishing Corp. is 2 West 45th St., New York City.

Question: Would you please tell me where I can obtain pictures of last World War airplanes? L. S., Dundas, Ontario, Canada.

Answer: You can buy such pictures from Aircraft Photo Service, Dept. A, 3 Myrtle Court, Bridgeport, Conn. They cost 4 cents each. Write for their catalogue.

Question: May I please have specifications of the following bombers: the B-24, B-25 and Catalina flying boat? Would also like to have the addresses of Allison, Pratt & Whitney and Curtiss-Wright. I. T., Edgemere, L. I., N. Y.

Answer: The Consolidated B-24 has a span of 110 ft., length 64 ft. The gross weight is 40,000 lbs. It is powered by four Pratt & Whitney engines developing 1,200 h. p. each. The maximum speed is about 300 m. p. h. The Consolidated Catalina flying boat has a span of 104 ft., length 65 ft. 2 in. The gross weight is 27,413 lbs. It is powered by two Pratt & Whitney Twin Wasp engines of 1,050 h. p. each. The maximum speed is 199 m. p. h., cruising speed 179 m. p. h. Cruising range is in excess of 3,000 miles. The North American B-25 has a span of 67 ft. 6 in., length 51 ft. 5 in.; weighs empty 16,000 lbs., fully loaded 24,000 lbs. Has a top speed of 308 m. p. h., cruising speed 259 m. p. h., service ceiling 25,400 ft. It is powered by two Wright Cyclone engines developing 1,600 h. p. for take-off. Allison Division, General Motors Corp., is located in Indianapolis, Ind. The Wright Aeronautical Corp., Division of Curtiss Wright Corp., is at 132 Beckwick Ave., Paterson, N. J. Pratt & Whitney Aircraft Division, United Aircraft Corp., is in East Hartford, Conn.

Question: Could you tell me something about the Brewster Buffalo and Bermuda? W. R. H., Hatboro, Pa.

Answer: The Buffalo is a low-wing single-seater all-metal fighter monoplane, having a span of 35 ft., length 25 ft. 6 in. It is powered by a Wright Cyclone air-cooled radial engine developing 1,000 h. p. The top speed is about 340 m. p. h. The Bermuda is a two-place midwing all-metal monoplane dive bomber with a span of 47 ft., length 38 ft. 10 in. It has a gross weight of 12,256 lbs. and is powered with a 1,275 h. p. Wright Cyclone. We do not know the performance of this ship.

Question: Please give me the name and specifications of the ship pictured on the inclosed clipping. Would it be possible for this ship to be dived at a speed of 500 m. p. h., starting the dive at 12,000 feet? D. H., Wilkes-Barre, Pa.

Answer: The ship is an old Boeing P-12E fighter, with a span of the upper wing of 30 ft., bottom wing 26 ft. 4 in.; fuselage length 20 ft. 8 in. It weighed empty 1,983 lbs., fully loaded 2,674 lbs. The maximum speed was 184 m. p. h., cruising speed 165 m. p. h., service ceiling 28,000 ft. It was powered by a Pratt & Whitney Wasp of 500 h. p. The terminal velocity of the ship was lower than 500 m. p. h., so it could not be dived at that speed.

Question: Could you tell me the speed of the North American XP-51? S. K., Cincinnati, Ohio.

Answer: Sorry, no official figures as to the performance of this ship have been released. It should do better than 360 m. p. h.

Question: Would you please give me the names and addresses of a few companies manufacturing light planes? L. P. C., Reserve, La.

Answer: Aeronca Aircraft Corp., Middletown, Ohio; Akron Aircraft, Inc., Akron, Ohio; Culver Aircraft Corp., Wichita, Kan.; Engineering & Research Corp., Riverdale, Md.; Interstate Aircraft & Engineering Corp., El Segundo, Calif.; Luscombe Airplane Corp., West Trenton, N. J.; Piper Aircraft Corp., Lock Haven, Pa.; Porterfield Aircraft Corp., Kansas City, Mo.; Rearwin Aircraft & Engines, Inc., Kansas City, Kan.; Stinson Aircraft, Wayne, Mich.; Taylorcraft Aviation Corp., Alliance, Ohio.

Question: Could you tell me the names of the airplanes on the inclosed pictures? Also, have you any information on the Spitfire II? How does it differ from the Spitfire I? Is the April 1941 issue of Air Trails available? R. S., Whitewater, Wisc.

Answer: The four-engined ship is a Junkers Ju-90 40-passenger transport; the single-engined job is a Heinkel He-70 4-passenger airplane. Sorry, we have no information on the Spitfire II. You can still get the April 1941 issue by sending 15 cents to Mr. Clifford of our circulation department.

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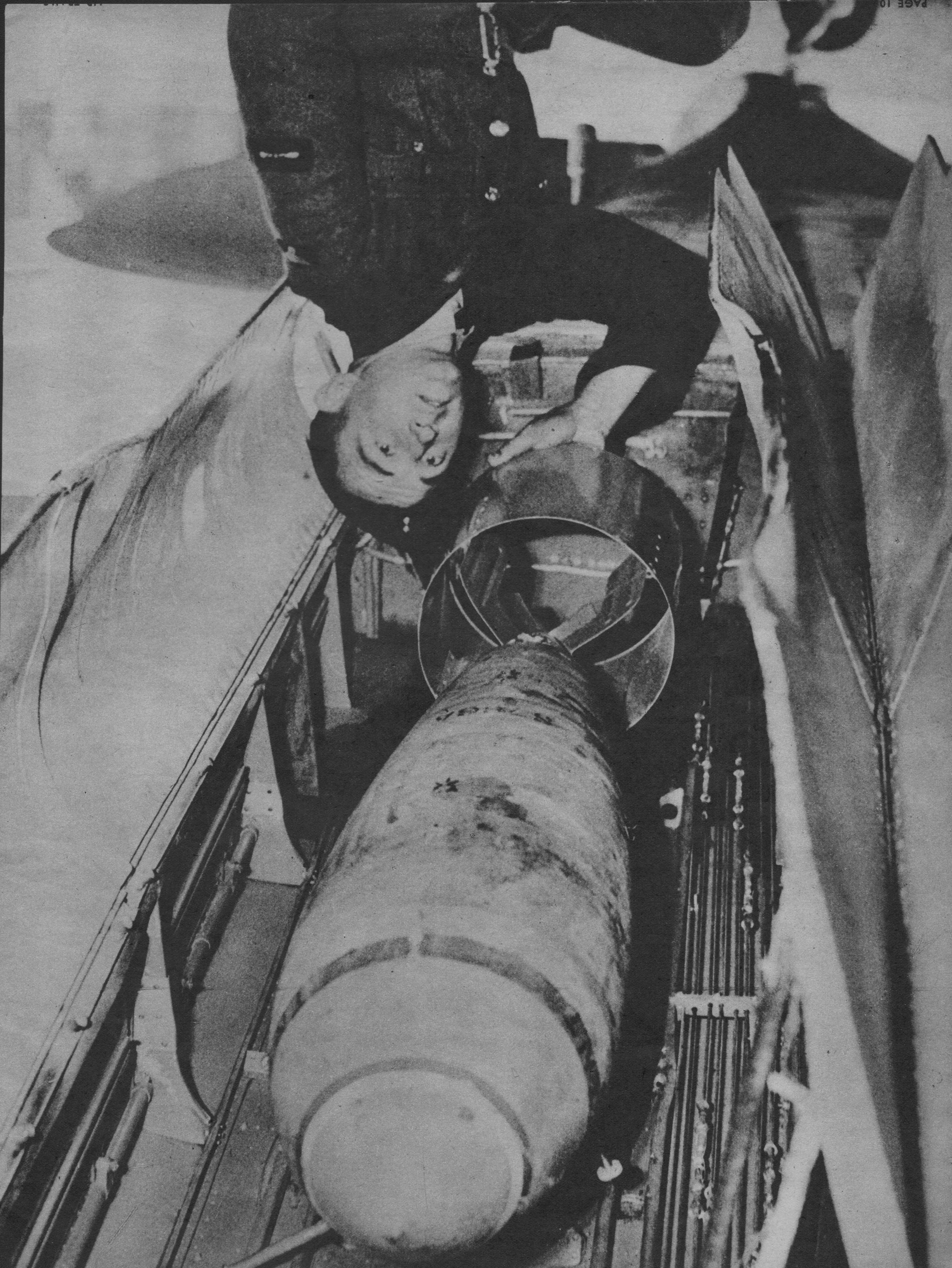
AT-NOV., 1941



I DESIGN BOMBS

BY AIR COMMODORE HUSKINSON, as told to SQUADRON LEADER HECTOR BOLITHO

One of Britain's most important men-behind-the-scenes talks shop—discussing English bombs from all angles.

THE Nazis have done many dastardly and a few foolish things during this war: none more foolish than the bombing of Buckingham Palace and the bombing of Air Commodore Huskinson.

The bombing of Buckingham Palace, coming at a time when the East End was suffering its most melancholy attacks from the enemy, served only to bring the king and his people together. The bombing of Air Commodore Huskinson filled an otherwise amiable, if dynamic man, with such venom that when he lay in hospital, in danger of losing his sight, he told the nurse that all he wanted was to get back to his desk and design more bombs.

The air commodore is working at his desk again. In an office beside the river Thames (which he is likely to set on fire with his vitality) he is making bigger and better bombs already, to avenge himself on the enemy.

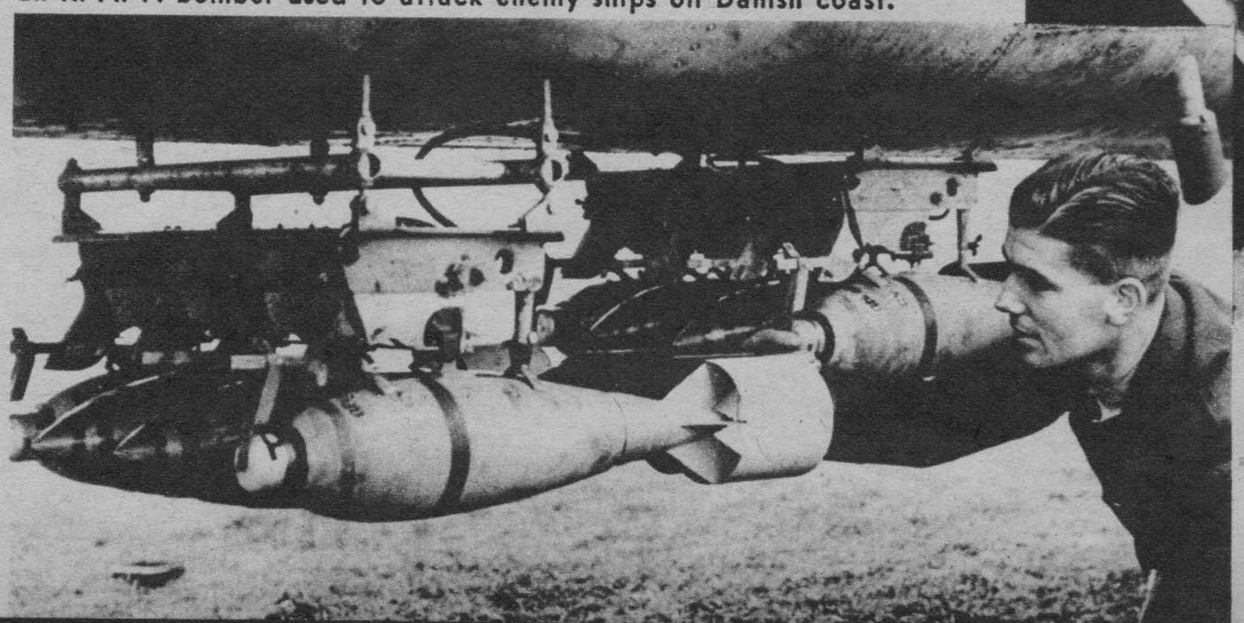
As much as anything, the air commodore is like a bomb himself. A kindly bomb! But a bomb. From the moment that his door opens, you sense life on another scale; life running at a new tempo. The typewriter in the next office seems to be hammering at unusual speed. People come in and out as if running on a quick-motion cinema reel.

With the river for his background, and the far-away skeleton of a bombed building to remind you of the purpose of his department, you find the air commodore sitting, still forced to wear smoked spectacles, but moving and speaking with such zest that you suffer from a kind of blast for the first few minutes. Then you settle down and realize that you are talking to a man whose mind is incapable of humbug; a man tolerant with good argument, but intolerant with fools, and devoted to his work with almost fanatical intensity.

I am not a good interviewer. The questions I rehearse going up in a lift always seem to fly off like

(Continued on next page)

Destination: escort vessels. These small bombs are slung beneath an R. A. F. bomber used to attack enemy ships off Danish coast.



Above—Air Commodore Huskinson, R. A. F., at his desk; below, the work of some of his bombs on German oil tanks at Dunkirk.

I DESIGN BOMBS

(Continued from preceding page)

thistledown when I try to ask them. I asked, a little foolishly, "I would like some facts about the work done in your department." The answer came, like a stick of bombs. "We produce all types of incendiaries, smoke floats, navigation aids, ideas for the balloon barrage, transport winches, motorboats, rescue craft, engines of motorboats, armament for motorboats, armor-plate protection, all guns of every size and caliber, turrets of every size and caliber, and all ammunition; that is, armor-piercing ammunition, ball ammunition, tracer ammunition, incendiary ammunition, bomb racks, bomb carriers, fuses of every description, and all bombs—what would you like to know about?"

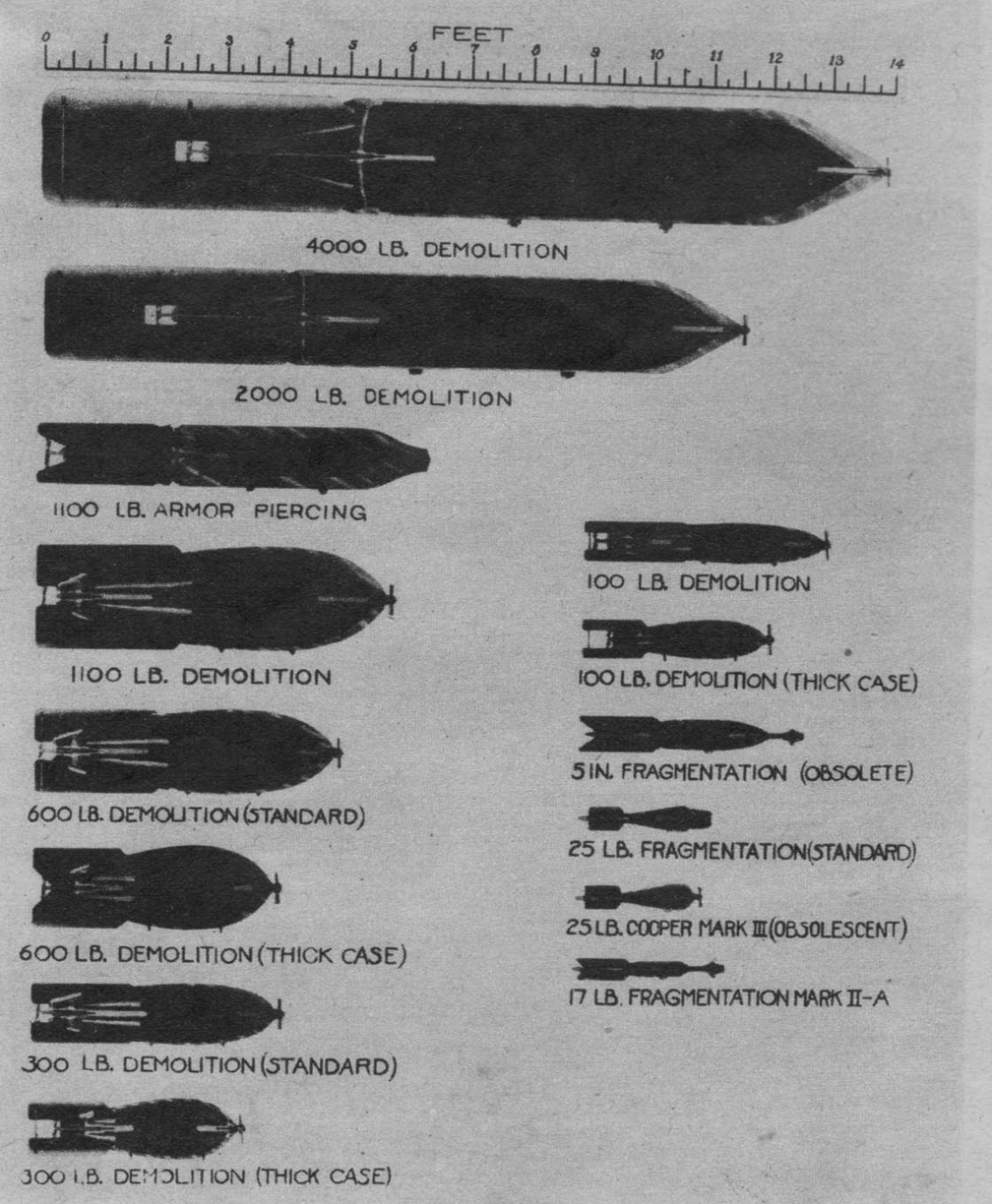
Rather weakly, I said, "Bombs, please."

"Would you like to know a little of types of bombs—as much as I dare tell you for print? As you know, the purpose of bombs differs. So you have many types for many purposes. For the attack of troops in the open, you need a bomb of say twenty pounds and so designed that it will break up, on detonation, into several thousand fragments. All these fragments are projected with such velocity that they cause the maximum of damage to personnel. These bombs require fuses with very rapid action. That is obvious because, if the bomb penetrated into concrete before detonating, the fragment effect would be lost. So a nose fuse is used with these antipersonnel bombs. It has a simple striker, held by a shear pin which is driven in on impact with the ground. These fuses have rapid action, being practically instantaneous, and therefore the bombs form a very small crater.

"Now we come to the bombs which *we* favor, which we use in our increasing attacks on the industrial plants of Germany. These weigh from 250 to 500 pounds, and their body is much stronger—it is made of steel. It must have this added strength, as it may be required to penetrate concrete floors, without breaking up, and still remain intact for detonation when it reaches, say, the ground floor of the target. The fragments produced are, of course, much heavier, and designed to do real damage to plant and walls of buildings.

Practice makes perfect bombing. These practice bombs are forerunners of the real thing to be handled later by this R. A. F. student bombardier.

Made in America. These various U. S. types are paralleled by the R. A. F. designs, although latter are based upon more recent air-war knowledge.

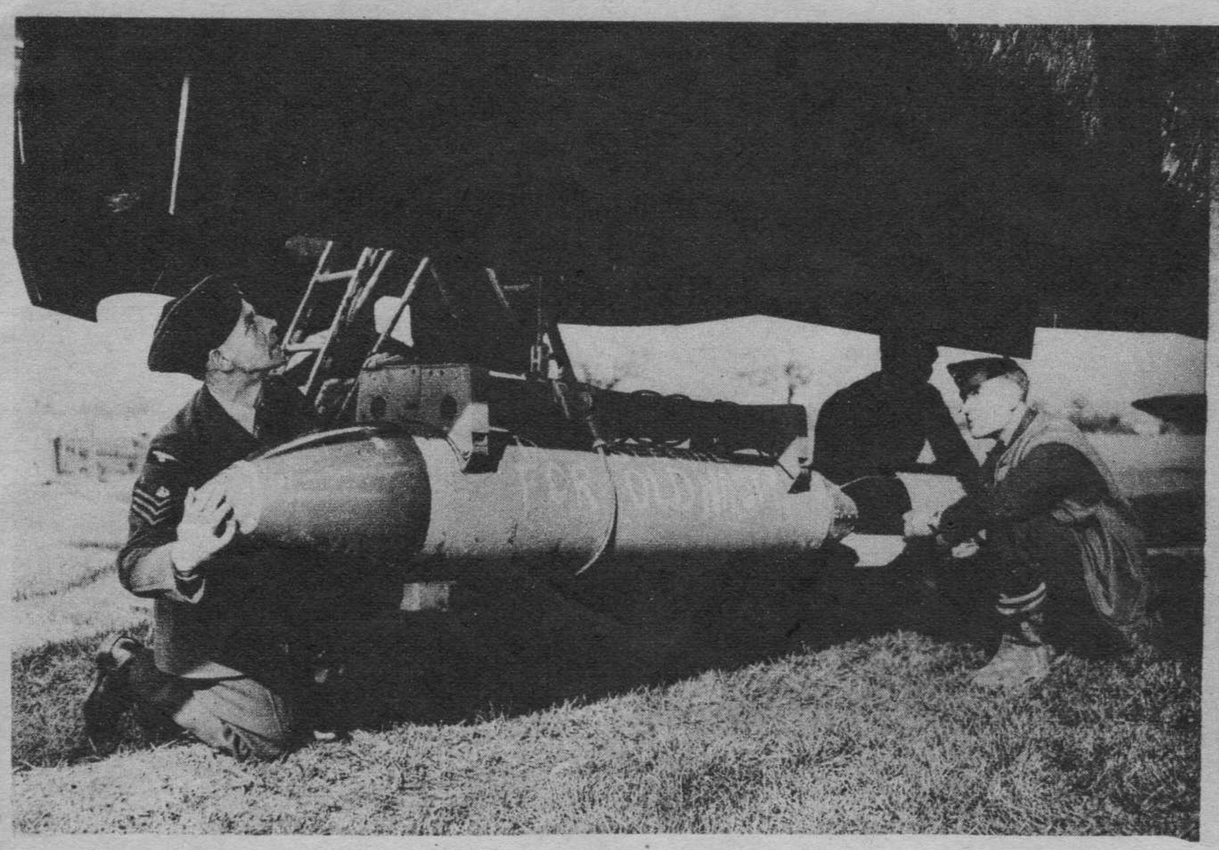


"We come to heavier bombs, the type we use for attacking warships. These are normally designed on lines very similar to the armor-piercing shell. The body of the bomb must be heavier and a highly streamline form is necessary so that we can get the high velocity needed to penetrate armor. The armor of today is mighty thick, and it takes some penetrating. In such attacks, with such bombs, it is important to have the added advantage of dropping from a great height, to gain the necessary velocity.

"Of course," said the air commodore, "we don't work on the same lines as the enemy. The Germans use a different type of bomb, with a very light case and containing a larger portion of explosives. This is the type of bomb he used for his day attacks on civilians in this country, before we taught him that daylight bombing was too costly.

"These bombs depend on blast for their damaging effect. There are enough gaps in the buildings of our towns to show you this, without my explaining any more. Just as the thickness of the bomb cases varies in these types, so does the proportion of explosive vary, in relation to the total weight. In the case of the antipersonnel bomb, favored by the Germans, it will be in the order of thirty parts per hundred. The armor-piercing bomb will fall to fifteen parts per hundred, whereas the blast bomb may contain sixty parts per hundred."

Air Commodore Huskinson opened a little book, at which he glanced for a second. Then he pressed a bell which was the signal for a trapdoor to open. He gave some instruction to the clerk whose head appeared—an instruction which assured me that he was one of those rare men who can think of two subjects at the same time. Then he went on to talk of fuses. "You will appreciate," he said, "that the attack of such diverse targets demands considerable elaboration of the methods employed for detonation. You see, these antipersonnel bombs must operate practically instantaneously. So they must have a direct-action nose fuse. But this is not so with general-purpose bombs—those used for industrial plants, of which I told you. They have to detonate at ground level, so a short delay is required.



"A special for old nasty" is inscribed on this one-ton bomb being loaded into a Whitley heavy bomber about to leave for Germany.

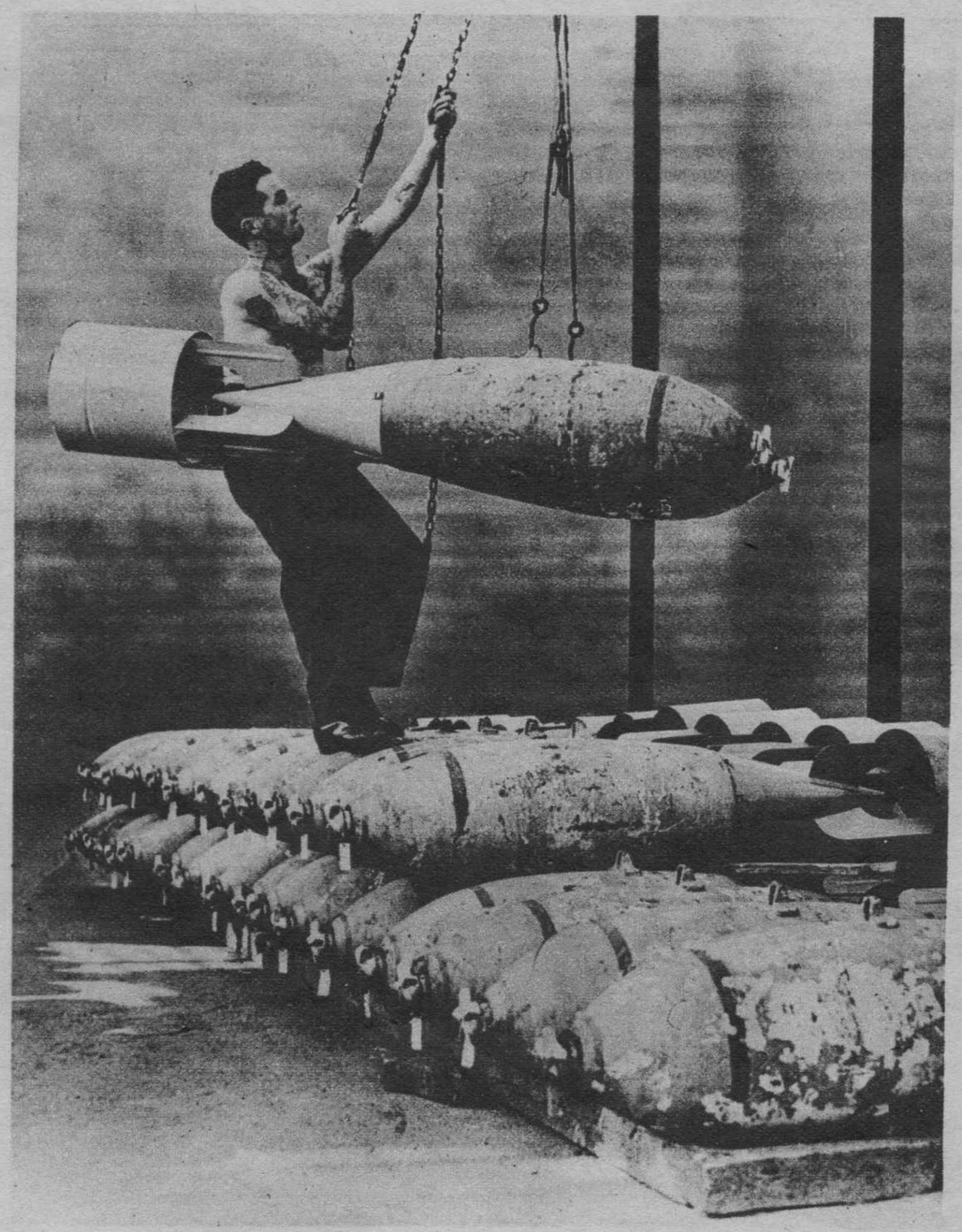
This stick of bombs being released over Vichy by R. A. F. plane shows method of dropping. Smaller bombs are dropped from wing racks; big ones from within.

"To cover all these varying conditions, fuse timing may vary from instantaneous to as much as ten seconds delay. Then there are the specialized fuses, used on account of their nuisance value. Then you have those menacing bombs which have forced so many people to be evacuated from their houses—those bombs that may not detonate for as long as a hundred hours after arrival. Many of these bombs have been dropped by the Germans on the English countryside and in our cities. They are usually supplied with an antidisturbance fuse which will detonate the bomb if it is roughly handled. The risks from this add to the valor of our bomb-disposal crews. They are great men. Yes, great men. And they are usually men with imagination, which makes their courage all the more wonderful."

On the wall of the air commodore's office was a big print, showing the inside of a bomb. I was so conscious of being in hush-hush land that I had not dared look at anything. But he directed me to look at it. "You see," he said, "a bomb consists of four essential parts. You have first the *body* or *container,* made usually out of steel, of varying thicknesses, according to its purpose. Then you have the *main explosive filling,* which usually consists of a mixed explosive, known as amatol and containing nitrate of ammonia and T. N. T. The third part is the *detonator,* which initiates the main filling when struck by the striker. Then you have the fourth part, the *pistol,* which is purely a mechanical device to strike the detonator cap on impact with the ground." Thus the chart on the wall became clear to me.

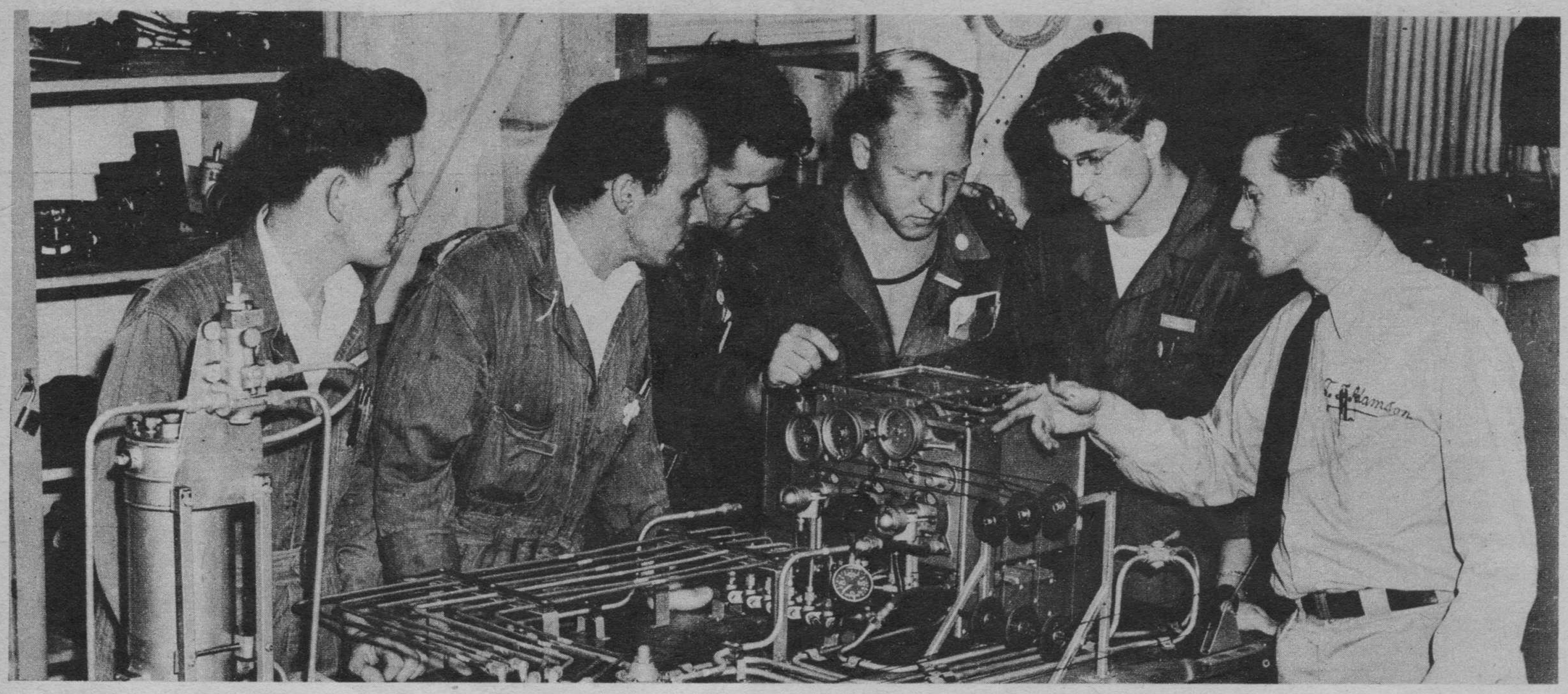
I asked Air Commodore Huskinson then if he could safely give me some idea of the time employed in experimenting with bombs before they can be used. He said: "Modern bombs require development for a long period, a very long period, before they are considered sufficiently reliable to be handed over to the service. We cannot allow the aircraft in action to run one risk by using new types of bombs of which we are not absolutely certain. That is obvious, isn't it? This development covers the production of what we call ballistic dummy bombs which are dropped from aircraft to test their accuracy in flight. We fill full-scale bombs with high explosive, and these are detonated statically on the ground. This is in order to take measurements of the blast, the pressure, the fragmentation—that is, the velocity, size and quantity of the fragments produced. Then similar trials are carried out with different high-explosive fillings so that we may compare the effects of each performance. Then live bombs are dropped from the air on various targets, to check the functioning of the fuses, the damage caused, and the size of the crater produced."

I dared then to ask a question. "Does it matter what sort of climate bombs are used in? Are they affected by temperature?" The air commodore did not apparently think my question idiotic. "Yes," he said, "it is essential for bombs to remain in good condition when stored in a hot climate for a number of years. We have therefore to go through storage tests under various tropical conditions."



Handle with care! These 500-pound bombs are being stacked by worker in R. A. F. ammunition store. Circular stabilizer fin has proven best.

Methods of bomb release naturally are dark secrets. Upon this matter the air commodore looked mysterious and waved my questions aside. But he said: "The methods of carriage and release have, of course, developed enormously from those old days when they threw grenades over the side of the aircraft. The methods of today are complicated. As you know, bombs may now be dropped singly or in what we all call a salvo, or at predetermined time intervals, in what is now popularly known as a stick. The bombs may be suspended from an eye bolt situated at the nose of the aircraft. This is vertical stowage. Or they may be suspended from a lug at the side of the bomb over the C. G. This is horizontal stowage. The bombs are released *(Turn to page 28)*



Author, fourth from left, who reports on fate of graduates from his particular school. (Side light: He walked 4,000 miles to attend school.)

P. S.—THEY GOT JOBS

BY JOHN A. SARKAUSKAS

Sherman W. McBain, C-W Tech grad now at Vultee, confers with his family.

After aviation school—what? Here are varied case histories.

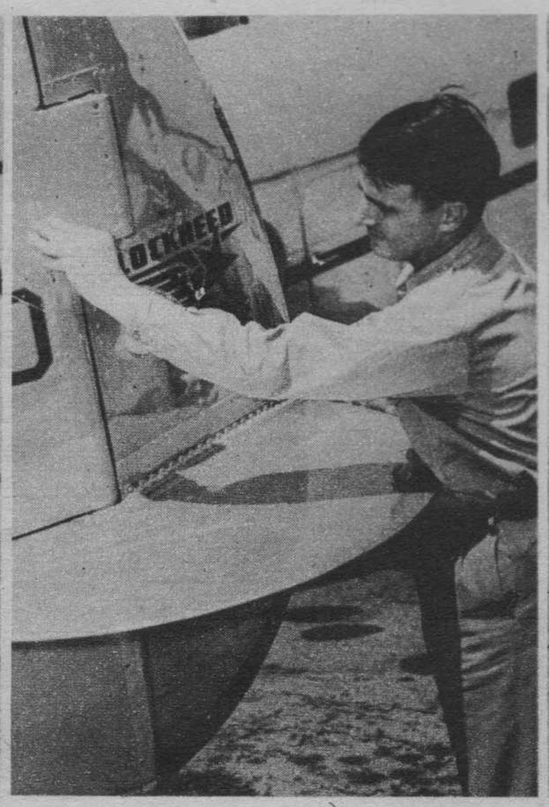
THE generally accepted knowledge that our government-approved aviation training schools are delivering thoroughly qualified young men to the aviation industry is directing many young footsteps away from home firesides to distant horizons where stand the leading airplane colleges of today. Many come on their own initiative, determined to join hands with the world's newest big-time industry; others come due to the wise counseling of parents. Young, noticeably green fledgelings just out of high school mingle with men in their twenties, thirties and even forties at the school registration desk, emphasizing the fact that age places no marked restrictions on the man who wants to acquire the necessary aëronautical training so vital to future success.

One year later, as an average, these same men take a parting glance at their school, and with diploma in hand knock at the gates of the industry, ready for a job. And now the questions come: How does this year of instruction affect their lives? What do they think of their training venture? What happens to these boys? These questions I shall answer from my own vantage point as a student mechanic, here in the heart of the aviation industry.

Three years ago, out on the plains of Colorado, some 180 miles east of Denver, a husky farm youth industriously worked his chores. For nineteen years he had *(Turn to page 26)*

Ray Gelvin landed a job a month after graduation. Engine expert.

Carburetor, ignition expert, Don Teel has important repair job.



Lockheed researcher Ira Richardson schooled at Curtiss-Wright Tech.

Service men are in demand. Graduate DeHaan went right to work.

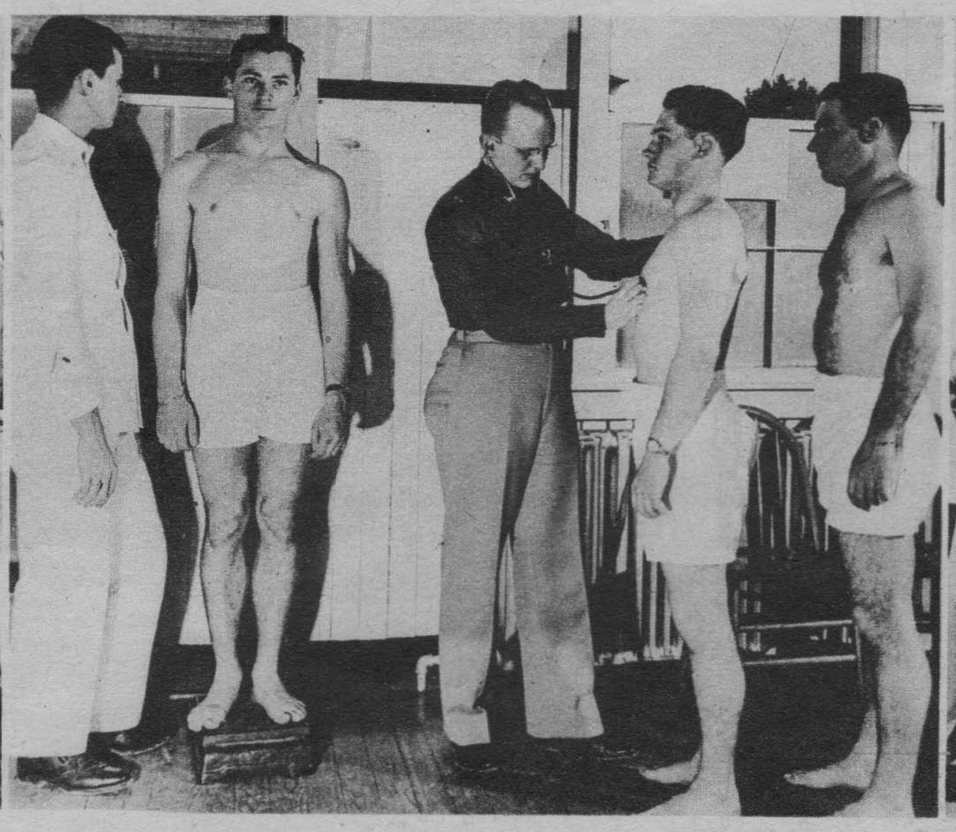
These cadets are signing in at a window where a check is kept of flights. Army will soon train 30,000 cadets annually. There were 325 trained in 1939.

JOHNNY GET YOUR WINGS

The entire story of air corps training in exclusive pictures, from elementary field to advanced, from fledgling to pursuit or bomber pilot.

PRIMARY TRAINING

You're in the army now—almost. Fledglings are met at gate by upper classmen. Course—30 weeks.



Breathe deep. Perfect physique is essential. Maximum height and weight: 6 ft. 2 in., 180 lbs.; minimum: 5 ft. 4 in., 115 lbs.

"Processing," fitting for uniforms and drill take five weeks.

Continued on next page

All primary training is carried on at the civilian flying schools. This one is the Darr Aero Tech at Albany, Georgia. Basic and advanced is handled by the army.

Each instructor has four primary students. Before flying he uses earth as a blackboard to diagram maneuvers. 28 elementary schools give six-week primary course.

250 h. p. Continental engine of this Stearman primary trainer is started by cranking inertia starter. Small flywheel stores energy to kick over engine.

Three-pointer. Primary schools in three areas feed cadets to basic centers: Randolph Field, Texas; Moffett Field, California; Maxwell Field, Alabama.

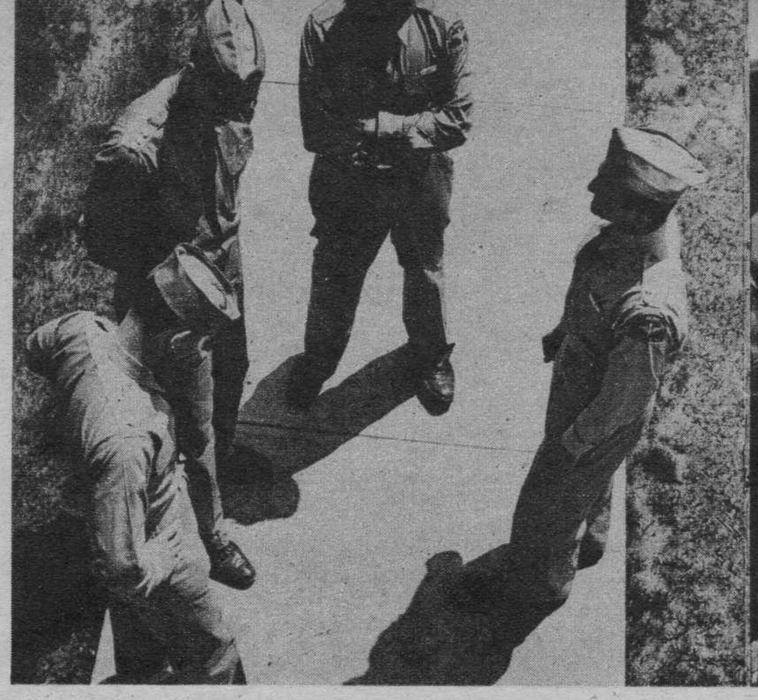
PRIMARY TRAINING

JOHNNY GET YOUR WINGS

Continued from preceding page

BASIC TRAINING

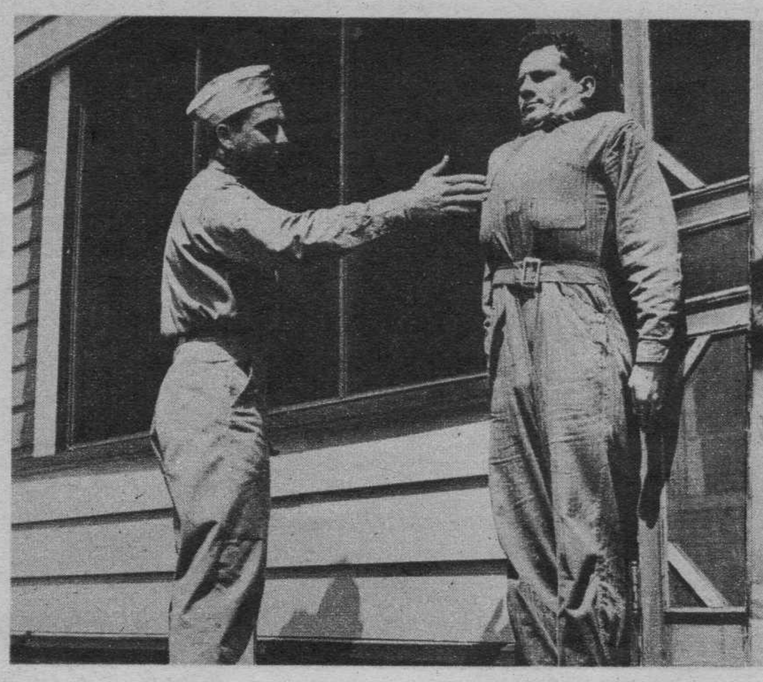
Endless rows of North American basic trainers make imposing picture at Randolph. Rarely are they idle. Randolph trains 12,000 pilots a year.



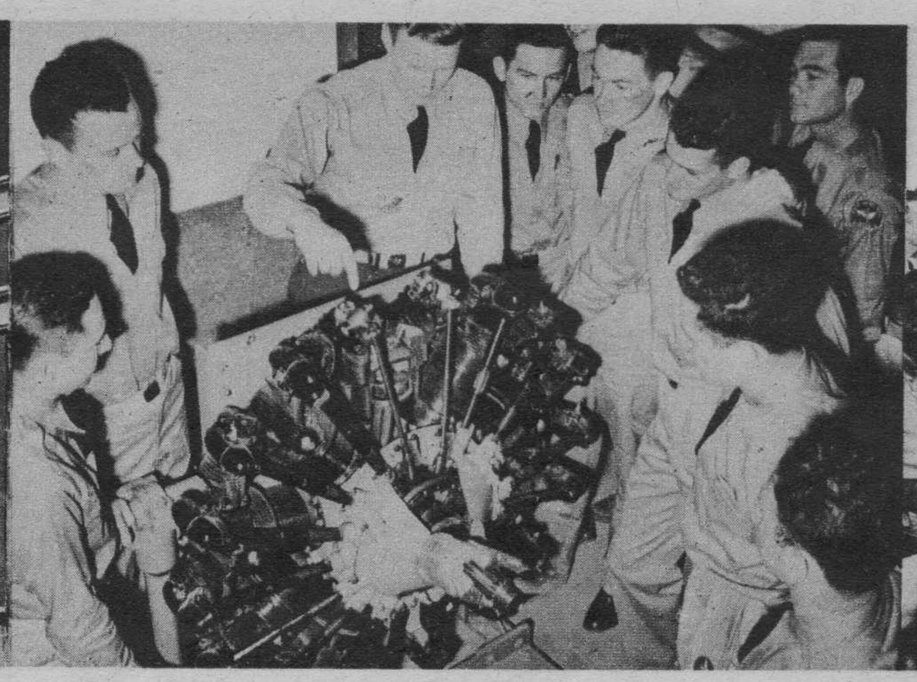
At primary, lieut. has two circles on shoulder; capt. three; major a diamond, private nothing.

Kiwi at Albany primary field must wear goggles around neck—when he isn't flying—and heavy flying jacket closed at top.

The boys must have their hazing, which is natural, since most of them come from college. Kiwis fly the "beam."



"Bracing" is old army favorite. Lower classman throws out chest, must show three chin wrinkles.



Elementary engine instruction is given the primary flight students. Flying cadets who fail may later train for other duties.

The neophyte at privately operated schools gets plenty of skull work. Here a class studies aerodynamics.

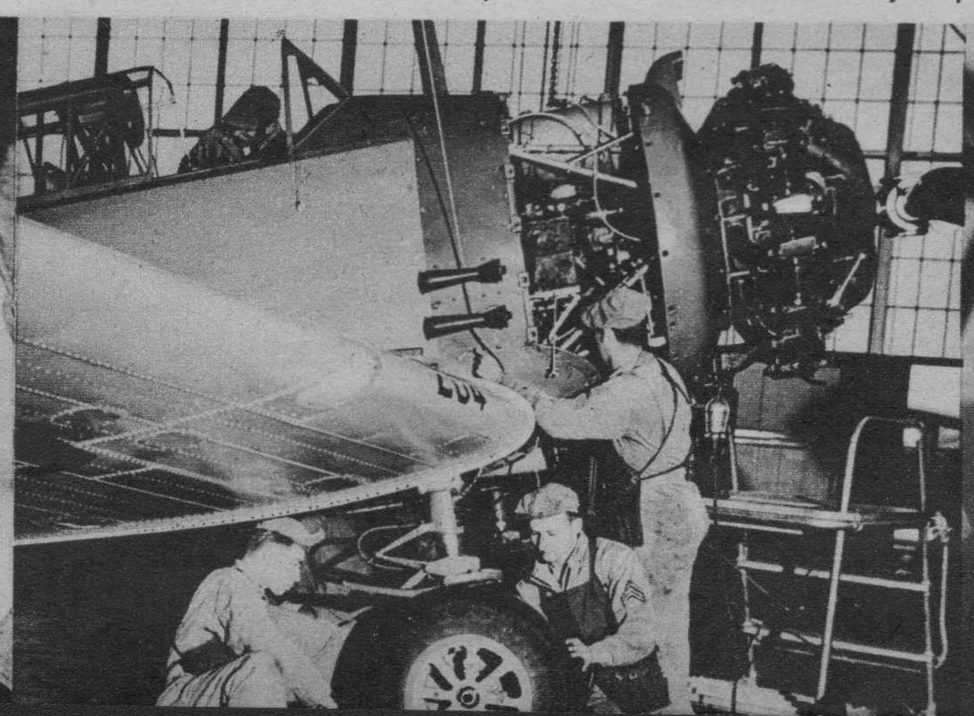
Continued on next page

The boys at Randolph Field have dubbed their army haircuts the "Randolph Rip." Of the 12,000 yearly crop there, 7,500 will be multi-engined pilots, and 4,500 fighter pilots.

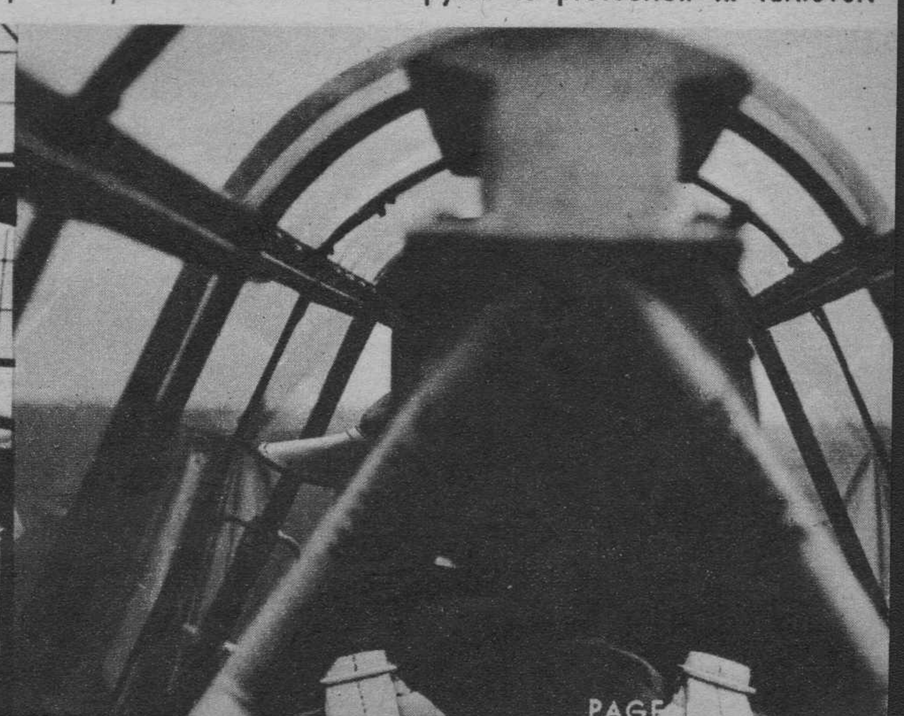
Basic-training students receiving their flight gear. Ten weeks are required for basic training. Including Randolph Field, there are 21 air-corps-operated basic fields.

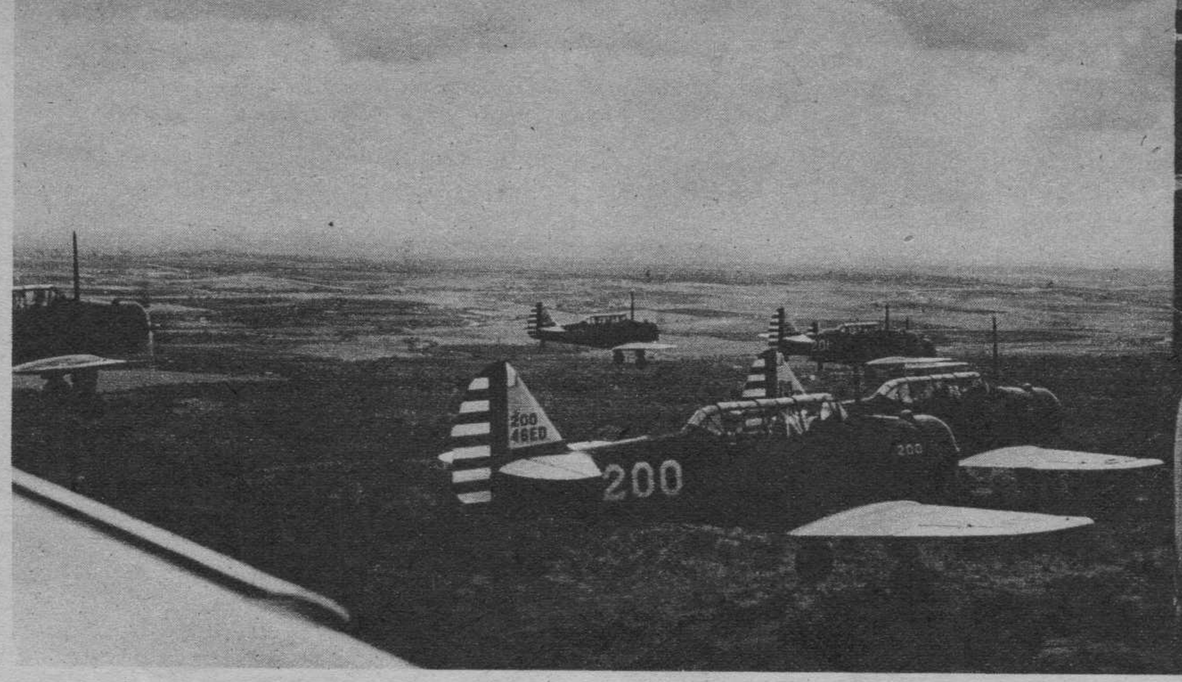
Don't be alarmed. It's not a fire. Pressurized soapy steam cleans grease and oil.

Ten men on the ground for one in the air. Ground crews at Randolph condition planes that fly total of 40,000,000 miles yearly.



Pilot looking to left reveals the visored cap worn to shield eyes from sun. Tube pylon is protection in turnover.





Over vast Texas plains wheel training formations of BT-9s. Partly open wing slot in left foreground preserves smooth flow of air over tip at steep flight angles.

Every man a weather man. Flight cadets meteorology class at Randolph receives instruction in weather maps, cloud formations, the winds aloft, etc.

Code room. Radio class takes test in International Code. Instructor in background "sends." Of a typical group of 20, only 10 will emerge as military pilots.

It's this way. Instructor in navigation class shows how to use flight calculator for solving various problems of dead reckoning. Note computer on desk.

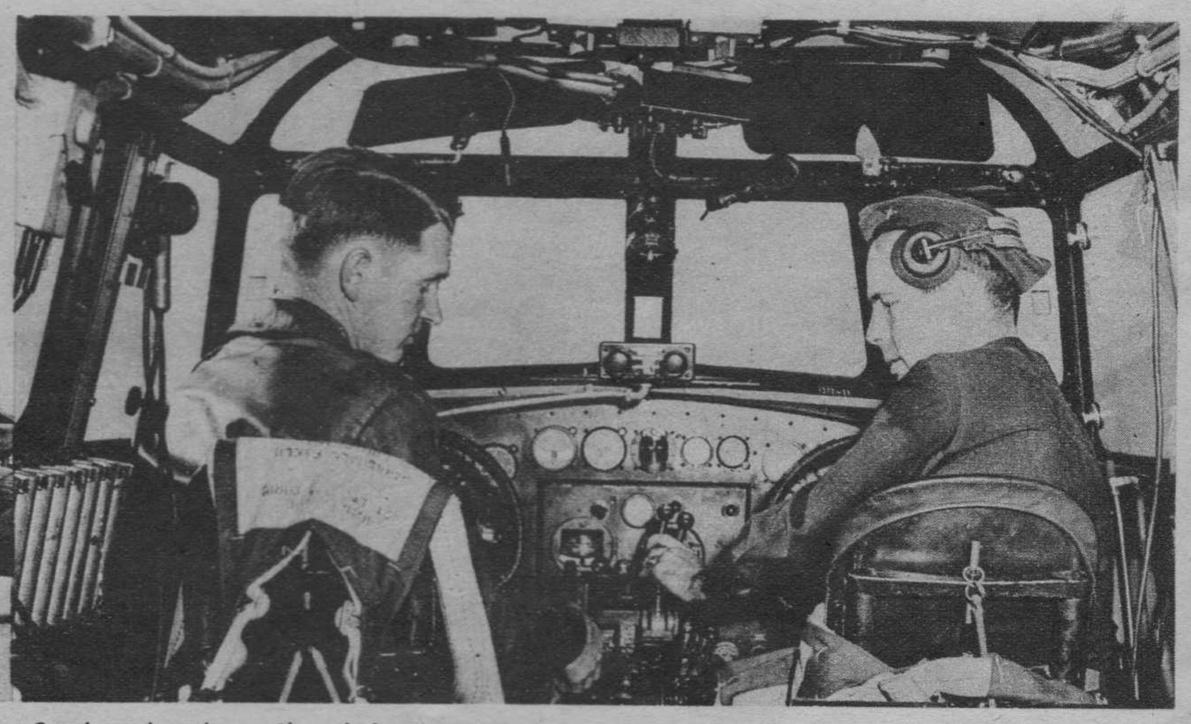
BASIC TRAINING

JOHNNY GET YOUR WINGS

Continued from preceding page

ADVANCED TRAINING

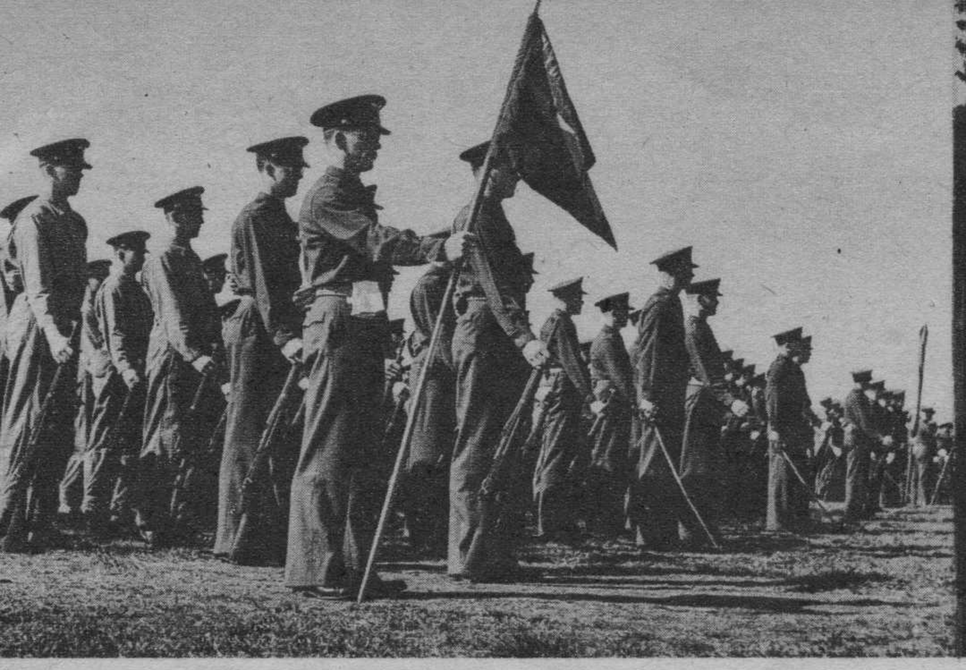
Chief pilot of pursuit training flight gives last-minute instructions for rendezvous. Ships are Republic P-35 single-seaters. Advanced training at Kelly takes ten weeks.



Student bomber pilot, left, gets tip from instructor. Advanced pursuit, gunnery, and bombardment are done at Barksdale Field, La., among others.

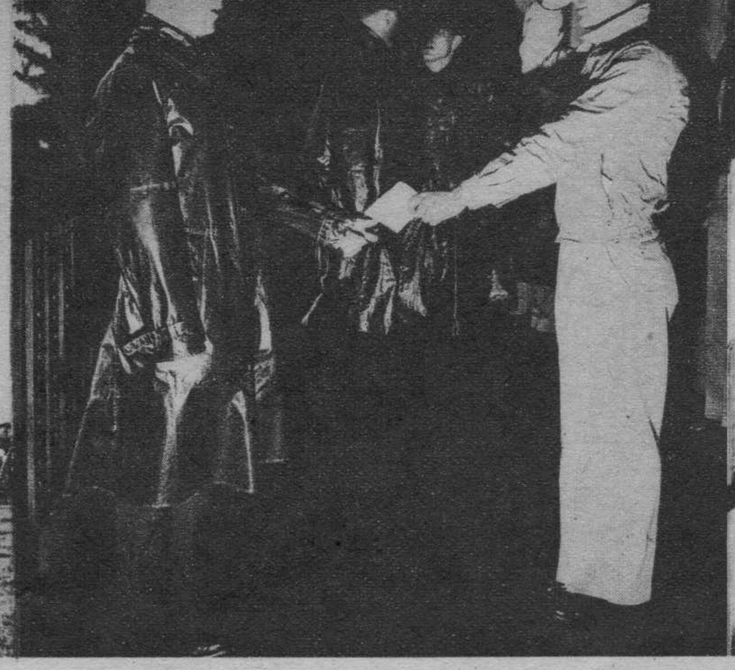
Pilots must be familiar with their weapons, capable of completely disassembling either .30-caliber machine gun, foreground, or the heavy .50-caliber one in the rear.

Gee, real bullets! At Barksdale the student gets his first taste of actual gunnery. Practice guns on this North American advanced trainer are .30s.



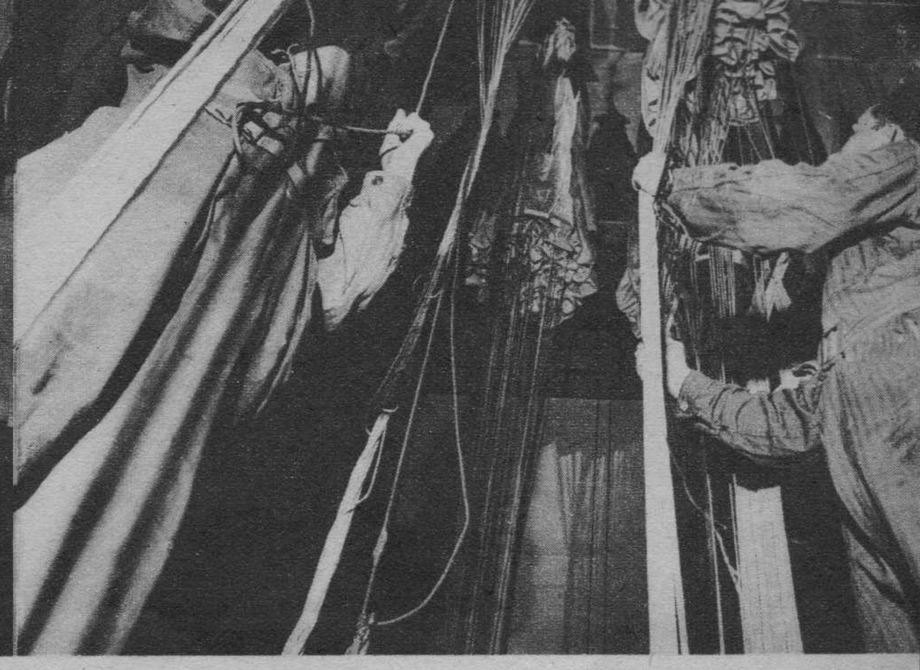
Drill. At basic schools guns are used in drilling. At primary schools drilling is done without guns. Guns are Springfields.

Randolph barracks, like all army barracks, are spotless. Four cadets bunk in a room. One bed inverted makes double-decker.



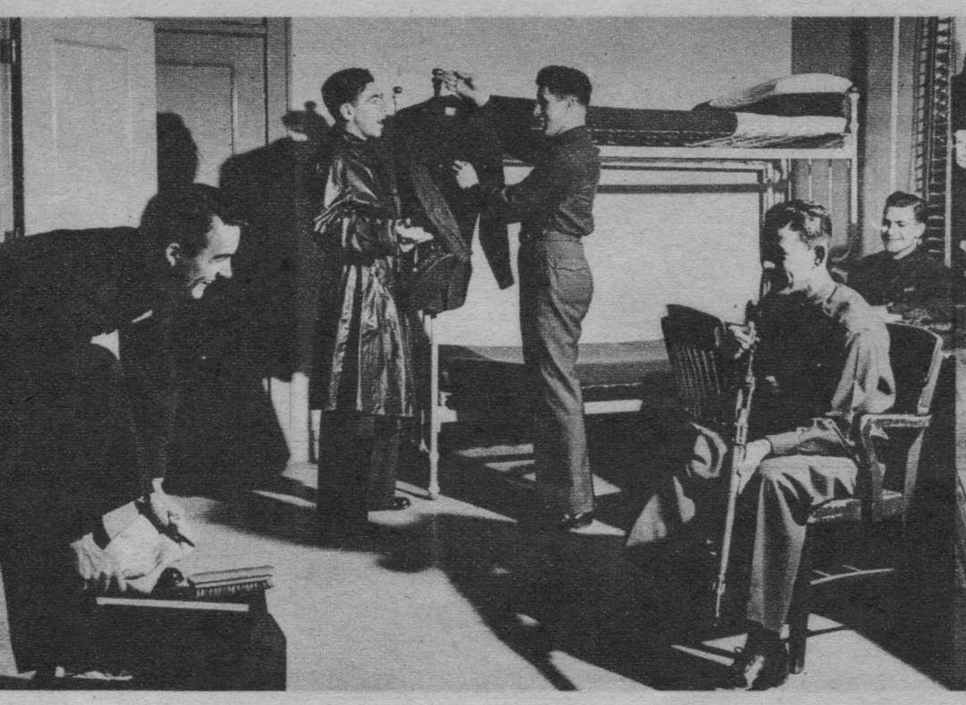
Discipline is essential to morale. This cadet learns how to present himself to a commanding officer.

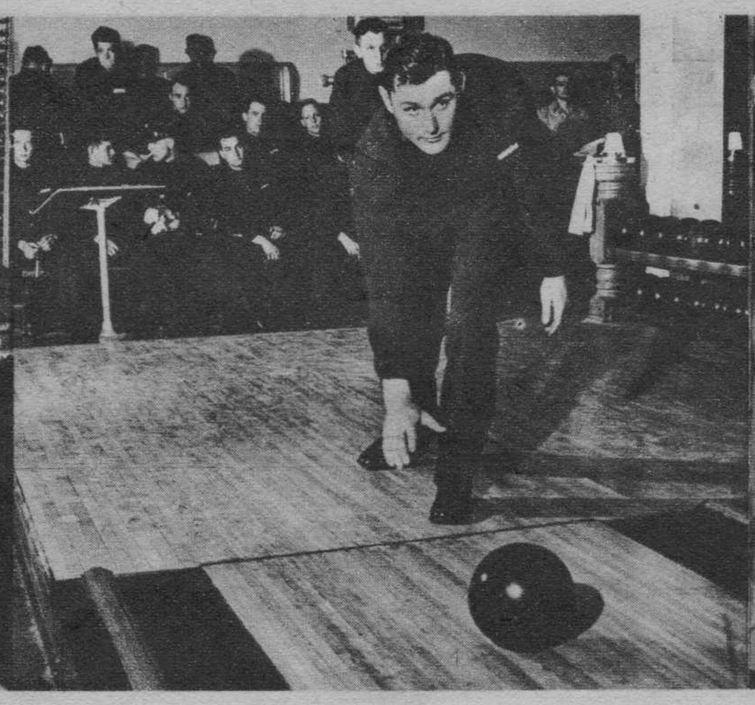
All work and no play would make Jack a dull boy. Randolph has numerous recreation facilities.



Parachutes are hung up in " 'chute room" to air every sixty days; drop-tested with dummy every two years.

Cadets invite their best girls to tea dances. Military pilot must have adequate relaxation from tension.



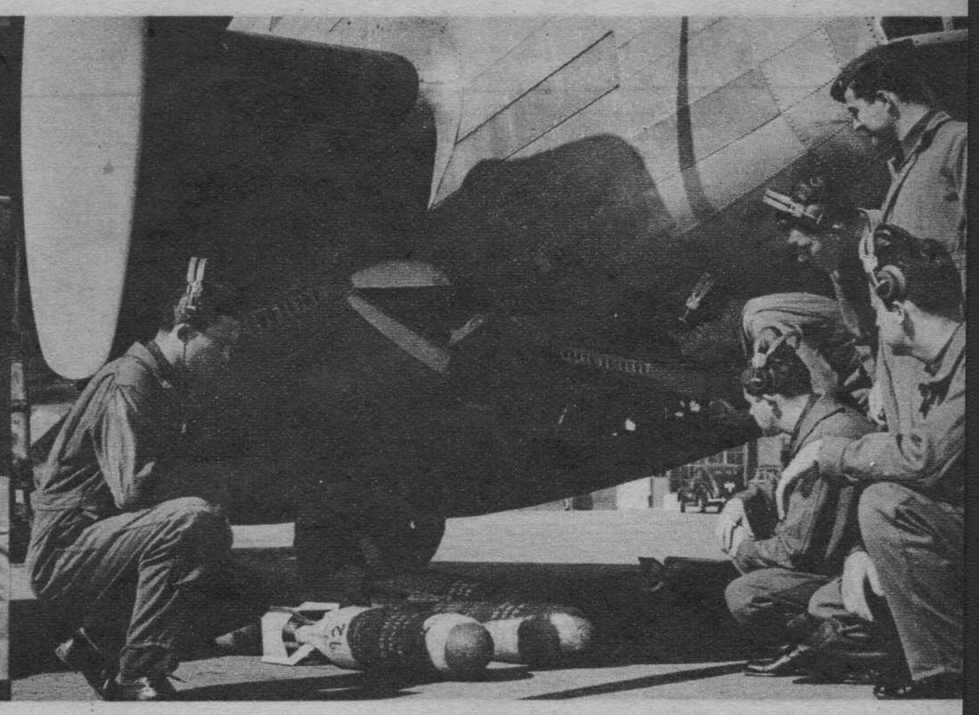


Bombardier. Left, instruments and release switches. Sight mount in front.

Through flat plate-glass panel bombardier looks down from his nose perch.

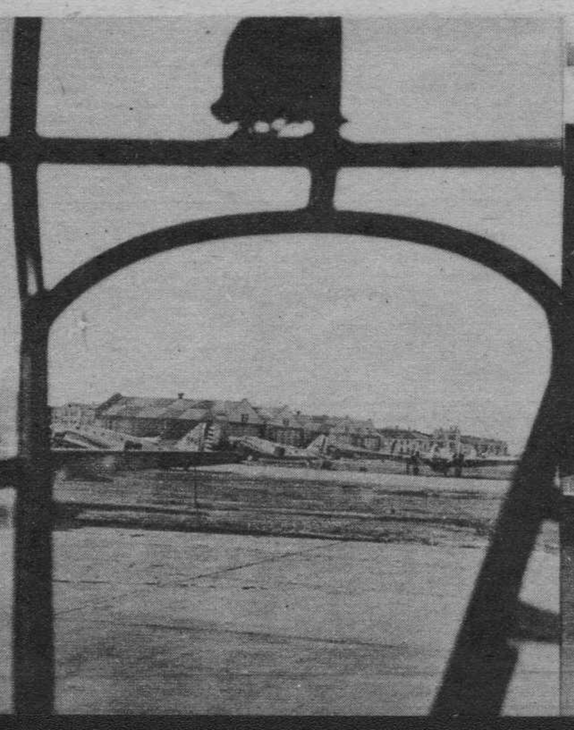
Prospective bomber pilot learns types of bombs and their uses. Various light fragmentation bombs foreground. 100-lb. practice bombs rear.

Blind-flying training at Kelly Field is done with this battery of Link trainers. Mechanical "crab," foreground, traces the pilot's course.



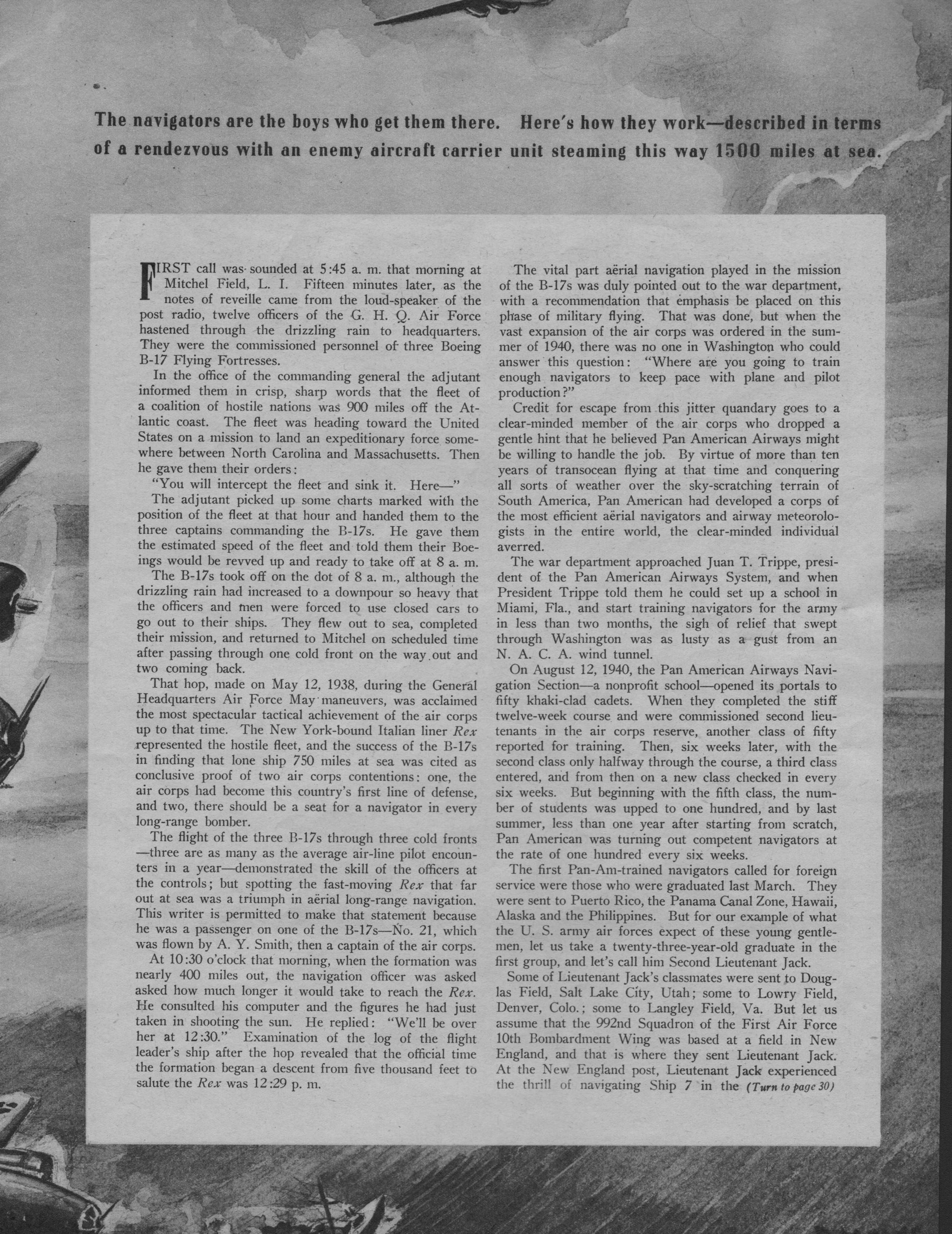
The group moves on to see how the 100-pounders are attached. Bombs can be dropped in any combination.

In ready room student pilots look over terrain map to plan practice raid. In Randolph area are 32 training fields.



NAVIGATING OUR BIG BOMBERS

BY SLOAN TAYLOR



The navigators are the boys who get them there. Here's how they work—described in terms of a rendezvous with an enemy aircraft carrier unit steaming this way 1500 miles at sea.

FIRST call was sounded at 5:45 a. m. that morning at Mitchel Field, L. I. Fifteen minutes later, as the notes of reveille came from the loud-speaker of the post radio, twelve officers of the G. H. Q. Air Force hastened through the drizzling rain to headquarters. They were the commissioned personnel of three Boeing B-17 Flying Fortresses.

In the office of the commanding general the adjutant informed them in crisp, sharp words that the fleet of a coalition of hostile nations was 900 miles off the Atlantic coast. The fleet was heading toward the United States on a mission to land an expeditionary force somewhere between North Carolina and Massachusetts. Then he gave them their orders:

"You will intercept the fleet and sink it. Here—"

The adjutant picked up some charts marked with the position of the fleet at that hour and handed them to the three captains commanding the B-17s. He gave them the estimated speed of the fleet and told them their Boeings would be revved up and ready to take off at 8 a. m.

The B-17s took off on the dot of 8 a. m., although the drizzling rain had increased to a downpour so heavy that the officers and men were forced to use closed cars to go out to their ships. They flew out to sea, completed their mission, and returned to Mitchel on scheduled time after passing through one cold front on the way out and two coming back.

That hop, made on May 12, 1938, during the General Headquarters Air Force May maneuvers, was acclaimed the most spectacular tactical achievement of the air corps up to that time. The New York-bound Italian liner *Rex* represented the hostile fleet, and the success of the B-17s in finding that lone ship 750 miles at sea was cited as conclusive proof of two air corps contentions: one, the air corps had become this country's first line of defense, and two, there should be a seat for a navigator in every long-range bomber.

The flight of the three B-17s through three cold fronts —three are as many as the average air-line pilot encounters in a year—demonstrated the skill of the officers at the controls; but spotting the fast-moving *Rex* that far out at sea was a triumph in aërial long-range navigation. This writer is permitted to make that statement because he was a passenger on one of the B-17s—No. 21, which was flown by A. Y. Smith, then a captain of the air corps.

At 10:30 o'clock that morning, when the formation was nearly 400 miles out, the navigation officer was asked asked how much longer it would take to reach the *Rex*. He consulted his computer and the figures he had just taken in shooting the sun. He replied: "We'll be over her at 12:30." Examination of the log of the flight leader's ship after the hop revealed that the official time the formation began a descent from five thousand feet to salute the *Rex* was 12:29 p. m.

The vital part aërial navigation played in the mission of the B-17s was duly pointed out to the war department, with a recommendation that emphasis be placed on this phase of military flying. That was done, but when the vast expansion of the air corps was ordered in the summer of 1940, there was no one in Washington who could answer this question: "Where are you going to train enough navigators to keep pace with plane and pilot production?"

Credit for escape from this jitter quandary goes to a clear-minded member of the air corps who dropped a gentle hint that he believed Pan American Airways might be willing to handle the job. By virtue of more than ten years of transocean flying at that time and conquering all sorts of weather over the sky-scratching terrain of South America, Pan American had developed a corps of the most efficient aërial navigators and airway meteorologists in the entire world, the clear-minded individual averred.

The war department approached Juan T. Trippe, president of the Pan American Airways System, and when President Trippe told them he could set up a school in Miami, Fla., and start training navigators for the army in less than two months, the sigh of relief that swept through Washington was as lusty as a gust from an N. A. C. A. wind tunnel.

On August 12, 1940, the Pan American Airways Navigation Section—a nonprofit school—opened its portals to fifty khaki-clad cadets. When they completed the stiff twelve-week course and were commissioned second lieutenants in the air corps reserve, another class of fifty reported for training. Then, six weeks later, with the second class only halfway through the course, a third class entered, and from then on a new class checked in every six weeks. But beginning with the fifth class, the number of students was upped to one hundred, and by last summer, less than one year after starting from scratch, Pan American was turning out competent navigators at the rate of one hundred every six weeks.

The first Pan-Am-trained navigators called for foreign service were those who were graduated last March. They were sent to Puerto Rico, the Panama Canal Zone, Hawaii, Alaska and the Philippines. But for our example of what the U. S. army air forces expect of these young gentlemen, let us take a twenty-three-year-old graduate in the first group, and let's call him Second Lieutenant Jack.

Some of Lieutenant Jack's classmates were sent to Douglas Field, Salt Lake City, Utah; some to Lowry Field, Denver, Colo.; some to Langley Field, Va. But let us assume that the 992nd Squadron of the First Air Force 10th Bombardment Wing was based at a field in New England, and that is where they sent Lieutenant Jack. At the New England post, Lieutenant Jack experienced the thrill of navigating Ship *7* in the *(Turn to page 30)*

NEW RECRUITS FOR R.A.F.

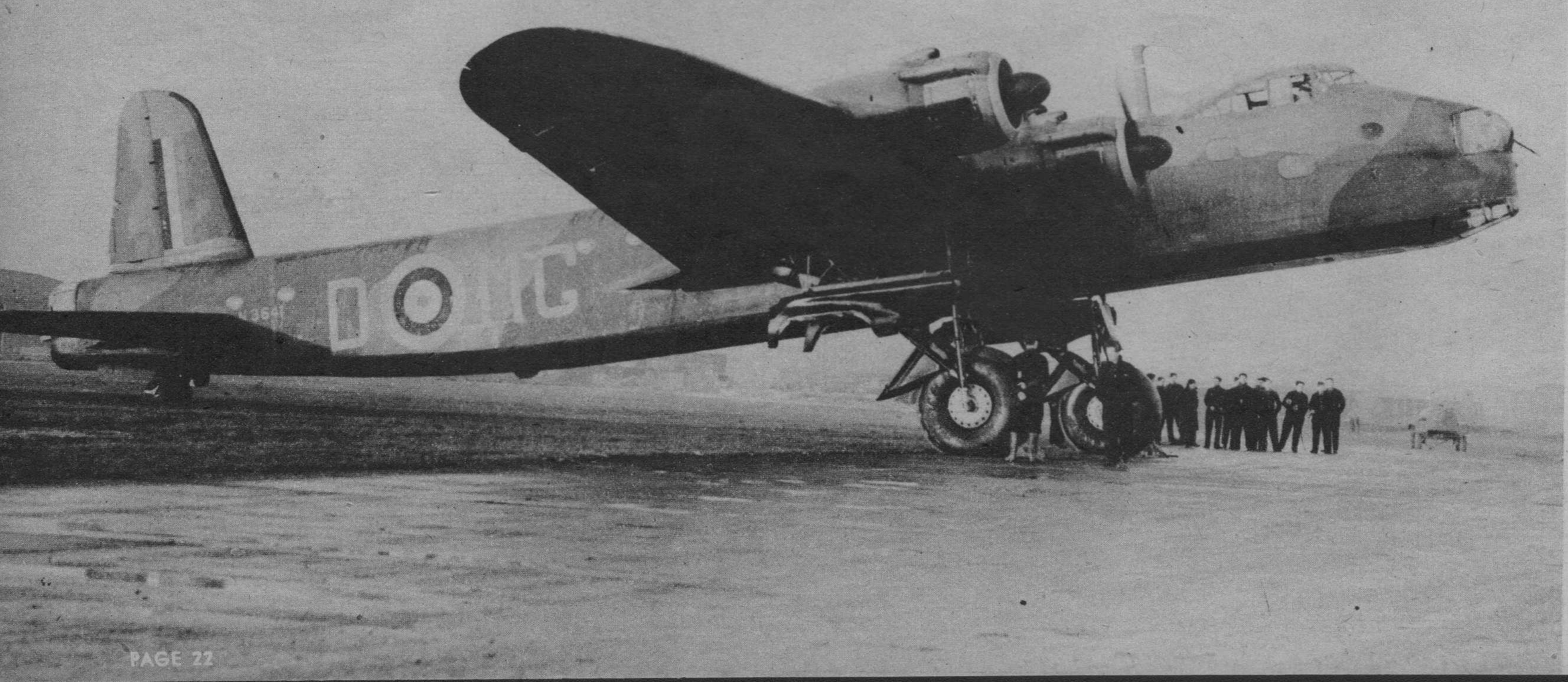
Watch these latest British ships —they're extra fast and furious.

Newest dive bomber. This Brewster Bermuda carries 1,000-lb. bomb within fuselage. Has twice range of German types, powered turret.

Nightmare. Bristol Beaufighter, by builders of famous Blenheim bomber, is very effective night fighter. Fast, armed with four cannon and six machine guns.

Vengeance indeed. Vultee's new dive bomber for Britain has crew of two. Carrying bombs in fuselage gives cleaner lines and better performance. Heavily armed.

This 99-ft.-wingspan Stirling long-range four-engined bomber is only 12 feet wider than long. Has four double-row Wright Cyclones totaling over 6,000 h.p.



It won't be long now—the shirttail, we mean. Tailfeathers Club initiation. Left to Right—Mancini, Harris, author-victim, Headstrom, Bowes, Newman.

Swing club in session. Instructor Headstrom teaches author the gentle art of spinning the prop without losing sections of your anatomy.

6-DAY SOLO

BY AVERAGE GUY

Proving an average guy can really learn to fly in less than a week and have a swell time doing it.

SIX days ago I'd never flown a plane alone. Today I am not only a man, various individual opinions to the contrary, but a pilot. Beyond the fact that I have flown solo, that last statement is a masterpiece of overstatement, but let's look at the record.

This year I decided to take a week of my vacation to learn to fly, just like that. The neighbors muttered to each other behind their fences and my six-year-old daughter tapped her forehead and pointed to me whenever the subject was mentioned in public.

I must confess that ten years ago I had a few flights in a glider, since then have gingerly held the stick of several light planes while the owners visibly sweated, and have flown many thousands of miles in commercial and military ships, but never had I had any serious instruction in the actual mysteries of power-plane flying. As to physical qualifications I'm about normal, I drive a car, like sports, and can't eat radishes. Beyond that, the general picture would fit almost any chap around 36. The mental qualifications are a matter of opinion. As an aviation writer I've read books on flying and have a basic knowledge of how and why a plane flies. . . . But let's get on to this six-day adventure.

I arrived in Lock Haven, Pa., home of the Piper Cub planes, where I was to learn this business of flying, last Saturday afternoon. After nine hours on the train I was more ready for bed than a flying lesson, but the gang that met me at the station would hear none of it. After checking in at the hotel I was driven to Cub-Haven Airport and introduced to my instructor for the day, Alvin Headstrom, and NC35489. This last introduction was most important, for this was to be my ship during the stay. The Piper J-3 trainer groaned as I climbed into the rear seat and *(Turn to page 32)*

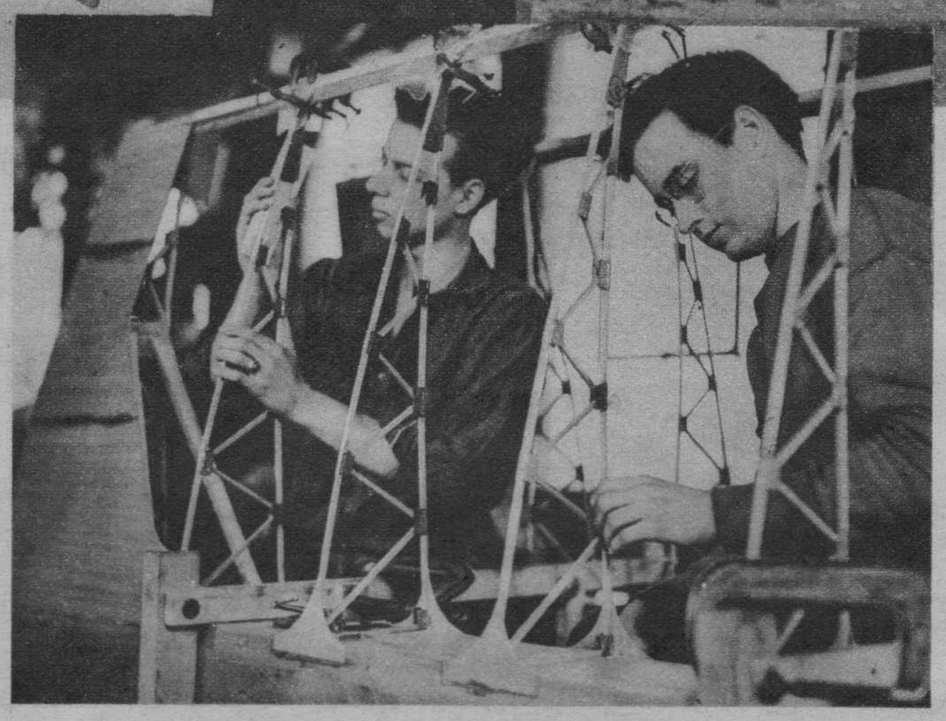
World's most patient man, Instructor Hall inspects author's belt in the cabin of faithful old NC35489, the Piper Cub J-3 trainer used.

Congratulations, you made it! Charlie gives the author the glad hand for bringing NC35489 back in one piece from his solo flight.

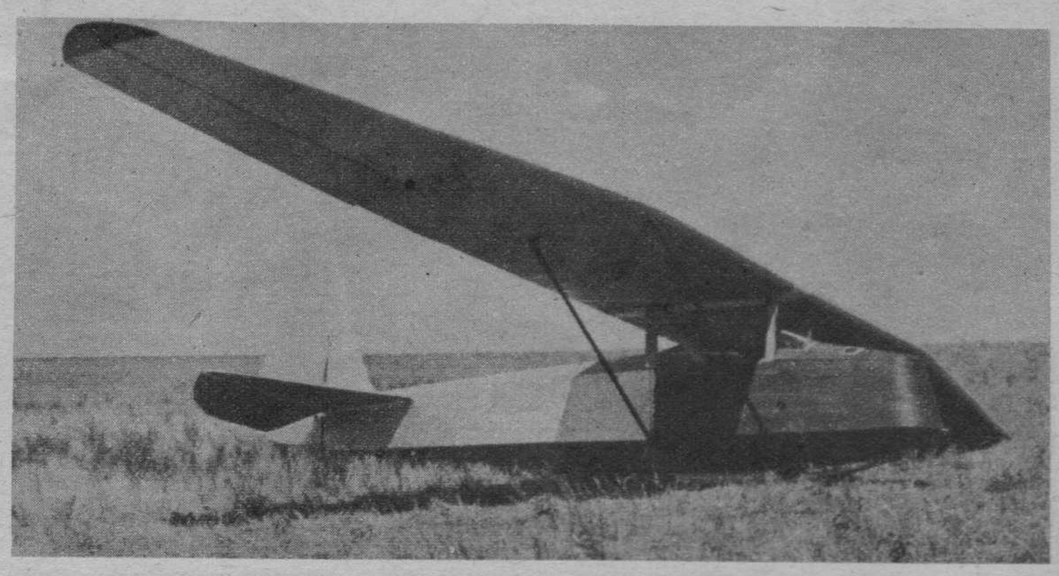
Henry Stiglmeier, right, shown with brother Herman (both outstanding glider pilots) used to be well-known model builder. Now he's flying ships himself.

FROM MODELS TO GLIDERS

BY ALEXIS DAWYDOFF



Old stuff to model builders. The construction of all-wood gliders and sailplanes presents no problems to skilled model-plane makers.



All-wood wagon. This home-built sailplane is modeled after the Pruefling with a special wing. Harland Ross flew it to an altitude of 7,000 feet.

Model makers are "naturals" to build and fly sailplanes. Why not give the boys a hand?

RECENTLY two friends of mine, both members of a large glider club, purchased a cracked-up sailplane. Their jobs did not permit them to spend any time repairing their ship, and taking it to an airplane repair shop was beyond their means. It so happened that one of the members of the club was a young boy who, until the time he joined the group, used to be a model builder of some note. This youth volunteered to work on the glider in his spare hours, with the result that in a short time the two partners were able to fly the ship without going into hock for the repair bill.

The quality of his work was as good as that turned out by the factory which built the sailplane, and the repair entailed reading of blueprints as well as the use of considerable ingenuity, inasmuch as the ship was of foreign construction and plans for a number of parts were not available. This boy had, actually, never worked on full-size aircraft; his knowledge of construction and his inventiveness were a result of building and designing model airplanes.

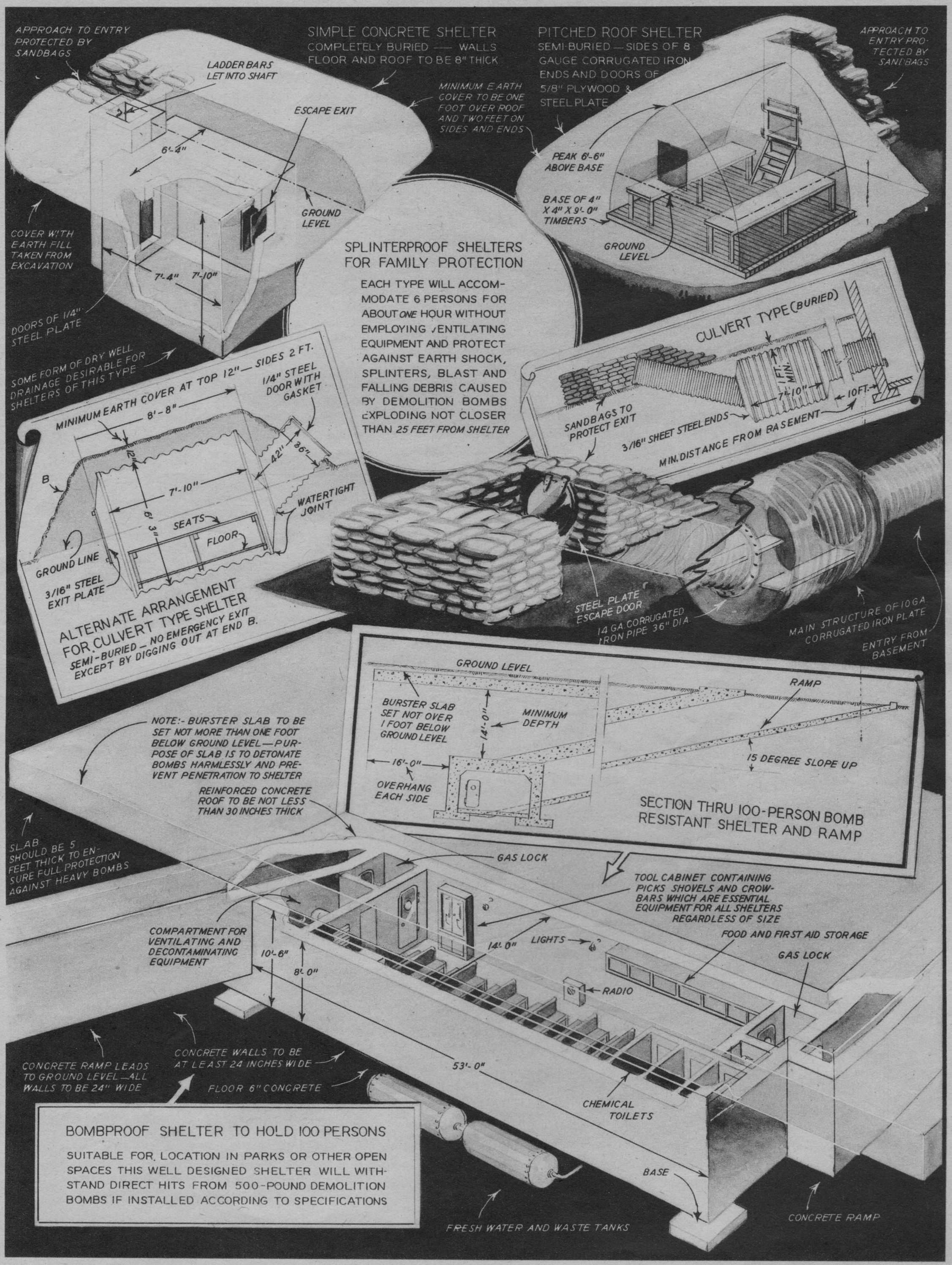
On a number of occasions I've joined in the talk fests of model builders, and I've always been amazed by their knowledge of aërolynamics, theory of flight and meteorology. Expressions like 'Reynolds number," "L over D," "lift curves," and the like were not just words flung around to make an impression. The boys did know what they were talking about. They knew all about thermals, how they occurred, and the best location for them. I've often gone away from these model sessions thinking to myself: *"There's* a bunch of fellows who will make excellent glider pilots and designers."

These model builders have confessed to me a number of times that their next ambition is to fly motorless planes. I can well see the point. Having successfully built and flown model airplanes, they quite naturally want to experience the thrill of piloting a real plane. Seeing the model plane soar in a thermal, after its engine has stopped, they want to soar themselves, because they understand that it is the purest type of flying, requiring piloting skill, knowledge and ability to find rising upcurrents with which they are already acquainted through watching their models soar.

Herein lies one of our greatest opportunities to advance flying, an opportunity so far ignored. All other countries *(Turn to page 28)*

AIR DEFENSE NOTE BOOK

No. 2—Types of outdoor bomb shelters as developed by Britain. These are U. S. approved.



P. S.—They Got Jobs

(Continued from page 14)

known the farm as his home, his world, and he loved it. The usual farm problems were there: broken wagons, needed repairs to the house and barns, damaged fences, an old car and a tractor that would run —sometimes. By the time he was out of high school his dad had noticed that the family car and the field tractor, both long past a just retirement age, were running better than ever. With even more pleasure he observed ever-declining repair bills. He encouraged the boy's interest in mechanics, and with wonder watched the skill the youngster applied to groaning engines. While working in the fields, the youth saw huge twin-engined United Mainliners twice a day roar overhead, silhouette their wings against the Colorado sky, and gradually sink into the flat horizon.

Now let's jump to the time when he garnered all his finances, persuaded friends to loan him a like amount, and in the autumn of 1940 set out to enter Curtiss-Wright Technical Institute of Aeronautics at Glendale, California. Although without even a nodding acquaintance with an airplane engine, he chose the specialized engine course, an eight-month training. He found it more than interesting. Following graduation last July, one of the largest repair stations on the West coast lost no time in placing him on the pay roll. One month later the civil service commission of Sacramento placed an attractive bid for his services. Today he is there.

Before he left for his new duties, I chanced to ask Ray Gelvin of Wray, Colorado, how he felt about it all.

"Aw, shucks," he replied, "I'm not the only guy who's got a good job. Look at the other fellows who graduated with me and before me and where they've gone to." And he proceeded to relate a litany of names and aircraft companies.

"Just how did all this start?" I queried.

"You mean airplanes?" he came back. "Well, the United Air liners were always flying over our farm, and doggone it if I didn't get a hankerin' to take the engines out of those silver-winged sausages to see what made them go."

Multiply Ray Gelvin's case by the hundreds and you find one answer to the tremendous increase of qualified aircraft workers during the last few years.

Contrary to popular belief, no special brand of intelligence is necessary to understand the construction and operation of modern aircraft. The average American high-school education is sufficient for this school's aëronautical engineering course, and is not required or necessary for any mechanical course. Time in college may be beneficial, but beyond the standard school training of today, individual initiative counts most in aviation.

One of my acquaintances, a distinct newcomer to things aëronautical, was listening to a class lecture where the topic was surface covering. Before the lecture was ten minutes old, up went his hand with the question: "If you please, sir, just what hide of what animal is used in the covering of wings?"

The instructor controlled his emotions rather well and asked for more detail. "Well," replied the youth in all seriousness, "you keep saying about the skin on the wings, the skin on the fuselage, and all that."

Probably not all students enter aviation with such a decidedly limited aëronautical knowledge, but their number is high. Their recovery, on the other hand, is equally astounding. The youth mentioned above now ranks with the leaders of his particular class.

The presence of the numerous aircraft factories in southern California is one of the most compelling factors in the attendance of this particular aviation school. Fully eighty-five percent of my fellow students come from outside the State's borders. Here in the very heart of the industry one is not far from modern developments, a decided advantage. The California climate may also come in for consideration. Then, too, being away from home has its good points. In new and congenial atmosphere, one is apt to concentrate better on new problems. The usual home and community distractions are missing. Still, because of this, timid souls might begin to wonder how a young person, having lived all his life within walking distance of his front door, can readily adjust himself to a change in living so far from the paternal roof. Take the case of Don Teel.

Back in February, 1940, Don left Lansing, Michigan, to study aviation in southern California. Expecting to find a spacious dormitory where the student body resided, Don found his room and board instead arranged for him in one of the pleasant private residences of Glendale, near the school, and at a very low figure. In his own words, he was "at home, although home was 2,000 miles away." He chose the master aviation mechanic's course so, as he put it, he would "get the whole works."

His first months were filled with ever-mounting wonders. What amazing possibilities one could realize from a sheet of aluminum alloy, the many and varied projects that could be created out of certain types of steel, hollow and sheet, the knack of riveting, the painstaking accuracy of template making, the delicate art of torch welding, all impressed themselves firmly upon young Teel. Later months brought the various divisions of the conventional aircraft to be analyzed in minute detail: the formation of wing structures and the reason for the airfoil contour, the fuselage and tail group, the controls, instruments, electrical wiring, surface covering, hydraulics, landing-gear assembly, rigging and thorough inspection procedures, and a clear knowledge of the theory of flight and Civil Air Regulations. Intermingled with practical work were lectures in the classroom and on the apron of the adjoining airport. Toward the last third of his one-year course, Don was transferred to engines. Here was the very heart of the airplane. As the days went by, Don found himself gradually mastering the intricacies of both radial and in-line engines, together with the various types of propellers. Here again daily lectures solved puzzling problems.

February of 1941 rolled around and Don, diploma in hand, lost no time in changing his status from student to employee. He couldn't very well have refused, since the industry had requested his services some months previously. He is seriously optimistic about the future, and solemnly declares his career in aircraft is a permanent one.

Like many, many graduates, Don has found his future here in California. Others have gone so far as to thoroughly insure permanence on the coast. They have married California girls, bought homes and have settled down near their place of employment.

Yet many graduates have returned home to present their diploma before the Eastern and Middle Western branches of the aviation industry. Records prove conclusively that their success duplicates that of the California converts.

Yet the diploma-made trails after graduation do not always lead to hangar and drafting-room duties. A number have gone further and occupied the pilot's seat in the cockpit. An instructor at Randolph Field, a Pan-American Clipper engineer, a dozen Eastern pilots, a score of Canadian youths and even an RAF officer in England head the list of graduates who have branched into flying.

Another type of student who approaches the entrance gates of the aviation school with serious intent is the young man who, though apparently set for life in some other line, decides to "pull stakes" and set off in quest of a more appealing career. The word "career" is used since that is primarily the aim of all leading aviation schools like CWT: the molding of career men. Take the picture as it has appeared to me to date. Personal observations and contact have revealed former musicians, a newspaper reporter, garage service men, photographers, truck drivers, electricians, office, hotel, pharmacy and soda-fountain clerks, a pilot, a taxi driver, farmhands, a sheepherder, a movie actor, an Alaskan fur trapper, a miner, and numerous salesmen—all training side by side as aviation mechanics and engineers.

One example, from scores, is Ira Richardson, at present experimental engineer in Lockheed's huge Burbank plant. As field engineer engaged in Diesel electric installation, Richardson traveled the length of the hemisphere from Chile, South America, to Point Barrow, Alaska. Choosing a master aviation mechanic's course, he found that a number of electrical applications fitted well with airplane electrical systems which in turn led him into the mastering of more complicated set-ups of modern ships. Today, in an excellent position, he forecasts great things for future aviation; and he continually finds pleasant surprises on his weekly pay check.

There are instances recorded where young graduates, immediately after leaving school, sailed for distant shores to work on special contracts offered by a foreign government. Three years ago, because of a Curtiss-Wright Tech engineer's diploma, Sherman W. McBain, together with six other fellow graduates of the same school, sailed for Sweden. Their contract, arranged through the good offices of our school placement bureau, called for one year of designing for the Swedish government. While in the course of his duties in the town of Linkoping, he gained the acquaintance of a California businessman and his daughter. The inevitable happened, and as soon as McBain returned to Los Angeles, a wedding and honeymoon followed in quick succession. Later he reported for work at the giant Douglas plant at Santa Monica. At present he is employed nearby by Vultee Aircraft as layout man. His salary has advanced with him. Vultee's latest, the Vengeance, has many hours of his work incorporated in its structure.

On the personal side, Mr. and Mrs. McBain share an attractive Los Angeles home with seven-and-a-half-months-old Gregory W., who takes unconcealed pride in personally testing the strength of his father's gas-model airplanes. That the aircraft industry has provided them with comfort and happiness, as it has thousands of others, is readily admitted by McBain. Without reservation, he views with high hope the trend of today's youth if they get expert preliminary training.

"There is no doubt about it," he states with conviction, "the best training you can get is indispensable. Your entire future stems from that one period of preparation. In my opinion, aviation presents the best pay and the greatest opportunities of all modern industries. It may be an old tale now, but I'll still say the young man will get into real aviation far quicker, reach higher, and then be far more satisfied with his career if he turns down very short, or 'free' job courses and makes whatever sacrifice necessary to get sound career training."

To me, who have six more weeks left of a twelve-month master aviation mechanic's course, it sounds fine. Maybe I will land a good job and progress the way I've long planned. Maybe I'll join the ranks of those graduates, who are legion, and who in a few months report promotion after promotion with corresponding salary increases, and a future undreamed of. But, from the other side of the fence, I've thoroughly enjoyed the training process, the gradual climb from riveting to general inspection, the type of training that readily permeates one's whole being, and, because so interesting, stays.

SWORDFISH *Cripples* BATTLESHIP!

131-mph-Plane with 18" torpedo avenges H.M.S. HOOD sinking after American-built Catalina Bomber spots BISMARCK

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ASK YOURSELF THESE QUESTIONS

How many countries use the swastika design on their warplanes?

Which is faster—
The Hurricane or Airacobra?
Messerschmitt 110 or Lockheed P-38?

What is the comparative power of—
Rolls Royce and Allison engines?
Modern radial and in-line engines?

What was the highest Thompson Trophy Race speed?

What American firms make—
Machine guns? Cannon? Bombs?
Torpedoes? Gas Masks?

What firms make—
De-icing devices? Direction finders?
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Who's who in the firm you're writing to?

•

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From Models To Gliders

(Continued from page 24)

have encouraged youths to go from model building into gliding. The youth of Russia, Germany, France, Poland, Czechoslovakia progressed naturally from building models to motorless flight. They've not only flown gliders and sailplanes, they've also been encouraged to build them from plans available to all clubs and organizations at a minimum price. This is very difficult, if not impossible, here, because our gliders are constructed mostly of metal tubing, and some entirely of metal, while the European ships are wooden. Metal requires welding by skilled aircraft welders, and there are very few of them among boys of model age. Wood is their natural medium. There is no reason in the world why a good utility or secondary sailplane could not be designed sturdy enough, and C. A. A. approved plans should not be made available, so that groups would have opportunity to build gliders under proper supervision.

As things stand now, aircraft metals are harder and harder to obtain. Some glider manufacturers are considering substituting metal for wood. And unless the government gives financial support to the motorless sport in America, which at the present writing seems pretty remote, the manufacturers will have to depend mostly on possible army orders. This undoubtedly will help the now-existing glider factories, but it will impose quite a hardship on private glider flying. It will be difficult for clubs and private owners to obtain ships suitable for their purpose. Gliders built for the armed forces will be far too expensive, and a good workable type which can be used by private organizations will be practically nonexistent because the factories will be too busy designing and building ships for the army, navy and marines.

The solution, therefore, would be to design one or two types of ships, preferably of wood, have the plans approved by the C. A. A. and made available for construction to groups who have an experienced and dependable leader. We would like to see model-building clubs form advanced groups in which the senior members would construct such a glider under supervision of a suitable person, to see such groups acquire an instructor through the co-operation of a local glider club, or better yet, acquire membership in this club, because, at present, it is the only way flight instructions can be had. The difficulty of obtaining glider ports will require such groups to meld into an already existent glider club in order to use its flight facilities. However, the benefits will not be one-sided by far. The glider clubs will benefit from this added membership of skilled young boys wise in construction problems, bristling with good ideas, and many an improvement in glider and sailplane design will undoubtedly result. And a number of excellent soaring pilots will be turned out who will later be absorbed by the aviation industry as well as the military air forces.

NEWS AND EVENTS

The London *Times,* under the date line of July 4, 1941, quotes: "The usual type of German glider used in the attack of Crete had an empty weight of about 1,800 pounds, and an all-up flying weight of 4,500 pounds. It was made of tubular steel, with wooden wings, and there were flaps on the trailing edge. Most of the gliders had a wing spread of eighty feet and were fifty feet long. They carried between ten and twelve men armed with submachine guns, two radio sets, six Tommy-guns and two machine guns. Average number of gliders towed by each airplane was two, though it is possible for six to be towed by one Ju.52 troop carrier."

Another contingent of six army air corps officers is being trained in glider flying at Elmira, N. Y. The first group graduated from the Elmira Area Soaring Corp. School just previous to the National Soaring Contest. The course takes three weeks and is very popular with the army boys. Bill Putnam, who took second place at the national meet, has joined the school as instructor.

Joe Steinhauser, who operates the Motorless Flight Institute at Rubinkam Airport, Chicago, Ill., has moved to Gliderport-Chicago, Chicago Chicago Heights, Ill. Leeds Mitchell, business manager of the school, writes that they are operating to capacity, even turning away many students.

Lewin B. Barringer, Golden "C" pilot and author of the book, "Flight Without Power," organized the Southwest Soaring Club at Phoenix, Ariz. Club members are Lewin Barringer, president; Fred Riggins, vice president; Roy M Taylor, secretary and treasurer. The club has purchased a two-place Cinema sailplane.

At the annual meeting of the stockholders of Bowlus Sailplanes, Inc., the following were elected as officers of the organization: Albert C. Essig, president; William Hawley Bowlus, vice president; H. D. Carey, general manager; Melvin Scudder, treasurer; J. Stanley McCauley, secretary. Some of the directors elected were Donald Douglas of the Douglas Aircraft Co.; Reuben Fleet, president of Consolidated Aircraft Co.; Carl Squier, vice president of Lockheed Aircraft Corp., and others.

The two-place Schweizer sailplane purchased by Jack Brookhart, Allen Van Name and Winthrop Block from the Airhoppers Gliding and Soaring Club was recently test-flown at Elmira by Emil Lehecka. Later it was flown by Nelson Shapter of the airworthiness section of the C. A. A., prior to being granted its airworthiness certificate. This ship will carry more instruments than any other sailplane in the country. It will be equipped, among other things, with directional gyro, thermal sniffers, new type of electric variometer and turn indicator, as well as a two-way radio.

Herman Kursawe put in four and a half hours of soaring in his Kirby Kite at the Wurtsboro, N. Y., gliderport. The pulley-tow method used by him and Frank Schellhorn proved to be a great time saver, necessitating less crew than the winch method.

The recent flood of publicity on gliding created quite a situation among glider clubs. They were swamped by letters from newspaper and magazine readers asking for particulars to join the organizations. Most clubs have not the equipment to expand membership, and shortage of materials makes it practically impossible to buy gliders. The only hope is use of wood, or that orders from the army and navy will put glider manufacturers on priority basis, and that the government recognize the importance of gliding to our national defense.

And in conclusion, do not miss the December issue of Air Trails, which will carry pictures and descriptions of most American sailplanes and gliders.

I Design Bombs

(Continued from page 13)

by a mechanical release gear, usually operated by an electrical relay."

We went on to the question of bomb sights. He became secretive again and would say no more than: "These sights are extremely complicated, and I won't say much about them. But you can say that the sight, in essentials, consists of two parts. First, the means of sighting, which is usually comparatively simple. Second, the calculating machine, which determines the line of sight in terms of aircraft speed and direction relative to the ground, height, shape and weight of bombs, et cetera."

Air Commodore Huskinson then told me some interesting facts about German bombs. "Their policy, as I said at the beginning, is largely in favor of concentrated attacks on civilian population. Their designs therefore vary largely from ours. The greater proportion of the bombs dropped here are of the blast-bomb type. This is essentially a light-case bomb containing a high proportion of high explosive and is designed to produce considerable blast damage, together with little fragment damage.

"The fusing of these bombs is of

(Turn to page 30)

HERE'S the aviation employment story in a nutshell: Yesterday thousands of trained men were needed: today it's tens of thousands; tomorrow it will be hundreds of thousands. Yet, more important than quantity is personnel *quality*. Aviation's greatest need is for "lead men"—men who couple natural ability with adequate training to step into group and section leadership, department management and finally executive responsibilities. Such men are "marked" for success from the first day of their employment. As the training subsidiary of the Ryan Aeronautical Co., this school can give you the training you need for that kind of success in *flying, mechanics or engineering*. And Ryan "success training" costs no more than ordinary courses. You can graduate from a Ryan course into a job for as little as $100.

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I Design Bombs

(Continued from page 28)

interest, as the German employs a very complicated electrical fuse. The basic principle lies in the use of a condenser charged electrically as a source of energy.

"You see," said the air commodore, drawing a pencil over his blotting paper to illustrate his description, "impact with the ground closes an inertia switch and shorts the charge through a wire bridge, thus firing the fuse head. For safety reasons, there must be a delay after the bomb leaves the aircraft before the fuse becomes alive. This is obtained by using two condensers. There is a reservoir condenser which is charged on leaving the aircraft. The charge of this is allowed to leak through the other condenser by means of a high-resistance connection. It is this time, required for the charge to build up from the firing condenser, that gives the required delay."

The air commodore said: "But there is a *great* disadvantage in this electrical fusing. It means that the electrical means of initiating is essential in all cases. This is inconvenient, especially when specialized fuses, such as the long delay fuses we were talking about, are used. These long delay fuses of the Germans consist of a normal electric fuse, so arranged that closing of the circuit starts a clockwork mechanism, which releases a striker, on the alarm-clock principle, at a set time. This fuse is usually associated with an antidisturbance fuse, similar to the standard fuse, except that it has a very long arming time (fifteen minutes) and a very sensitive inertia switch."

The air commodore ended his talk with the punctual decision of a dentist withdrawing his drill. But that is perhaps unkind. One could say that the facts he told me were only part of the experience of talking with him. It is his zeal, as much as his information, that remains with me now. Since the day I talked to him, I have felt refreshed confidence in those mighty bombs that fall, night after night, over Germany. Their construction may be secret, but one feels that the ingredient which makes all the difference is the high explosive of energy that goes into them from Air Commodore Huskinson's office. I now know what Lord Beaverbrook meant when he talked of "beautiful bombs."

Navigating Our Big Bombers

(Continued from page 21)

thirteen-plane formation of B-17E's on numerous day and night training hops out to sea and up and down the Atlantic coast.

The work was long and exacting, but for Jack the job was duck soup by reason of the thorough training he had received at Miami in the subjects necessary to know. These included celestial navigation, swinging the compass, correcting the compass, dead reckoning, star identification, and co-ordination of radio and direction-finding bearings. In addition, the school had given him fifty hours of navigation exercises over the Gulf of Mexico and the Caribbean, sixteen of the hours being at night. Another circumstance that made the job a cinch for Jack was the fact that the B-17E's were equipped with panoramic sextants, which required only one reading instead of the ten usually necessary with a hand-held sextant.

Jack's serious but easy manner of handling his work quickly clicked with the squadron commander, Major X. And, after six months, the major selected Jack to navigate the lead ship.

Soon after Jack's advancement, there reached the field a report that a foreign aggressor, notorious for striking without declaring war, had threatened a "token" bombing of New York. The report was confirmed by intelligence officers of G-2, and all leaves were canceled. Then the war department issued a special order for "all bombardment, attack and combat units to stand by, fully armed and ready for action."

Two nights after the order had been read at retreat and posted in operations, a breathless orderly rapped on the door of Jack's room in bachelor officers quarters at 10:30 p. m. "The major wants you to report at once with your gear at Hangar 34, lieutenant."

As Jack streaked across the parade field he saw other officers of the 992nd running toward the hangar. On the tarmac in front of Hangar 34 were all fifteen ships of the squadron, the thirteen active and two reserve. The major was standing in a corner of the hangar, checking off the names of the officers as they arrived. When the last came in, buttoning his tunic, the major waited for absolute silence. The officers detected beneath his calm a tension full of meaning.

"An aircraft carrier, 1,432 miles out and slightly north of the forty-first parallel, was sighted at 4:30 this afternoon by a Pan American clipper en route to Lisbon. The carrier was proceeding in this direction, and when the clipper radio asked for identification there was no answer. Twenty miles beyond the carrier, and following it, the clipper saw four destroyers. The destroyers also refused to answer a request for identification.

"Two hours later, at 6:30 p. m.," the major continued, "a coast guard patrol plane sighted the carrier, then being escorted by the destroyers, 1,376 miles out and still proceeding in this direction, which would indicate a speed of twenty-eight knots. They refused to answer the coast guard plane's questions about their identification and purpose for being at that position."

The major looked at Jack. "What's your weather conditions out there, lieutenant?"

"Clear and unlimited for about 500 miles, sir. Then squally conditions over a 250-mile area, and seventy-five miles beyond that about 120 miles of cumulus, down as low as 1,200 at some points and extending up to 20,000. The reports were made by coast guard air and sea patrols at 21:15."

The major studied a pad on which he had jotted down the data reported by Jack Suddenly he seemed to make up his mind. He gave no hint of what had been puzzling him, but the officers knew he had been estimating the chances the formation would have of catching the carrier before it reached the overcast of cumuli.

"You will take off in three-ship formations and rendezvous at Montauk Point, the eastern end of Long Island," the major said. "Then you will proceed in a V due east to the squall, and follow me over it. You will then proceed to the cumulus overcast, where I will signal for an in-line formation, the interval between ships to be five miles, with the course continuing straight east."

The major paused, and the officers watched him intently, knowing that he wanted their closest attention. "Now get this, and underscore it—under no circumstances shall there be any radio communication whatsoever from any ship until you get orders from me. Do you understand?"

The officers nodded, but in every mind there was the question of how the plane finding the carrier could notify the others.

"I know what you are thinking," said the major, "and here's the answer." He reached into a carton standing against the wall and took out a small music box. "I have fifteen of these, one for the commander of each ship. They work this way." He turned a tiny crank, and within the little tin box sounded the melody of "Yankee Doodle," high-pitched and jerky.

"The commander of the ship finding the carrier shall operate this instrument in his radio transmitter for fifteen seconds. Then he shall identify his ship by announcing the identification letters of a commercial broadcasting station, such as WEAF, WABC, WJZ, WOR and so on. Here are lists of the station identifications each of you will use. All planes, when they hear this signal, shall assemble on the plane sending the message. By this procedure the carrier will not be able to intercept radio communication that would reveal our presence and enable it to have fighters in the air to meet us. All right, let's go."

It was 11 p. m. when the bombers started out of the field. The moon was not due to rise until 3:30 a. m., Eastern time, at the point the formation was heading for, so the planes

flew with lights burning to the cumulus overcast, as prearranged. Then the major signaled with his wings for an in-line formation, and they switched off their lights and peeled off, one by one, right and left, and entered the overcast at 12,000 feet, climbing like weird specters.

A few minutes after they entered the white-out, the major went back to Jack's desk, which was in a tightly shut cabin where he could have a light for his reckonings. Customarily, Jack sat at a folding table behind the copilot's seat.

"What track are you making, Jack?"

"Exactly due east, sir. Ground speed is 26 miles. There's a slight head wind, but not much, and it may not increase."

"What's the rate of interception?"

Jack looked at a sheet containing the figures of the plane's ground speed and rate of drift and the reported speed and track of the carrier. "About 292 miles an hour, if she holds her track and speed, sir."

"Get another speed line as soon as possible," the major said, and returned to his seat on the left of his copilot captain and took over the controls.

During the flight through the clear weather on the way out, Jack had determined his ground speed and drift by checking both with his drift indicator. He obtained his ground speed by checking gaps between the whitecaps and his drift by dropping magnesium flares every half hour and sighting them with the indicator. Half an hour before entering the overcast he had made a fix on Arcturus, Vega and Altair. But now, in the thick mist of the clouds, the sighting methods were not usable to obtain the new speed line ordered by the major. His alternatives were radio co-ordination or dead reckoning.

Jack was opposed to using dead reckoning under the conditions then prevailing, so he dialed in the Naval Radio Station at Arlington, Va. He intercepted a message that made him catch his breath.

"All stations off the air at once. Stop all broadcasting until permission is given to resume. Authority of the United States Navy."

It was easy to understand what had happened. The stations had been silenced to prevent air raiders from the carrier from using radio co-ordination to find their way directly to their objective. But the action also put Jack on a spot. Now he had only dead reckoning to use in carrying out the major's orders.

Jack began to get nervous. Dead reckoning was all right for a mariner on the sea under conditions like these, but in a formation of bombers flying in a line front at 260 miles an hour it was dangerous business, even if they were five miles apart. An error of a few minutes or degrees would not be serious to a ship at sea, but even a couple of seconds off in this formation might cause the paths of two of the 36,000-pound planes to cross tracks with an annihilating crash.

Jack's hand shook as he fumbled for a handkerchief to wipe his face. He looked quickly at his aperiodic compass. Yes, she was holding her track. But what about Ship 2 on the right and Ship 3 on the left? Were they holding their tracks? Or, were they drifting over toward Jack's ship?

It occurred to Jack that he might appeal to the major to throttle back to avoid the possibility of a collision. No, not that, because the major had given him his orders and expected him to carry them out. He asked instead:

"Would it be practicable, sir, to go up in the thinner stuff? Up there we can make a fix by shooting the moon. It's up now."

The major gave him a look of friendly confidence. "As you say, lieutenant."

Ten minutes later Jack reported to the major that they were true on their course and that they should be on the meridian with the carrier in twenty-five minutes, if the carrier had held her track and speed. The major nodded, and Jack took his regular seat behind the copilot.

The twenty-five minutes passed, and ten more, and now, at their altitude of 20,000 feet, they could see the ruddy brow of the sun emerging from the indigo sea, but there was no trace of the carrier or her convoy. Jack made a careful check of his observations, noticing that the major was looking around at him.

"She must have changed her course, sir," Jack volunteered. "I'm sure that—"

The major removed his earphones, motioned his copilot to take the controls and started to get up and look at Jack's figures. But there was a yell from the radio operator. The major recovered his earphones in haste. It was the music signal.

All hands waited tensely for the identification letters. The pilots of fourteen ships braced themselves for a sharp ninety-degree turn, north or south, depending on which ship would send the message. It came from No. 15, which was flying on the extreme left of the formation, indicating the carrier and convoy were thirty-five miles north of the course originally reported.

The major caught Jack's eye and gave him an approving wink as he began speaking into the transmitter.

"No. 1 calling No. 15," said the major.

"No. 15. Go ahead, No. 1."

"What's the situation there?"

"No. 15 reports twenty fighters on the carrier's flight deck, sir. Two destroyers ahead of her, about half a mile, and two aft, about half a mile. The destroyers in each pair are about one mile apart, forming a square, with the carrier in the center. They are making about twenty-one knots."

"Neutralize those fighters, Fifteen. Go down as low as you have to, but get 'em."

"Fifteen willco."

"No. 1 calling No. 13 and No. 11."

"No. 13. Go ahead, No. 1."

"No. 11. Go ahead, No. 1."

"Proceed to carrier full throttle and join attack on carrier."

"Thirteen willco."

"Eleven willco."

The major then called Nine, Seven, Five and Three. He ordered Nine and Seven to take out the destroyers

aft, Nine the one on the south, Seven the north. Five and Three were assigned to take the destroyers forward, Five the south and Three the north.

"No. 1 calling all other planes," the major said, getting the attention of Two, Four, Six, Eight, Ten, Twelve and Fourteen of the right wing. "Proceed to the position of the carrier and stay at 20,000 until further orders."

The planes answered in rotation with "Willco," the term used briefly to report that orders have been understood and will be executed. The major took the controls and put the B-17E in a gradual power dive from 20,000 feet, and in a few minutes the officers in the control cabin saw a dim red glow in the deep-blue haze covering the sea.

"Good work," said the copilot, but the major did not answer. He was deaning over his wheel, scanning the sea for the destroyers.

"Fifteen calling No. 1."

"Go ahead, Fifteen."

"We let 'er have it all at once from 10,000, sir. She's on fire. Her anti-aircraft got our outboard port engine, but without the bomb load we can fly out here all day on three."

"Any vibration in your wing?"

"No, sir. I've feathered the prop and the wing's O. K."

"All right. Go up to 25,000 and stay there while we mop up."

"Thirteen calling No. 1."

"Go ahead, Thirteen."

"We missed with the first, but the second opened her starboard side, sir. She's got a bad list."

"Go upstairs, Thirteen. No. 1 calling for a report from Eleven."

"Eleven reporting, sir. One missed and one damaged her bow."

"Upstairs with the others, Eleven."

While the major was taking the reports, Jack spotted the destroyers, scurrying around like rats. He was in time to see the one in the southeast position lift her bow clear of the water as a 2,000-pounder struck aft of the funnels. She remained in the praying mantis attitude for a few seconds, then sank quickly by the stern into the foam.

"Roger, Seven," said the major. "Go up to 25,000 and stand by."

As he gave the order, two geysers appeared a mile to the north. When the spray settled the destroyer was still afloat and apparently undamaged.

"Upstairs, Nine," the major ordered, and he put his ship in a glide toward the destroyer Nine had missed. As he closed in for the kill, the wafer-thin destroyer zigzagged and twisted like a sunfishing cayuse. The major throttled back and spoke by interphone to the bombardier in the glass-inclosed nose directly beneath him.

"Ready?"

A moment after he got the answer the destroyer made a violent turn to port, and the major dipped his left wing, following it. The destroyer was slightly ahead when the two bombs, 4,000 pounds of explosive, were released from the bomb bay.

The major jammed his throttles forward and pulled up in a sharp chandelle to the left so his officers could see the effect of the bombs. They scored direct hits, and the major circled the huge spot of froth and bubbles that marked the grave of the destroyer. He gave the swirling water a parting glance, then turned to other business at hand.

Five and Three were still jockeying for positions from which they could, with fair certainty, pay their lethal respects to the two surviving destroyers. They let go about the same time, and all four bombs were effective.

"Roger, Five. Roger, Three," said the major, employing the expression used by the air forces for "O. K." He directed them to go aloft with the others while he circled back to see what further attention the carrier needed.

He found her starboard gunwales awash and some of her crew on crowded life rafts at a safe distance. Looking up through the overhead blister, the major saw that all of the right-wing planes had assembled. He called their numbers and ordered:

"Fly over the carrier in an echelon and drop your stuff. This is just target practice for you guys, so show us what you can do from 30,000."

Every one of the fourteen bombs struck critical area, and the copilot remarked that the 992nd had mighty good men.

"Yeah," replied the major. "With a fixed target and Norden bomb sights. Let's go home."

He signaled for a V and reported by radio to base operations that the carrier and convoy had been encountered and immobilized. Operations informed the squadron that fifteen light bombers from the carrier had staged the "token" bombing of New York. Air-raid wardens had spotted them, however, and the area was blacked out when they arrived. The result was no casualities or property damage because the rattled enemy dropped his explosives in Lower Bay. The enemy formation was now on its way back to the carrier, operations said.

"Funny, we didn't see them on our way out," the copilot ventured.

"Most likely they passed under us in that squall or the overcast," the major said, and tuned in on a commercial station for more details about the raid. The broadcast, by an excited commentator, was listened to by the entire squadron.

"It was a dastardly deed, indeed," shrilled the commentator. "And how unfortunate that the dastards who committed this crime made a clean getaway. After committing this horrid crime, those brutal birdmen are now flying back to their carrion mother, the aircraft carrier, who is waiting for them safely at sea, unharmed, untouched, even unsuspected, and licking her lips for another such foray. I tell you, these dastards—"

The major couldn't take any more. He switched off. The major seldom laughed, and even now he was confining his amusement to a grim smile, although those about him were chortling in glee. Dryly, the major remarked:

"I can't help but think what a hell of a surprise is waiting out here for those dastards—if that is what that radio fellow called them."

6-Day Solo

(Continued from page 23)

Al into the front, the prop was cranked and we were off.

Once in the air, did we have fun! At least I did. Al said go ahead and fly it and try a few things. I tried straight and level flying and then a few mild banks and turns. Nothing horrible happened, so I tried a few more, and then at Al's suggestion attempted a few power-off stalls. They were fun. You close the throttle by pulling it back to idling speed, pull the stick back toward your belt buckle and let nature and the J-3 take their course. The nose climbs, the ship slows and just when you think nothing is going to happen it does. With a sort of pricked-balloon sensation the nose drops and there's the ground right ahead of you instead of below you.

Nothing else happens as long as you keep equal pressure on the two rudder pedals and the stick centered left and right. The plane's nose rises right back to the horizon line and there you are. Al's nonchalance was colossal. I was enjoying myself immensely when he suggested we head home. Back at the field Al landed the ship and the first hop was over. I proudly presented my nice clean uncontaminated log book and the entry was made. This must be done after each flight and shows the date, make, model and number of plane, where the flight was made from and to where, maneuvers or incidents of flight, and then the instructor signs it to make it legal.

It is amazing how all-important these notations become to the student and how jealous he is of every minute. I now had a bit over an hour of flying, and back at the hotel jotted down my reactions. Not that you can learn to fly from all the books in the world, but here are the reactions to my first instruction.

The ease of handling of the plane. Its remarkable stability when not being flown. The plane flies itself, all you do is change its course so that it either flies in a new direction or performs a maneuver.

The things I found out about *my* end of the deal were: keep wings level, keep the wings level and most important of all keep wings level. The plane will do that itself if you leave it alone—but you know *me*. I usually came out of a turn, stall or spiral with the horizon off-center. (Aside to Mr. Piper: Can't you build in an automatic horizon leveler?)

The next day, Sunday, I met Al at the field and we went for a morning spin. My really serious instruction was to begin Monday, but in the

meantime I was to get in all the flying I liked, to be so much ahead. This morning we had a lesson in swinging the prop, and I really began to feel like an airman. The Franklin starts easily, usually on a few pulls through and a quick swing with the ignition on. You must be sure the chocks are in front of the wheels or the brakes on, or the brass hats in the Civil Aeronautics Authority become mightily annoyed and rightly so. To have even a light plane leap at you and chew off a few arms when the engine starts is not considered good ethics around an airport. Once I had learned the technique of starting the trainers I became an airport menace. No one could even get into a plane to get out of the sun without finding me grasping the prop and screaming, "Switch off?"

To proceed with the Sunday-morning flight. We took off and headed for Williamsport, down the river. On the way we gained a couple thousand feet of altitude and tried a few maneuvers. Al handed me an air map of the section and had me pick out various points along the way. Did you ever lose a city? I did, but finally found it right under my left wheel. Look there next time. After Williamsport passed slowly under our left wing, we climbed up and over the ridge of mountains to the right and over into the valley beyond, toward Harrisburg. Over the ridge it became bumpy and we decided to grab a little more altitude and went up through a mile-wide hole in the ceiling of scattered clouds above. We emerged into a world of white cotton, sunlight, and blue sky. Al, a true airman, turned with a grin and said, "Where can you find a sight like this, down there!" After a half hour of buzzing around at our leisure we picked a hole and started spiraling down, with Al handling the ship.

I had another lesson that afternoon with David Long, Piper engineer and instructor. More straight and level flying, easy turns. Corrections, suggestions, and comments by Dave did a lot to make my air work better and increase my confidence. His quiet directions and remarks smoothed out a few bad ideas I had.

My notes that night contained the following points to be remembered. Look everywhere for cities, even under the seat of your pants. Use stick and rudder pedals smoothly and together. Taxi slowly even if there is plenty of room. Always swing a prop as though the chap assuring you the switch is off is the world's biggest liar.

I now had over two hours of flying in my log book and was about to start with the serious business of really learning to fly in a week. Monday morning I met my instructor for the week, Charles Hall. (Pardon me while I take my hat off to him—for his uncanny knowledge of instruction, his patience and his skill. Fortunate is the student who encounters a Charlie Hall along the hectic and often bewildering road to his solo.) In the air once more with faithful NC35489, I began all over again, with straight and level flying, medium turns and banks and gentle spirals and side slips.

Once I could really fly the ship with an air of assurance, Charlie developed the cute trick of pulling the throttle back unexpectedly and making me pick a field to land in. This is fun, and mighty good practice—and besides, wasn't he there if I discovered at the last minute that the field wasn't so hot after all? I think one of the things that gave me confidence flying with Charlie was that he never took the controls unless he found it imperative.

By Monday evening, after two half-hour sessions of slips and review air work, I had a few more notes to add to my collection: In a slip, be definite about it and give rudder and stick together. When the throttle is closed for a practice emergency landing, pick your field and don't change your mind halfway in and head for a bigger and better one somewhere else.

I now had three hours and was ready Tuesday morning for my first real landing try. Gosh, did I hang onto the stick! Charlie must be a mind reader, for he'd look back and say in an amused tone, "Why the devil don't you relax?" And then I'd realize how tense I had been. I'd find my hand on the stick wet with sweat and my stomach muscles all tightened up.

Don't let anyone ever tell you you can learn to land a plane by reading about it. It has to be done in person. You must sort of feel your way down in a normal glide until over the runway, then come back on the stick to flatten your glide to a bit less than normal as you go forward. Keep it coming back so that the ship settles; ease up a bit if you feel the "bottom dropping out" and then come back again, as you keep the ship floating straight down the runway with your rudder.

As you settle down just off the surface bring the stick hard back—and I mean hard back—and hold it there. I couldn't get this "hard back" business to save my neck. Thought I was practically bending the stick, and she wouldn't "stick" once she was down. My inclination when she bounced, and apparently this is true of all students, was to push the stick forward to get the nose down again quickly. This is the logical thing to do, yet very wrong, for you only bounce harder than ever. Just ease up a bit, and the plane will come down again easy.

Instructor Hall made my landings very much easier by his genuine, or pretended, nonchalance. As I was feverishly watching the runway, checking the altimeter, and the airspeed indicator and trying to unloosen my stomach muscles, he was unconcernedly humming to himself, pointing out highway traffic or a particularly nice field of corn. (There was plenty of corn connected with my landing technique without having him point out more.)

Up and down we went, take-off and landing, take-off and landing, some good, some bad, and some awful. The take-offs were fun and I really did pretty well on most of them. You open the throttle, push the stick forward to get the tail up and let her roll down the runway wide open. You hold her right smack

in the middle of the runway (sounds easy) with the rudder, and when she feels light on her wheels, another feeling you can't learn from a book, you come back on the stick till she is off. Once off the ground you level off to let her sort of catch her breath and get up a bit of speed for the climb and then climb straight ahead.

Tuesday night I found I had totaled four and a half hours and only needed three and a half hours more before I had my eight hours required by law before I could legally go solo. Comments for the book were: In landing, come back with the stick easily until a few feet off, then come on back as she settles and then get that stick back hard, and hold it there till she stops rolling. Get off the runway as soon as possible, for there may be someone right behind. Before taking off, look all around for incoming planes.

Tuesday evening I had a date with the flight surgeon for the necessary medical exam before the solo. This went off without a hitch, and for the benefit of those worried about this angle of the learning-to-fly question, stop worrying. Any normal chap can pass this test as long as his eyesight is average and his sense of balance is normal.

That same night I went back to the airport and took the written examination required of student pilots before soloing. This examination consisted of twenty questions with several suggested answers. You check the number of the answer you select as correct. Seventy is considered passing grade and I drew an eighty-five. These are questions that are supposed to be of importance to a student pilot, and there are several sets of them which are handed out, so one student does not necessarily get the same set as the next fellow.

Wednesday morning instructor Hall and I once more did our merry-go-round routine about the airport and then tried a few stalls and forced landings. After lunch Charlie went to the airport office and drew two parachutes from Andy Mancini, who more or less keeps the hangar gang in line, and announced we'd learn a bit about spins as they must be understood before a solo is allowed. Power stalls and recoveries must also be mastered before solo.

Now about me and my spins. I'd rather not go into that, but did, along with Charlie, some barns, roads and a lot of unidentified Pennsylvania scenery. It is comforting to know that the modern light plane will not spin without coaxing, and if there's anything I hate to do it's coax something to do something it doesn't want to. A spin develops from a stall, either power on or off, and is not half as scaring as it is astonishing. One instant you are looking at the sky in a stall, and the next you are standing on your feet while the ground spins around like a colored phonograph record with your feet right over the little peg it sits on, on the turntable.

Charlie said to pick out a certain house, bridge or farmer's daughter, and when they had been around twice ease the stick forward a bit from the stall position of 'way back and touch opposite rudder. I got so interested in seeing the daughter spin around I forgot to push opposite rudder and what happened from then on for a few seconds was nobody's business, least of all mine.

Wednesday evening I noted my reactions to spins and stalls: Forget the farmer's daughter and keep your eye on his barn. I entered the day's flight sessions in the log book and realized we had a half hour to go to the required eight hours. Nothing had been said about going solo, and of course your instructor won't turn you loose to solo even with a hundred hours unless you are "ripe," both from a mental as well as piloting angle.

On Thursday I had an early date with Instructor Hall early in the morning, for the air is smoother at that time of day. I arrived at the field about seven and found Charlie already there. I cranked old NC35489, and off we went for more round-the-field landings and take-offs. We made about three or four and they were all pretty fair. After about the fourth one we were all set to take off for another, when I'll be doggoned if Charlie didn't clamber out and say with a grin, "I'm going to solo you!"

I heard a far-off voice say, "Well, O. K., if you think I'm ready to."

Charlie looked right at me and answered this other guy's remark with: "I'm a married man, too, and I wouldn't send you solo if I didn't feel you were ready. Just go up and around the way we just did and forget I'm not with you—and good luck!"

The other guy said "O. K.!" and it dawned on me it was my voice that was doing the talking. I taxied out on the runway, gave her the gun, lifted her tail and scooted down the strip and into the air. About a thousand feet beyond the field as I was climbing up and around to the 600-foot level, it suddenly occurred to me for the first time that I could really see the instrument board in front of me. The reason was that there was no one in the front seat to hide it. For the first time I really noticed that the board was black-crackle finish and that some of the dials had red pointers and that—*Say, I'm flying alone! I'm solo!*

Scared? Nope! Worried about getting down? Nope! Tickled? You're darn tootin' I'm tickled! But now to make this landing the best yet. I can see better, watch the instruments better and furthermore this has *got* to be good.

I level off and start back along the field. There's Charlie's white shirt, a tiny dot beside the edge of the runway. The gang at the hangar are out front. Let's see, now, almost to the end of the field, throttle back, nose down and here we go. Guess we better go a bit farther out before we come back. Not a bad gliding turn, if I do say so. Over the river straight for the runway. Charlie is still squatting, but I bet he's ready to jump if I should head that way. Better start coming back on the stick. Looks about right right here, so haul her back easy, a bit more—remember, this has to be a good one. Almost down, ease off a bit, now back, and back *hard*—H-A-R-D!

With the familiar clunk of a landing that sticks we're down, roll to a stop and taxi off the runway and head back to the end where Charlie is now walking toward us waving his arms. I taxi up to him, a silly grin on my face, and he shakes hands with a picturesque congratulation that will always be remembered with pride.

It seems like tempting fate, but he says, "Let's see you go round again," so I do and make another landing right in the same spot. This time he says, "Let's go in town and get some coffee." O. K. by me, so he climbs in and we taxi up to the hangar.

Now let me explain a queer custom of the Cub-Haven gang. They have the weird habit of cutting off the shirttail of everyone who solos, inscribing on it the particulars of the solo and hanging it on the hangar bulletin board. They call it the Tailfeathers Club, and it's a very distinct honor to belong.

As we taxied up to the hangar we were met by a delegation headed by the chief shirttail-amputator, Mancini, armed with a pair of metal shears. With him were such assistant amputators as Al Headstrom, Bob Bowes, and Prof. Harris, ably assisted by Instructor Newman. Right on the spot out came the shirttail and off came several square inches of shirt. Whoopie, now I'm a member of the Tailfeathers Club and the "cokes" are on me!

While the symbol of my new-found wings was being inscribed for the bulletin board, Charlie and I drove into Lock Haven for a second breakfast. At the restaurant he wrote the precious word SOLO in my log book and signed my student permit making it a valid license. He also gave me some sound advice about flying and what to expect from now on. At least I think he did; I have some sort of a dim, hazy remembrance of that.

After coffee, we went back to the field. There upon the bulletin board was my shirttail suitably inscribed for all to see. I bought cokes for the gang and walked around in a personal haze for some time.

One well-known writer of a book on light-plane flying says that a first solo flight is no thrill. I cannot imagine any normal chap who has soloed agreeing with him. Perhaps that writer is just tired with life in general.

Soloing in under a week is certainly no record for men have soloed in as little as two hours, three hours, or a day, but it does convince me that any average guy can easily learn to fly in a week and have a couple of days left to get in some solo time afterward. Planes like the Piper J-3 trainer and other similar light training planes bring safety and ease of instruction right down to a level where Mr. Average Guy can really imitate the birds.

Over at Lock Haven my shirttail has been added to the collection of varicolored patches, some of which are lace trimmed, for there are tailfeathers from lady birds, too, but I brought away with me many memories of swell guys, swell flights, and confidentially, the rubber grip off the stick of the Cub I soloed in.