

Flight Testing



The Boeing bomber in flight, a new type that has been exhaustively tested by Captain Gothlin.

by
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THE pursuit ship roared down from the sky in a power dive. It hurtled through the last bank of clouds, turned upward and with terrific speed disappeared in the clouds again. The spectacular sight left me gasping for a moment. Again the roar came, and again the little ship hurtled downward, up in a half loop and roared away on its back. It was Captain Gothlin testing a new plane.

Captain Oliver P. Gothlin Jr., Army Air Corps representative at the Boeing Airplane Company, is required to fly each ship a minimum of two hours before it is accepted by the government.

Attaining a safe elevation, his first maneuver is to fly upside down for a few seconds to shake out metal shavings, bits of material and anything else that might have been missed by the vacuum cleaner. Once a forgotten wrench struck him on the side of the head in its drop to earth. Climbing then to a height of several thousand feet, the plane is nosed over into a power dive.

With open throttle he plunges down a mile in twelve seconds, reaching terminal velocity of 350 miles per hour in 3000 feet. The propeller does not turn over fast enough to give more power and even the law of gravity does not allow an increase over that speed. In the first dive the wires are stretched and the plane "shakes down," an expression meaning that all the integral parts find their most comfortable positions, just as a new car loosens up in the first thousand miles of travel.

Captain Gothlin tries to tear off the wings in a succession of dives and thus far he has failed in that purpose. Instruments, controls and other operating mechanisms are checked in a series of wild maneuvers. By flying on his back, and rolling the ship, he determines the balance of the wings. The rolling test puts such stress on them that it is considered one of the most severe tests given to airplanes.

BUT the power dive and subsequent pull-out is the greatest test of any ship. Every part of consequence is strained, and a sturdy ship will survive but little more pressure than human eyes can stand. Pulling up from a dive, if it is done too quickly, a pilot will momentarily lose his eyesight and then his consciousness. A Boeing test pilot had such an experience not long ago.

HOW would you like to take a brand new army ship, just out of the shop and flight test it to see if it was strong enough to stand up under the work demanded of it by the Army?

Wouldn't that give you a thrill and the jitters, not knowing whether the wings were going to stay on or strip off?

Well, that's the daily job of Capt. Oliver P. Gothlin, Jr., who tries to tear a ship to pieces before it is finally accepted by the U. S. Army Air Corps. It's a good story—read it.

The Immelman turn is a reliable test of the maneuverability of a ship at slow speed. A dive, an upward half loop that puts the plane on its back in a reversed position, and a roll constitute the turn, which is one of Captain Gothlin's favorite maneuvers.

Attaches at the Boeing hangars say that Captain Gothlin in his regular test flights gives a more exhilarating performance than barnstorming stunt flyers do in the public exhibitions.

The Boeing Airplane Company's P-12 type greatly excels the other pursuit planes in the service and is the fastest ship of its type in the world. Of the 350 built for the army, a few were shipped to overseas posts but more than 300 have been tested by Captain Gothlin. Visit an army field some day and watch a P-12 in flight.

It will give you a thrill worth a day's travel to see.

Results of tests and comparisons with fighting aircraft of foreign nations, as published in an official report by Major C. W. Howard, chief of the engineering section of the United States Army Air Corps material division, reveal the fact that the Boeing P-12E pursuit plane is unexcelled in its class.

"Without challenge, it has the highest rate of climb and is faster than any single-seater aircooled type in the world," says the Howard report.

With a full military load it is capable of climbing to an altitude of 10,000 feet and landing again in six minutes.

THIS remarkable time record is due in part to the P-12's ability to negotiate safely, a vertical no-lift dive. Instead of being exactly perpendicular, the ship is put over fourteen degrees from perpendicular on its back to offset the lifting tendency of the wings, thereby attaining a truly vertical dive.

A few months ago Captain Gothlin flight-delivered the second Boeing Y1B-9A bomber to Wright Field, Dayton, Ohio, where exhaustive tests were made. The Howard report heralds it as the outstanding international plane development of the year. This twin-motored, low-wing monoplane attains a terrific speed, and is capable of remarkable maneuvers surpassing all other multiple-engined planes in the service.

Test flying these Boeing types is but one of the many duties of Captain Gothlin. Engineering problems develop daily at the factory requiring constant attention. The change from fabric covered to all-metal fuselages necessitated endless tests and experiments. Problems of construction in the fuselage, failures of instruments, variations in material requirements, etc.—constitute matter requiring expert decision.

A staff of two secretaries and five inspectors attend to all detail work under Captain Gothlin's direct supervision. Each part is inspected after

U. S. Army Planes

ALMOST unbelievable care is taken in building warplanes for the government. First come the various engineering calculations, then the laboratory tests on the materials and the tests and inspections made on the finished parts.

Finally, as a final test of the pudding, come the actual flight tests of the completed plane as described in this article. The flight tests not only require great courage but also an extensive knowledge of airplanes and their peculiarities.

each step in manufacture, and a final assembly inspection is made before the planes are taken to the hangar. And there they again undergo a rigid inspection.

A plane is delivered for flight test only after extensive factory tests have been completed. A testing department is maintained by the Boeing Company where the engineer in charge tests all grades and types of materials before they are turned over to the machine, welding and sheet metal shops for the various steps in manufacture.

Weight tests, chemical tests, pressure tests, and many more scientific tests are administered, and the results of each are observed by a government inspector. All the parts used in the final assembly,—struts, flying wires, engine mounts, wing sections, ribs, rudders, and so on,—are tested to determine the stress on each angle and surface before they are submitted for the final assembly.

THE weight of airplanes is a major consideration in their performance. Before construction begins, engineers estimate the weight within a very few pounds of the actual weight of the completed ship, which is, in the case of the P-12E, a little more than a ton. Each individual part is weighed as the assembly progresses.

The pursuit ship contains more than thirty different basic materials in hundreds of grades, types and specifications that are used in the manufacture of the required thirty thousand parts, irrespective of the power plant.

Practically all ships assigned to Army service within the United States are flight delivered. Army officers are sent to Seattle in groups of from three to fifteen to take delivery of the planes at the hangar and fly them to their posts.

Generally these men are young lieutenants not long out of training schools, eager in their dangerous work, and straining at the leash of discipline. Keeping them in bounds and handing over planes that will carry them safely



And here is Capt. Gothlin, test pilot of the U. S. Army Air Corps as he appears on the field.

on their cross-country flights is a responsibility greatly appreciated by Captain Gothlin.

The real test of his work is in the attitude of ranking officers, flyers of great experience, some of them war aces who often take flight delivery. Their praise is unstinted. "When the captain is through with a ship there is nothing more to be done," the flyers at Boeing Field often say.

At thirty-seven, Captain Gothlin can look back on an extensive experience that began in the youth of aviation. After attending the Culver Military Academy and Ohio State University, he enrolled in the Army Air Corps ground school at Champaign, Illinois, on the twenty-second of July, 1917. The following November he finished the primary flying course at Scott Field and was commissioned on December



Tests and comparisons with foreign fighting planes reveal the fact that the Type P-12 U. S. Army Air Corps pursuit ships have no equal in the world for speed and rate of climb.

twenty-sixth. He was assigned to Post Field, Fort Sill, Oklahoma, followed that with a squadron in Texas, and for five years served with observation squadrons throughout the country.

As a lieutenant he was commanding officer of the 165th squadron in Hawaii, remaining there from 1923 until 1926. During that period his active flying time was spent in pursuit planes. Recalled to the United States in 1926, he was assigned to the Rockwell Air Depot in San Diego, and left there to become Air Corps representative at the Boeing Airplane Company in Seattle in March, 1929. His promotion to a captaincy in the Army Air Corps came in October, 1930.

During this varied and extended service Captain Gothlin has flown nearly all of the service ships used by the Army until 1929, when he began his more concentrated work at the Boeing factory. There he flies all Boeing types and occasionally has an opportunity to take up one of the Douglas planes.

Danger and thrills have become so commonplace in the everyday business of testing pursuit planes and bombers that it is difficult for Captain Gothlin to select any particular experience as outstanding.

"I am still intact, so nothing I have done has been very dangerous," he said in response to my query, "but I can tell you about an incident I witnessed in 1917."

"It was probably the most unusual thing I have seen in the air," he continued. "Johnny Simpson was in the cross-country stage of his training and was soloing in a Curtis JN. As he passed near the field on one leg of his flight the ship nosed over suddenly. Johnnie's safety belt must have been unfastened because he fell forward in the cockpit against the control yoke.

The weight of his body against the controls put the plane in a sudden dive and threw Simpson out of the cockpit. At that time a wheel very much like the steering wheel of an automobile was attached to the top of the control yoke and he luckily retained his hold of this wheel."

GOTHLIN warmed up to his story, using his hands to demonstrate the action of the ship.

"The ship made a half outside loop putting it on its back, with Johnnie clenching his fists in an iron grip on the wheel. He had no parachute, and had a chance for life only as long as he could hang on. He struggled furiously trying to climb into the cockpit. His body swung forward with the effort, putting the control stick forward. This reverse effect to normal flight caused the ship to climb.

It climbed until the propeller would pull no longer. The ship stalled, fell off and again it dived. The dive threw Johnnie's weight forward on the stick, pulling the ship out of the dive, and causing it to climb again."

Captain Gothlin carefully demonstrated with a letter-head, and explained that all this time the plane was upside down with Johnnie swinging like a pendulum 2000 feet above the ground.

"He was losing altitude rapidly. We, at the hangar, were spellbound. The ship went into another stall, then dived, repeating the action three or four times. Coming out of the last stall, it had just nosed down when it hit the ground, flipped over and threw Johnnie clear of the wreckage."

"After two weeks in bed with minor injuries he was up in another ship determined to get his commission, and very careful to fasten his safety belt."

I had been warned that Captain Gothlin was very reticent, but this story of another pilot loosened his tongue just enough for me to hear about one of his own difficulties.

"Since coming to the Boeing plant my worst experience was with one of the early P-12 types," he began, "Johnny Corkille of the flight test section, Army Air Corps, informed me that while flying a P-12 at Wright Field he had experienced great difficulty in getting out of a flat spin. So I took a P-12 up one day to see what it would do from a stall."

A spin starts from a stall. When the angle of ascent becomes so great that the engine will no longer pull, and if the controls are still held in climbing position, the plane falls off and goes into a twisting, uncontrolled dive.

CAPTAIN GOTHLIN put his ship into a spin but nothing unusual happened. "I gave it some power trying to force it into a flat spin. My speed increased and I soon began to lose my sense of direction. The controls would not straighten me out. My

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The Transcontinental Fleetster



The Transcontinental Fleetster is a unique type of monoplane transport because of its parasol type wing.

HERE is a new cargo carrying bird, a Fleetster, just put into service by the Transcontinental & Western Airlines. It shows the trend in design for carriers of passengers, mail and express.

This ship carries seven passengers at a cruising speed of 145 m. p. h. and has a flying range of 750 miles. It

is equipped with a single 575 h. p. engine, and as will be noted, is a monoplane of the parasol type—new to commercial airliners.

This arrangement of the wing gives almost perfect visibility for the pilot and is also said to considerably improve the performance and flying characteristics of the ship.

The Dirigibles TC-13 and Macon Near Completion

NOT to be outdone by the Navy in the matter of lighter-than-aircraft, the Army has been quietly going ahead for some months with the construction of the largest non-rigid airship ever built in America.

Goodyear Zeppelin engineers at Akron have been busily at work on the TC-13, simultaneously putting the finishing touches on the U. S. S. Macon, sister ship to the giant navy dirigible Akron. It is estimated that both ships will take to the air about the same time—early in April.

While the design and details of the Macon are well known, because of its similarity to the Akron, the TC-13 has had very little ballyhoo. It is 233 feet long and 54 feet in diameter. Including the car underneath, it has a height of 69 feet and a capacity of 360,000

cubic feet. Larger non-rigids have been built in France, but this is the giant of this country.

An unusual feature of the completed craft will be the presence of five control surfaces. These surfaces will be located at the rear of the ship.

The control car is of welded tubular construction with a covering of corrugated metal and fabric. Space is provided for three pilots, two mechanics, a navigator, radio operator, a bomber and with sleeping facilities, toilet facilities, a compartment for bombs, a sub-cloud car, and a radio set with a 3,000 mile range.

On each side of the car will be an engine of 375 horsepower, geared at a ratio of three to two. A three bladed

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Here is a scale model of the "Macon," showing how it will appear when completed. Standing beside it is Dr. Carl Arnstein, the designer of the Akron and the Macon.

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mind began to fog over, and my only thought was to stop the spin.

"I tried to force out of it with power. I juggled the stick, and spun faster and faster. My head was swirling and I didn't know up from down. I couldn't even see the instruments. One more try with power did the trick.

"I jerked the throttle open and straightened out so quickly that it cleared my head, and my troubles were over. Not very exciting to tell, perhaps, but it was the toughest spot I've been in for a long time. And I've never been able to get another P-12 into that kind of spin."

The elaborate system of tests and the standardization of plane assembly have brought the aircraft industry out of the chaotic first growth into a period of stabilization. Revolutionary discoveries that were so frequent until a few years ago, have all been appraised, and the practical theories that are now being utilized in the quantity production of planes.

Starting with nothing more than a vague idea in the engineering department the plans gain momentum through the various departments until the laboratory tests begin on the raw materials, then shop tests on the various assemblies until the final completely fabricated airplane is ready for the strenuous tests just described.

The hazardous business of testing new planes requires a thorough and comprehensive knowledge of all the crazy things a plane is capable of doing, and practical experience in getting out of awkward positions. Only iron nerves will stand the daily test of flying. END,