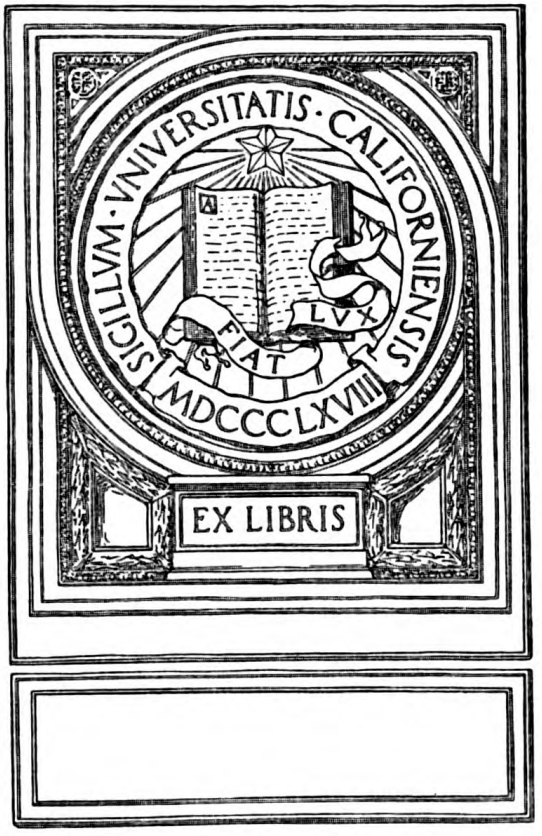


WAR WINGS

FIGHTING PLANES OF THE AMERICAN AND BRITISH AIR FORCES

This is what today's pilot is wearing at high altitudes. Most important item of equipment is the face-mask, with rebreather bag and tube, which supplies life-giving oxygen to the pilot from the plane's supply. Other equipment includes an emergency oxygen mask around the neck, connected with a flask of oxygen worn on the leg of the flying suit, built-in radio earphones in the helmet, parachute with ripcord cable, ripcord ring over the heart.

WAR WINGS

FIGHTING PLANES OF THE AMERICAN AND BRITISH AIR FORCES

By DAVID C. COOKE

With a Foreword by
AL WILLIAMS

ROBERT M. McBRIDE & COMPANY
New York

WAR WINGS

PRINTED IN THE UNITED STATES
OF AMERICA

FIRST EDITION

DEDICATION

This volume is respectfully dedicated to all pilots, skilled and unskilled workers connected with aviation, and one who will never be a military flyer—my wife, Yvonne, whose untiring assistance in the preparation of "War Wings" could not have been replaced.

FOREWORD

Truly the Air Age of which we have dreamed and feared is here. We dreamed of commercial air grandeur, and Destiny has dealt us air-power. Our people must know the machinery of this Age. My good friend, David C. Cooke, has painstakingly surveyed and studied the field of American and British military aircraft, and has interpreted the outstanding features of many types in an interesting, fascinating, and informative manner—in pictures and in descriptions. There is a big place for this book, and it will satisfy the burning curiosity of millions of air-minded Americans.

AL WILLIAMS

Roosevelt Field
Mineola, New York

ACKNOWLEDGMENT

The author wishes to express his appreciation to the U.S. Army Air Corps, Bureau of Naval Aviation, Royal Air Force, various manufacturers of aircraft, *Flying Aces, Aviation,* and *Flight* magazines, and the Aeronautical Chamber of Commerce of America for their cooperation in supplying photographs, pertinent data, and other assistance in the preparation of this book.

CONTENTS

INTRODUCTION

BOTH America and England sadly neglected their air arms between the close of the first World War and the outbreak of the second World War. Aviation appropriations had slid down the scale, and neither country was actually ready to wage either an offensive or defensive air war.

On the other hand, the ink on the Treaty of Versailles had no more than dried when Germany secretly began to rearm with an eye toward the next conflict, the future war in which they planned to continue where the British blockade had defeated Kaiser Wilhelm's legions. This shroud of secrecy was continued, and manufactured implements of war were stored away throughout the von Hindenburg republic and the first two years of Adolf Hitler's Nazi regime. Then, on March 16, 1935, Hitler tore up the military provisions of the Treaty of Versailles and openly announced that Germany was to institute a rearmament program.

Shortly after that date, the German Air Force—*Luftwaffe*—started to take form and slowly began to rival even the then all-powerful air arm of France. Before this time, though, the German Air Force was in the making. Germany, according to provisions, was not to build military aircraft of any nature. She got around this clause by experimenting and developing airplanes in the guise of commercial craft; needless to say, these were in reality nothing but war machines with a bit of cleverly-conceived camouflage. Germany was not to have more than a certain stipulated number of power-plane pilots. She got around this provision also by extensively training glider pilots. And under the cloak of peacetime sport flying, Germany built up a reserve of potential war flyers such as the world had never seen.

When the real danger was eventually realized in England, they

feverishly went about the task of building up their Royal Air Force and the component Fleet Air Arm. Mechanics and metal workers were specialized to a greater degree, engines were standardized for mass production, and the assembly-line system of manufacturing was adopted in the aircraft industry instead of continuing the old, piece-meal construction principle favored by the English. Moreover, the highly-publicized and condemned "shadow factories" sprung into existence, the purpose of which was to manufacture aircraft sections and matériel in scattered shops throughout England.

By following this system, and by working at top speed, the R.A.F. began to take the semblance of an air arm worthy of military consideration. At the same time, however, the *Luftwaffe* was growing in leaps and bounds and Germany was once again flaunting its might in the teeth of the world, proudly stating that they were now ready to take all comers. It was the threat of this air-power that virtually cowed the English into submission when the Hitler troops marched into Czechoslovakia in March, 1939. But while the Chamberlain government was following its appeasement program, it was also steadily building up its R.A.F., Navy, and Ground Forces.

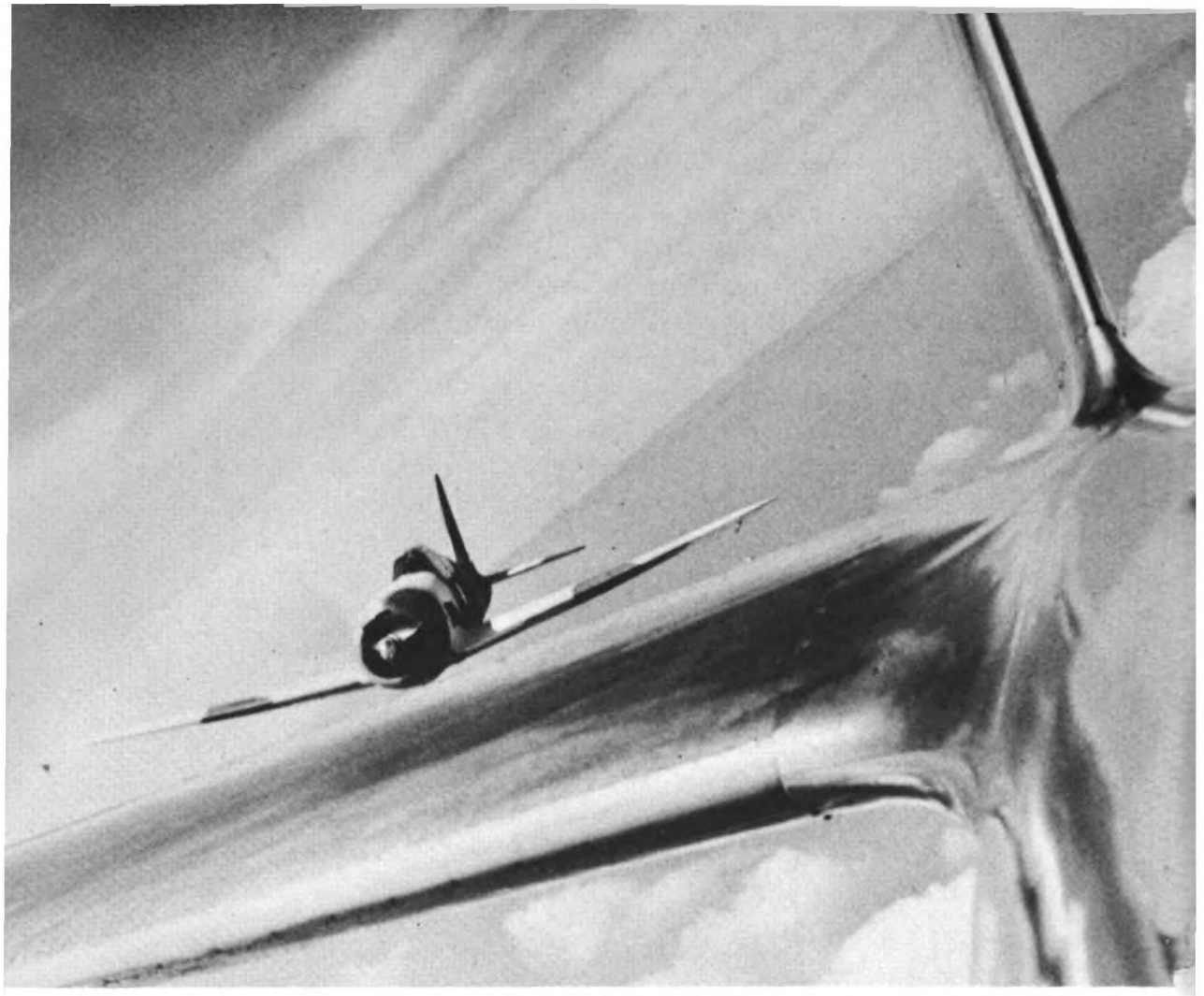
August 23, 1939, marked the turning point in the British policy, and at last the lion had its back to the wall and was ready to show its sharpened claws. For when Hitler demanded that Danzig and the Polish Corridor be turned over to the Third Reich, England instructed Poland to "stand fast" and remain unyielding. Poland complied, with the promise of "all the aid Great Britain can possibly furnish," and was subsequently invaded on the 1st of September.

Like England, America also is now building planes as rapidly as possible, and many aircraft factories are working 24 hours a day. The entire industrial might of the nation is being thrown behind the intensive plan to make America first in the air and to assist England as much as possible. And that dream is rapidly being realized, for our production rate has quickly zoomed up the chart and will shortly equal, if not exceed, the capacity of Germany.

The Army Air Corps and the Naval Air Service are being supplied with more modern, faster, better armed airplanes; training of pilots has been stepped-up to a new level; and schools are being instituted throughout the country to train men to man the machines that turn out battle planes.

Most of this, granted, is common knowledge. But what types of planes are being utilized in the fight against Hitlerism and to build up the American Air Services? What do these planes look like, how are they constructed, how fast do they fly, and what armament do they carry? The purpose of this volume is to answer those questions and to present actual photographs of both American and English military machines. Here you will find specifications, details, characteristics, and other data concerning ships in service with those air arms.

DAVID C. COOKE
Springfield, N. Y.



Look out ahead! Ideal position for a fighter is on his enemy's tail. Machine guns on single-seat plane are all pointed directly forward and the pilot must aim his entire ship to fire his guns accurately.

CHAPTER 1

PURSUITS AND FIGHTERS

PURSUIT—or fighter—is that branch of the service whose prime purpose and duty is to go on forays into enemy territory and engage in combat and to keep the skies above home territory clear of foreign ships. This type craft is also used to escort bombers on raids deep into alien territory, to machine gun and harass troops, and to partake in light bombing where heavier and slower planes would not be able to get through defenses of barrage balloons and anti-aircraft fire. In addition, specific types of fighters come under the heading of interceptors. The duty of these machines is to get into the air rapidly, upon receiving an air raid alarm, and to stop enemy raiders from reaching their objective or slow them up until more heavily-armed fighters are able to reach the battle scene.

In the U.S. Army Air Corps these planes are referred to as "pursuits." Technically speaking, however, fighter is more correct, since pursuit is of little use after the enemy has reached his objective and completed his bombing, reconnaissance, or whatever the mission may be. As a matter of fact, the Air Corps is the only major air arm that uses the term "pursuit." The U.S. Navy, the Royal Air Force and Fleet Air Arm component, Russia, Germany, Italy, and many other countries utilize the name "fighter" exclusively.

No more remarkable airplane has ever been devised for war service than the fighter. It is usually small, having a speed greater than any other type, exceptionally maneuverable, and in most cases is manned by but one person, although a few bi-place and multi-place fighters have been built.

On the single-seater, all guns point directly forward to the line of flight and are so placed that their bullets will converge at a certain given distance in front of the ship. (This is usually left to the

discretion of the individual pilot.) The machine guns are in a fixed position and are mounted in the wing leading edge or hidden in the engine cowl, or both. With the standard .30 caliber Browning machine gun, the fire-power is 1,200 rounds per minute per gun. Thus, the Hurricane, with eight fixed wing guns, has a total fire-power of 9,600 rounds per minute. Later models, which are said to mount twelve guns, have a total fire-power of 14,400 rounds per minute! (Synchronizing cuts down the fire-power per gun to 500 rounds per minute. The Curtiss P-40, which is one of the most modern and heavily-armed fighters in the U.S. Air Corps, has four wing guns and two cowl guns, giving a total fire-power of only 5,800 rounds per minute—3,800 less than the Hurricane which has but two more guns.) The average firing time for British planes, however, is only fifteen seconds, since the usual ammunition load per gun is 300 rounds. Therefore, even though 2,400 or 3,600 rounds are carried, the total actual firing time is approximately only one-fourth of a minute. This does not necessarily mean that air battles—or dogfights—are over in a few moments, for a pilot rarely makes more than a burst of two or three seconds. If firing time is longer, the pilot is said to be "freezing on the teat," as the machine gun trip, or trigger, is commonly called.

Because of this forward armament, a fighter is completely vulnerable to the rear, top, bottom, and sides. His plane, in other words, is nothing more than a flying machine gun, and he must aim the entire machine firing at a given target.

Fighter aviation is probably the most romantic branch of any air service, since in single-seaters the pilot is entirely on his own to wage combat and destroy the enemy. This is not only the most thrilling unit of war aviation but is also the one in which most casualties occur, since sheer luck as well as experience and ability plays a big part in determining the victor or vanquished.

In order to be a fighter pilot, an airman must be impulsive though cool-headed, daring though brave, quick-witted and fast to act in emergencies, and possessed with a full complement of facilities enabling him to reason and solve tactical and strategic problems in an instant.

The old idea of "tall, dark, and handsome" is definitely dis-

couraged—especially for the former. Today, fighters are small, cramped, and the pilot is housed-in by a sliding hatch, or canopy, which completely covers him. If a pilot is too tall it is next to impossible for him to squeeze into the confined quarters.

AMERICAN

BELL P-39 AIRACOBRA

The striking feature of this plane—and one that will undoubtedly be noted in many new models to come—is that the engine is placed well aft of the pilot's cockpit. A geared driveshaft in a housing between the flyer's feet connects with the propeller. This arrangement was adopted to accommodate the lengthy American Armament Corporation's 37mm. air cannon which fires through the hollow driveshaft.

According to experts, the placing of the engine, the pilot, and the retractable landing gear in the center of the wing has made the Airacobra a beautiful plane that is easy to handle in high-speed maneuvers. By this means the center of gravity is more central, a feature which makes flying a great deal more simple physically on the pilot. This is very important, since super speeds demand high velocity turns which frequently cause "mental blackouts" of the pilot.

The fuselage is built in two sections. The front portion has two longitudinal beams extending its entire length; these girders support the engine, propeller reduction gear box, extension driveshaft, fuselage machine guns, ammunition, and pilot. The rear section is of all-metal semi-monocoque construction. The pilot's cabin is integral with the fuselage and is fitted with side doors which are releasable for emergency exit.

The single cantilever wing is of all-metal construction and is built-up in four sections, consisting of right and left panels and right and left wing tips. The fuel tank is integral with the wing structure. All-metal electrically-operated trailing edge flaps are fitted.

The tricycle undercarriage arrangement does away with the necessity for a tail wheel and also protects nosing over in muddy

fields when making full use of brakes. The gear is fully retractable in flight, resulting in an exceptionally clean craft.

The Airacobra has been purchased in large quantities by the British and is known as the Caribou. A multiple armament fitting, including a 37mm. cannon firing through the propeller hub and synchronized and wing guns of .30 and .50 caliber, provides a devastating fire-power.

(A slightly modified version, with the conventional undercarriage, has been submitted to the Naval Air Service for tests. It is known as the XFL-1 Airabonita.)

Power is supplied by a liquid-cooled in-line Allison engine of 1,150 h.p. at 3,000 r.p.m., giving a top speed of 400 m.p.h. at 15,000 feet. Cruising speed is 335 m.p.h., and landing speed with flaps extended is 77 m.p.h.

Other data: Span, 34 feet; length, 29 feet 9 inches; height, 9 feet 3 inches; wing area, 213 square feet; range, 1,000 miles; loaded weight, 6,143 pounds; ceiling, 36,000 feet.

BELL XFM-1A AIRACUDA

This is the first and only multi-place fighter ever submitted to the Air Corps for experimental purposes, other than the original model XFM-1. The XFM-1A, however, is practically the same ship, the only external difference being the addition of a tricycle landing gear.

The Airacuda is probably the only fighter in the world that is not vulnerable at some point, for there are four machine guns covering the top, bottom, and sides. In addition, two 37mm. cannon are carried in the forward section of the engine nacelles to cover the front of the plane.

The fuselage is of all-metal construction with a transparent enclosure in the nose for the pilot. Metal sheet covering is riveted over the usual transverse frames and longitudinal stringers.

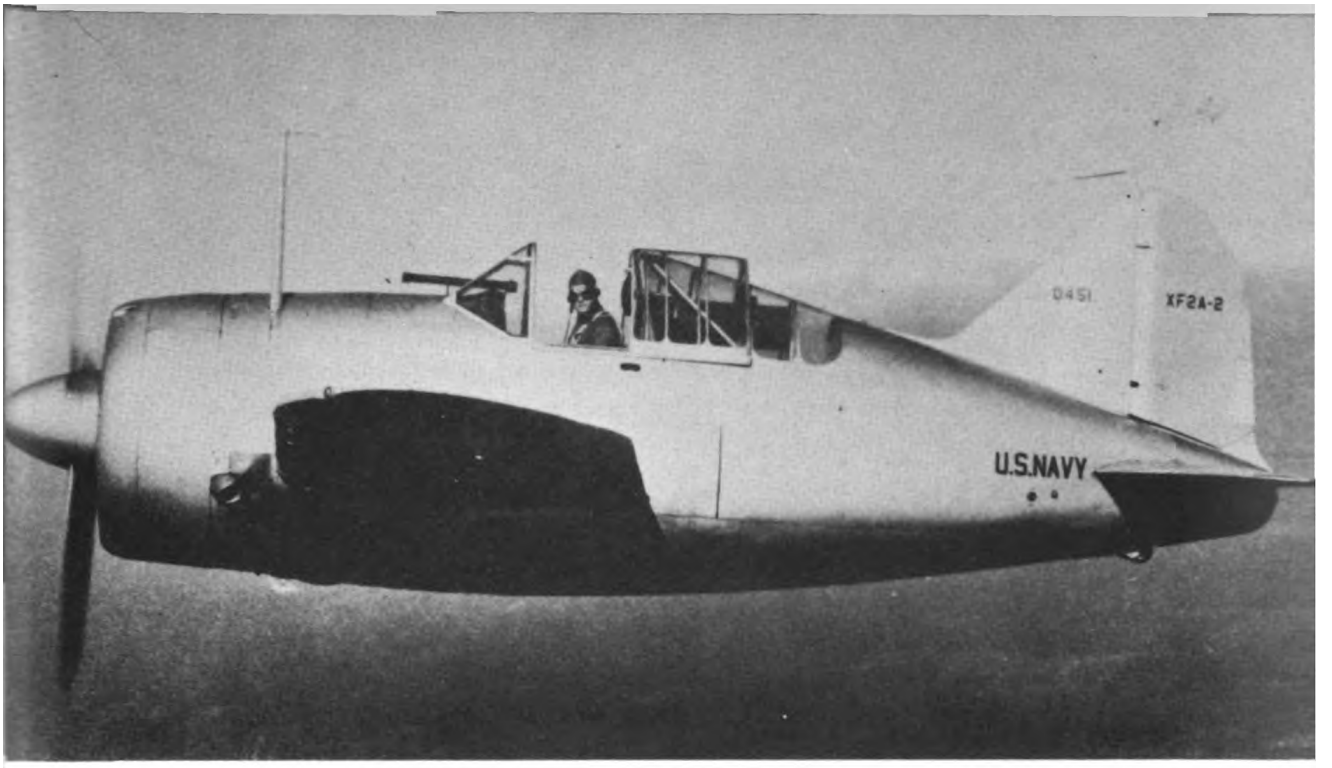
The wing is set in mid style and is fully cantilever. All three landing legs are fully retractable, the nose wheel folding up and back into the undersection of the fuselage nose. Flaps are all-metal, with metal sheet covering, and the ailerons are fabric covered metal structures.

Equipped with a tricycle landing gear, the Bell P-39 Airacobra has a top speed of 400 m.p.h. at 15,000 feet and a service ceiling of 36,000 feet. The engine is placed behind the pilot and the propeller is turned through the use of a long driveshaft. Six machine guns and one cannon provide the armament.

Wearing the Air Corps' new camouflage war paint, the Bell P-39 Airacobra looks like a vulture of death. The undercarriage is fully retractable; the nose wheel folds back into the fuselage and the main legs are flush with the wing undersection. Cruising speed is as high as the maximum speed of Britain's vaunted Hurricane.

Bell's Navy XFL-1 Airabonita is almost identical to the Army P-39 Airacobra. Main change is that the Navy version has the standard undercarriage. The engine is a liquid-cooled in-line Allison of 1,150 h.p. Placing of the power plant behind the pilot and over the wing is said to make for better handling qualities.

Only multi-seat fighter in service with the Air Corps is the Bell XFM-1A Airacuda. It accommodates a crew of from five to seven, is powered by two Allison engines set in pusher style, and has a top speed of approximately 300 m.p.h. Gunners in the forward section of the engine nacelles are provided with 37mm. cannon.



Standard shipboard Navy fighter is the Brewster F2A-2. The ship is replacing older biplane types. Two machine guns are synchronized to fire through the propeller arc and others are set in the wing panels. Powered by a Wright Cyclone engine of 1,000 h.p. at 13,250 feet, the top speed is 340 m.p.h. at 15,750 feet.

Power is supplied by two liquid-cooled in-line Allison pusher engines of 1,050 h.p. each at 2,600 r.p.m., giving a top speed of approximately 300 m.p.h. at best operating altitude.

Other data: Span, 70 feet; length, 47 feet 2½ inches; height, 12 feet 11 inches; wing area, 688 square feet; range, more than 3,000 miles at 150 m.p.h.; loaded weight, 17,500 pounds.

BREWSTER F2A-2

Present standard shipboard fighter of the Naval Air Service is this F2A-2. It is only the second ship that has been designed by the company, but it immediately became popular because of its versatility and ease of operation. In British service it is known as the Buffalo.

The fuselage is of all-metal semi-monocoque construction and is covered with stressed metal skin. The pilot sits high in the body and is housed-in by a transparent canopy. Additional panels in the floor of the cockpit provide excellent downward vision. Nor-

mal armament consists of two .50 caliber machine guns mounted on the engine cowl and two .30 caliber weapons set in the wing panels outside the propeller arc.

The wing is placed in mid position and is fully cantilever. Of all-metal construction, the wing itself is covered with metal sheet and the metal framed ailerons are fabric covered. The center section carries hydraulically-operated trailing edge flaps; these may also be actuated manually from the cockpit.

In the retractable landing gear used, the wheels fold up and in toward the belly of the fuselage. The undercarriage struts slip into open spaces in the undersection of the wing and the wheels are housed in special wells in the sides of the body. The tail wheel also retracts to further aid streamlining.

Power is supplied by an air-cooled radial Wright Cyclone of 1,000 h.p. at 13,250 feet, giving a top speed of 340 m.p.h. at 15,750 feet. Cruising speed is approximately 295 m.p.h., and landing speed with flaps extended is 69 m.p.h.

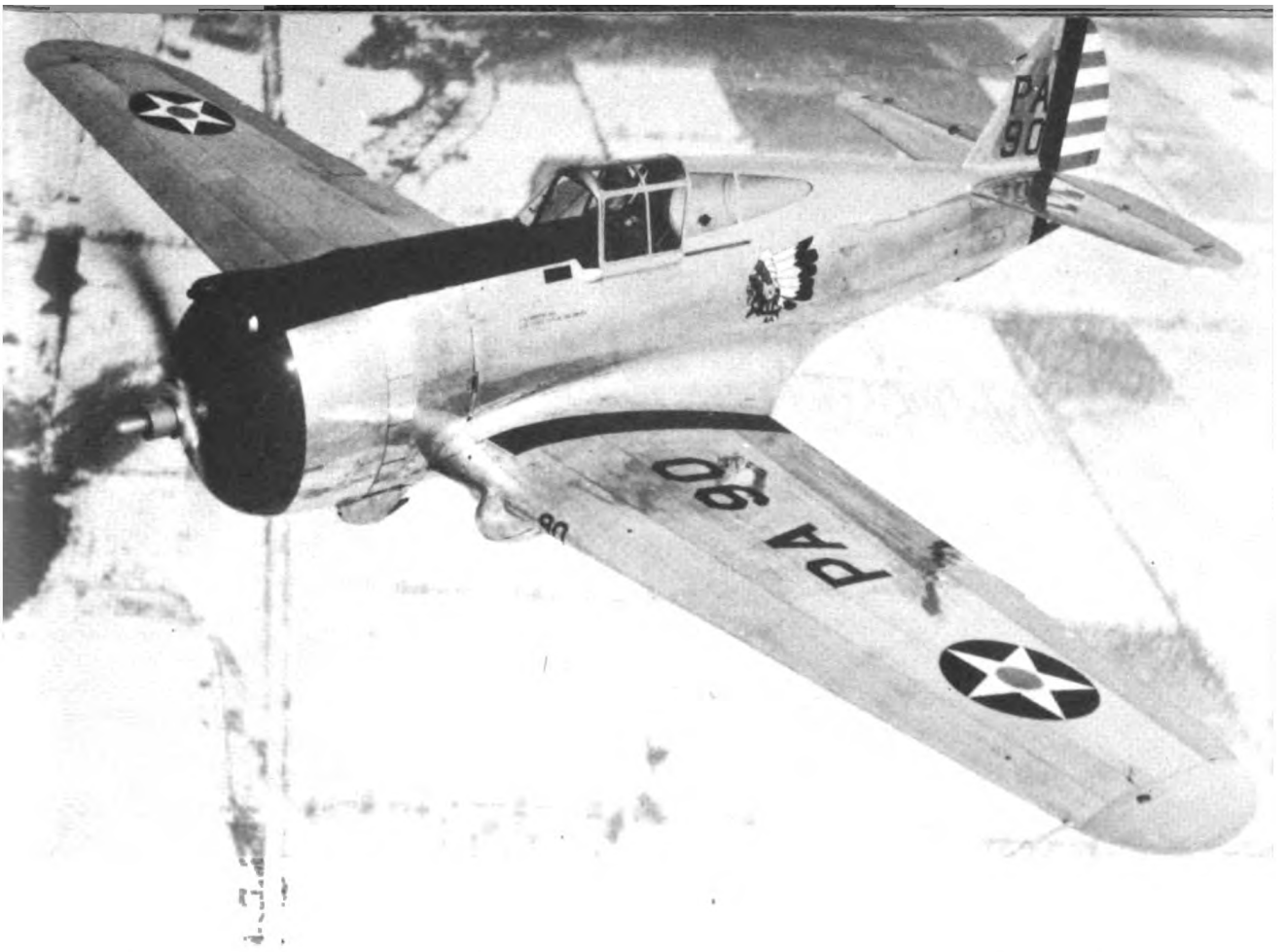
Other data: Span, 35 feet; length, 25 feet 7 inches; height, 11 feet 4½ inches; wing area, 209 square feet; range 1,500 miles; loaded weight, 5,806 pounds; ceiling, 34,500 feet.

CURTISS P-36A

Probably the most talked-about single-seat fighter ever produced in America is the P-36A. It was the standard Air Corps pursuit for many years and is now being replaced as first-line by other, more modern types. France contracted for a "large number" and later stated that they were the best fighter machines they had and were definitely superior to anything the Germans used against them.

The fuselage is of all-metal construction and is covered with metal sheet riveted to the formers and stringers. The pilot's cockpit is covered by a Plexiglas canopy, and the bulkhead forming the rear of the seat is armored to protect the flyer from bullets coming from the rear.

The cantilever low wing is of multi-spar structure with sheet metal covering. The wing tips are detachable and the outer panels are bolted to the center section, which is integral with the fuselage.



A close-up of one of the Air Corps' fast, maneuverable Curtiss P-36A fighters. Machines of this type, renamed Mohawk by Great Britain's R.A.F., have proved their mettle in European combat. Two machine guns are carried on most models, though some also have wing guns. Top speed is listed as 323 m.p.h. at 15,000 feet.

Camouflage makes the P-36A even more striking. The landing gear legs retract straight back into the wing undersection, the wheels turning to lie flat with the wing. The plane is of metal construction, with metal sheet covering.

The landing gear legs retract up and back into wells in the wing undersection.

The P-36A's which were still undelivered when France was defeated were turned over to England, and subsequent contracts also followed. They call the ship Mohawk and have it fitted with four wing guns of .30 caliber and two cowl guns of .50 caliber.

Power is supplied by an air-cooled radial Wright Cyclone engine of 1,200 h.p. at 2,500 r.p.m., giving a top speed of 323 m.p.h. at 15,000 feet. Cruising speed is 260 m.p.h., and landing speed with flaps extended is 68 m.p.h.

Other data: Span, 37 feet 3 inches; length, 28 feet 8 inches; height, 9 feet 5 inches; wing area, 236 square feet; range, 1,003 miles; loaded weight, 5,731 pounds; ceiling, 33,600 feet.

CURTISS P-40

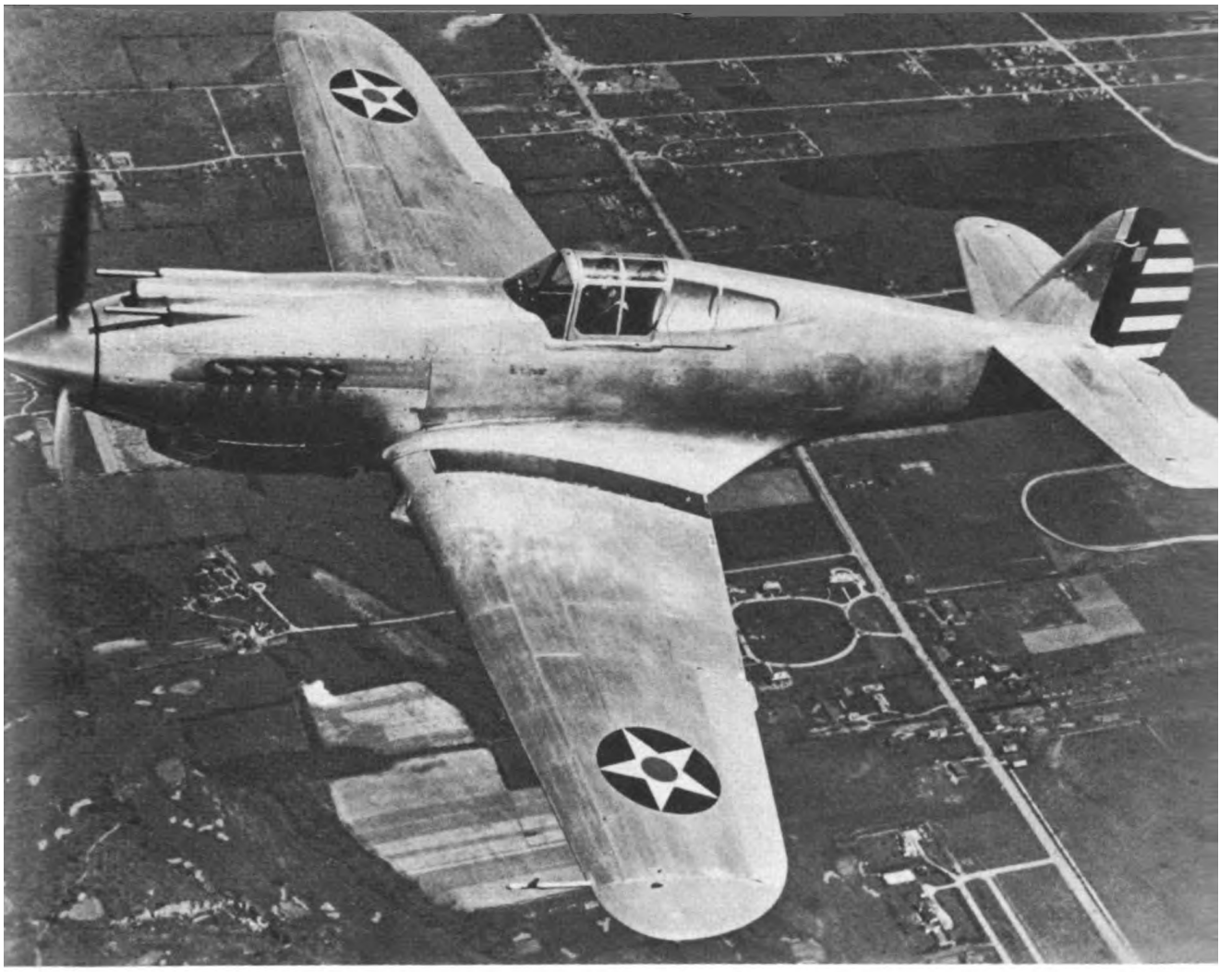
This ship is really nothing more than a further development of the P-36A, and the main external difference is the substitution of a liquid-cooled engine for the usual air-cooled power plant. This change, however, along with certain necessary internal alterations, apparently has made for a remarkable difference in handling qualities, for recently Lord Beaverbrook, Britain's former Minister of Aircraft Production, stated that the Tomahawk—as it is known in the R.A.F.—was "equal in speed and performance to any standard fighter in service with the Royal Air Force."

The fuselage is built-up on a framework of dural formers and longerons, with solid bulkheads behind the pilot and forward of the tail section. The movable tail controls are of metal structure with fabric covering.

The machine's wing is of full cantilever, all-metal aluminum alloy construction, covered with metal sheet. The wing is made in two panels which are joined at the center by a continuous bolt angle around the outer surface of the skin. The undercarriage legs are fully retractable, folding back and up into wells in the wing undersection.

Armament consists of two synchronized .50 caliber machine guns mounted on the engine cowl and four .30 caliber guns in the wing leading edge, two in each panel.

Power is supplied by a liquid-cooled in-line Allison engine of



The new Curtiss P-40 fighter is a single-seat low-wing monoplane capable of carrying out the most exacting pursuit missions. It has a range of more than 1,000 miles and a top speed of 360 m.p.h. Armament consists of two synchronized .50 caliber machine guns mounted on the engine cowl and four .30 caliber guns in the wing leading edge.

Similarity between the P-40 and P-36A can be seen from view. The main change is the substitution of a liquid-cooled in-line Allison engine for the usual air-cooled radial power plant. Note smooth nose streamlining achieved through use of a spinner.

1,000 h.p. at 2,950 r.p.m., giving a top speed of 360 m.p.h. at 16,000 feet. Cruising speed is 320 m.p.h., and landing speed is approximately 69 m.p.h.

(A later model, called P-40D, is now in production and is being delivered to the Air Corps in large quantities. It has also been sold to the Royal Air Force as the Kittyhawk.)

Other data: Span, 37 feet 3 inches; length, 28 feet 11 inches; height, 10 feet 6 inches; wing area, 236 square feet; range, more than 1,000 miles; loaded weight, 6,789 pounds; ceiling, more than 36,000 feet.

GRUMMAN F3F-3

Last of the biplane fighters ordered by the Naval Air Service, this machine was built in 1938. Since then, monoplanes have become standard equipment, and it's probably safe to say that biplanes are now a type of the past in the fighter classification.

Arranged in the usual Grumman style, the ship has an all-metal fuselage with metal sheet covering. The wings are of metal structure and are fabric faced, as are the control surfaces. The landing gear is fully retractable, and the legs fold up and into wells in the fuselage sides.

The cockpit is covered by a transparent canopy, and two synchronized machine guns are hidden in the engine cowl. These weapons are synchronized and fire through the propeller arc.

Power is supplied by an air-cooled radial Wright Cyclone engine of 750 h.p. at 2,100 r.p.m. at 15,200 feet, giving a top speed of 270 m.p.h. Cruising speed is 224 m.p.h., and landing speed is 67 m.p.h.

(Grumman biplane fighters, earlier than the F3F-3, which are still in service are the F2F-1, F2F-2, F3F-1, and F3F-2.)

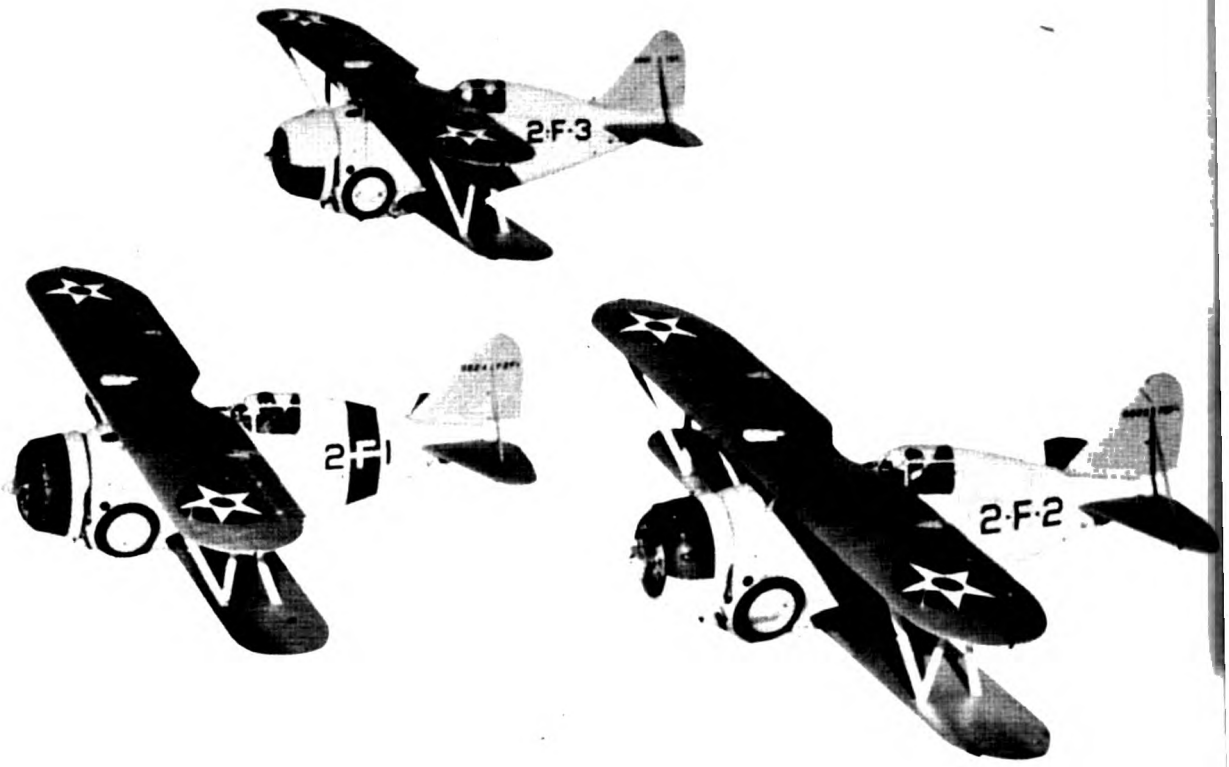
Other data: Span, 32 feet; length, 23 feet 3 inches; height, 8 feet 8¾ inches; wing area, 260 square feet; range, 720 miles at 190 m.p.h.; loaded weight, 4,553 pounds; ceiling, 32,000 feet.

GRUMMAN F4F-3

With the F4F-3—or Martlet, as the British call the ship in the Fleet Air Arm component of the R.A.F.—Grumman changed its entire policy of construction, for this is the first monoplane fighter

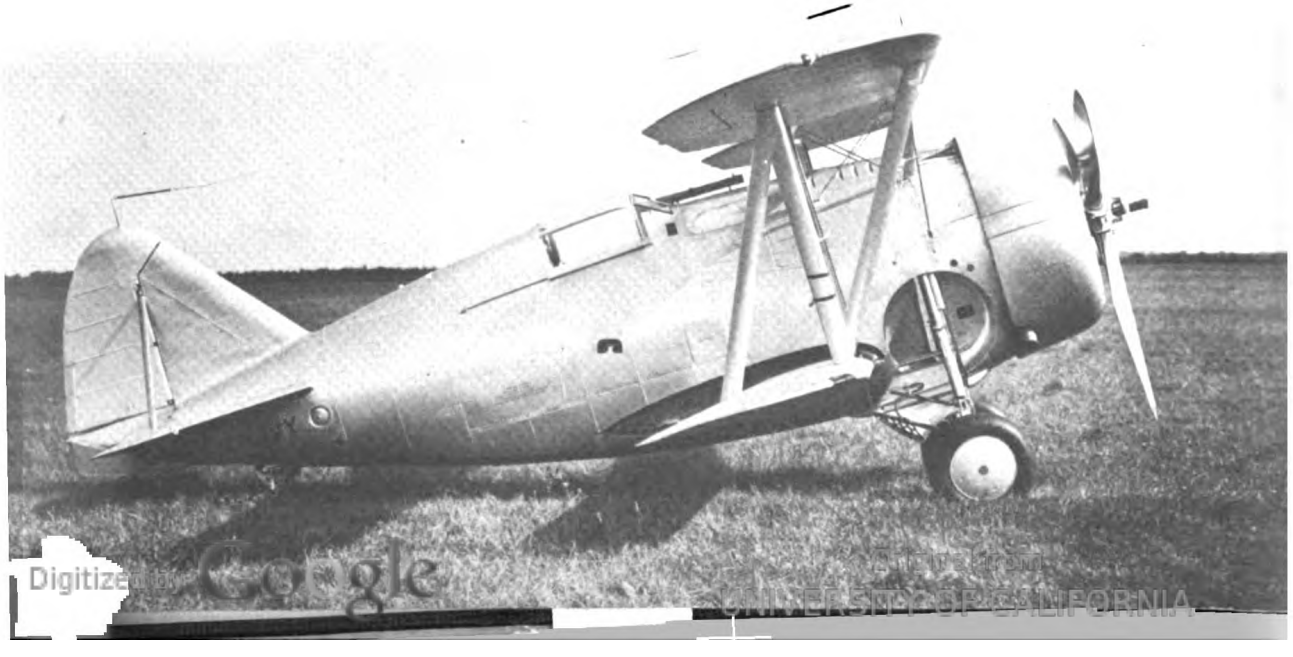
Mass output of Curtiss aircraft types, including P-40 fighters for the Air Corps and Tomahawks for the R.A.F., now averages a new all-time record of 10 planes daily. A section of the final assembly line is seen here.

Substantially similar to the P-40, this P-40D is merely a later and modified version. There is a larger air scoop under the engine to make for better cooling, and the pilot enclosure seems to give more visibility. Four fixed machine guns are set in the wing center section. As far as can be observed, there are no cowl weapons.



First single-seat fighter produced by Grumman Aircraft was the type F2F-1. It is powered by an air-cooled radial Pratt & Whitney twin-row Wasp Junior of 650 h.p. and has a maximum speed of 240 m.p.h. Although the ship is no longer first-line, it is still being used by the Naval Air Service.

Listed top speed of the Grumman F3F-3 Navy fighter is 270 m.p.h. with an air-cooled radial Wright Cyclone engine of 750 h.p. at 15,200 feet. This was the last biplane to be accepted by the Navy for combat duty. Fuselage is of all-metal construction. Landing gear legs retract.



Very few external changes over the F2F-1 are noticeable in the F3F-1 Grumman fighter. Like its predecessor, it uses the air-cooled radial Pratt & Whitney Twin Wasp Junior of 650 h.p. and top speed is also 240 m.p.h. The service ceiling and cruising range, however, were stepped-up considerably.

The first low-wing fighter produced by Grumman was the F4F-3. The plane is of all-metal construction and is covered with metal sheet. Power is supplied by an air-cooled radial Pratt & Whitney Wasp engine of 900 h.p. at 12,000 feet, giving a top speed of 320 m.p.h. The machine has also been purchased by the British for Fleet Air Arm duty. The R.A.F. name is Martlet.

they ever turned out. The F4F-3-type is now in quantity production for both the Naval Air Service and England.

The fuselage is of circular cross section tapering to a smooth oval near the aft end of the craft. It is of full monocoque construction, being built-up on conventional bulkheads of pressed flange and channel-section types; the entire framework is covered with metal sheet. The spar fittings are continuous through the width of the fuselage and are located at the mid-point of the body side elevation. Cutouts for observation windows are in the floor of the cockpit, offering a good downward view.

The wing panels are of the single-spar variety. Two small auxiliary spars, both front and aft, support the wing leading edge and aileron-flap combinations. The ailerons are small, fabric covered, and are located far out on the wing. The flaps are of the split trailing edge type and run the span of each wing panel from the aileron to a point near the fuselage bolting angle.

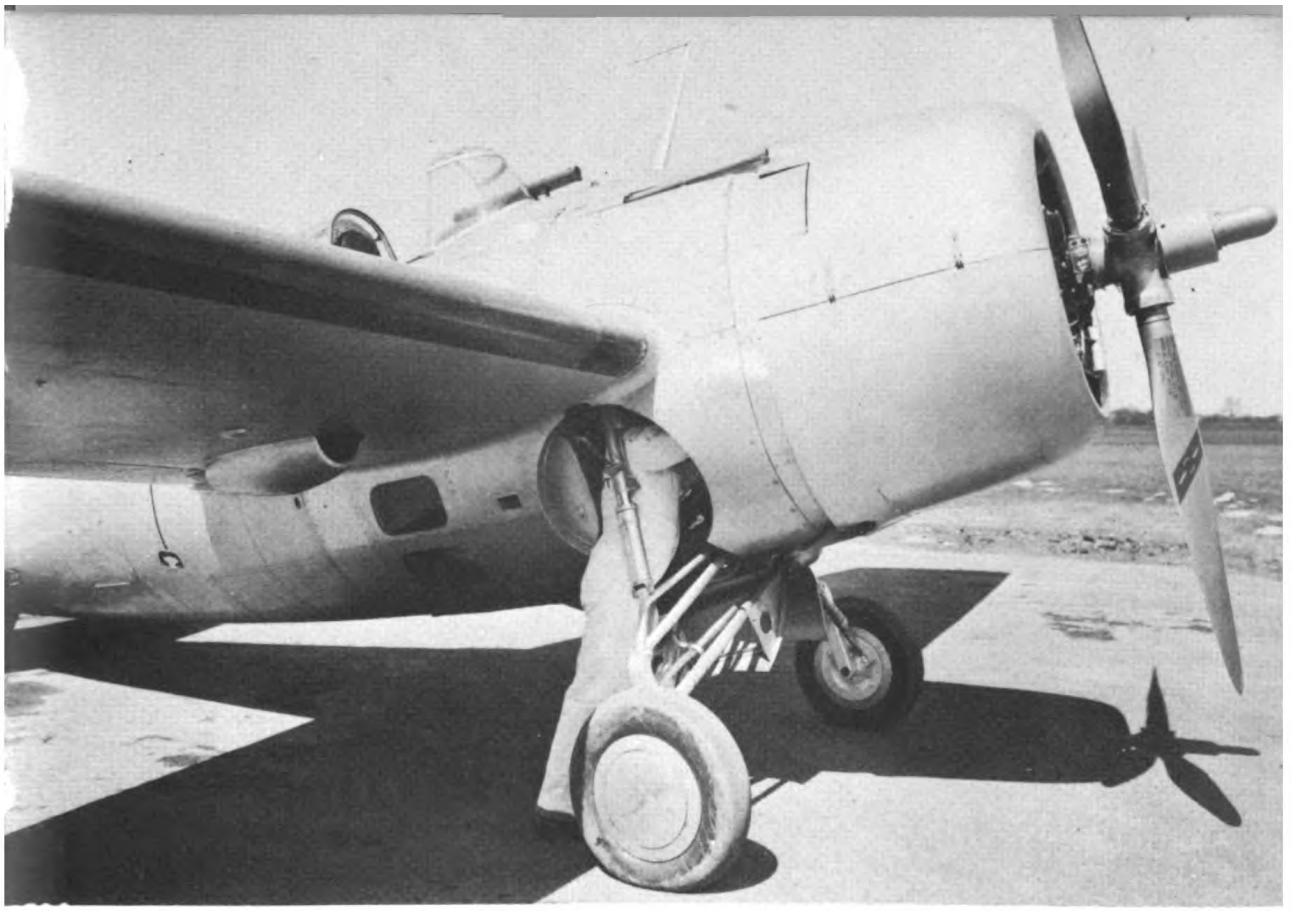
The single-seat cockpit is located high atop the fuselage and over the main wing spar. The windscreen is exceptionally high and provides excellent visibility. No details are available as to armament in Naval service, but those delivered to the British mount two synchronized machine guns and two free guns in each wing panel.

Power is supplied by an air-cooled radial Pratt & Whitney Wasp engine of 900 h.p. at 12,000 feet, giving a top speed of 320 m.p.h. Cruising speed is 287 m.p.h., and landing speed with flaps extended is 68 m.p.h.

Other data: Span, 38 feet; length, 28 feet 5 inches; height, 11 feet 10 inches; wing area, 260 square feet; range, 1,100 miles; loaded weight, 5,876 pounds; ceiling, 28,000 feet.

GRUMMAN XF5F-1 SKYROCKET

This is the first radial-powered twin-engined single-seater ever produced in the United States and is one of the most weird-appearing machines yet delivered for experimental purposes. None have as yet been ordered by the Naval Air Service, but it is said by unofficial sources that the British are interested in the machine and that it is possibly being constructed for R.A.F. service.



This close-up view of the Grumman Navy F4F-3 shows how the engine accessories may be reached through the wheel well. Note transparent panels in belly of the fuselage, giving the pilot a downward view. Height of the machine is 11 feet 10 inches. Machine guns are synchronized.

(Courtesy of *Aviation Magazine*)

Grumman went to the extreme in producing this completely unorthodox XF5F-1 fighter. Nothing even remotely similar had ever before been seen in the United States. A similar model is said to have been built for experimentation by the Air Corps. Top speed is rated at more than 400 m.p.h.

The fuselage is of conventional frame, longeron, and riveted skin construction and the wing is bolted to it at four points. The nose is rounded and extends almost to the wing leading edge, giving one the impression that a wingless fuselage rammed into a stray wing floating in the sky. The pilot sits high in the body and is housed-in by a Plexiglas covering. The bulkhead directly behind the cockpit has been extended to make for a crash protector which also acts as a head rest.

The single wing incorporates two parallel spars, running from tip to tip, and built-up metal ribs. The entire panel is covered with flush-riveted metal sheet, with the ailerons fabric covered. Flaps run the length of the wing undersection from the root to the aileron hinge.

Power is supplied by two air-cooled radial Wright Cyclone engines of 1,200 h.p. each at sea level, giving a top speed of more than 400 m.p.h. at 16,000 feet. Cruising speed is approximately 380 m.p.h., and landing speed with flaps extended is near 70 m.p.h.

Specifications awaiting release by the U.S. Navy Department.

LOCKHEED P-38

The P-38 was first made known to the American public on February 11, 1939, when it flashed across the country from California and cracked-up at Mitchel Field on Long Island. Lieut. Ben Kelsey, Air Corps test pilot, was at the controls during the flight. Since then, photographs of the craft have been published in practically all American newspapers and the plane has been much publicized. The British dubbed this ship the Lightning, and the original order was for 800.

The machine is an unorthodox airplane with a tricycle landing gear, twin engines, and a twin tail; a crew of one is carried. Fitted as a mid-wing monoplane, there is really no fuselage as such and the body is merely a nacelle of all-metal semi-monocoque construction with stressed skin covering.

The wing is in three sections, incorporating a single spar and built-up ribs. The outer panels are joined to the center section at a point slightly outboard of the engine mountings. Both flaps and ailerons are fitted. Twin booms carry the engines. These booms

Looking like a new kind of aerial monster, Lockheed's P-38 fighter bids fair to change the course of military plane construction. Engineers quietly estimate the top speed, under ideal conditions, at between 540 and 580 m.p.h. Listed maximum, however, is 404 m.p.h. at 16,000 feet.

Very little accurate information concerning North American's very secret XP-51 Air Corps fighter is available. Top speed is said to be "in excess" of 400 m.p.h. at best operating altitude. Power is supplied by a liquid-cooled in-line Allison engine. British version is known as the Mustang

are elongated and have the tail sections at their aft ends. The main landing gear legs retract into the engine nacelles.

All armament is carried in the nose. Mounts are provided for two .50 caliber Colt machine guns with 500 rounds of ammunition, two .30 caliber Colt machine guns with 1,000 rounds of ammunition, and one 23mm. Madsen cannon with 50 rounds of ammunition.

Power is supplied by two liquid-cooled in-line Allison engines of 1,090 h.p., giving a top speed of 404 m.p.h. at 16,000 feet. Cruising speed is 350 m.p.h. at 16,000 feet, and landing speed is approximately 72 m.p.h.

Other data: Span, 52 feet; length, 37 feet 10 inches; height, 9 feet 10 inches; wing area, 327 square feet; range, 1,070 miles; loaded weight, 13,500 pounds; ceiling, 30,000 feet.

NORTH AMERICAN XP-51

Of all Air Corps planes, this is the most hush-hush and the most difficult on which to obtain information. It is so secret, in fact, that the manufacturers were very wary in even releasing photographs. By some means, though, British periodicals were able to obtain data, and it is necessary to draw upon these sources for material. In R.A.F. service, the XP-51 is known as the Mustang.

The machine is arranged as a low-wing monoplane and is very similar in appearance to both the Curtiss P-40 and the British Supermarine Spitfire. The fuselage is built-up in the conventional manner, incorporating transverse frames and longitudinal stringers over which metal skin is attached. The cockpit is directly over the wing center section and appears to afford a very limited view downwards.

Like the fuselage, the wing is of metal structure and is covered with metal sheet. It is faired to the fuselage with a generous fillet. The landing gear is retractable, folding up and in.

Power is supplied by a liquid-cooled in-line Allison engine of 960 h.p. at 12,000 feet, giving a maximum speed of more than 400 m.p.h.

Other data: Span, 37 feet; length, 32 feet 3 inches; height, 8 feet 8 inches; wing area, 209 square feet; range, 640 miles; loaded weight, 7,708 miles; ceiling, more than 36,000 feet.

Of the Air Corps' "big four" standard single-seat fighters, the Republic P-43 Lancer is the only one fitted with an air-cooled engine. The ship is of all-metal construction and is probably one of the most intricate military machines in the world. Top speed is said to be 375 m.p.h.

Original prototype of the Republic P-43 Lancer is this Seversky P-35. A total of 85 of these craft were ordered for Air Corps service several years ago. Ship uses approximately 50 gallons of gasoline per hour and top speed is 315-plus m.p.h.

REPUBLIC P-43 LANCER

Republic airplanes are probably the most intricate military machines in the world. The fuselage has thirteen formers, all fashioned by hand from aluminum alloy sheet, which are joined by stringers and then covered with a skin of metal. The wing is the main item, though. There are five full-length spars in each section (the wing is made in two outer panels and one center section). These supports run through the ribs which, in some cases, are not more than six inches apart. The whole affair is covered with corrugated metal and then sheet skin. The gas tank is built integral with the wing.

The full-cantilever wing is fastened to the fuselage underside with scores of bolts, forming a union that could never come loose from flight strain. The landing gear folds up and in and may be operated either manually or by automatic control.

The most startling aspect of the Lancer is the instrument board —or instrument *boards*. There is a full total of seven of these panels in the cockpit, each covered with countless gadgets. And on top of that, there is a light switch panel on the left, with at least fifteen individual switches, a Pyrene fire extinguisher on the right and forward of the main instrument panel, and a compass on the floor between the pilot's legs. Major Alexander P. deSeversky, the designer of the original Republic type, is not only an engineer but is also a racing pilot and has seen war service. All this might have some direct bearing on the use of all these instruments. (The original prototype of the P-43 is the Seversky P-35, which is still in service.)

In Air Corps squadrons, the P-43 is fitted with two cowl guns and two wing guns.

Power is supplied by an air-cooled radial Pratt & Whitney engine of 1,200 h.p. at 23,000 feet, giving a top speed of 375 m.p.h. Cruising speed is 325 m.p.h., and landing speed with flaps extended is approximately 75 m.p.h.

Other data: Span, 36 feet; length, 28 feet 5¾ inches; height, 10 feet 2 inches: wing area, 224 square feet; range, 750 miles; loaded weight, 7,155 pounds; ceiling, more than 35,000 feet.

REPUBLIC XP-47B THUNDERBOLT

"Most effective military pursuit airplane yet produced anywhere in the world" is what Republic officials claim the XP-47B Thunderbolt to be. It is the first 2,000-h.p. single-seat fighter constructed for the Air Corps and is said to have the strong fire-power needed to attack enemy bombers and fighters.

The machine is of typical Republic design and is quite similar in general layout to the P-43 Lancer and the P-35. The fuselage is of semi-monocoque, all-metal construction, with metal sheet covering over transverse frames and longitudinal stringers. The pilot's pit is located over the wing, transparent panels providing excellent visibility to the top, sides, rear, and front. Below, however, the ship seems to be almost completely blind.

The wing is set in low-mid-wing position and is fully cantilever. Of multi-spar construction, the wing is covered with metal sheet. The undercarriage is retractable, the legs folding up and into wells in the wing undersection. Swinging doors come up to complete the streamlining. The tail wheel is also retractable in flight.

Performance figures and specifications awaiting release by the U.S. Army Air Corps.

Latest in the Republic line is the XP-47B. It is the first single-seat machine ever produced in the United States with a 2,000-h.p. engine. It took exactly eight months to construct the first experimental model.

VOUGHT-SIKORSKY F4U-1

Latest of all Naval Air Service fighters is the single-seat F4U-1, which is claimed to be one of the fastest military machines in the world.

The fuselage is monocoque and is of all-metal; spot welding is used instead of the usual rivets. The pilot's cockpit is covered. The fuselage turtle-deck blends smoothly with the aft of the cockpit, sloping down gently to the cantilever tail section. The inverted gull wing is cantilever and is built around a single spar. Ribs are of the pressed flange type and are divided at their center to allow attachment to the spar. The top and bottom surfaces of the spar are faced flat against the wing skin. The ailerons are of all-metal construction, fabric covered, and are balanced. Flaps are of the trailing edge type and are hydraulically-operated.

The undercarriage is of the fully retractable type, each unit being mounted at the lowest point of each gull at the junction of the center and outer wing panels. The tail wheel is also retractable and is hydraulically-operated to work in unison with the main undercarriage legs.

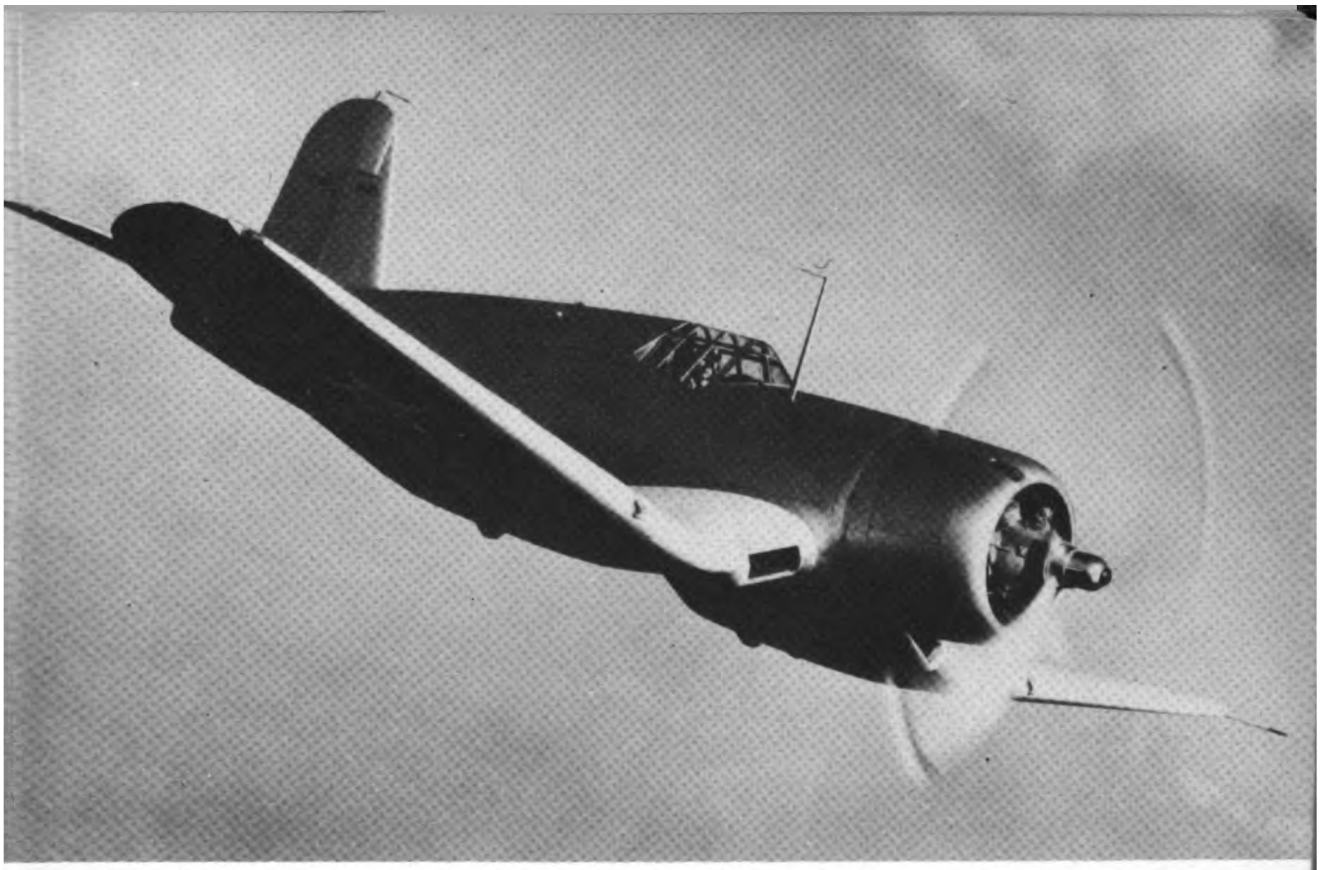
Power is supplied by an air-cooled radial Pratt & Whitney Double Wasp engine of 1,600 h.p. at 20,000 feet, giving a top speed of 366 m.p.h. at 16,500 feet. Cruising speed is 324 m.p.h.

Other data: Span, 40 feet; length, 31 feet 6 inches; range, more than 1,000 miles; loaded weight, 9,100 pounds.

VULTEE VANGUARD

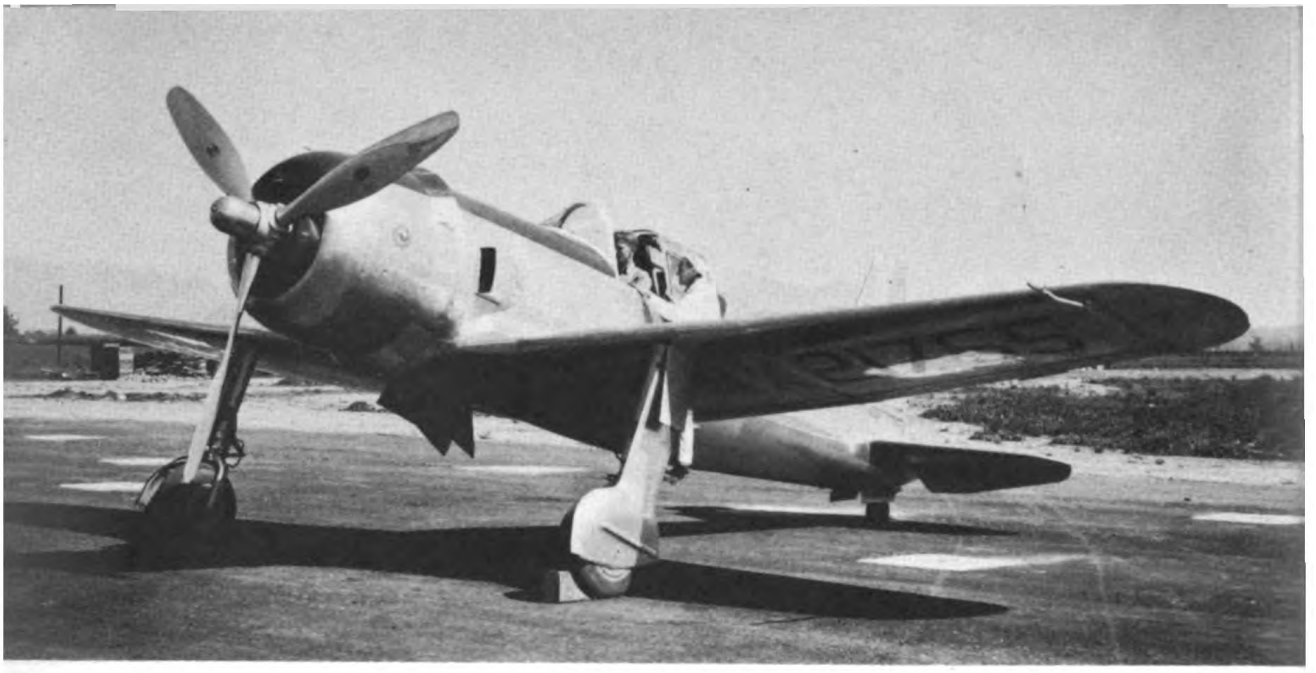
Widely recognized as one of the fastest, most maneuverable fighter airplanes in existence, the Vanguard is capable of unusually high performance and is designed to accommodate armament installations that equip it for use on either interceptor-pursuit or fighter missions. It is designed to permit easy and rapid maintenance, so that a minimum of time and effort is required to keep it in constant readiness for military use. The machine has not as yet been contracted for by either the Air Corps or Naval Air Service, but a substantial number has been ordered by the Royal Air Force.

The fuselage is of all-metal construction with metal sheet cov-



The Vought-Sikorsky F4U-1 is the U.S. Navy's latest shipboard fighter. Very little information concerning this plane is available, but it is reported to have a top speed of 366 m.p.h. at 16,500 feet. It may also be used for dive-bombing, carrying the bomb load beneath the fuselage.

Vultee's Vanguard has not been ordered by either the Air Corps or Naval Air Service, but it has been shipped in quantity to the Royal Air Force. Ten machine guns are mounted and the top speed is 350 m.p.h.



On the ground, the hugeness of the Vultee Vanguard is apparent. The height is 9 feet 5 inches. Fuselage panels are readily removable to give access to the interior of the ship if repairs are needed. Landing gear legs are completely retractable.

ering. Internal bracing is of both built-up bulkheads and welded chrome-molybdenum tubing. The entire forward section of the body has detachable inspection plates which may be easily removed to allow access to the interior of the ship.

The wing is of all-metal structure incorporating a single spar and built-up ribs covered with sheet metal. The center section is integral with the fuselage and the outer panels are bolted on at the butt joint. The undercarriage legs retract up and in, folding into recesses in the wing undersection.

The Vanguard is reported to be more heavily armed than any other American-built fighter. It is said to be fitted with ten guns —eight .30 caliber weapons in the wing leading edge and two .50 caliber machine guns on the engine cowl.

Power is supplied by an air-cooled radial Pratt & Whitney Twin Wasp engine of 1,200 h.p. at 2,700 r.p.m. at 4,900 feet, giving a top speed of 350 m.p.h. at 15,100 feet. Cruising speed is 299 m.p.h. at 16,000 feet, and landing speed with flaps extended is 77 m.p.h.

Other data: Span, 36 feet; length, 28 feet; height, 9 feet 5 inches; wing area, 197 square feet; range, 1,190 miles; loaded weight, 6,182 pounds; ceiling, 33,000 feet.

BRITISH

BLACKBURN ROC

The Roc's wing seems to be mounted too far back to give good balance, the landing gear legs, judged from the usual standard, are too close together, and the tail assembly appears to be all off whack. It is truly one of the most weird-looking machines in the R.A.F. However, the designers undoubtedly knew what they were doing, and the performance and record of this machine in the face of the enemy proves that beauty does not necessarily make the airplane. The Roc's predecessor, the Skua, is almost identical in design and construction and was the first monoplane to be adopted for use from British aircraft carriers.

Structurally a low-wing monoplane with folding undercarriage, the Roc has metal-stressed skin, folding wings for stowage aboard aircraft carriers, and a metal monocoque fuselage. The internal structure is entirely of metal.

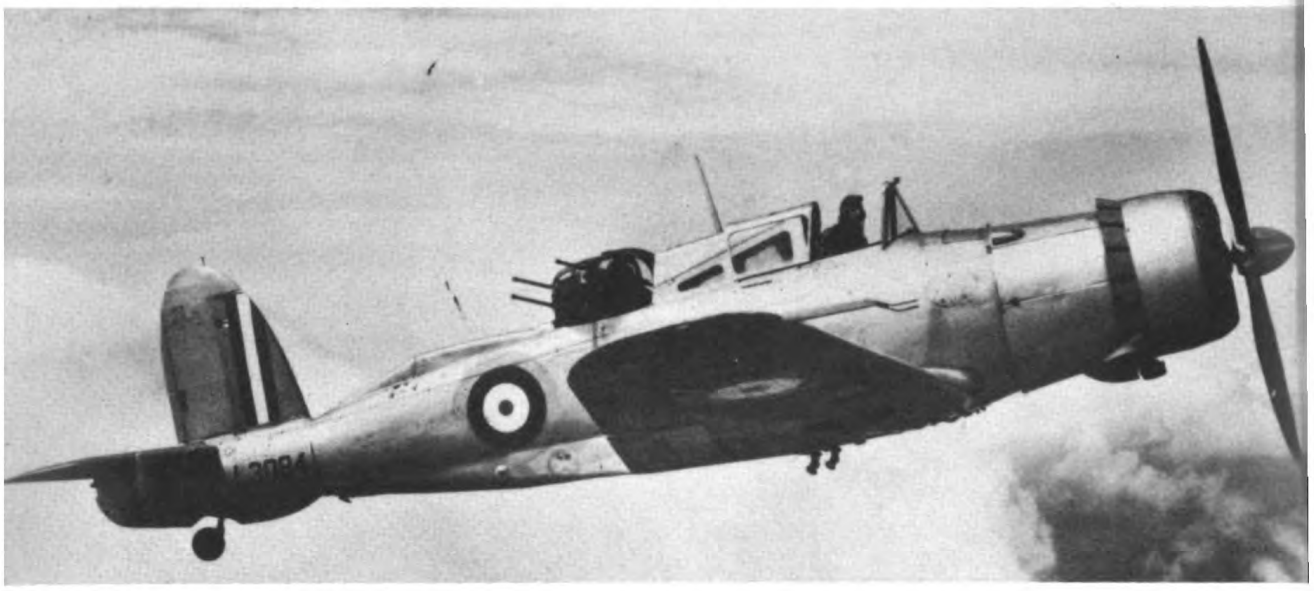
One good point in favor of this craft is its power-driven multi-gun Boulton Paul rear turret. Four .30 caliber machine guns are mounted in this turret, two on each side, which may be swung in a wide arc to cover the rear and sides from attack.

The pilot sits high in the nose, immediately behind the firewall and directly over the leading edge of the wing. He is protected from the slipstream by a near-vertical windscreen, which undoubtedly cuts down forward speed by several miles per hour. No machine guns are provided for the pilot.

The Roc is not a pure fighter, for it may also be utilized on dive-bombing missions. For work of this sort, bombs are slung beneath the wing panels on special racks; a larger and heavier bomb may also be carried under the fuselage.

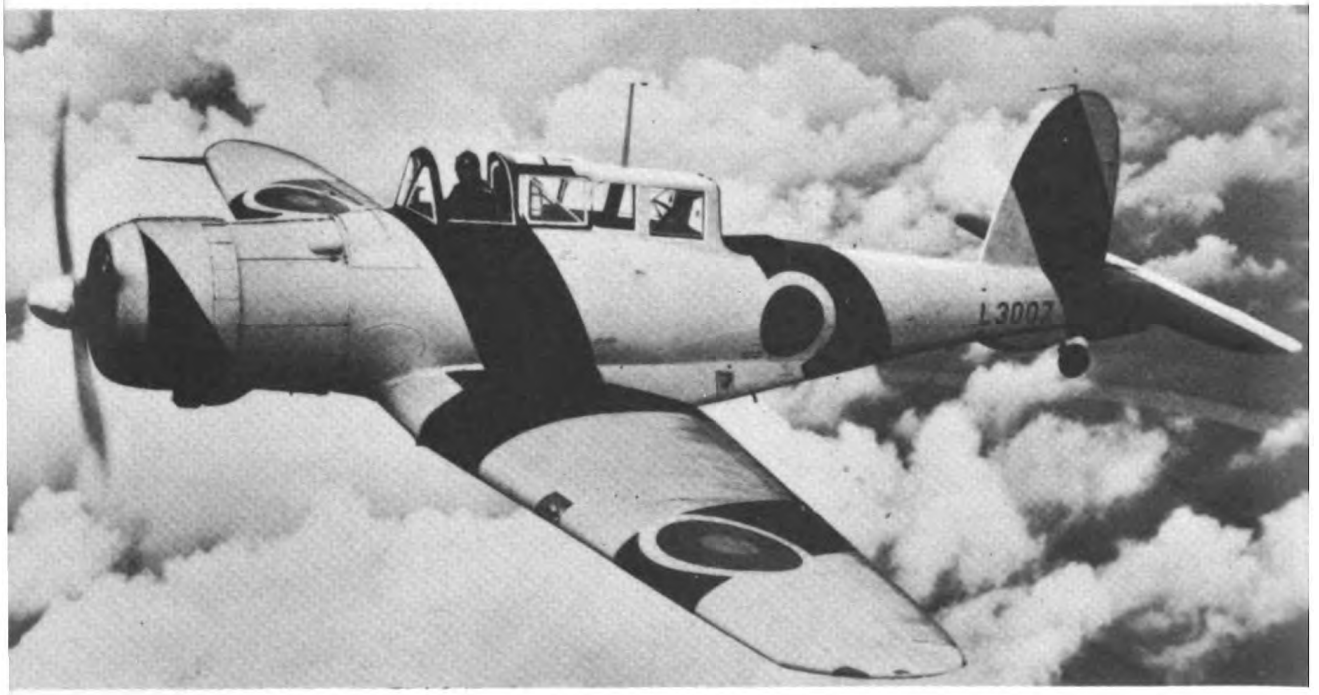
Power is supplied by a Bristol Perseus sleeve-valve air-cooled radial engine of 900 h.p., giving a top speed of 225 m.p.h. at 6,500 feet. Cruising speed is 187 m.p.h. at 15,000 feet, and landing speed is 62 m.p.h.

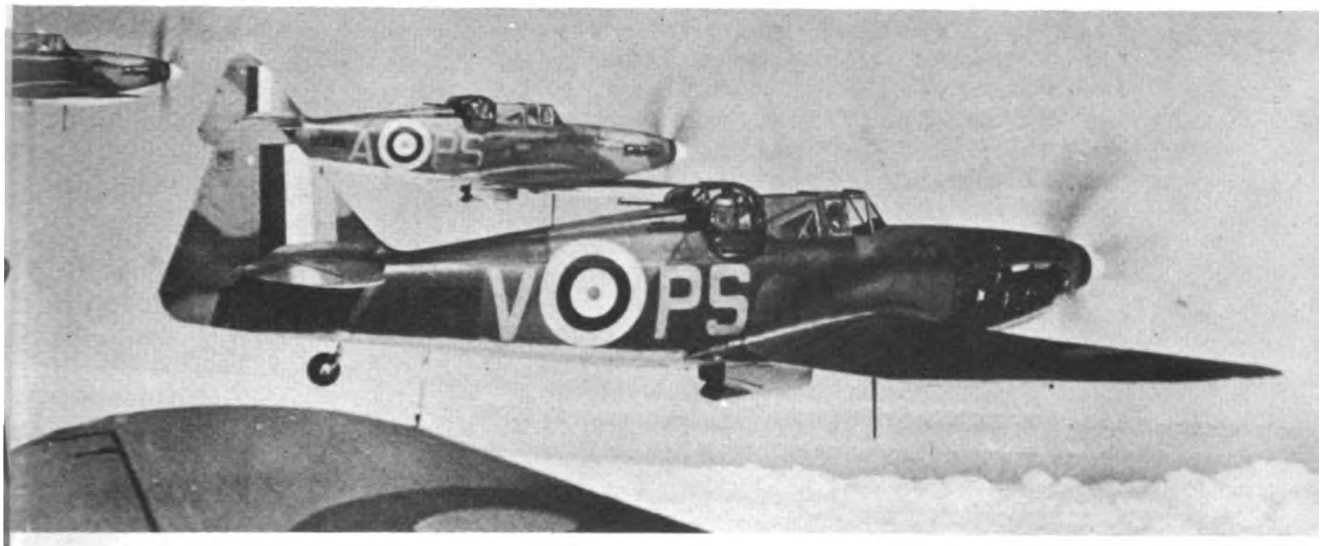
Other data: Span, 46 feet 2 inches; length, 35 feet 7 inches; height, 14 feet 2 inches; wing area, 312 square feet; loaded weight, 8,228 pounds; ceiling, 20,200 feet.



The Blackburn Roc Fleet Air Arm fighter packs plenty of punch and is a good machine to stay away from. Four .30 caliber machine guns are mounted in the rear power-operated turret; no guns are provided for the pilot. Power plant is an air-cooled Bristol Perseus of 900 h.p.

Looking quite similar to the Roc, the Blackburn Skua is used aboard aircraft carriers as a fighter and dive-bomber. It was the first monoplane to be adopted by the R.A.F. for these duties. Power is supplied by a Bristol Perseus engine of 905 h.p., giving a top speed of 225 m.p.h. at 6,500 feet.





Nazi raiders are frequently met above England by these powerful Boulton Paul Defiants. The original ship was built in 1938 as a night fighter. It was first used during the Norwegian campaign and did much to slow the German Panzerdivisions in that country. Four machine guns are mounted in the rear power-operated turret.

BOULTON PAUL DEFIANT

Few military airplanes have come into the picture to the tune of such carefully prepared ballyhoo as the Defiant, Britain's very hush-hush bi-place fighter. Newspaper accounts in this country have it that the Defiant carries 21 machine guns in all, 14 of them firing forward. All this, of course, is so much propwash. While the Defiant is a good ship, there's nothing so startling about it and it definitely does not carry anything like 21 machine guns—or even air rifles, for that matter. Also, instead of being produced in 1940, as is generally believed, the Defiant first came out in 1938!

The craft is a low-wing monoplane powered with the 1,050-h.p. Rolls-Royce Merlin liquid-cooled engine. It was designed for night fighting duties and convoy defense work in cooperation with bombers. In the Norwegian campaign, however, the Defiant was pressed into service as a day fighter and was forced to use special tactics because of its peculiar adaptability. No performance figures have been released.

The gunner has a power turret at his command, mounting four

machine guns—not seven—on a special bar attachment. These weapons are reported to be the Vickers-K type which are capable of a very high rate of fire.

The Defiant is constructed of aluminum alloy throughout. With the exception of movable control surfaces the plane is metal covered. The fuselage is built-up in the conventional manner on a framework of flanged formers and bulkheads with channel-type stringers. The covering is attached by flush riveting. The landing gear is completely retractable, folding up and in. After closing, small plates secured to the wheel fittings completely seal the undercarriage in position.

The pilot's cockpit is located immediately behind the engine firewall and directly over the leading edge of the wing. As stated previously, newspaper accounts have it that 14 guns are fixed to fire foreward, but according to official British sources *there is no armament provided for the pilot!*

Other data: Span, 39 feet 6 inches; length, 30 feet; height, 12 feet; wing area, 250 square feet.

BRISTOL BEAUFIGHTER

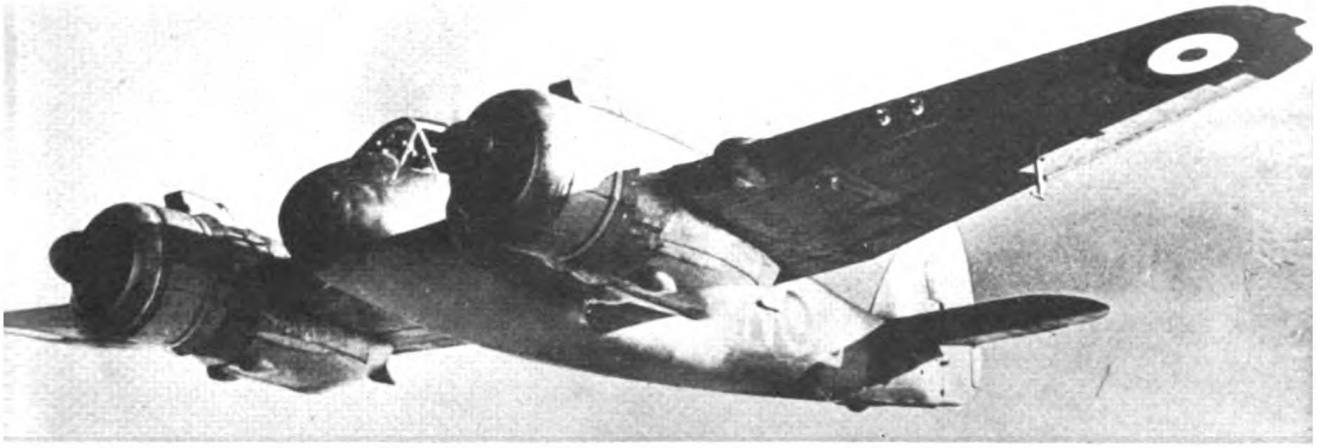
Latest multi-seat fighter to be produced in England is the Beaufighter, which seems to be somewhat of a cross between the Blenheim and Beaufort medium bomber types.

The machine is arranged as a three-seater and is of all-metal construction. The nose is blunt and extends just a very short distance in front of the wing leading edge. It is said that all armament is handled by the pilot and that his guns are grouped in the nose.

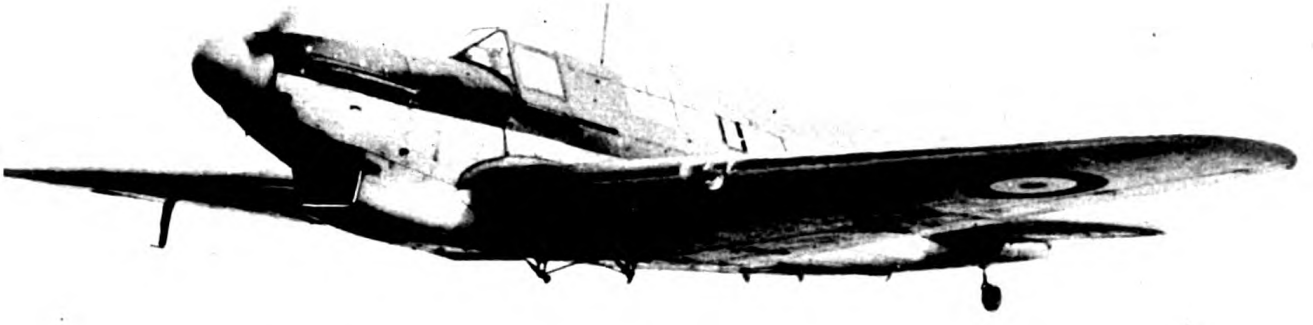
The wing is of the low-mid-wing design and is fully cantilever. It is probably built-up on two spars and has metal sheet covering. The ailerons are of metal structure with fabric covering.

Two engines are mounted on the wing. They are air-cooled radial Bristol Pegasus plants and probably develop about 815 h.p. each at 2,250 r.p.m. The undercarriage legs are retractable, folding back and up into the engine nacelles. Swinging doors complete the streamlining. The tail wheel is also retractable.

Performance figures and specifications awaiting release by the Royal Air Force.



The twin-engined Bristol Beaufighter, from the same company as the famous Blenheim and Beaufort medium bombers, is a high-speed and heavily-armed fighter monoplane suitable for use as a day or night interceptor. A crew of three is accommodated.



Lines of the Fairey Battle are very apparent in this new Fulmar Fleet Air Arm two-seat fighter. The pilot has full control of the eight .30 caliber machine guns mounted as armament. The engine is a Rolls-Royce Merlin of 1,145 h.p.

Even though the Gloster Gauntlet is an old machine and is approaching obsolescence, it is still being used successfully in Mediterranean operations. It is powered by a Bristol Mercury engine of 640 h.p. and has a top speed of 230 m.p.h. at 15,000 feet.

FAIREY FULMAR

This ship, which is the Fleet Air Arm's newest and fastest fighter, gives fair promise of adding still more fame to the already great reputation gained by the many types of Fairey military airplanes which have seen service with the British during the past twenty years. Within a few weeks after going into service late in 1940, it is claimed, the Fulmar had several confirmed victories to its credit, without loss.

The Fulmar has the characteristic Fairey lines in which one can trace the influence of the Fairey Fox—an airplane which started a new fashion. The Fulmar is, in fact, a direct development of the Fairey P. 4/34 of 1936, which was designed as a light bomber. The P. 4/34 was itself a smaller version of the Fairey Battle.

This latest ship in the Fairey line is a cantilever monoplane of all-metal construction with stressed-skin covering. It was modified from the P. 4/34 to make it suitable for Naval operations. The principal changes are the fitting of eight guns in the wing panels, making the wing sections to fold, providing catapult points, a deck arresting gear, and room for a dinghy to be stowed aft of the cockpit. The radiator tunnel has been extended forward, although the radiator itself is in much the same position.

The pilot flies the machine and fires the eight fixed Browning .30 caliber guns. The second man is a radio operator-observer. There is no backward armament, which makes the Fulmar actually a single-seat fighter carrying a passenger. Power is supplied by a liquid-cooled in-line Rolls-Royce Merlin engine of 1,145 h.p.

Performance figures and specifications awaiting release by the Royal Air Force.

GLOSTER GAUNTLET

This is probably one of the oldest fighting machines in the R.A.F.; the first model flew in 1933. But even with that against it, the Gauntlet lived up to its name excellently and did much to smash Mussolini's air force during the British offensive in North Africa.

The ship is arranged as an open cockpit biplane of composite construction. The fuselage forward section is of metal structure with sheet metal covering. The metal structure of round tube hoops and stringers at the rear has fabric covering. The pilot sits high in the cockpit under the top wing trailing edge cutout and is exposed almost entirely to the slipstream.

Two .30 caliber Vickers machine guns are carried on the fuselage sides and are synchronized to fire through the propeller arc. It is doubtful whether additional armament could be carried, because the wings would probably demand additional bracing to withstand the extra recoil.

All control wires are external and a set of parallel wires join the outer aileron sections. This ship is truly a rigger's nightmare and could be serviced correctly by only a skilled mechanic.

Power is supplied by an air-cooled radial Bristol Mercury engine of 640 h.p. at 2,400 r.p.m., giving a top speed of 230 m.p.h. at 15,000 feet. Cruising speed is 200 m.p.h., and stalling speed is 59 m.p.h.

Other data: Span, 32 feet 10 inches; length, 26 feet 2 inches; height, 10 feet 2 inches; wing area, 315 square feet; loaded weight, 4,050 pounds; ceiling, 33,500 feet.

GLOSTER GLADIATOR

Thirteen squadrons of Gladiators saw action in France before the Germans invaded Belgium and subsequently went on to defeat the French. The ship was also used by the Finns against the Russians, was employed against the Germans in Norway and the Italians in Africa. Still later, it saw service against the Nazi hordes which swept down through the Balkans. During all these campaigns the Gladiator did much more than merely hold its own against superior forces. Quite a record for an old-timer of 1935 vintage!

The fuselage is of all-metal structure, fabric covered. Ailerons are carried on both upper and lower wing surfaces. The equal-span wings are of metal construction and are fabric covered. The top wing center section is mounted above the fuselage by four splayed-out struts; a pair of parallel struts brace the wings interplane. The landing gear legs are not retractable.

The Gladiator is listed as a single-seat multi-gun fighter. Two guns are mounted in troughs low in the sides of the fuselage, and four additional weapons are in the wings. Also, the ship carries day and night flying equipment, oxygen, and a two-way radio.

Power is supplied by an air-cooled radial Bristol Mercury engine of 795/825 h.p., giving a top speed of 255 m.p.h. at 15,000 feet. Cruising speed is 210 m.p.h., and landing speed is 61 m.p.h.

Other data: Span, 32 feet 3 inches; length, 27 feet 5 inches; height, 10 feet 4 inches; wing area, 323 square feet; range, 420 miles at 210 m.p.h.; loaded weight, 4,800 pounds; ceiling, 32,800 feet.

HAWKER NIMROD

Here is a machine that has been practically unheard of during this war. It is in service with the Fleet Air Arm of the Royal Air Force, flying off aircraft carriers, and is also used in the Near East.

The Nimrod is not what one would ordinarily call a modern ship, for it does not have the general lines of a so-called first-line airplane. However, it is exceedingly clean in design and is very eye-pleasing. It was first flown about 1935.

The fuselage is of metal structure and is faired with metal forward and fabric at the rear. The elevated open cockpit is located behind the center section of the top wing. The fuselage slopes away gently forward of the cockpit, and the pilot has very good visibility to all sides. Armament consists of two synchronized .30 caliber machine guns located in troughs in the fuselage top. The biplane wings are staggered and are of composite structure. The spars are spruce and the ribs are metal, fabric covered. The top wing center section is attached to the fuselage by splayed-out parallel struts, and the wings are braced interplane by "N"-struts and landing and flying wires. The undercarriage is fixed.

Power is supplied by a liquid-cooled in-line Rolls-Royce Kestrel engine of 550 h.p. at 2,500 r.p.m. at 11,000 feet, giving a top speed of 181 m.p.h. at 13,120 feet. Cruising speed is 160 m.p.h., and landing speed is approximately 60 m.p.h.

Other data: Span, 33 feet 6¼ inches; length, 27 feet; height, 10 feet; wing area, 298 square feet; range, approximately 380 miles; loaded weight, 4,042 pounds; ceiling, 26,000 feet.

The Gloster Gladiator really lived up to its name in combat against Field Marshal Hermann Goering's Luftwaffe in France. It was also used extensively in Libya and Greece. Note sliding hatch over cockpit.

Hawker's single-seat Nimrod fighter is powered by a Rolls-Royce Kestrel engine of 550 h.p. at 2,500 r.p.m. at 11,000 feet. The top speed is 181 m.p.h. at 13,120 feet. Two machine guns are mounted.

HAWKER OSPREY

Like the Nimrod, the Osprey is also in use by the Fleet Air Arm. It is to be found mostly aboard aircraft carriers and as a catapult craft for use off cruisers and battleships. In the latter capacity, it is fitted with floats instead of wheels.

Arranged as a two-seat biplane, the fuselage is of metal tubing and is fabric covered aft of the front cockpit; forward the body is faced with metal panels. The cockpits are open and are set in tandem. The pilot has two synchronized .30 caliber machine guns placed low on the fuselage sides, and the observer-gunner has either one or two weapons on a manually-operated swivel mount.

The biplane wings are of metal structure and are fabric covered. Small slots are on the leading edge of the upper wing. The upper wing center section is braced to the fuselage by splayed-out parallel struts and the outer panels are braced interplane by "N"-struts and landing and flying wires. The undercarriage is fixed.

Power is supplied by a liquid-cooled in-line Rolls-Royce engine of 600 h.p. at 2,500 r.p.m. at 11,000 feet, giving a top speed of 173 m.p.h. at 16,400 feet. Cruising speed is 152 m.p.h., and landing speed is near 60 m.p.h.

Other data: Span, 37 feet; length, 29 feet 4 inches; height, 11 feet; wing area, 339 square feet; range, 400 m.p.h.; loaded weight, 4,790 pounds; ceiling, 25,000 feet.

HAWKER HURRICANE

The Hawker Hurricane is one of the two fighters that are mentioned daily in newspaper accounts concerning R.A.F. action. And the pride a loyal Englishman holds for the potent Hurricane is second to none, for in combat it has been proven that this machine is better for air fighting than anything the Germans have yet been able to produce. Further, it has been demonstrated that the Hurricane is not limited to the 335 m.p.h. usually claimed for it, for on a 327-mile ferrying hop from Edinburgh to Northolt a Hurricane averaged 407 m.p.h., covering the distance in 48 minutes.

Used mostly aboard aircraft carriers, cruisers, and battleships in conjunction with the Fleet Air Arm, the Hawker Osprey is a two-seat fighter. Upon occasions it is also used for fleet spotting and reconnaissance.

Probably the most famous of all R.A.F. fighters is the Hawker Hurricane. It has a maximum speed of 335 m.p.h. at 18,500 feet and carries eight Browning machine guns in the wing leading edge. This gives a fire-power of 9,600 rounds per minute.

Steel and dural are used in the fuselage construction. The longerons, between which the struts run in zigzag fashion in the vertical plane and transversely in the horizontal plane, are of circular section tube. A secondary section of wood carries the fabric covering, which extends from the rudder post to about the level of the pilot's seat. In front of this point the covering is in the form of light metal panels which continue the smooth curves of the cowling.

The cantilever low wing is constructed in an ingenious adaptation of old methods to new requirements. In a general way, the spars resemble those of the earlier Hawker biplanes—that is, they have bulbous steel booms at the top and bottom and a center web of flat sheet. In the wing center section, which is a single unit extending about three feet on each side of the fuselage, the web is solid and stiffened and riveted on vertical channels. Both fabric and metal covering is used on the wings. The landing gear is fully retractable.

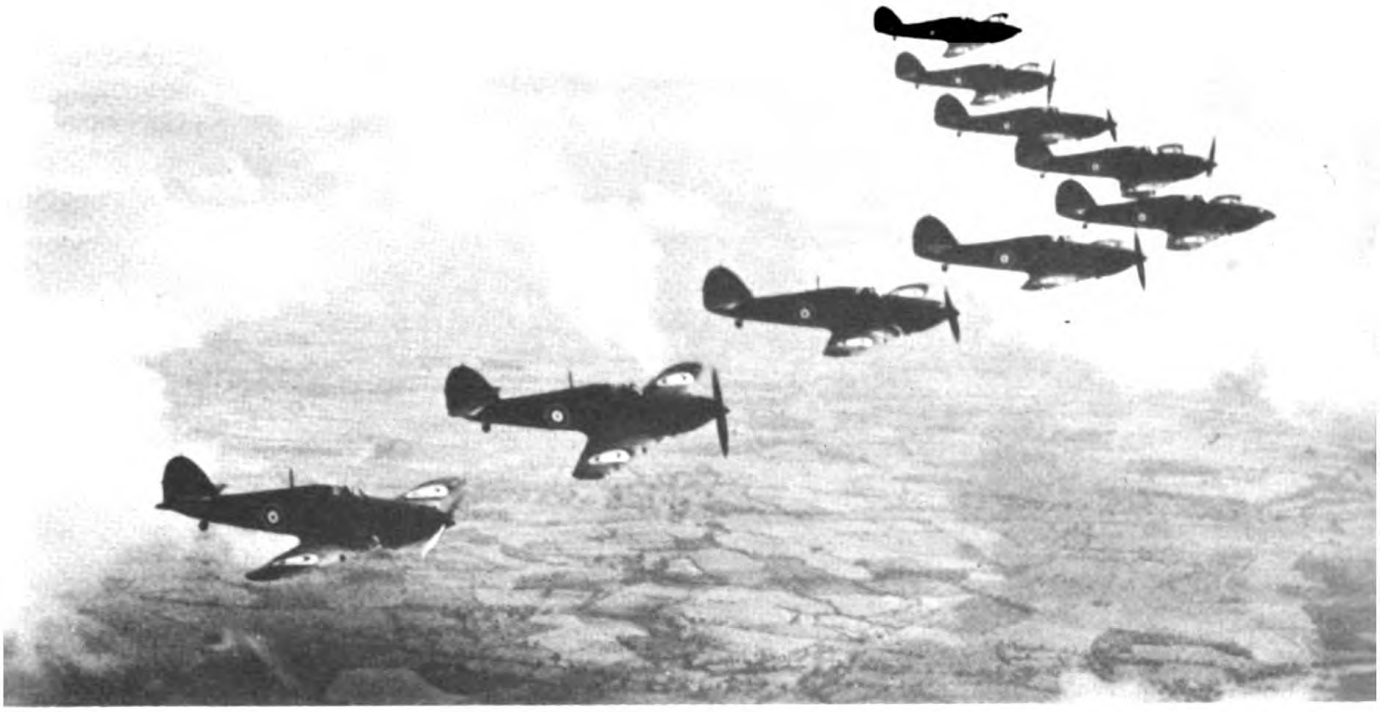
Hydraulically-operated split trailing edge flaps are fitted on the inner section of the wing, near the fuselage. The ailerons have their controls internally, as do the elevators and rudder, and are fabric covered.

A Rolls-Royce Merlin 12-cylinder liquid-cooled engine is mounted on a simple steel tube engine mount, the radiator for which is placed well aft of the fuselage near the wing trailing edge. The power plant is rated at 1,030 h.p. at 3,000 r.p.m. at 12,250 feet. Although the first Hurricanes, built in 1935, had two-bladed fixed-pitch propellers, all current machines are fitted with three-bladed variable-pitch types.

Armament consists of eight American Browning machine guns placed in the leading edge of the wing, four in each panel. Full day and night fighting equipment is carried, which includes blind flying instruments, oxygen, flares, and a two-way short wave radio.

The Hurricane is Britain's first-line and stock fighter. While it is not as fast as some other types in service, and quite heavier than many, it handles beautifully and is one of the most maneuverable low-wing monoplanes in the world.

Other data: Span, 40 feet; length, 31 feet 5 inches; height, 13



"Somewhere over England," a flight of Hurricanes heads forth to meet enemy machines crossing the Channel. From above, the shadow-shading camouflage used makes the Hurricanes virtually invisible. British pilots fondly call them the "Hurry Boxes."

The most speedy fighter in service with the R.A.F. is the Supermarine Spitfire. It has a top speed of 367 m.p.h. and, like the Hurricane, mounts eight .30 caliber machine guns in the wing. Construction is metal.

feet 3 inches; wing area, 258 square feet; range, 850 miles; loaded weight, 6,380 pounds; ceiling, 34,000 feet.

SUPERMARINE SPITFIRE

Invariably spoken of in the same breath as the Hurricane, this ship, though similar in appearance, is actually quite different from the Hurricane and is used for other purposes. While the Hurricane is a dyed-in-the-wool fighter, the Spitfire is more of the interceptor type. It is lighter, carries less fuel, and in performance differs greatly from the Hurricane.

It is evident from an external study of the Spitfire that advantage has been taken of pioneer work done by the Supermarine Company in the design and construction of seaplanes from the Schneider Cup Races of a few years ago. The lines are exceptionally graceful, and it is claimed that the technique utilized in construction, which is of the stressed-skin variety, gives extra stiffness to the wings and fuselage for a structure never before attained in this class of craft.

The fuselage is of all-metal construction built-up from transverse frames with longitudinals intercostal except for four main longerons. The skin is flush riveted. The enclosed cockpit is slightly forward of the wing trailing edge, and the rear portion of the canopy fairs cleanly with the fuselage lines.

The wing is of light alloy construction and has a single spar comprising tubular flanges and a plate web. Forward of the spar, the wing is covered with heavy-gauge light alloy sheet which forms with the spar web a stiff, strong torsion box. Split trailing edge flaps are on the inboard wing section, and fabric covered ailerons on the outer portions.

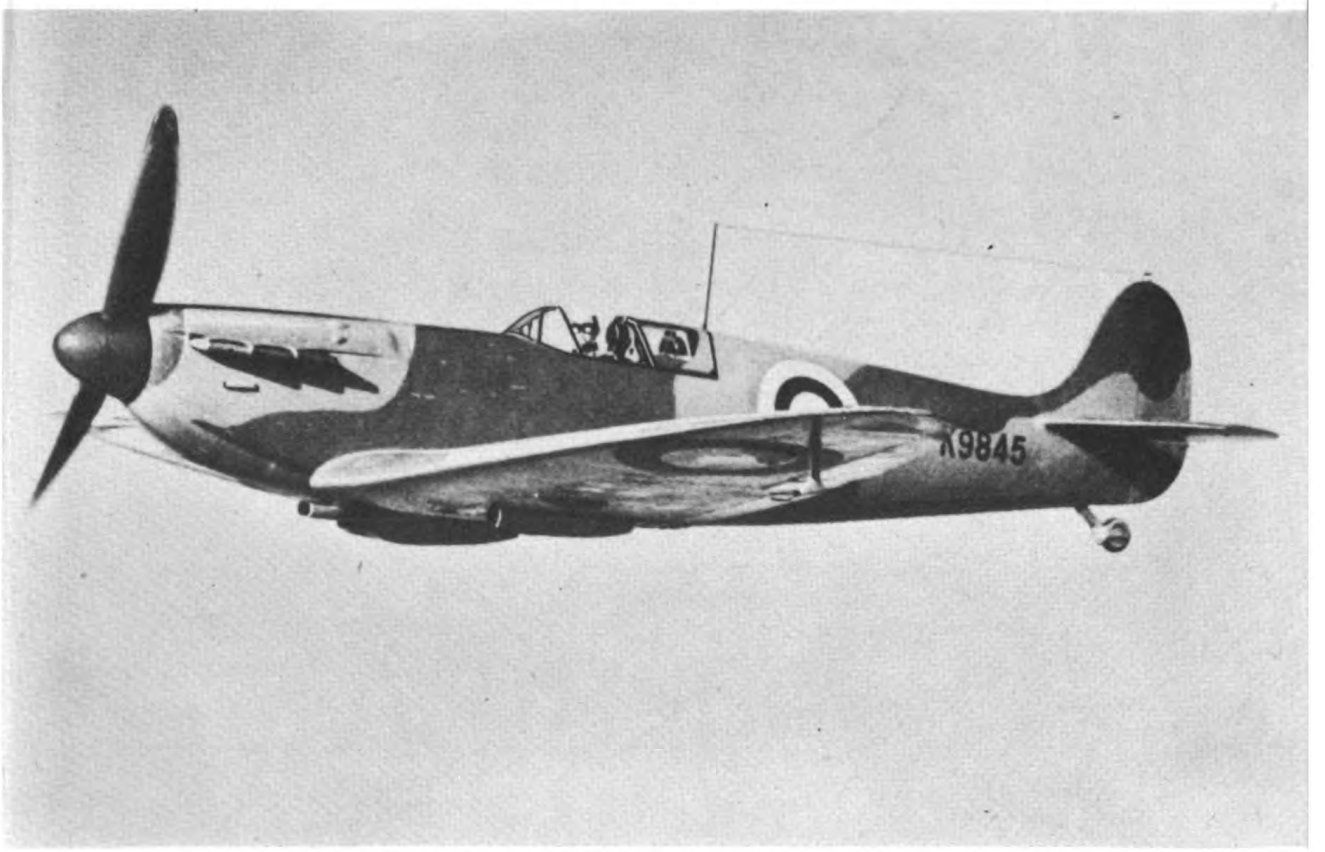
Like the Hurricane, eight .30 caliber Browning machine guns are carried in the leading edge of the wing, four in each panel. The weapons are spaced wide to get as great a blanket of fire as possible.

Spitfire successes in the war have been too numerous to mention. Squadron Leader Farquhar, D.F.C., of the Auxiliary Air Force, shot down the first raider to fall on British soil. That was on October 28th, 1939. The type came into large-scale use at Dunkerque, and took a large part in the record air battle in which

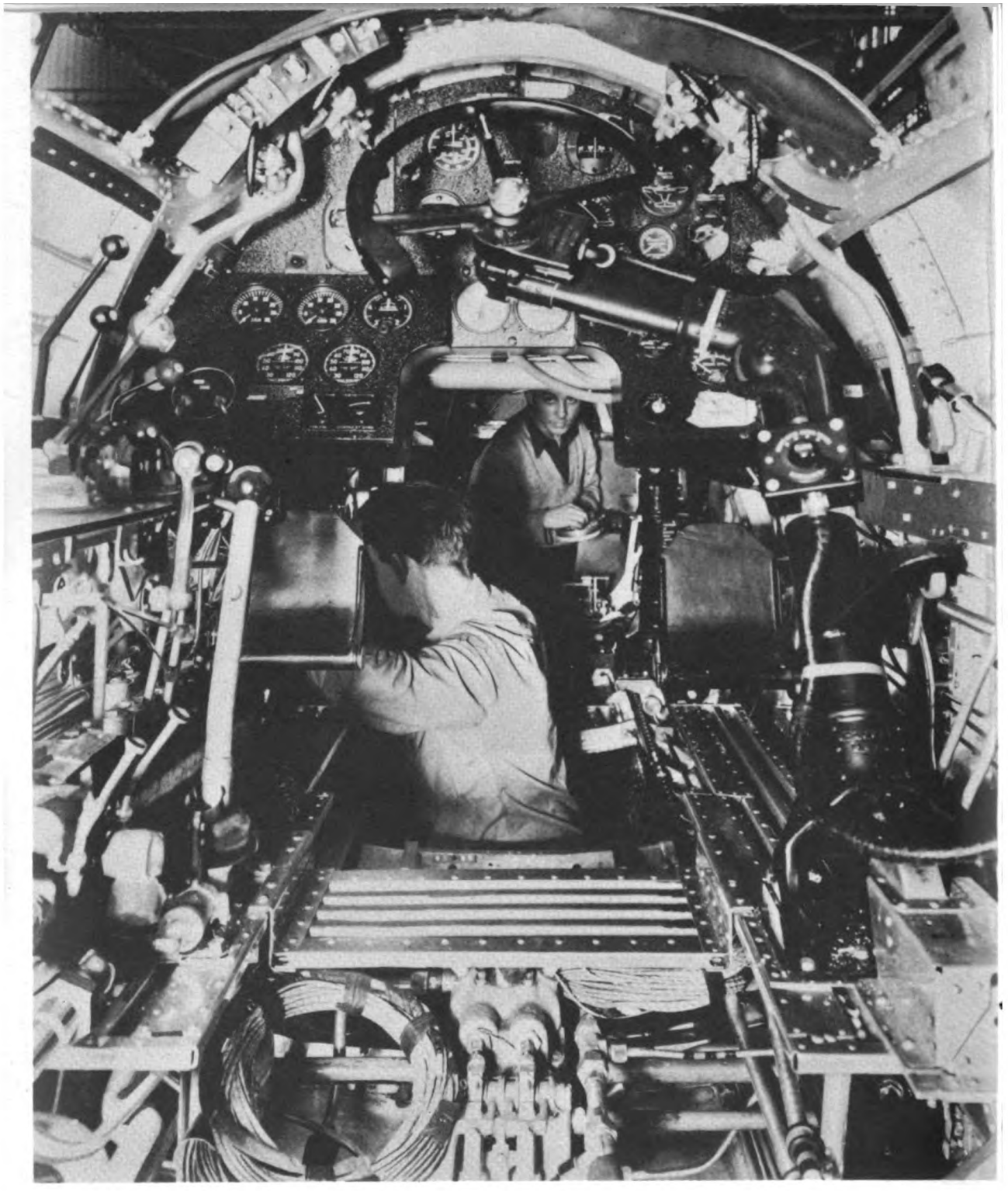
some 200 enemy raiders were brought down in a single day of September, 1940.

The engine is a 12-cylinder liquid-cooled Rolls-Royce Merlin of 1,030 h.p., giving a top speed of 367 m.p.h. Cruising speed is 340 m.p.h., and landing speed is approximately 70 m.p.h.

Other data: Span, 36 feet 10 inches; length, 29 feet 11 inches; height, 11 feet 5 inches; wing area, 242 square feet; loaded weight, 5,850 pounds.



Close-up of the Spitfire. Note the smooth streamlining, the bulge in the cockpit housing to give the pilot head room, and the antenna mast behind the cockpit. The undercarriage legs retract flush with the wing undersection.



You are looking into the cockpit of an American Martin Maryland bomber as workmen install the dozens of instruments that will spell "flight security" to pilot and crew. Multiply this scene several thousand times, and you will have some idea of the task confronting aeronautical instrument makers who are working day and night to fulfill their part of the growing defense program.

CHAPTER 2

LIGHT AND MEDIUM BOMBERS

ALTHOUGH the bombing airplane is frequently likened to a long-range piece of artillery, it must be borne in mind that a big shell, once it leaves the muzzle of a gun, is impersonal, invulnerable, and inevitable, whereas the bomber is guided by human hands, can be destroyed, recalled, or redirected. Also, it is dependent for success on weather, the preparedness and efficiency of enemy defenses, and the skill of the bomb-aimer.

While fighter planes, in a sense, might at times be referred to as defensive machines, since their purpose upon occasions is to protect home territory from raiders, the bomber can never be anything except an offensive craft. The prime purpose of this type is to carry the war to the enemy, to strike at his communications and supply lines, troop concentrations, ammunition dumps, fortifications, and home areas. The bomber's job is to stop the enemy ground troops before they get started, to demoralize citizens and workers to hold up production, and to make the war thoroughly distasteful to non-combatants. This plan worked very effectively against Poland, Belgium, The Netherlands, and France, and roads were so clogged with refugees that troops and supplies were not able to get through to stop the German war machine. Against Britain, however, no such success has been realized and the only area to be evacuated to any extent was Plymouth.

Bombing aircraft have been categorized as night and day machines and later as light, medium, and heavy types, depending upon the load carried. Light and medium bombers, ordinarily, come under the day heading, for they are usually faster and more evasive than the big, lumbering night machines. In the United States this classification is carried even further, and many of our light and medium bombers are also listed as scout-bombers, to be

used on general reconnaissance duties as well as bombing, which usually consists of dive-bombing or torpedo dropping.

There is no general formula for recognition of light or medium bombers as there is with single-seat fighters or heavy bombers. They can be arranged similar to the bi-place fighter, for which duties they may also be used in some instances; as attack planes, which are a type in themselves; or as ships which actually have the lines and general characteristics one would ordinarily expect to see in a bomber. The crew runs anywhere from two to five and six men. Some bombers are monoplanes and some are biplanes, some carry but one machine gunner and others two or three, and some are bi-engined while others are powered by a single engine. All in all, there is no definite and set rule for the light and medium types, but they are in any event equipped and destined for fundamentally the same duties.

AMERICAN

BREWSTER SB2A-1

According to Company publicity, this machine is capable of flying non-stop from New York to Los Angeles and is 100 m.p.h. or more faster than Germany's Stuka or American-built dive-bombers now in use by the Naval Air Service. A similar model has also been sold to Great Britain and is known as the Bermuda by the Fleet Air Arm.

The plane is of all-metal construction with metal sheet covering. The wing is set in mid position and is also of metal structure. A British-designed power-operated machine gun turret is aft for the gunner, and at least four weapons are fixed to fire forward, it is believed. The enclosure of the 1,000-pound bomb within the fuselage gives the SB2A-1 as trim an appearance as a fighter and increases speed by eliminating drag created by carrying bombs on external racks.

(The SBA-1, which is still in service, according to reports has also been sold to England as the Bermuda. It is supposed that this model will now be withdrawn.)

Performance figures and specifications awaiting release by the U.S. Navy Department.

This Brewster SB2A-1 dive-bomber is the first two-seat machine ever constructed for the Naval Air Service, with a power-operated machine gun turret. No details are available, but it is believed that the top speed is very close to 400 m.p.h. British version is known as Bermuda.

Brewster's SBA-1 scout-bomber was built about 1937 and was the first machine designed by that company. It is a two-seat plane and has a top speed of 302 m.p.h.

(Courtesy of *Aviation Magazine*)

No official information concerning the new Curtiss SB2C-1 scout-bomber is available, but it is able to out-perform any similar plane now in existence. It is said that an original contract for $50,000,000 was let. Note how smoothly the undercarriage legs retract against the wing.

CURTISS SB2C-1

Early in March, 1941, the Curtiss Company announced completion of a new dive-bomber that was said to out-stuka the Stuka. That ship was the very secret SB2C-1 U.S. Navy scout-bomber, for which a contract amounting to $50,000,000 was given to the Curtiss Company.

The machine is a two-seat low-mid-wing monoplane of all-metal construction. The crew is housed-in by a transparent sliding canopy which fairs smoothly with the fuselage lines at its aft portion.

Concerning this craft, Burdette S. Wright, vice president of Curtiss-Wright, stated:

"The U.S. Navy wanted a 'Super' dive-bomber that could carry twice as many heavy bombs as any existing dive-bomber, fly twice as far as present models to protect America and its fleet 600 miles farther than previously, remain in flight 4½ hours longer than previously, attain a maximum speed of 100 m.p.h. faster than current types, double the existing armament thus achieving greater fire-power than any other single-engined Naval plane, and incorporate many mechanical improvements.

"The Curtiss SB2C-1," Wright admitted, "incorporates numerous new features in naval aircraft design. These include unusually heavy armament, provisions for carrying the bomb load inside instead of outside the fuselage thus eliminating drag, wings that fold upward to better facilitate storage on shipboard, wing slots that make the plane highly maneuverable even at the low speeds used in landing on an aircraft carrier deck, and major controls that operate hydraulically instead of mechanically."

Performance figures and specifications awaiting release by the U.S. Navy Department.

CURTISS SBC-4

During 1940, many service machines were withdrawn from the Air Corps and Naval Air Service to be shipped abroad to Britain and France. The Curtiss SBC-4 scout-bomber was among these, and it is known in the R.A.F. as the Cleveland.

A crew of two is accommodated and the cockpits are covered by

Last biplane scout-bomber accepted by the Naval Air Service was the Curtiss SBC-4. The gasoline tank shown beneath the fuselage here is replaced by a 1,000-pound bomb for dive-bombing missions. Racks on the lower wing panels carry smaller projectiles. Top speed is 235 m.p.h. British version is called Cleveland.

a long transparent canopy. The pilot has one forward .30 caliber fixed machine gun, synchronized to fire through the propeller arc, and the gunner has one swivel weapon. In addition, provisions are made to carry a 500- or 1,000-pound bomb under the fuselage. Racks on the lower wing panels are fitted for small projectiles.

Power is supplied by an air-cooled radial Wright Cyclone engine of 840 h.p. at 2,100 r.p.m. at 9,800 feet, giving a top speed of 235 m.p.h. Cruising speed is 197.5 m.p.h., and landing speed with flaps extended is 60 m.p.h.

Other data: Span, 34 feet; length, 27 feet 7 inches; height, 10 feet 5 inches; wing area, 317 square feet; range, 610 miles; loaded weight, 5,581 pounds; ceiling, 24,700 feet.

CURTISS A-18

According to latest available information, attack-bombers are being discontinued in the Air Corps. However, there are still a number in service, and the Curtiss A-18 is the only one that is fitted as a twin-engined mid-wing monoplane.

In the usual style, the fuselage is of all-metal construction with

metal sheet covering. The rear cockpit is fitted with dual controls, so that the gunner may take over command of the ship either to assure its return or to relieve the pilot on long flights.

Four .30 caliber machine guns are normally fitted in the nose of the fuselage. The gunner has one .30 caliber swivel weapon. Racks in the body carry twenty chemical or fragmentation bombs, and additional racks on the wing are fitted to accommodate four 100-pound bombs. The landing gear legs are retractable and fold up into the engine nacelles.

Power is supplied by two air-cooled radial Wright Cyclone engines of 850 h.p. each, giving a top speed of 252 m.p.h. at 4,500 feet. Cruising speed is 212 m.p.h., and landing speed is 72 m.p.h.

(Curtiss attack-bombers, earlier than the A-18, which are still in service are the A-8 and A-12.)

Other data: Span, 59 feet 6 inches; length, 41 feet; height, 11 feet 6 inches; range, 1,700 miles; loaded weight, 12,793 pounds; ceiling, 28,650 feet.

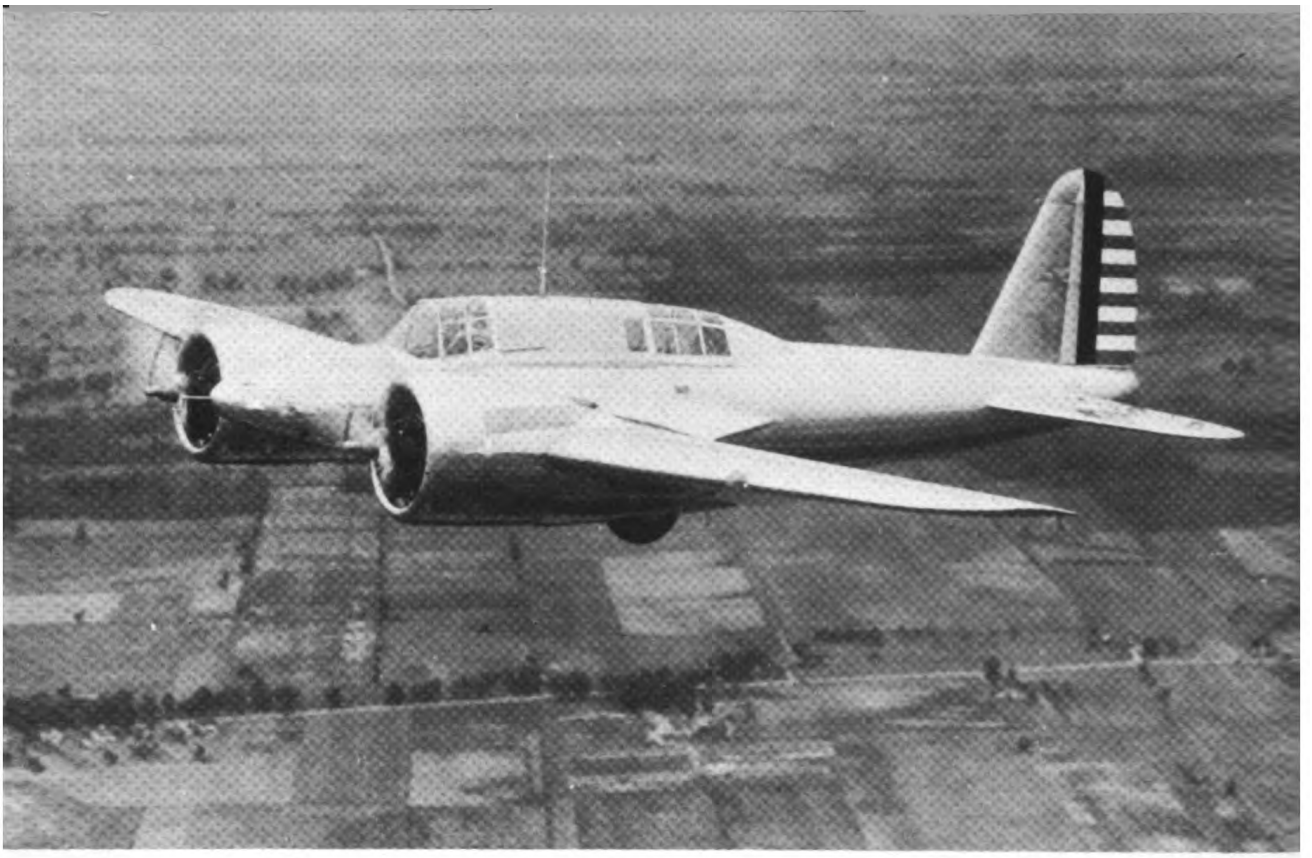
DOUGLAS A-20A

Here is still another standard-type Air Corps ship which was ordered by France in the first place and then delivered to Britain. And according to reports from the Fleet Air Arm, the Boston—or A-20A, Army designation—performed brilliantly in Africa against the Italians.

The pilot is located in the fuselage in a narrow, single-seat cabin ahead of the wing leading edge. Immediately behind the pilot in the center section of the fuselage is the bomb compartment, which runs the full length and width of the body from the wing leading edge to trailing edge.

The fuselage is of all-metal frame and stringer construction, with metal sheet covering. The observer-bomb-aimer is in the extreme nose of the ship. Located on each side of him and projecting through streamlined apertures are fixed machine guns which are actuated by the pilot.

Behind the bomb compartment is the rear gunner's station which is enclosed by a sliding hatch. One machine gun is provided on a swivel mount. Another weapon is mounted on a special re-



Only twin-engined attack-bomber in the Air Corps is the Curtiss A-18. Four .30 caliber machine guns are normally fitted in the fuselage nose; the rear gunner has one weapon on a swivel mount. Engines used are Wright Cyclones of 850 h.p. each.

A close-up of the Curtiss A-18, showing one of its Curtiss electric propellers in "full feathering" position. Note how the landing gear legs retract straight back into the engine nacelles. Top speed is 252 m.p.h. at 4,500 feet.

tractable tunnel behind the rear portion of the fuselage proper.

The wing is built in four sections and is of the single-spar, multi-channel type. The center section houses the engine nacelles into which the main landing wheels retract. The front wheel folds back and up into the fuselage. Trailing edge flaps are provided on the center section, with ailerons on the outer panels.

Power is supplied by two air-cooled radial Pratt & Whitney Twin Wasp engines rated at 1,050 h.p. each, giving a top speed of 320 m.p.h. Cruising speed is 280 m.p.h., and landing speed is approximately 65 m.p.h.

Other data: Span, 61 feet 4 inches; length, 47 feet; height, 15 feet 10 inches; wing area, 363 square feet; range, 1,200 miles; loaded weight, 15,030 pounds; ceiling, 17,000 feet on one engine, unspecified on two.

DOUGLAS B-18A

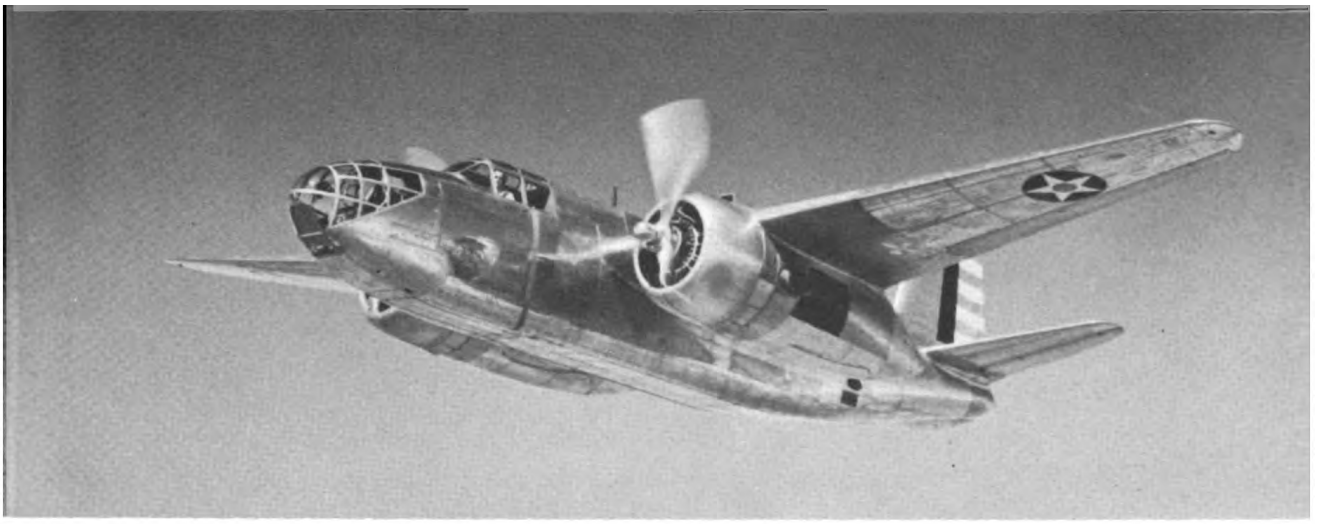
Standard Air Corps medium bomber is the B-18A, which has been sold to the R.A.F. in numbers as the Digby. The original ship was known as the B-18, but alterations were made and the stock planes were given the suffix "A" to denote changes from the former model.

It is arranged as a mid-wing twin-engined monoplane with gun positions in the nose and amidships; the amidships turret is retractable to make for smoother lines. The fuselage and wing panels are of all-metal construction with metal sheet covering riveted to the formers and stringers.

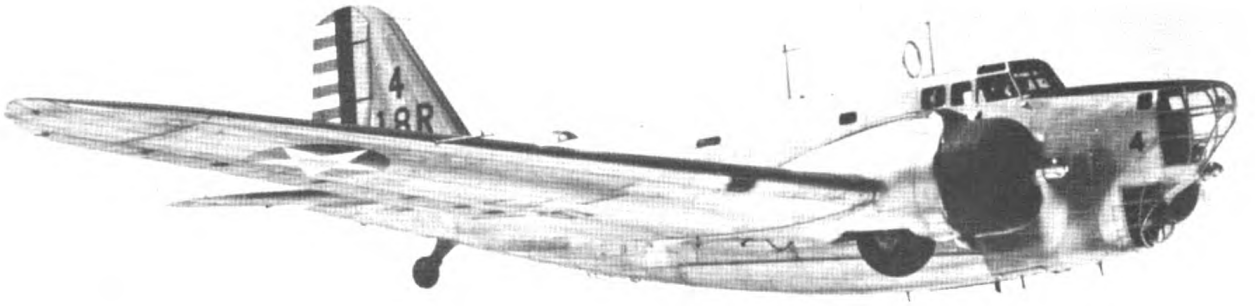
The bomb load is carried in racks within the fuselage. To drop the explosives, bomb bay doors swing down and out. And while the B-18A has been in Air Corps service for several years, and more than 300 have been delivered, the bomb load figures are still unavailable.

Power is supplied by two air-cooled radial Wright Cyclone engines rated at 1,200 h.p. each, giving a top speed of 220 m.p.h. No other performance figures have been released for publication.

Other data: Span, 90 feet; length, 57 feet; height, 15 feet; loaded weight, 29,500 pounds; ceiling, 26,000 feet.



Fitted with a tricycle undercarriage, the Douglas A-20A has exceptionally clean lines in flight. The ship is well protected and has a top speed of 320 m.p.h. British version is known as the Boston.



The Douglas B-18A medium bomber was first-line equipment until recently. Latest information has it that the machine is now being replaced by speedier types. Note landing wheel projecting half-way from the engine nacelle. In R.A.F. service, the craft is called Digby. Deliveries made to Britain by air.

(Courtesy of *Aviation Magazine*)

Douglas' B-23 is unofficially called the Baby Flying Fortress and is reported to carry a bomb load in excess of 2,500 pounds. It is provided with gun turrets in the nose and tail, with probably a third amidships. Speed is believed to be in excess of 325 m.p.h.

DOUGLAS B-23

Commonly referred to as the Baby Flying Fortress, this Douglas B-23 is the latest of medium bombers accepted by the Air Corps for service.

The fuselage is of all-metal construction and is semi-monocoque. A crew of five or six is accommodated. There are only two visible gun stations, in the nose and tail, but it is more than probable that there is also an amidships turret which is retractable. From all appearances, the tail gunner is in a prone position when firing.

The wing is set in low-wing position and is fully cantilever. It is built-up in three sections, the center section being integral with the fuselage and carrying the engines and the outer panels bolted on at a point just outboard of the engine nacelles. A two-spar construction principle is used, with built-up ribs. Metal sheet covering is used. The ailerons are of metal structure and are fabric covered. The trailing edge flap is metal, in the usual style. Generous filletting streamlines the trailing edge of the wing to the fuselage.

The undercarriage is fully retractable, the legs folding back and up to the engine nacelles. Swinging doors house-in the landing gear when in retracted position. The tail wheel is also retractable.

Performance figures and specifications awaiting release by the U.S. Army Air Corps.

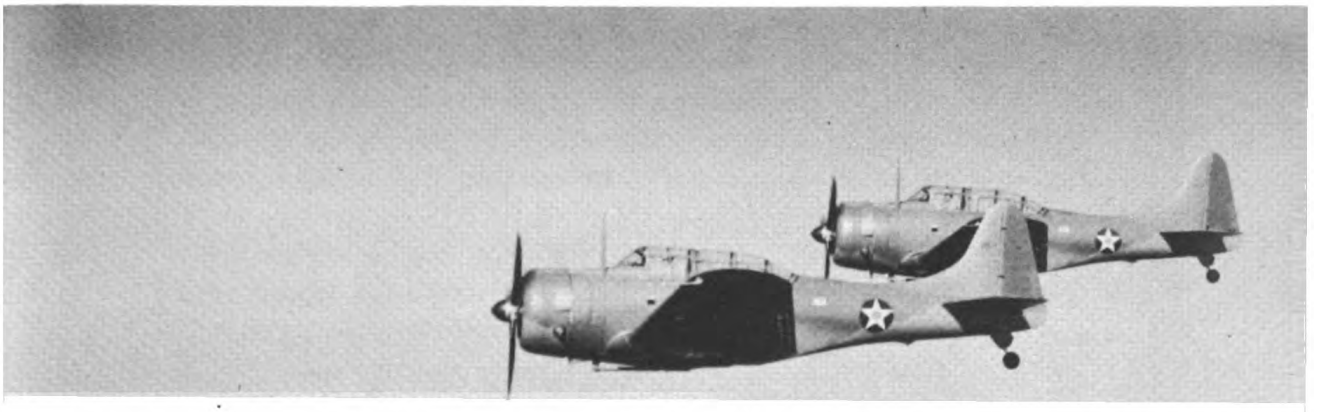
DOUGLAS SBD-3

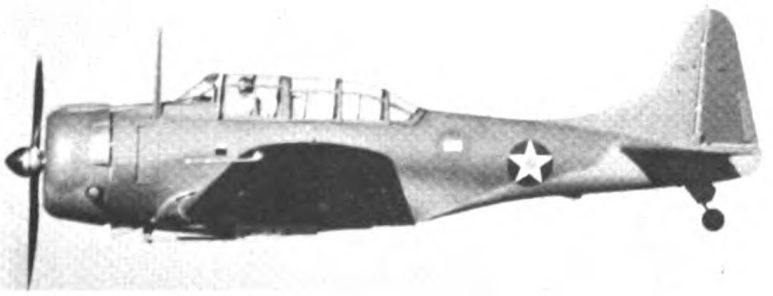
There is nothing particularly outstanding in the general appearance of this machine, even though all data have been withheld by the Navy Department. And the only word that can be got from the Douglas Company is that the ship "may be considered superior in performance and armament to the famed Stuka of Europe's war." Considerations, however, mean very little; it's actualities that really count.

The SBD-3 is arranged as a low-wing monoplane, and, as the designation implies, is for scout-bombing duties. Construction is all-metal, and the fuselage is built-up in the conventional style

Mounting two synchronized machine guns and one swivel weapon, judging from photographs, the Douglas SBD-3 Naval scout-bomber is said to be superior to the famed German Stuka. Between the landing wheels, barely perceptible, may be seen the outline of a bomb. It is on an ejector-type rack to throw it clear of the propeller when being released.

For the first time in the history of the U.S. Army Air Corps, a dive-bomber has been accepted for service—the Douglas A-24. The ship is merely an Army version of the Navy's SBD-3. All performance figures have been withheld.





with transverse frames and longitudinal stringers, covered with metal sheet.

The wing is of all-metal structure and is full cantilever. The center section is integral with the fuselage and the outer panels are fastened to the stubs at a bolting angle. It is supposed that a two-spar construction principle is used. Ailerons extend to the tips and are fabric covered. The landing flaps are inboard of the ailerons and are of the split type.

For dive-bombing, a single large bomb, probably a 1,100-pounder, is slung beneath the fuselage on an ejector-type rack. When releasing the bomb in a steep dive, it swings away from the ship, to clear the propeller arc, before being released. Additional bombs may be carried on wing racks.

(The Air Corps has also awarded a contract to the Douglas Company for a number of this type, and the name has been changed to A-24. This is the first dive-bomber that has ever been accepted for Army service.)

Performance figures and specifications awaiting release by the U.S. Navy Department and Air Corps.

DOUGLAS TBD-1

The three-seater TBD-1 is the U.S. Navy's standard torpedo-bomber and is for operation off aircraft carriers. To facilitate stowage aboard ship, the wings are constructed to fold up and back from the center section.

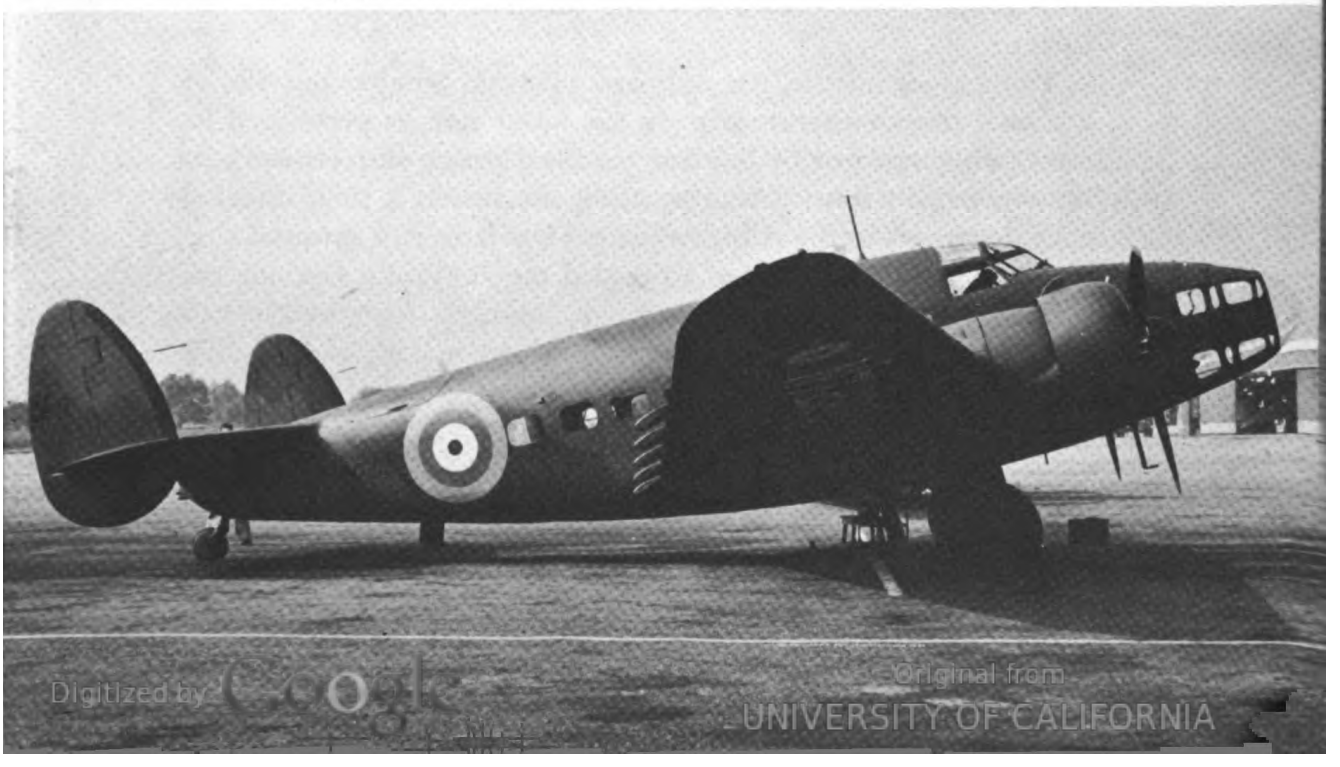
A single torpedo is accommodated between the undercarriage legs in the belly of the fuselage, the aft section of the torpedo extending slightly into the fuselage itself. Small bombs are also probably fitted on wing racks to be used on dive-bombing missions.

The fuselage is of all-metal construction and is metal sheet covered. The crew is accommodated under a long transparent canopy. The rear gunner has one swivel gun at his command, and it is believed that the pilot has two forward synchronized weapons.

The undercarriage is retractable, and the wheels fold up and back into wells in the wing undersection. The tires protrude

Another Douglas Naval plane is the TBD-1 torpedo-bomber. The "E" on fuselage denotes "excellent," meaning that the squadron to which this plane is attached was outstanding during Navy games. Wing folds up for stowage aboard aircraft carriers.

Although the Lockheed Hudson has not been ordered for either the U.S. Army Air Corps or Naval Air Service, it has been and is being used to good advantage by the Royal Air Force. It was a Hudson, as a matter of fact, that located the Nazi prison ship "Altmark."



about half-way, so that safe landings may be made even though the landing gear is in the "up" position. In event of such a landing, probably the only damage would be a bent propeller.

Power is supplied by an air-cooled radial Pratt & Whitney Twin Wasp engine of 850 h.p.

Performance figures and specifications awaiting release by the U.S. Navy Department.

LOCKHEED HUDSON

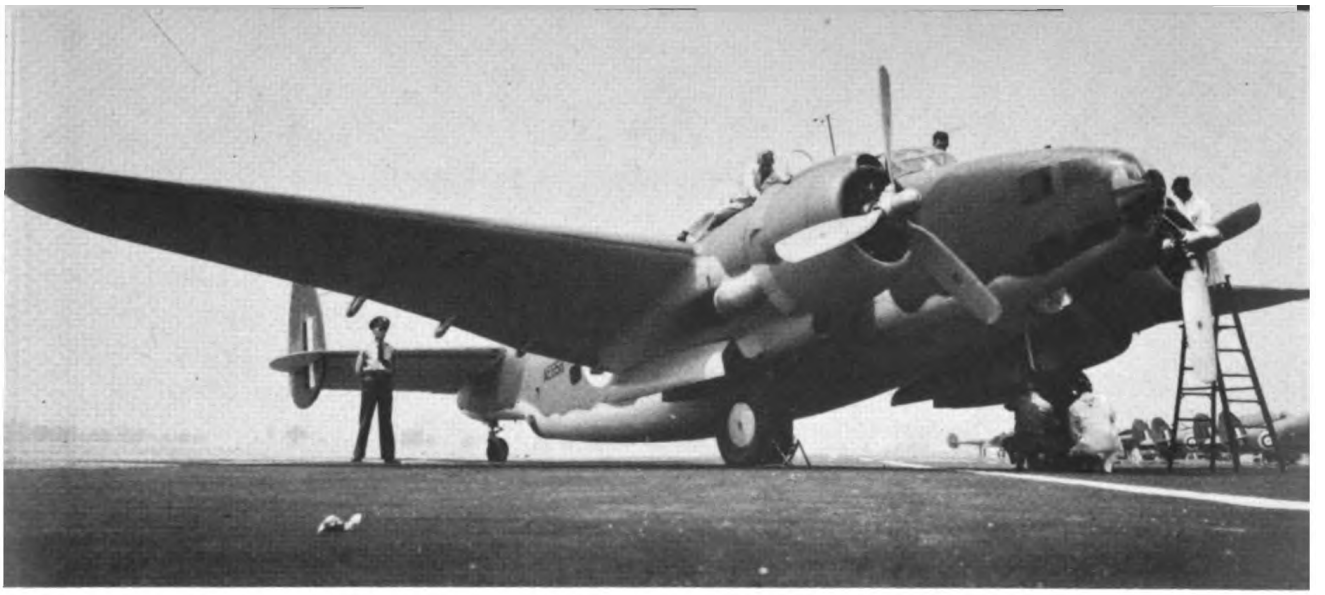
This machine is not in service with either the U.S. Air Corps or Naval Air Service, but it has been purchased by the British in large quantities.

The Hudson is an adaptation of the widely-used Lockheed 14 airliner. Howard Hughes' round-the-world record flight, incidentally, was made in a 14, and airline routes the world over have these craft in service. At this writing, the Lockheed Company is turning out Hudsons at the rate of one each working day. They are delivered to Canada and flown across the Atlantic to England; some, too, are shipped by boat from the Brooklyn, N.Y., Floyd Bennett Airport.

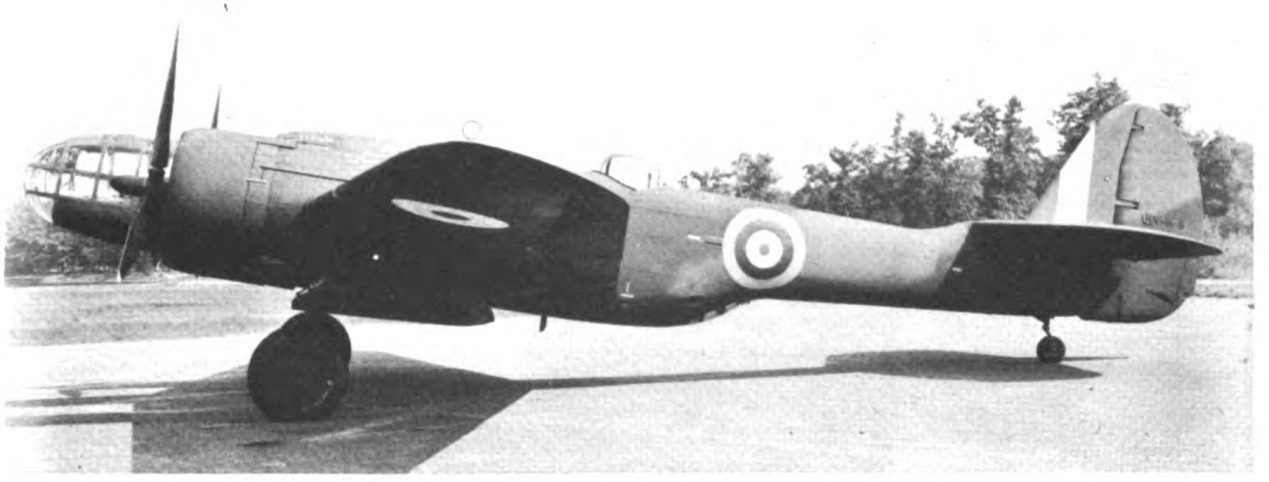
A crew of four is carried in the Hudson—a pilot, two gunners, and a bomb-aimer-gunner. The pilot is located directly behind the forward gunner, slightly higher; there is an additional seat next to him for a co-pilot. The bomb-aimer's station is amidships, and transparent panels are provided in the fuselage belly for sighting purposes. The bomb bay is within the fuselage. The rear gunner fires from a standing position, swinging a power-turret.

The craft is utilized not only as a medium bomber but also as a coastal reconnaissance ship. In the latter role, it performed its most publicized feat by locating the Nazi prison ship *Altmark* in the Norwegian fjords. After spotting the vessel, it then directed navy destroyers to the *Altmark,* which was later run aground.

Power is supplied by two air-cooled radial Wright Cyclone engines of 820 h.p. each at 2,100 r.p.m., giving a top speed of 246 m.p.h. at 6,000 feet. Cruising speed is 227 m.p.h., and landing speed is 65 m.p.h.

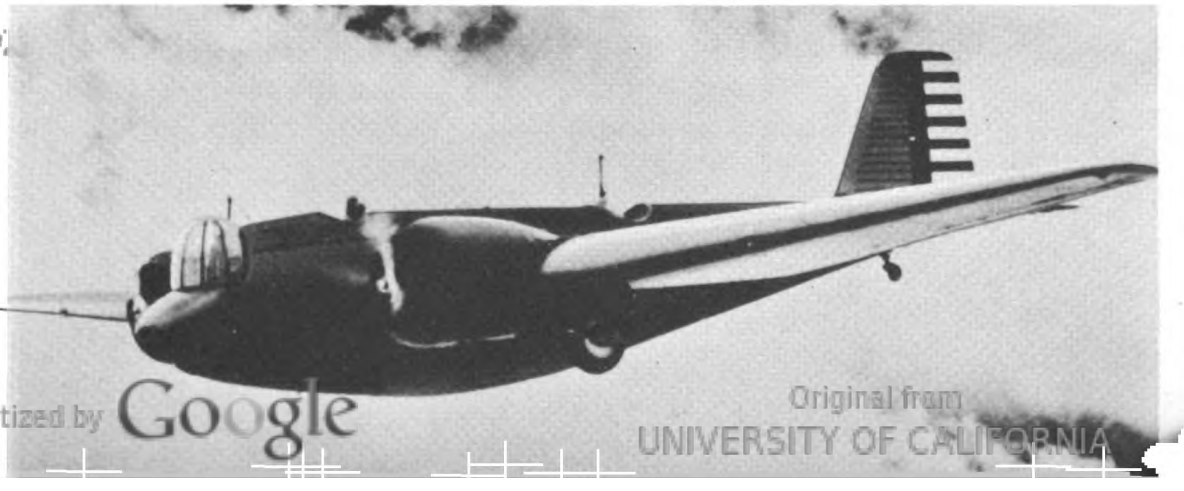


Somewhat similar to the Hudson is the Ventura, which has also been ordered by Britain. Commercial name for the machine is Lodestar.



Credited with taking the now famous "Taranto pictures," the Martin Maryland is explained by the British with one word—"excellent." Originally ordered by the French, it is said that the ship is faster than the Nazi Messerschmitt 109 below 6,000 feet.

Although no longer first-line, the Martin B-12 is still being used by the Air Corps. Known as the Flying Whale, it has a top speed of 255 m.p.h. Power is supplied by Pratt & Whitney engines of 1,050 h.p. each.



(The Ventura, which is somewhat similar to the Hudson, has also been ordered by the R.A.F. It is a slightly larger ship but has the same characteristics and performance as the Hudson.)

Other data: Span, 65 feet 6 inches; length, 44 feet 3 inches; height, 11 feet 5 inches; wing area, 551 square feet; range, 1,660 miles; loaded weight, 17,500 pounds; ceiling, 24,700 feet.

MARTIN MARYLAND

Like the Hudson, this is an American military-type airplane which is manufactured for export purposes and has not been accepted by either the Air Corps or the Naval Air Service. It was used effectively by the French on the Western Front in long-range reconnaissance, bombing, ground strafing, and even pursuit duties. Reports from French combat pilots declared that the Martin Maryland could outrun the German Messerschmitt 109 below 6,000 feet altitude. One French squadron leader reported that his command of Marylands performed eight bombing missions in one twenty-four-hour period without the loss of a single ship. The unfilled French order was subsequently taken over by the British, and one of these ships was credited with taking the now-famous "Taranto pictures."

The fuselage is of all-metal construction, sheet metal covered. The aft section of the body tapers sharply to allow a greater arc of fire for the rear gunner.

The wing panels are set in mid-wing position, and the engines are fitted in streamlined nacelles which take the undercarriage. The wings are of all-metal construction with metal sheet skin. Ailerons and other movable controls are fabric covered.

Power is supplied by two air-cooled radial Pratt & Whitney Twin Wasp engines of 1,050 h.p. each at 2,250 r.p.m. at 7,500 feet, giving a top speed of 310 m.p.h. Cruising speed is 248 m.p.h., and landing speed with flaps extended is 69 m.p.h.

Other data: Span, 61 feet 4 inches; length, 46 feet 8 inches; height, 10 feet; wing area, 538 square feet; range, 2,470 miles; loaded weight, 15,297 pounds; ceiling, 31,000 feet.

MARTIN B-12

This machine was once the standard Air Corps medium bomber and was replaced as first-line by the Douglas B-18A. Many of them are still in active service, however, and are used for the most part for training bombardment crews.

The fuselage is of all-metal construction and is covered with metal sheet. The bomb load is carried within the body and is discharged through bomb bay doors which swing down and out. Gunners are stationed in the nose, amidships, and in the fuselage undersection to protect the rear. The front gunner is housed-in by a turret similar to the Boulton Paul types, although it is not power-operated. He has one gun on a swivel mount, as do the other gunners.

The B-12 is arranged as a mid-wing machine. The wing is of cantilever construction and is built in three sections, the center panel being integral with the fuselage. Like the body, the wing is of metal construction, metal sheet covered. Ailerons are on the outer tips; flaps are of the split trailing edge type. The landing gear legs are retractable, folding up and back into the engine nacelles.

Power is supplied by two air-cooled radial Pratt & Whitney engines of 1,050 h.p. each at 2,550 r.p.m. at 6,500 feet, giving a top speed of 255 m.p.h. Cruising speed is 205 m.p.h., and landing speed is 65 m.p.h.

Other data: Span, 70 feet 10¼ inches; length, 44 feet 2½ inches; height, 11 feet 4 inches; wing area, 682 square feet; range, 2,000 miles; loaded weight, 15,894 pounds; ceiling, 24,800 feet.

MARTIN B-26

The most modern of all Air Corps medium bombers is the Martin B-26 Flying Torpedo. According to informed sources, a preliminary order for 1,100 machines of this type was let, involving an expenditure of $99,641,880.

Of high-wing design, the B-26 is of all-metal construction and is fitted with a tricycle landing gear. It has three gun stations—in the nose, tail, and amidships. The amidships turret is power-operated

and is probably fitted with four machine guns, two on each side. The fuselage has a perfectly circular cross section.

The wing panels are of the two-spar, full cantilever type and are built-up in five sections—the center section, two outer panels, and detachable tips. Like the fuselage, the wing is of all-metal construction and is covered with metal sheet. The engine nacelles are slung almost entirely beneath the wing and are tapered to a smooth streamline; they accommodate the main landing wheels. The nose wheel retracts into the fuselage.

Power is supplied by two air-cooled radial Pratt & Whitney engines of 1,850 h.p. each, giving a top speed of 350 m.p.h. Cruising speed is said to be 315 m.p.h., and landing speed is approximately 70 m.p.h.

Specifications awaiting release by the U.S. Army Air Corps.

NORTH AMERICAN B-25

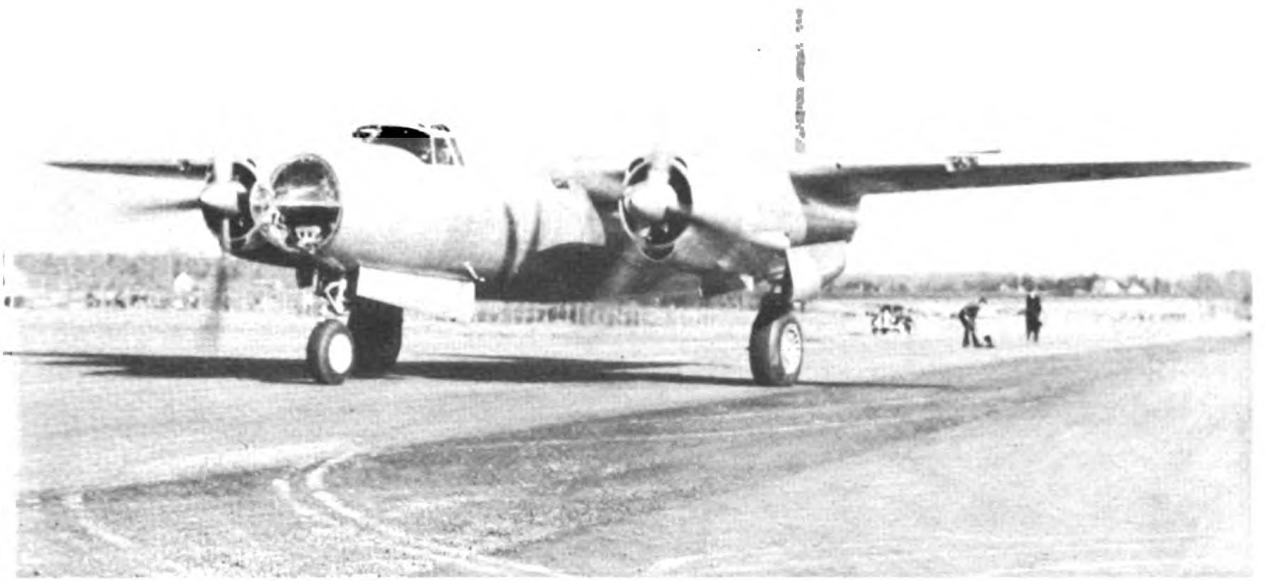
North American Aviation has been noted mainly for its excellent training and observation craft and this is the first bomber they have had accepted by the Air Corps to date.

The machine is arranged as a mid-wing medium bomber and is equipped with a tricycle landing gear. Accommodations are provided for a crew of five. The fuselage is of all-metal construction, metal sheet covered. The nose wheel retracts directly back into the belly of the body.

All in all, the B-25 is quite similar to the Martin B-26. The fuselage has somewhat the same arrangements, although being different in cross section, and there is a tail turret from which a swivel gun is fired. Likewise, the engine nacelles are practically identical, also accommodating the retracted undercarriage.

Power is supplied by two air-cooled radial Wright Cyclone engines of 1,250 h.p. each at 12,000 feet, giving a top speed of 308 m.p.h. at 13,000 feet. Cruising speed is 259 m.p.h. at 10,500 feet, and landing speed is approximately 70 m.p.h.

Other data: Span, 67 feet 6 inches; length, 51 feet 5 inches; height, 14 feet 10½ inches; wing area, 610 square feet; range, 1,728 miles; loaded weight, 24,000 pounds; ceiling, 25,400 feet.



Most secret of all recent Air Corps medium bombers is the Martin B-26 Flying Torpedo. It is powered by Pratt & Whitney engines of 1,850 h.p. each and is fitted with four-bladed propellers.

Coming in for a landing. Here, the Martin B-26 has its tricycle undercarriage extended and its flaps down to decrease speed. Both nose and tail machine gun turrets are provided. Top speed is said to be 350 m.p.h.

Dressed in camouflage paint of the Air Corps, North American's B-25 twin-engined bomber was caught by the cameraman as it began a wide turn over Los Angeles. Top speed is 308 m.p.h., length is 51 feet 5 inches, and span is 67 feet 6 inches. Undercarriage is tricycle.

Designated an attack-bomber, the Northrop A-17A is powered by a Pratt & Whitney Twin Wasp engine of 1,050 h.p. and has a retractable undercarriage. Top speed is 260 m.p.h. and cruising speed is 205 m.p.h. In addition to machine guns, light fragmentation or chemical bombs are carried for use against infantry troops.

Naval counterpart of the Northrop A-17A is the BT-1. Two forward firing synchronized machine guns and one swivel weapon are normal armament. For dive-bombing missions, one large bomb is mounted below the fuselage and smaller bombs are on the wing panels.

The Vought-Sikorsky SB2U-2 Naval scout-bomber is used mainly aboard aircraft carriers. With a Pratt & Whitney engine of 750 h.p., the top speed is 259 m.p.h. at 9,500 feet. In the Fleet Air Arm the name was changed to Chesapeake.

NORTHROP A-17A

Two models of this craft were produced and accepted by the Army Air Corps, the A-17 and A-17A; the A-17 has a fixed landing gear while the A-17A's undercarriage is retractable. Ships in the "A" classification are for attack-bombing purposes. A number of these were released to Britain, although no name has as yet been given to them by the Royal Air Force.

Four machine guns are mounted in the wing leading edge, two in each panel, for the pilot, and another weapon is provided on a swivel mount in the rear pit for the gunner. Both cockpits are covered by a transparent sliding hatch. Light chemical or fragmentation bombs, or both, may be carried on wing racks.

The fuselage and wing are of metal construction, metal sheet being used for covering. The landing gear legs retract into the wing undersection by hydraulic pressure.

Power is supplied by an air-cooled radial Pratt & Whitney Twin Wasp engine of 1,050 h.p. at 2,700 r.p.m., giving a top speed of 260 m.p.h. Cruising speed is 205 m.p.h., and landing speed is 66 m.p.h.

Other data: Span, 47 feet 8¾ inches; length, 32 feet 5 inches; height, 9 feet 9 inches; wing area, 363 square feet; range, 910 miles; loaded weight, 8,948 pounds; ceiling, 29,600 feet.

NORTHROP BT-1

This dive-bomber is generally referred to as a Douglas, since that company bought out the original Northrop concern, but it carries the Northrop designation—"T"—and is rightly, in the eyes of the U.S. Navy, a Northrop and not a Douglas.

The BT-1 seems to be a Naval version of the Air Corps A-17A, with a slightly different landing gear retraction system. The general fuselage design and wing attachment seem to be identical.

Power is supplied by an air-cooled radial Pratt & Whitney Twin Wasp engine of 750 h.p., giving a top speed of 223 m.p.h. Further performance figures are not available.

Other data: Span, 41 feet 6 inches; length, 30 feet 3 inches; height, 9 feet 4 inches; wing area, 318 square feet; loaded weight, 6,527 pounds; ceiling, 25,000 feet.

VOUGHT-SIKORSKY SB2U-2

Named Chesapeake by the R.A.F., this Vought-Sikorsky scout-bomber is being used aboard aircraft carriers to further supplement the work done by the Blackburn Roc and Skua and Fairey Albacore machines. Many of these craft are also in service with the U.S. Navy and are likewise used mainly from carriers.

The fuselage is of welded chrome-molybdenum steel with aluminum fairing. The section aft of the cockpit is fabric covered and the forward portion is faced with sheet metal skin. A crew of two is accommodated in tandem style under a long sliding canopy.

The wing is constructed of metal and incorporates a single spar and built-up ribs. Covering forward of the spar is metal. The center section and outer panels are attached by three hinges for folding. The landing gear is retractable, folding up into special recesses in the wing undersection.

Power is supplied by an air-cooled radial Pratt & Whitney Twin Wasp engine of 750 h.p. at 2,550 r.p.m. at 9,500 feet, giving a top speed of 259 m.p.h. Cruising speed is 227 m.p.h. at 10,000 feet, and landing speed is 60 m.p.h.

(The Vought-Sikorsky SBU-2 is also still in service. It is a biplane and is somewhat older than the SB2U-2.)

Other data: Span, 42 feet; length, 33 feet 11¾ inches; height, 9 feet 9½ inches; wing area, 305 square feet; range, 726 miles; loaded weight, 6,500 pounds; ceiling, 28,200 feet.

VULTEE VENGEANCE

Another formidable American plane that has been ordered by the British but is still being passed up by the U.S. Air Services is the Vultee Vengeance. The machine was christened on July 23rd, 1941, by Lady Halifax, wife of the British Ambassador, and is called the latest and most powerful single-engined dive-bomber ordered to date by the R.A.F. Such a large contract has been let for the Vengeance, so it is claimed, that the ship will be manufactured not only by Vultee but also by the Northrop Company.

The fuselage is of all-metal construction and is probably monocoque. The two-man crew is housed-in by a transparent canopy.

Four guns are set in the wing center section for pilot use, and the rear gunner-observer probably has two weapons on a swivel mount.

Bombs are carried in the unusually deep belly of the ship, doors swinging down and out to discharge the explosive load. There is also undoubtedly an ejector-type rack for use when dive-bombing, so that bombs will clear the propeller blades.

The wing is set in mid position and is built-up of metal. The center section is integral with the fuselage and the outer panels are bolted on at the butt ends. The outer panels have a very marked dihedral. The main landing wheels are fully retractable, folding back and up into the wing undersection. The oleo struts are streamlined by a special housing when in the retracted position, and the wheels turn 90 degrees to lie flat against the wing. Ailerons and other control surfaces are fabric covered, and the flaps are of metal structure and are metal covered.

Power is supplied by an air-cooled radial Wright Cyclone engine of undisclosed horsepower. British officials claim that the Vengeance is able to outperform any dive-bomber yet designed.

Performance figures and specifications awaiting release by the Royal Air Force.

VULTEE YA-19

Very little information is available concerning this all-metal attack-bomber being used by the U.S. Air Corps; but since the machine is so similar to the export V-11GB it may be assumed that the figures are somewhat the same.

A crew of three is accommodated under the transparent sliding canopy, in tandem style. The pilot has four fixed wing guns, the rear gunner is provided with a swivel gun firing above, and the third man in the crew operates a weapon firing down to protect the undersection of the plane.

The fuselage is of metal construction with metal sheet covering. The tail grouping is somewhat unique, in that the horizontal surfaces are set far forward of the vertical surfaces. Movable controls are fabric covered.

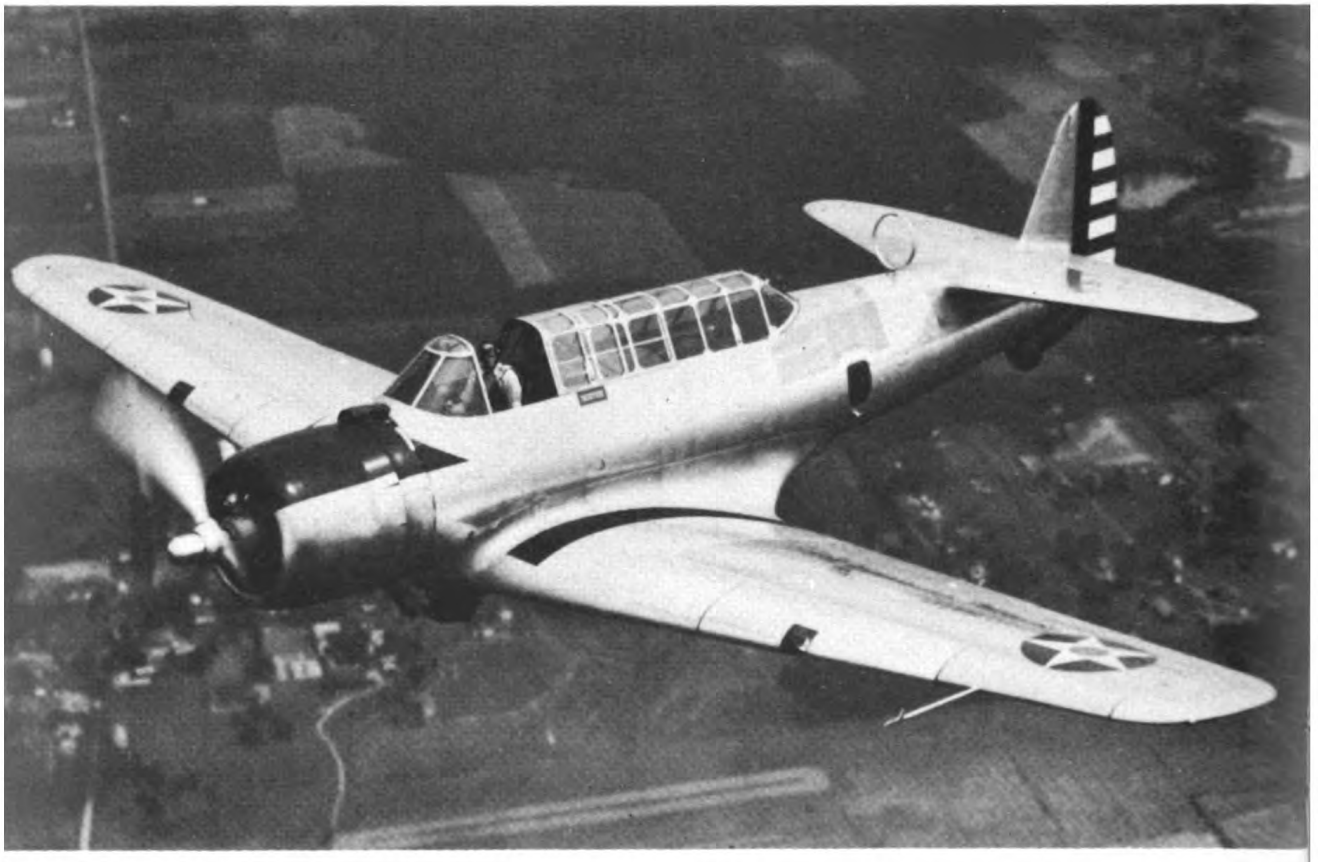
Only one forward synchronized machine gun is mounted on the SBU-2 scout-bomber. It was the last military biplane built by Vought-Sikorsky. Landing gear is fixed and covering, for the most part, is fabric.

The Vengeance, Vultee's new dive-bomber for Britain, begins its take-off from Vultee Field, Calif., after being christened by Lady Halifax, wife of the British Ambassador, on July 23rd, 1941. It is claimed that the machine is able to outperform any dive-bomber yet designed.

The wing is filletted generously at the root, tapering back smoothly to the fuselage. The landing gear legs are fully retractable, folding up into the wing undersection.

Power is supplied by an air-cooled radial Pratt & Whitney Twin Wasp engine of 900 h.p. at 2,550 r.p.m. at 12,000 feet, giving a top speed of 280 m.p.h. Cruising speed is 250 m.p.h. at 12,000 feet, and landing speed is 68 m.p.h.

Other data: Span, 50 feet; length, 37 feet 5½ inches; height, 10 feet; wing area, 384 square feet; range, 1,700 miles; loaded weight, 10,174 pounds; ceiling, 29,500 feet.



Carrying a crew of three, the Vultee YA-19 attack-bomber is a very potent military machine. Judging from its export version, it may be assumed that the top speed is 280 m.p.h. and that the landing speed with flaps extended is 68 m.p.h.

BRITISH

BLACKBURN BOTHA

The twin-engined, high-wing, cantilever Botha is listed as a general-purpose torpedo-bomber and carries a crew of four. The fuselage is a monocoque structure, flush-riveted construction being employed throughout. An enclosed cabin houses the crew, consisting of a pilot, navigator-bomber, wireless operator, and gunner; a gangway extends along the starboard side of the cabin, permitting intercommunication between forward and rear positions.

The wing is composed of three sections—the center section, which carries the engine nacelles, and two outer panels. The center section is parallel in plan, while the outer panels taper considerably toward the tips, which are rounded. Hydraulically-operated flaps are mounted on the wing trailing edge.

The landing gear consists of separate retractable oleo-pneumatic legs carried beneath the engine nacelles and retracting into them. The wheels are raised hydraulically.

Power is supplied by two sleeve-valve radial Bristol Perseus engines of 900 h.p. No speed details have been released, but it is believed that the Botha does more than 300 m.p.h. at best operating altitude.

Other data: Span, 59 feet; length, 51 feet 11½ inches; height, 14 feet 7½ inches.

BRISTOL BEAUFORT

The Beaufort is a very compact mid-wing monoplane with a body typical of two-seater fighters. There is a well-equipped power-driven turret up front, and aft, sheltered, is another.

Construction is all-metal, with metal sheet covering. The undercarriage legs retract up and back, folding into the engine nacelles. The wing, also, is of metal structure, and the engines are mounted on the inboard sections, slung almost completely beneath the wing.

The pilot's pit is just aft of the front gunner's position, and a little higher. It is completely enclosed. Transparent panels are

located in the floor of the pit and in the ceiling, thus making for exceptionally good visibility.

R.A.F. officials can be the most talkative and at the same time the most tight-lipped informants to be found. On some ships they are only too happy to write page after page of description, while on others it's almost impossible to get more than a bare outline of characteristics. The Beaufort is in the latter class. It is known that the machine was designed to replace the Bristol Blenheim, that it is powered with two Bristol Taurus 1,065 h.p. engines, and that the prototype was completed in 1939. Aside from that there is very little news except, "Production on the Beaufort is complete and it is now in active service."

Other data: Span, 57 feet 10 inches; length, 44 feet 2 inches; height, 14 feet 3 inches.

BRISTOL BLENHEIM

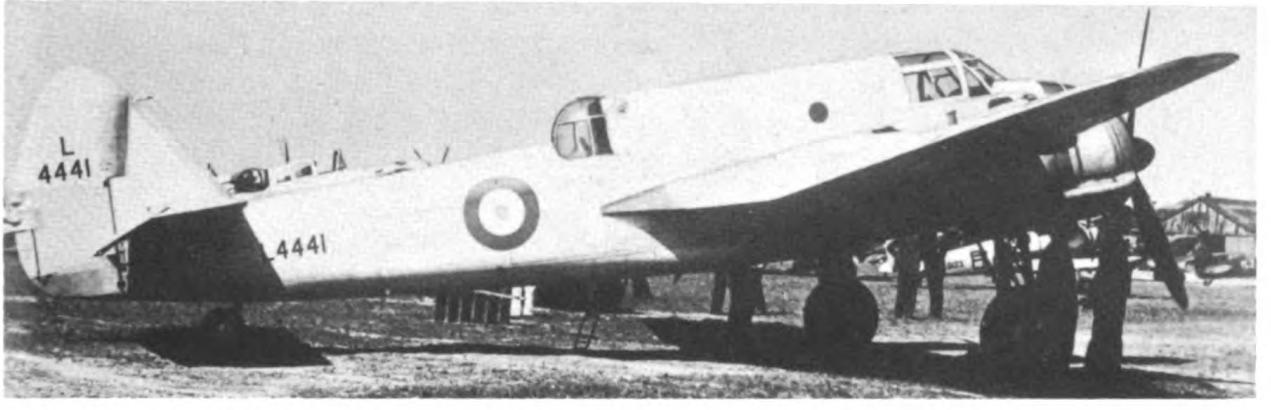
While the British are particularly proud of their Spitfire and Hurricane, they also have plenty of praise for their Bristol Blenheim. And they are really justified in this pride, for the Blenheim is considered the most efficient and fastest medium bomber now seeing war action with the R.A.F.

The crew consists generally of a pilot, bomb-aimer, and a gunner who also acts as the radio operator. A Vickers or Browning machine gun operated by the pilot is installed in the port wing outer panel and an observer's power turret is carried in a retractable station in the center of the fuselage aft of the wing trailing edge.

Although generally referred to as a medium bomber, the Blenheim is potentially a formidable twin-engined multi-seat fighter and is, in fact, said to be utilized by several R.A.F. squadrons in this capacity. Moreover, because of its good visibility, it is a first-line reconnaissance craft.

The fuselage is of light-alloy monocoque construction and is built in three sections. These segments, and the center section of the cantilever wing, are united by bolting only. The wing, which is also in three parts, embodies two main spars with steel flanges and alloy webs with ribs of metal sheet. Both the wing and fuselage are covered with metal sheet.

Latest known British medium bomber is the Blackburn Botha. No performance details have been released, but it is believed that the top speed is well in excess of 300 m.p.h. at best operating altitude. Power is supplied by Bristol Perseus engines of 900 h.p.



Having a slightly freakish appearance, because of the amidships gun position, the Bristol Beaufort is well armed and has good striking qualities. The twin engines are air-cooled radial Bristol Taurus plants of 1,065 h.p.

The Bristol Blenheim is truly a remarkable airplane. It is not only a very formidable long-range medium bomber but is also classed as a fighter. Two versions were produced, one with a long nose and the other with a short nose. Top speed is rated at 295 m.p.h. at 15,000 feet.

Power is supplied by two air-cooled radial Bristol Mercury engines rated at 840 h.p. each at 2,750 r.p.m. at 19,000 feet, giving a top speed of 295 m.p.h. at 15,000 feet.

Other data: Span, 56 feet 4 inches; length, 42 feet 9 inches; height, 9 feet 10 inches; wing area, 469 square feet; range, 1,900 miles; loaded weight, 14,400 pounds; ceiling, 27,280 feet.

FAIREY BATTLE

In general, this ship is a generous-sized low-wing monoplane bomber designed to be adapted for other duties. Probably the most talked-about mission it was used on during the second World War was the bombing of the Maastricht bridges during the blitzkrieg in the Low Countries. But although they were successful in destroying the bridges, of the six Battles that went on the mission only one returned.

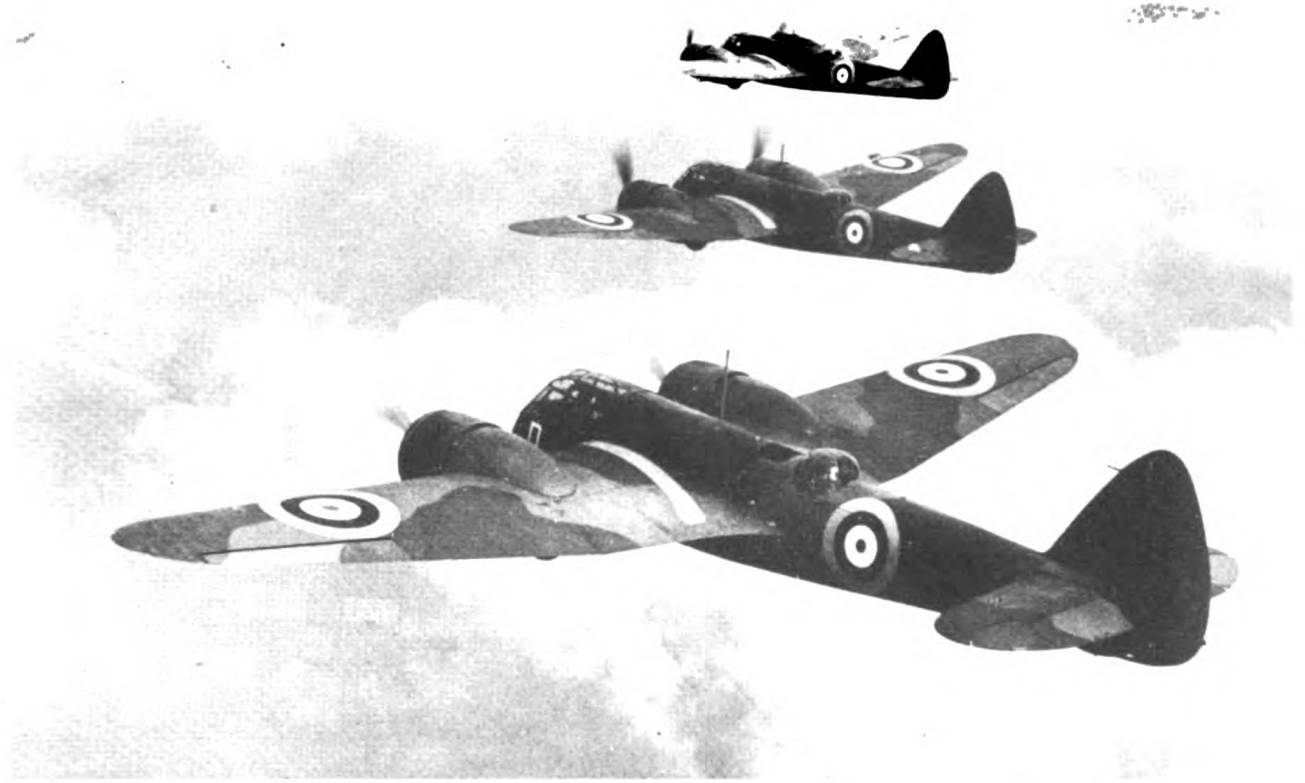
Outwardly, the Battle is one of the smoothest and most streamlined machines in the R.A.F. The wings sweep back gently from the roots and have a smooth curve around the tip to the trailing edge. The body is long, tapering, making the Battle seem like a slow-flying bird of peace instead of the war hellion she really is.

The interior of the machine is very interesting. The pilot has a roomy cockpit and one set of bomb releases on his right side. The gunner-bomber has a radio set, camera, chart table, and a swivel chair as well as a special prone position bombing cockpit.

Standard power plant is the Rolls-Royce Merlin III, which is carried on a welded steel-tube mounting, of 1,030 h.p., giving a top speed of 257 m.p.h. at 16,000 feet. Cruising speed is 200 m.p.h., and landing speed is 60 m.p.h.

(The P. 4/34, which is basically a smaller version of the Battle, has fundamentally the same external lines. The top speed, however, has been boosted to 285.)

Other data: Span, 54 feet; length, 42 feet 2 inches; height, 15 feet 6 inches; wing area, 422 square feet; range, 1,000 miles; loaded weight, 10,792 pounds; ceiling, 25,000 feet.



In formation. Three Blenheims wing above the clouds on their way to bomb Nazi-occupied French ports. The craft is well armed and is very maneuverable, so no escort is necessary. Bombs are housed in the fuselage.

Most famous feat of the Fairey Battle was the bombing of the Maastricht bridges during the blitz on the Low Countries. Only one of the six machines that went on the mission returned. Top speed of the Battle is 257 m.p.h. at 16,000 feet.

HANDLEY PAGE HAMPDEN

Latest of the Handley Page line to go into service with the R.A.F. is the Hampden, a twin-engined, mid-wing monoplane of unorthodox appearance. The wings are sharply tapered, and the fuselage, though clean of design, is unusual in that the rear part becomes abruptly small at the trailing edge, thus permitting a good field of fire from the rear lower turret.

Bombs are stowed in the fuselage center section, and there are three gun stations. One is located in the nose, one is operated from the top of the fuselage roughly in line with the wing trailing edge, and the third is mounted to fire rearward and downward from the lower end of the box-like forward section of the fuselage. In addition, one gun is fixed to fire forward and is controlled by the pilot.

The crew consists of a pilot, navigator-bomber, wireless operator-gunner, and a lower rear gunner. The pilot's cockpit is high on top of the fuselage, on a line with the engine nacelles; the navigator-bomber is located in the streamlined nose; the wireless operator-gunner has his pit directly behind the pilot in the rear of the fuselage; and the lower aft gunner's station is immediately below the wireless operator-gunner.

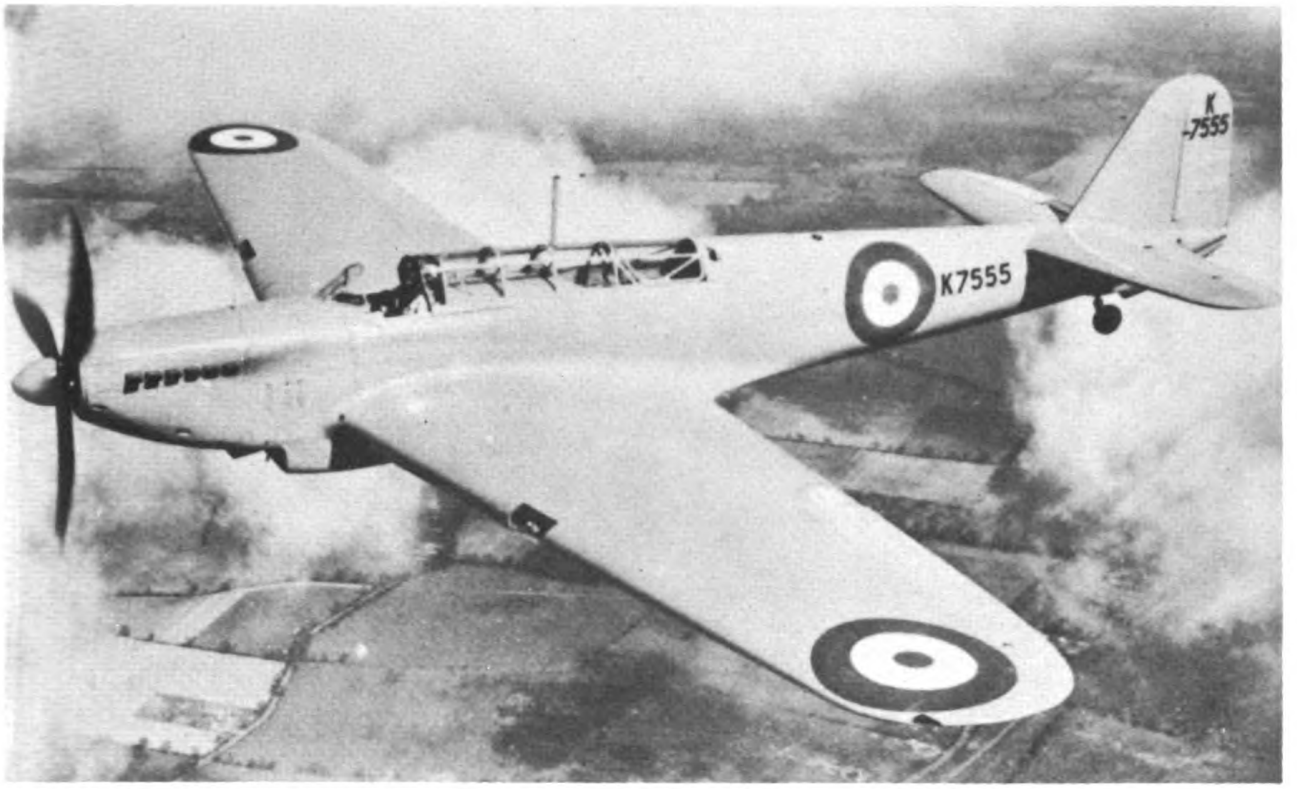
Power is supplied by two air-cooled radial Bristol Pegasus engines of 980 h.p. each at 2,250 r.p.m. at 4,750 feet, giving a top speed of 265 m.p.h. at 15,500 feet. Cruising speed is 217 m.p.h. at 15,000 feet, and landing speed is 73 m.p.h.

(The Hereford resembles the Hampden, except that it is powered with 1,000-h.p. Napier Dagger engines.)

Other data: Span, 69 feet 2 inches; length, 53 feet 7 inches; height, 14 feet 11 inches; wing area, 668 square feet; range, 1,725 miles; loaded weight, 18,756 pounds; ceiling, 22,700 feet.

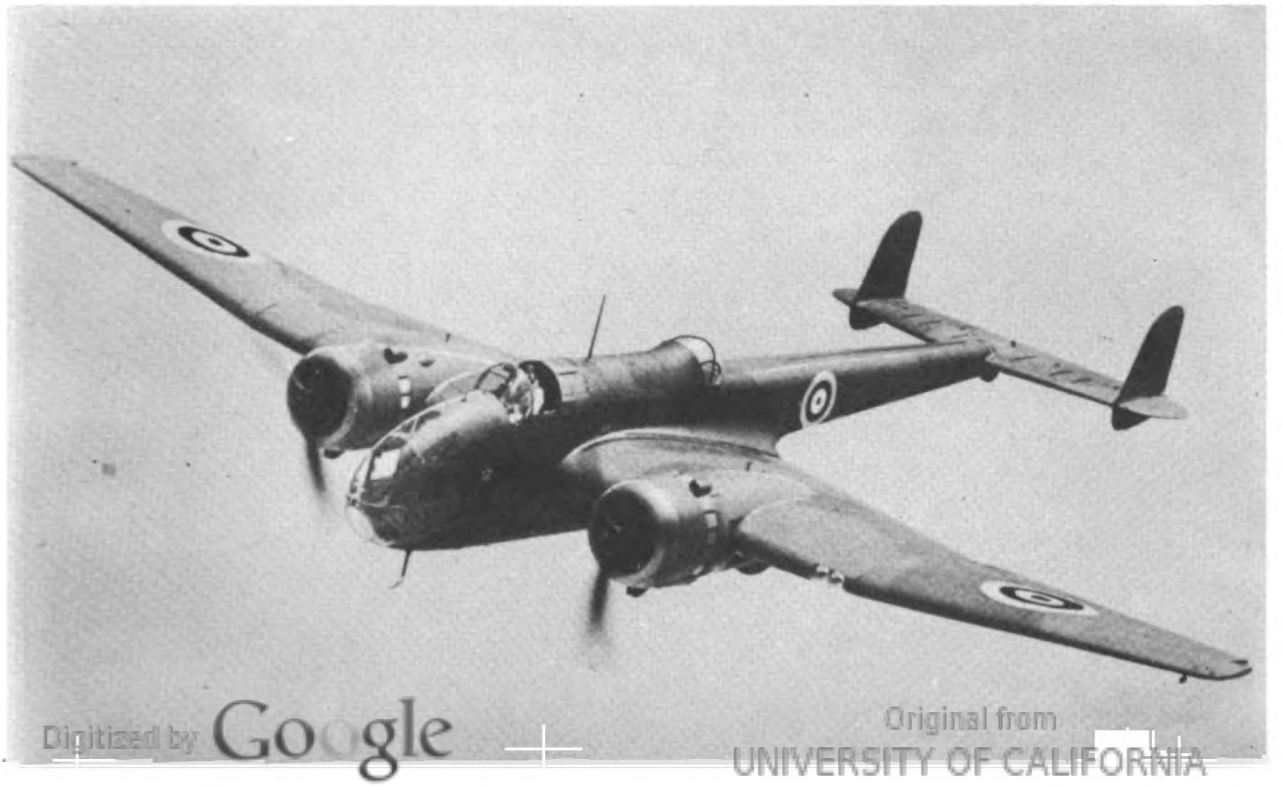
VICKERS WELLESLEY

Of all the various features incorporated into the Wellesley, probably the most publicized is the Vickers-Wallis principle of geodetic construction. According to Webster's dictionary, geodesy means: "That branch of applied mathematics which deter-



The P. 4/34 is quite similar to the Battle but has cleaner lines. Note slim engine cowl and method of fairing the cockpit canopy at its rear. A smaller version of the Battle, the P. 4/34 has a top speed of 285.

Powered by Bristol Pegasus engines of 980 h.p. each, the Handley Page Hampden has a top speed of 265 m.p.h. at 15,500 feet. Span is 69 feet 2 inches and length is 53 feet 7 inches. Four men comprise the crew.



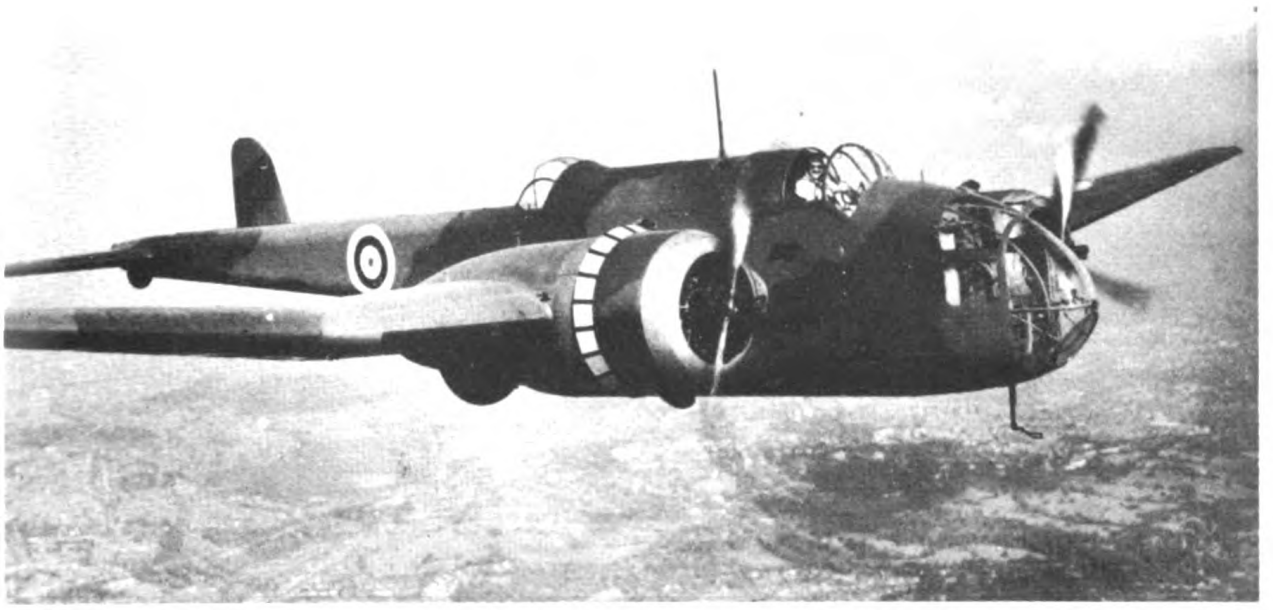
mines, by observation and measurement, the exact positions of points and the figures and areas of large portions of the earth's surface, or the shape and size of the earth, and the variations of terrestrial gravity." That explanation is long, drawn out, and complicated. But simply, as applied to the Wellesley, geodetic means that there are no bulkheads, as such, or stringers. The entire fuselage is built-up in a "spider web" fashion, thus eliminating the usual construction principles.

Only the Wellesley and the Wellington (see Heavy Bombers) are fabricated in this manner, and Royal Air Force advocates believe this to be the most desirable type of construction because it makes for greater strength and, at the same time, lighter weight.

The Wellesley is suited as a long-range bomber, torpedo carrier, and general-purpose craft. Under normal circumstances it would be listed under Miscellaneous Types, but because it is used almost exclusively as a bomber it should rightly come under this heading. Features of the plane include a wing of very high aspect ratio, built around a spar of dural tube covered with doped fabric; an inwardly-retracting undercarriage; separate cockpit enclosures for pilot and gunner; and streamlined bomb containers beneath the wing panels.

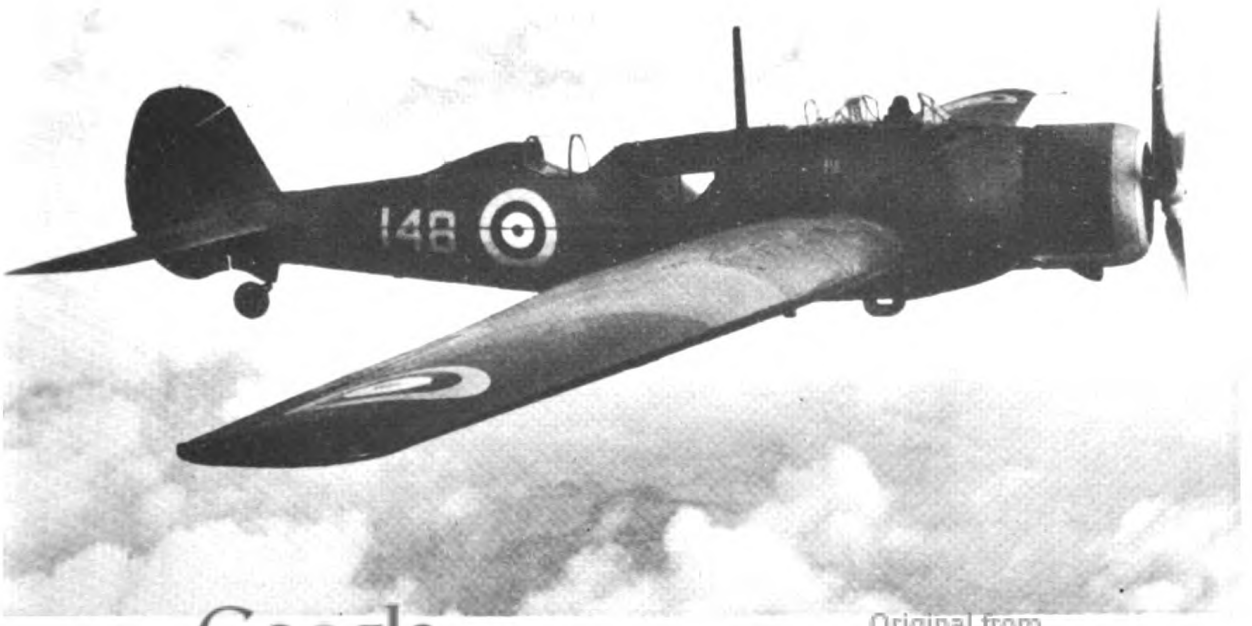
Power is supplied by an air-cooled radial Bristol Pegasus engine of 925 h.p. at 2,250 r.p.m. at 8,500 feet, giving a top speed of 228 m.p.h. at 9,680 feet. Cruising speed is approximately 180 m.p.h., and landing speed is 57 m.p.h.

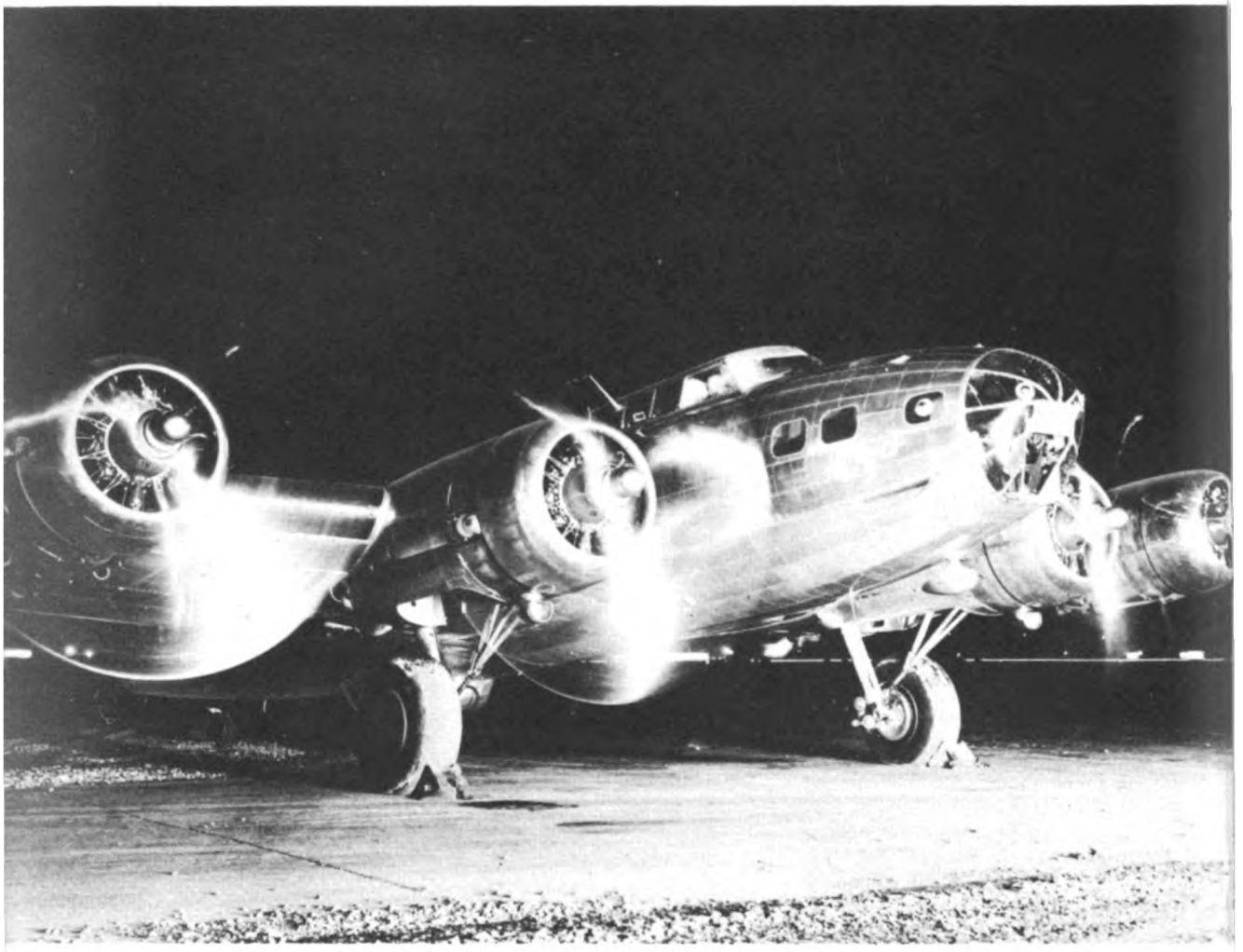
Other data: Span, 74 feet 7 inches; length, 39 feet 3 inches; height, 12 feet 4 inches; wing area, 630 square feet; range, 1,880 miles at 160 m.p.h. at 17,500 feet; loaded weight, 11,100 pounds; ceiling, 33,000 feet.



This close-up view of the Hampden gives some idea as to its size. With landing gear extended, the height is 14 feet 11 inches. The undercarriage legs fold straight back into the engine nacelles and the wheels project slightly when in flight. The pilot has a wheel control and has a fixed gun at his command.

On long-distance medium bombing missions, the Vickers Wellesley has been used with great success. The first England-to-Italy raids, as a matter of fact, were said to have been accomplished with machines of this type. The wing is exceptionally long, having a span of 74 feet 7 inches.





Black night, roaring engines, and the gleam of new metal in the glare of floodlights—a striking camera study of round-the-clock production by the aviation industry for National Defense. Add bombs and gunners and you have the typical setting of a heavy bombing squadron at war.

CHAPTER 3

HEAVY BOMBERS

AS THE doctrine of strategical bombing gains more adherents, so the importance of the heavy bomber increases. Since the primary duty of an air force is to strike at such objectives as factories, railway junctions, bridges, ammunition dumps, sea ports, and centers of organization and government, to strike repeatedly and hard, the heavy bomber has a great deal of work to do over enemy territory—more, in fact, than any other type ship.

Few experienced air force officers hold that the heavy bomber can be worked indiscriminately by day and by night. They believe that it is not and can never be a match for single-seat fighters, and that, if a formation of heavy bombers were to be caught by a flight of fighters, victory would certainly go to the fighters, with heavy losses in men and material for the other side. This, naturally, does not hold true in every case. Indeed, American heavy bombers such as the Boeing B-17 and Consolidated B-24 are believed to be quite able to hold their own—plus—against fighter craft. However, the failure of some machines to do this has been proven only too well by the German raids over London. Indiscriminate day bombing became so costly to the *Luftwaffe* that they were forced to resort to night tactics almost completely.

Since the former holds true in England, however, heavy bombers are visualized as working by night, in conditions of cloud and poor visibility, or escorted by heavy defensive screens of fighters. But when they do operate with complete success, for which result the element of surprise is almost completely and entirely necessary, they can hit more than four times as hard as day bombers. They carry enormous weights of explosives, and they have full facilities for obtaining the highest possible accuracy in dropping them.

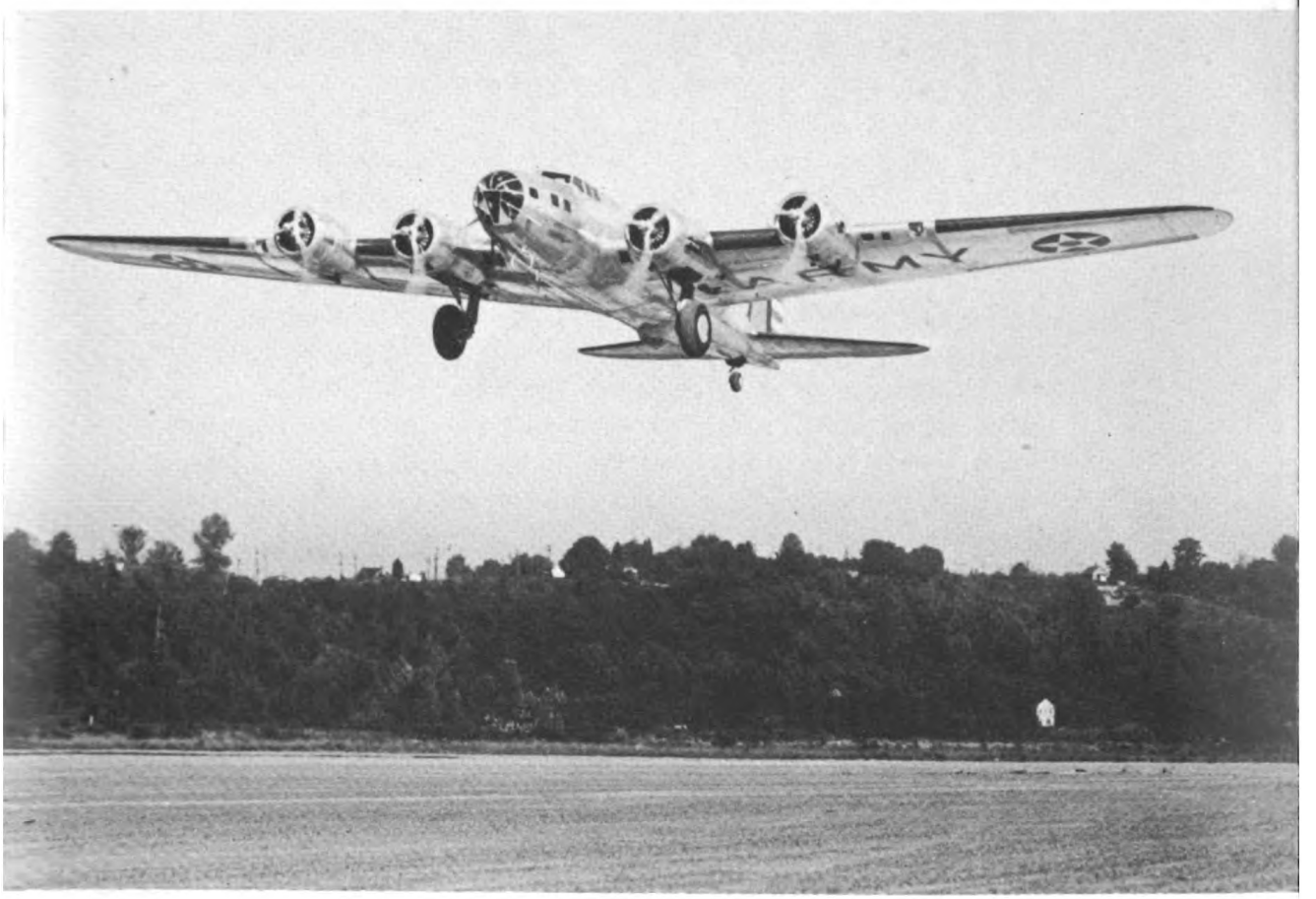
During offensive missions, the general plan is to fly high and to bomb from a horizontal position. The bomb-aimer peers down a sight which is corrected for forward speed, drift, altitude, and other factors. Depending upon the height of the bomber and external forces, bombs are dropped at varying distances before reaching the objective. Thus, hits can be scored and the machines can be on their way home even before air raid sirens have been sounded—depending, of course, on the element of surprise being present. But when bombers are spotted before reaching their objective, fighters are sent up for interception purposes. In this case, if the defense is too strong, the bombers merely dispose of their explosive loads as best as possible and return to the home base. When unescorted, they very rarely attempt to elude the defenders and reach their objective.

Carefully camouflaged with varying color paints, so that spotting by day or night is as difficult as possible, heavy bombers are the largest landplanes in any air force and are in all cases multi-engined machines. It must be remembered, incidentally, that loaded weight includes not only bombs but also the fuel load. That is why it is virtually impossible to give an exact figure for the actual bomb load carried, because it automatically becomes less as the range is increased and more fuel is needed for prolonged flights to and from the objective. The bomb load, therefore, always depends upon the radius of action—the distance the bomber can fly from its home base and return safely, all things being equal—and it differs according to the distance of the objective.

No more complex type plane is built than the heavy bomber. It accommodates a crew from four to nine, plus complete navigating, bomb-aiming, air fighting, and night flying equipment. The automatic pilot, which will fly the machine on a course once the flight path has been set by the navigator, is frequently included in the equipment.

The heavy bomber lumbers along and has none of the quickness or smooth lines of the single-seat fighter. But if it can get through—and with its elaborate navigating equipment it can do so at night and in bad weather with considerable success—it can hit harder than any other type of warplane.

This, then, is the heavy bomber—the plane that Germany is using to strike at English civilian centers, the machine that destroyed Coventry, caused such havoc in Plymouth, Dover, Birmingham, and other British cities. But it is also the long arm of the Royal Air Force which is nightly bombing, methodically, Berlin, Hamburg, and other German industrial cities and towns that supply the machines for Hitler's *Luftwaffe,* Panzerdivisions, and infantry troops.



Coming in for a landing, the huge Air Corps B-17D makes an impressive picture. A six-plane flight of these machines in 1938 established one of the longest and most dramatic mass flights ever undertaken by the Army Air Service—5,260 miles in 27 hours 50 minutes flying time.

AMERICAN

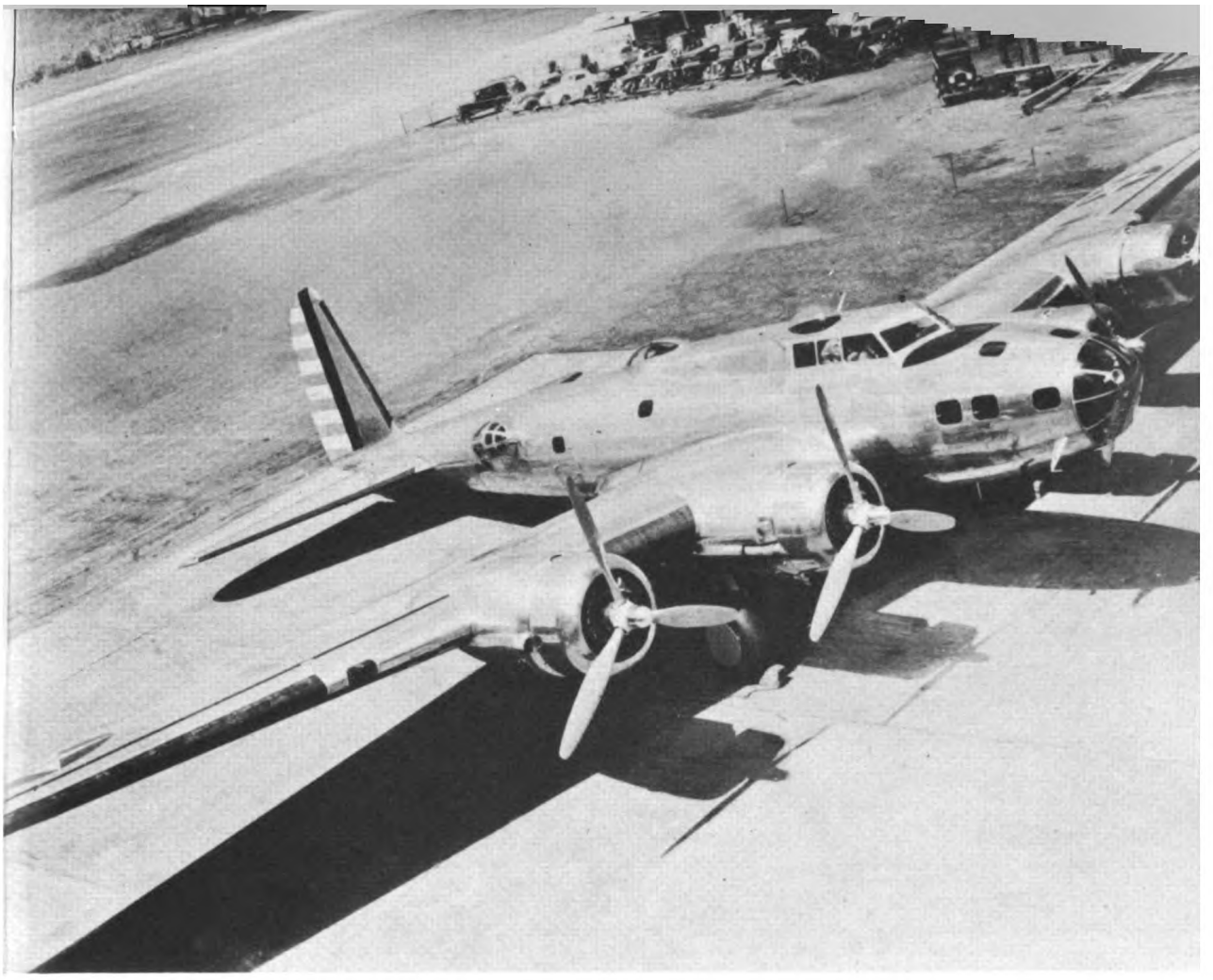
BOEING B-17D FLYING FORTRESS

This craft is probably the most widely known heavy bomber in service with the U.S. Army Air Corps. However, even though it is generally believed to be the most formidable machine of its type, the British requested certain changes in design before they would accept it for the R.A.F. Outstanding among these alterations was the complete elimination of the streamlined "blisters" on the fuselage. In their stead, the Flying Fortresses released for the Royal Air Force have Plexiglas transparent ports flush with the fuselage sides. In British service, these planes are known as Seattles.

With the Seattles, the English expected to do much more damage to Germany and German-occupied territory than was otherwise possible with their standard first-line bombers, because the Boeing machines not only carry a greater load but also have a longer cruising range than most British bombers. And on this range point, it might be well to mention details of the mass flight made by the Air Corps on February 17th and 18th, 1938.

This mass flight, which was between Miami, Florida, and Buenos Aires, Argentina, was the longest and most dramatic ever undertaken by the Air Corps and covered a distance of 5,260 miles. It required just 27 hours 50 minutes flying time and 34 hours 15 minutes total elapsed time, including a 6 hour 30 minute stop at Lima, Peru. The average speed for the entire trip was 189 m.p.h. and the average speed on the 2,565-mile non-stop hop from Lima over the towering snow-capped Andes to Buenos Aires was 209.5 m.p.h. This leg was completed by five of the bombers in 12 hours 15 minutes. The sixth plane, which followed later after making propeller adjustments at Lima, cut the time to 11 hours 10 minutes by taking a more direct route. All six of the ships reduced substantially the fastest time that had ever been flown non-stop between Lima and Buenos Aires.

The Flying Fortresses carry five machine guns and a crew of seven to nine men, including commanding officer, pilot, co-pilot, navigator, and gunners. All members of the crew can freely



Looking down on the huge Flying Fortress. There are five machine gun stations which provide a wide blanket of fire. The four 1,100-h.p. Wright Cyclone engines give a top speed of 325 m.p.h. It is said that the full altitude of this ship has never been reached.

change stations, and for long flights sufficient additional personnel is accommodated so that the operators of the airplane may be relieved when necessary.

With full military load it can fly and maintain its altitude when using only two of the four engines, a safety factor which practically eliminates the possibility of forced landings due to engine failure. This, coupled with the machine's long range and complete facilities for radio communication, makes it possible to find a safe landing field somewhere, even when fog covers large areas.

Power is supplied by four air-cooled radial Wright Cyclone en-

gines of 1,100 h.p. each, giving a top speed of 325 m.p.h. at 14,000 feet. Landing speed is 70 m.p.h.

(The XB-15 Super Flying Fortress is somewhat similar in general design, though with greater measurements. It is still experimental and has not been accepted for service duties.)

Other data: Span, 103 feet 9⅜ inches; length, 67 feet 10 9/16 inches; height, 15 feet 4½ inches; wing area, 1,417 square feet; range, 4,200 miles; loaded weight, 47,500 pounds; ceiling, 36,700 feet.

CONSOLIDATED B-24

America's first tricycled heavy bomber, and probably the first in any military air force, is the Consolidated B-24, a large number of which have been ordered and delivered by air to Great Britain as the Liberator.

The fuselage is built in a single unit of conventional monocoque construction employing the usual flanged formers, extruded channel-type stiffener stringers, and hi-duty extruded longerons. This framework is covered with aluminum alloy sheet, flush riveted throughout. The entire lower midsection of the fuselage is left open with the load carried by beam-type longerons to permit the installation of bomb doors and racks.

The pilot and co-pilot are seated side-by-side, high in the fuselage and forward of the wing and behind the nose turret. The radio operator-navigator is located aft of the bomb compartment with a small catwalk interconnecting the two stations. The rear gunner, who also acts as relief radio man, is in the extreme aft end of the fuselage. The commander of the ship has his station just behind the control pit. Both the forward and aft gun positions are said to be fitted with British-designed power-turrets.

The wing is constructed on two box-spars with built-up ribs, metal sheet covered. The main fuel tanks are within the center panel. Four tanks are provided, and it is reported that they have a total capacity "much in excess" of 600 gallons. Above each engine is an oil tank carrying 14 gallons of lubricant.

The landing gear is of the tricycle design employing a single nose wheel and two large main landing wheels. The nose wheel is

Even larger than the B-17 series is the XB-15 Super Flying Fortress. The plane still carries experimental markings and has not been accepted for Air Corps service.
(Courtesy of *Aviation Magazine*)

Of recent construction, the Consolidated B-24 heavy bomber is even more formidable than the Flying Fortress. Known as Liberator in British service, R.A.F. pilots say that the machine is the best that America has delivered to date.

Here one can see just how large the B-24 really is. It is the first heavy bomber built with a tricycle landing gear. Speed figures have not been divulged, but it is said that the maximum velocity is in excess of 320 m.p.h. Wing span is 110 feet and length is 63 feet.

just aft of the front gunner's compartment and is of the single fork type; in retracting, it swings up into the fuselage. The main undercarriage wheels are supported by short-travel shock struts and are operated by hydraulic struts. The wheels retract into the engine nacelles.

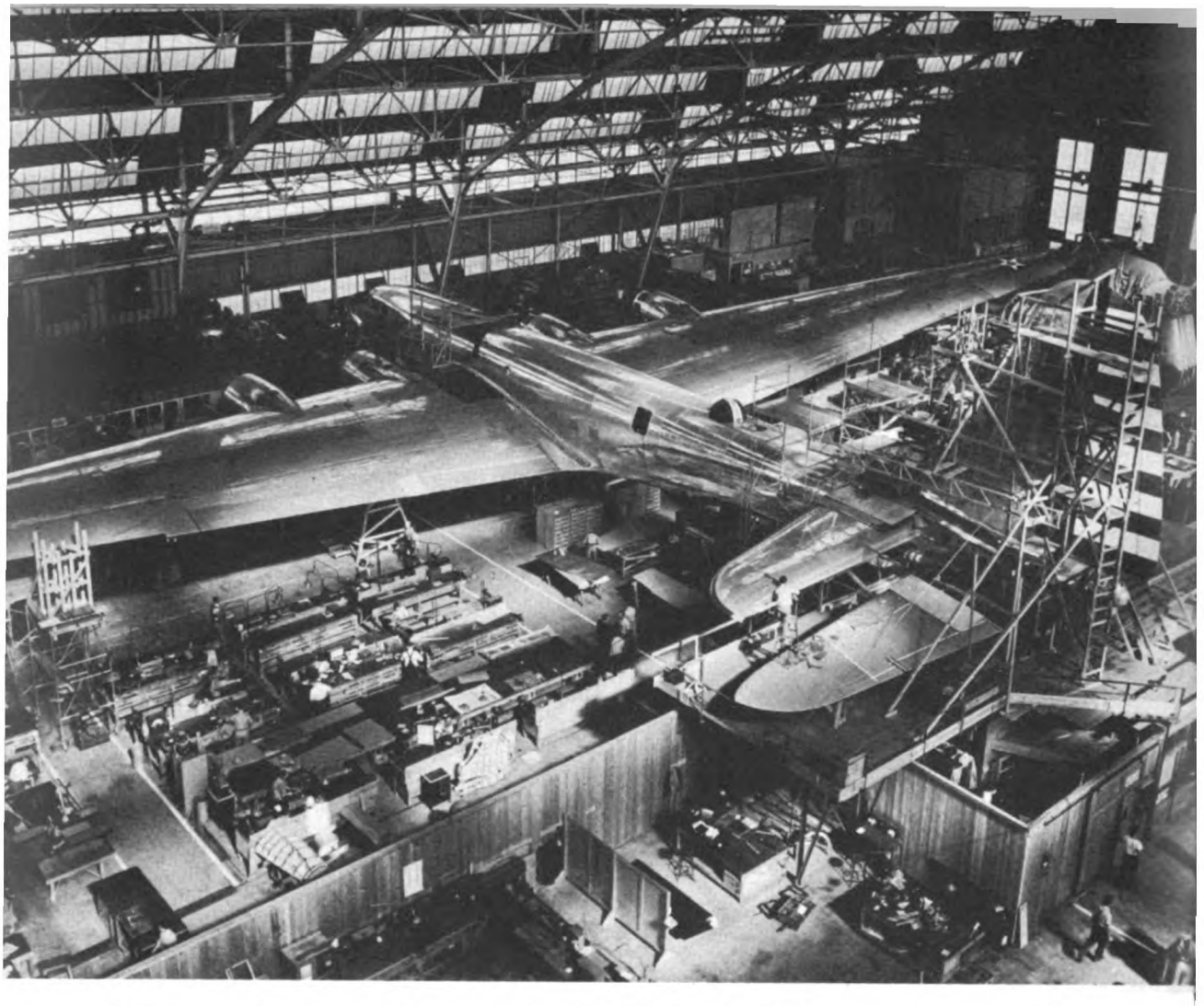
Power is supplied by four air-cooled radial Pratt & Whitney Twin Wasp engines of 1,200 h.p. each at 2,550 r.p.m., giving a top speed of more than 320 m.p.h.

Other data: Span, 110 feet; length, 63 feet; height, 19 feet; wing area, 1,100 square feet; range, 3,000 miles; loaded weight, 40,000 pounds; ceiling,. 35,000 feet.

DOUGLAS B-19

This is the largest and greatest bomber ever built in the history of aviation. It has a wing span of more than twice that of the

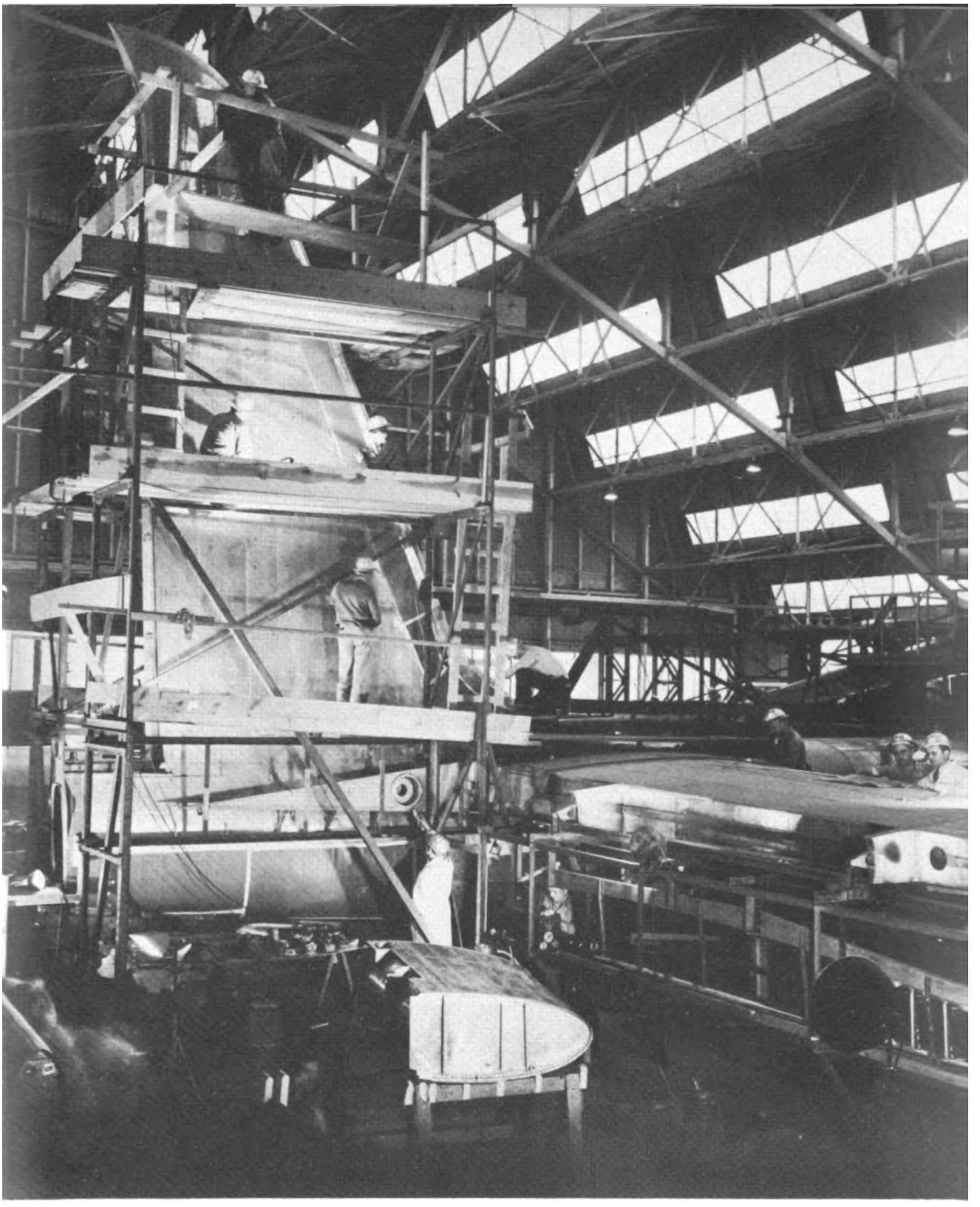
"Guardian of a Hemisphere" is the name given by Douglas Aircraft Company to their greatest of all bombers, the B-19. It is the largest airplane ever built and carries a bomb load sufficient to destroy utterly almost any conceivable military objective.



Three years in construction and costing $3,500,000, the B-19 is probably one of the greatest engineering feats of this century. "Its armament is a closely guarded secret," says the Douglas Company, but it is believed that large-caliber cannon are carried in addition to the usual machine guns.

gigantic Boeing Flying Fortress, and its vertical tail stands higher than the average three-story building!

With all this, the B-19, which was in the process of construction for something like three years, is an entirely conventional airplane. Further, because of its enormous size and the difficulties which were encountered in fabrication, it might well be considered one of the greatest engineering feats of this century. The fuselage was built in three separate sections, and when the workmen joined the units they were said to have fit perfectly. That is craftsmanship at its best!



The B-19's tail alone is larger than the wing on many fighters. It is said that the vertical fin stands higher than the average three-story building. With four Wright Duplex engines of 2,000 h.p. each, the top speed is said to be approximately 210 m.p.h.

The ship, however, should not be considered as anything more than a mere experiment, for it is inconceivable that such a machine would have a place in airwar under the present system. It would not only offer too good a target but is also so large that ordinary war-time flying fields would be entirely too small to accommodate it. In addition, fabrication of such a craft is entirely too costly to even warrant its use and possible destruction by enemy forces. Such a loss would well be comparable to the sinking of a luxury liner or an important battle cruiser. The original plane was said to have cost $3,500,000.

The machine is arranged as a low-wing monoplane of all-metal construction. A crew of ten is said to be accommodated, although this number seems far too small for the actual routine work required. For flights of any distance, it is more than probable that at least fifteen men are carried, including a commander, chief engineer, pilot, co-pilot, bombardment officer, radio operator, and navigator. At least five additional men will be needed to man the machine guns if the plane is actually used as a service-type plane.

Development of the retraction gear was an engineering feat in itself, for the landing wheels are about eleven feet in diameter and require a separate engine—large enough for the actual flying of some planes—for retraction purposes. The nose wheel folds up and back into the nose, and the main wheels in retracted position are housed in the inner engine nacelles.

It is said that a total of more than 36,000 pounds of bombs may be fitted in internal racks. This explosive force would be sufficient to completely destroy any military objective that might be conceived, considering that the plane would be able to reach its proposed target without difficulty.

Power is supplied by four air-cooled radial Wright Duplex engines of 2,000 h.p. each at take-off, giving an estimated top speed of 210 m.p.h. Cruising speed is believed to be 186 m.p.h., and landing speed is near 69 m.p.h.

Other data: Span, 212 feet; length, 132 feet; range, 7,750 miles; loaded weight, 164,000 pounds; ceiling, 22,000 feet. (These figures are not official.)

The world's biggest airplane has to have the world's largest wheel assemblies—and here is one of them. This tire and wheel are 96 inches in diameter and weigh 2,700 pounds—just about 23 times the weight of the young lady in the picture.

BRITISH

ARMSTRONG WHITWORTH WHITLEY

This low-wing bomber normally accommodates a crew of five, and there are power-operated turrets in the nose, amidships, and in the tail. The amidships position takes the form of a retractable "dust-bin" which is rotatable through 360 degrees. Bombs are stowed in the center section of the wing and in the fuselage. The machine was turned out as experimental in 1938.

There are no gun locations in the upper part of the fuselage center section. However, there is a turret in the extreme front of the ship, which may be rotated through 180 degrees on the horizontal and 90 degrees on the vertical. Also, there is a well-armed tail turret between the twin rudders. In this power-driven turret are four guns which offer a sufficient blanket of fire to keep enemy machines off the tail.

Power is supplied by two air-cooled radial Armstrong-Siddeley Tiger engines of 845 h.p. each at 6,250 r.p.m., giving a top speed of 215 m.p.h. at 15,000 feet. Cruising speed is 177 m.p.h., and landing speed is 59 m.p.h. The liquid-cooled Rolls-Royce engine is used in some models.

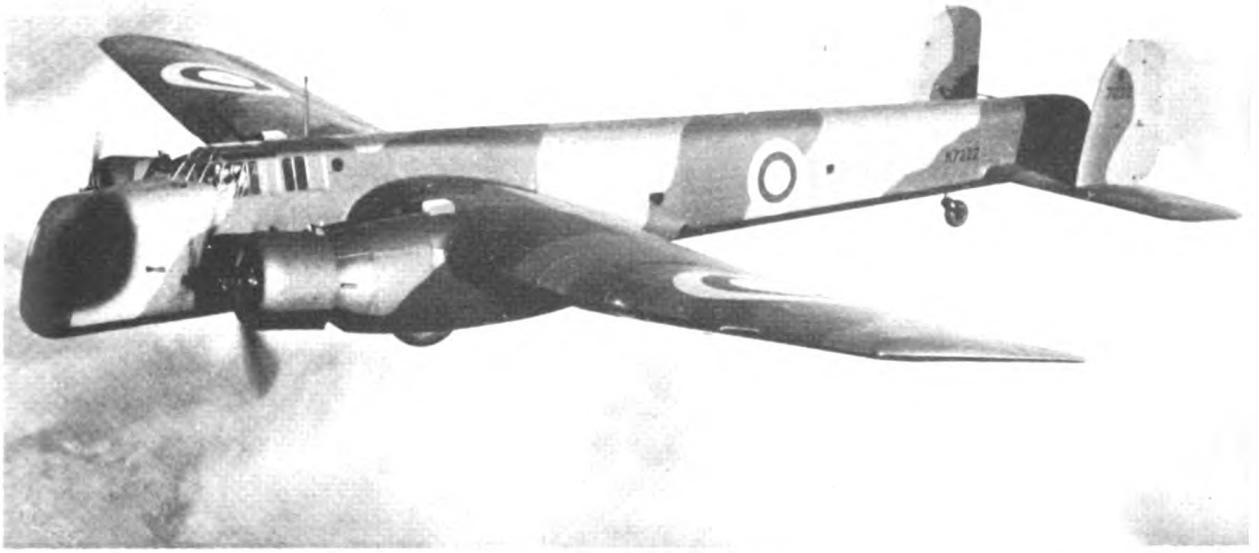
Other data: Span, 84 feet; length, 69 feet 3 inches; height, 15 feet; wing area, 1,137 square feet; range, 1,315 miles; loaded weight, 22,881 pounds; ceiling, 22,000 feet.

FAIREY HENDON

The Hendon's fuselage is different from the usual bomber type, in that it has no pronounced lines or curvatures and gives one the impression of being pencil-shaped. In the usual R.A.F. fashion, there is a gun station in the extreme forward tip of the fuselage, with the pilot located directly behind. Also, as in the Whitley, there is a rear turret and a "dust-bin" emplacement slung underneath the body.

The fuselage is of metal structure and is covered with fabric. The construction is of dural bulkheads and steel longerons in the front portion and triangulated steel girder tubes in the rear.

The low, cantilever wing is swept back and fabric covered. It is



One of the most mighty heavy bombers in service with the Royal Air Force is the Armstrong Whitworth Whitley. It has a top speed of 215 m.p.h. and a cruising speed of 177 m.p.h. Gross weight is 22,881 pounds and cruising range is 1,315 miles.

Tail turret of the Whitley is power-operated and is a formidable fortress in itself. There are four guns mounted, having a total fire-power of 7,200 rounds per minute.

built in three sections, with the center panel integral with the fuselage. Of metal structure, the outer panels taper in chord and thickness to the wing tip.

Power is supplied by two liquid-cooled in-line Rolls-Royce Kestrel engines of 600 h.p. each at 2,500 r.p.m. at 11,000 feet, giving a top speed of 156 m.p.h. at 15,000 feet. Cruising speed is 120 m.p.h.

Other data: Span, 101 feet 9 inches; length, 60 feet 9 inches; height, 18 feet 9 inches; wing area, 1,450 square feet; range, 1,360 miles; loaded weight, 20,000 pounds; ceiling, 21,500 feet.

HANDLEY PAGE HARROW

The Harrow is arranged as a high-wing monoplane with a fixed undercarriage. The fuselage is constructed in three sections. The forward portion is built-up of dural structure and is fabric covered, and the mid and rear sections are fabric covered steel tube construction.

The wing is built-up around a single girder featuring laminated dural flanges and diagonal and vertical tubular struts arranged in the form of an "N"-type truss. The trailing edge to the rear of the spar is fabric covered dural channel and tubular rib structure.

Power is supplied by two air-cooled radial Bristol Pegasus engines of 800/835 h.p. each at 2,250 r.p.m., giving a top speed of 200 m.p.h. at 10,000 feet. Cruising speed is 163 m.p.h. at 15,000 feet on 54 percent power, and landing speed is 63 m.p.h.

Other data: Span, 88 feet 5 inches; length, 82 feet 2 inches; height, 15 feet 5 inches; wing area, 1,090 square feet; range, 1,870 miles; loaded weight, 23,000 pounds; ceiling, 21,000 feet.

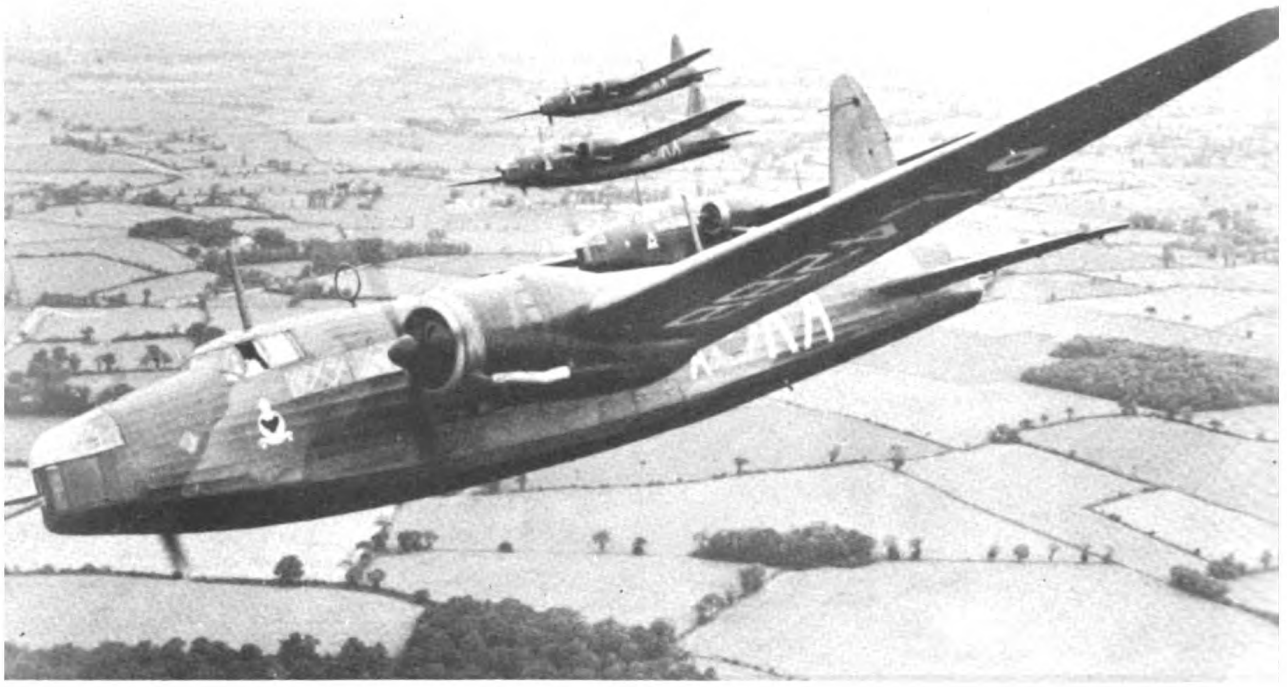
VICKERS WELLINGTON

Although officially listed as a long-range bomber of the medium type, the Wellington is heavier and carries a greater load of bombs than the standard Armstrong Whitley. Because of this, and because the Wellington has a larger span than the Whitley, it is being listed under the Heavy Bomber classification.

Like the Vickers Wellesley, the Wellington is of geodetic construction, fabric covered. A crew of five is accommodated—pilot,

One of the oldest bombers in service with the British forces is the Fairey Hendon. The fuselage is of metal structure and is covered with fabric. It is well armed, however, and mounts power-operated turrets both fore and aft.

It is unusual to see a high-wing bomber in these days of all-metal and liquid-cooled, high-powered engines. But unusual or not, the Handley Page Harrow, through actual work over Germany and Nazi-occupied territory, has proven to be a hard-striking craft.



One of the most popular and most versatile bomb carriers in the R.A.F. is this Vickers Wellington. It has a top speed of 265 m.p.h., weighs 27,000 pounds fully loaded, has a range of 3,200 miles, and mounts the usual fore and aft power-operated turrets.

co-pilot, nose gunner, amidships gunner, and tail gunner. All gun stations are equipped with power-driven turrets and mount from two to four guns. More than five tons of bombs are carried on internal racks in the fuselage center section.

There is nothing particularly striking about the general appearance of this machine. Of conventional design—with the exception, of course, of its geodetic construction—it is a mid-wing craft with the lines of an airliner. In fact, minus the gun turrets and cocardes, the Wellington would pass quite well as a passenger-carrying commercial airplane.

Power is supplied by two air-cooled radial Bristol Pegasus engines of 885 h.p. each at 2,250 r.p.m. at 15,500 feet, giving a top speed of 265 m.p.h. at 17,000 feet. Cruising speed is 215 m.p.h. at 15,000 feet.

Other data: Span, 86 feet; length, 61 feet 3 inches; height, 17 feet 5 inches; wing area, 750 square feet; range, 3,200 miles; loaded weight, 27,000 pounds; ceiling, 26,300 feet.

CHAPTER 4

FLYING BOATS AND SEAPLANES

AMERICA and Great Britain can rightly claim to have played a predominant role in the development of the flying boat. It is a type which is already of importance in both civil and military aviation, and one which is likely to become a great deal more important in the future. As a matter of fact, that future is almost being realized today, for recently the Pan American Airways announced that they had made plans for instituting a daily-except-Sunday flying boat service to Europe.

Aviation as a whole—and particularly over-water travel for long distances—is still in its infancy. But the time is coming when huge flying boats will be used not only as passenger-carrying planes on trans-oceanic routes, but also as cargo machines. The necessity for rapid shipment of many products makes this a definite need for the furtherance of world commerce and development. Too, it is not inconceivable to visualize the possibility that the world trade routes will be taken over almost completely by flying boats. Because of the comparatively low construction price of flying boats, and because of the miles they are able to cover before depreciation, the picture of the skies filled with flying boats regularly plying their way to Europe and Asia and other continents is not only a possibility but is a definite probability for the not-too-distant future.

When flying boats were first conceived, they were airplanes that could float. This practice was followed almost religiously until designers and engineers realized that there was more to the question than that. They then reversed the entire procedure and made the type boats that could fly, thus lifting surface vessels from the sublime nautical to the august aeronautical.

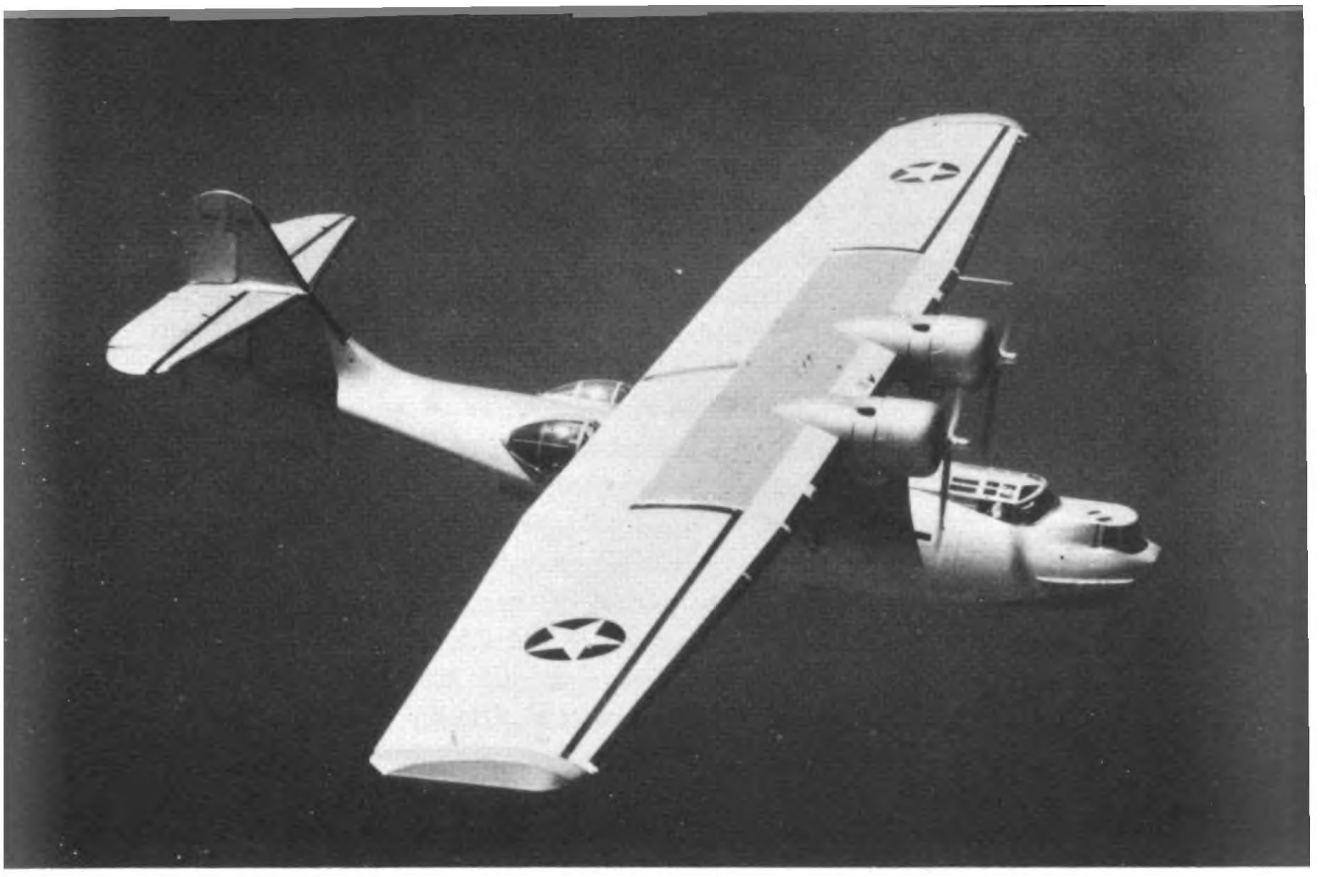
While the flying boat, then, is extensively employed as a bird of war by air forces of the world, it will most certainly develop with time into the carrier of the olive branch in bringing countries closer together. Its very nature makes it better for this than the landplane. For while the landplane has undergone extensive development, it has serious drawbacks for commerce duties because it is not capable of carrying the terrific loads that the flying boat can accommodate. The reason for this is that airports for the landplane will always be limited in size, and the craft therefore will not have room for a long enough run with tremendous loads of cargo. On the other hand, the flying boat has unlimited expanses of water from which to take-off, thus making possible much greater pay loads.

For war duties, seaplanes and flying boats are usually the work dogs of a naval air force. They have exceptionally long ranges, and because of this they are dispatched for coastal reconnaissance, convoy duties, and spotting. Seaplanes, which are usually nothing but landplanes with seagoing gear fitted for landings and take-offs, are employed for catapult purposes aboard battleships, cruisers, and other airplane-carrying warships. For the most part, they are scout machines, used for observation and shoot spotting. They are the eyes of the navy, directing batteries in firing against enemy surface vessels over the rim of the horizon or concealed by smokescreens, guiding squads and crews for rescue work, and locating the enemy who might be miles and several hours surface distance away.

AMERICAN

CONSOLIDATED PBY-5

Almost as soon as they were delivered to the U.S. Navy, planes of the PBY type established new massed flight records. These flights involved 147 PBY's and 1,022 men and crew members. The non-stop hops were from San Diego to Pearl Harbor, Hawaii (2,553 miles) and from San Diego to Coco Solo in the Canal Zone (3,087 miles). The smallest group in these flights was 12 planes, and the largest was 48, making hops concurrently. In only one



One of the most successful and dependable patrol-bombers in service with the U.S. Navy is the Consolidated PBY-5. It carries three machine gunners and has full facilities for crew comfort. Top speed with two 900-h.p. Twin Wasp engines is 198 m.p.h. Cruising range is 3,300 miles.

Very slightly different from the PBY-5, the Consolidated PBY-5A is called the largest amphibian in the world. Fitted with a tricycle undercarriage, the nose wheel retracts directly into the hull bottom. Note how wing tip comes down to provide flotation for the wing during water landing.

occasion did any of the machines alight en route. On the flight of 48 to Coco Solo, three of the group, after battling adverse flying conditions for hours, descended a few miles short of their destination to take on additional fuel simply as a precautionary measure. The flights were otherwise completed without incident, thus piling up an almost incredible record of consistent long-range performance; 422,283 airplane miles, or about 17 times around the globe!

In order that this patrol-bomber may be entirely independent of any base for an extended period of time, the hull is protected from corrosion by the latest approved finishes and all facilities for extended flight and comfort of personnel are provided. These include commodious sleeping quarters, living quarters, galley complete with range and refrigerator, soundproofing, clothes lockers, toilet and washing facilities, heating and ventilating system, and even a well-equipped workshop.

Another novel feature is the installation of retractable wing floats which in flight are drawn up to form the tip of the wing. At the time of landing, the floats are let down and form, in addition to necessary flotation for the wing, an additional braking effect for slow landing. A complete telephone system is installed within the boat whereby any member of the crew may contact any other member without leaving his station.

The PBY-5 has been sold to the British as the Catalina, and is being utilized by Coastal Command units for long-distance reconnaissance and other duties.

Power is supplied by two air-cooled radial Pratt & Whitney Twin Wasp engines of 900 h.p. each at 12,000 feet, giving a top speed of 198 m.p.h. Cruising speed is 183 m.p.h. at 10,000 feet, and landing speed is 68 m.p.h.

(A similar ship, the PBY-5A, is called the largest amphibian in the world. Specifications and performance figures are practically identical to those of the PBY-5.)

Other data: Span, 104 feet; length, 65 feet 2 inches; height, 19 feet 9 inches; wing area, 1,490 square feet; range, 3,300 miles; loaded weight, 32,000 pounds; ceiling, 29,700 feet.

CONSOLIDATED PB2Y-2

There is absolutely no data available at this time concerning the PB2Y-2, other than that it is probably the largest plane in service with the U.S. Navy and that it is for patrol-bombing purposes.

Even though the PB2Y-2 is meant for over-water duties, one can very readily see the similarity of the B-24 in its general design. As a matter of fact, it is said by many informed sources that the Army B-24 heavy bomber was evolved directly from this flying dreadnaught.

The fuselage is of all-metal construction and is probably arranged to accommodate a crew of nine or more. It has gun turrets in the nose, tail, and amidships; additional weapons are manned from ports on the fuselage sides aft of the wing trailing edge.

The wing is of the full cantilever type with retractable tip floats like those carried on other Consolidated patrol-bombers. Four air-cooled radial engines are in the wing leading edge. They ordinarily swing three-bladed controllable-pitch propellers.

Performance figures and specifications awaiting release by the U.S. Navy Department.

Largest of all Naval Air Service patrol-bombers is the Consolidated PB2Y-2. The plane is of all-metal construction and probably carries a crew of nine or more. It is said to have a comparatively high speed and an exceptionally long cruising range.

CURTISS SOC-4

This scout-observation machine may be fitted either with the conventional landplane gear or with seaplane floats. It is used in large numbers in the latter fashion aboard battleships and cruisers in the U.S. Navy for catapult work.

The fuselage is a welded steel tube structure and is covered forward with sheet aluminum and aft with fabric. A crew of two is accommodated under a transparent sliding canopy. The pilot normally has but one .50 caliber Browning machine gun, with 500 rounds of ammunition, synchronized to fire through the propeller arc; the rear gunner-observer has one .30 caliber weapon on a swivel mount.

The SOC-4 is arranged as a single-bay staggered biplane. The wings are of metal structure, fabric covered, and have a pronounced dihedral angle in the upper plane. For catapult work, floats are mounted on each lower wing tip to provide lateral balance during operations on water. Racks on the lower wing panels are fitted to carry 100-pound bombs.

Power is supplied by an air-cooled radial Pratt & Whitney Wasp engine of 500 h.p. at 2,200 r.p.m. at 5,000 feet, giving a top speed of 165 m.p.h. Cruising speed is 133 m.p.h., and landing speed is 57 m.p.h.

Other data: Span, 36 feet; length, 31 feet 5 inches; height, 14 feet 9 inches; wing area, 342 square feet; range, 675 miles; loaded weight, 5,437 pounds; ceiling, 14,900 feet.

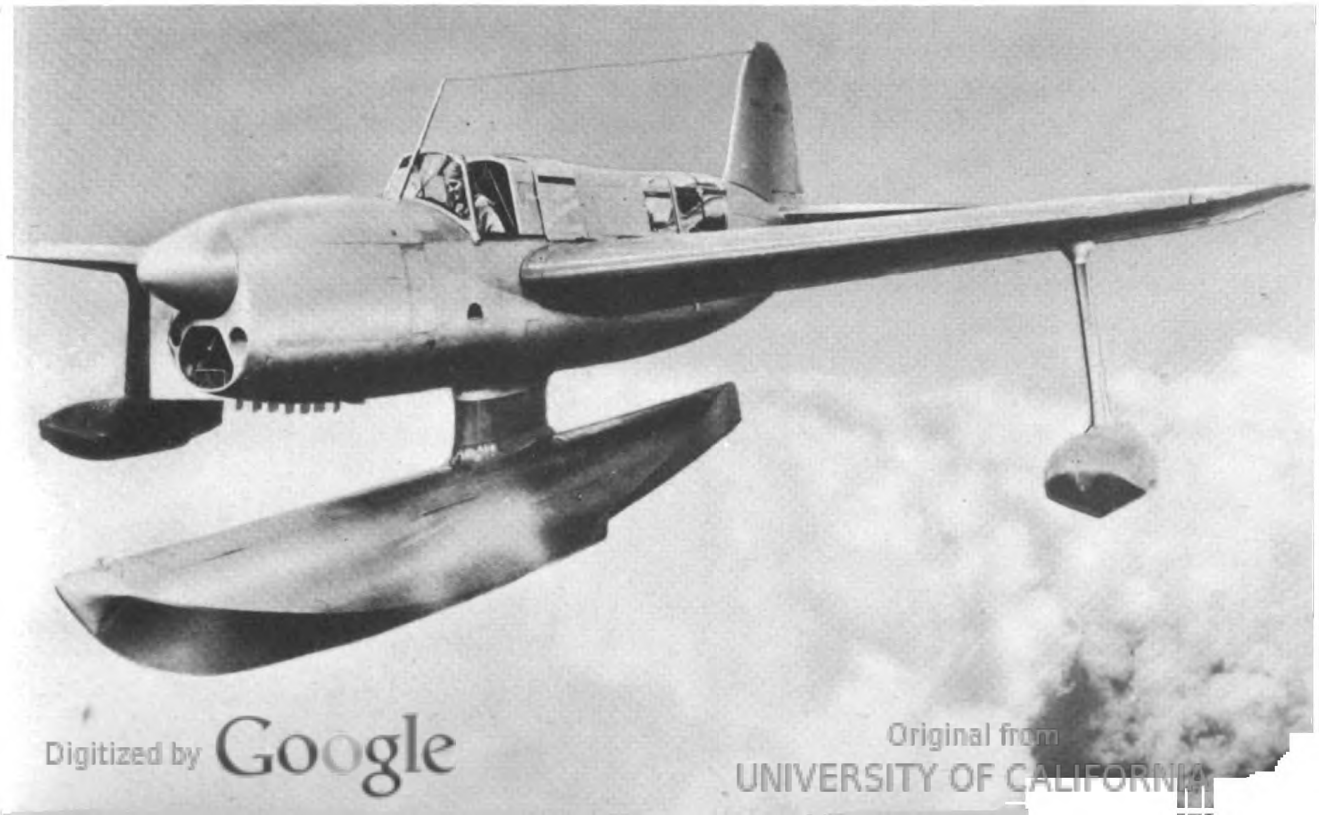
CURTISS SO3C-1

Like the SOC-4, the SO3C-1 may also be fitted as either a landplane or seaplane. And, like the SOC-4, it is usually found with the float arrangement. Available information has it that the SO3C-1 is being used to replace the SOC-4.

The ship is a mid-wing monoplane and has extremely modernistic lines. It accommodates a crew of two under a sliding canopy. The fuselage is long and slim and seems to have very little waste space, except for the section between the pilot and gunner-observer. The rear cockpit is far aft and is just a bare few inches from the vertical fin. This gives exceptionally good visibility.

The Curtiss SOC-4 is used quite extensively aboard battleships and cruisers for catapult purposes. The single main float may be removed and fitted with standard wheels for land operations. The top speed is 165 m.p.h.

With very modernistic lines, the Curtiss SO3C-1 is a scout-observation machine for operations with the Fleet. It carries a crew of two and may be used for general reconnaissance, patrol duties, and shoot spotting.



And the pilot, instead of being located directly over the wing in the usual fashion, is situated slightly forward of the leading edge; this feature also makes for better than usual visibility for observation purposes.

The full cantilever wing is of metal structure and, according to company 3-view plans, is entirely without sweepback. The panels are attached to the fuselage at a point just below the pilot's pit; wing tips are detachable and are designed for quick replacement.

A single float, mounted on an "I"-strut, is under the fuselage for water landings, and wing tip floats are far out on the wing panels.

Power is supplied by an air-cooled inverted Ranger engine of 520 h.p. Performance figures have not been released.

Other data: Span, 38 feet; length, 36 feet 9 inches; height, 15 feet; wing area, 290 square feet; loaded weight, 5,729 pounds.

GRUMMAN J2F-2

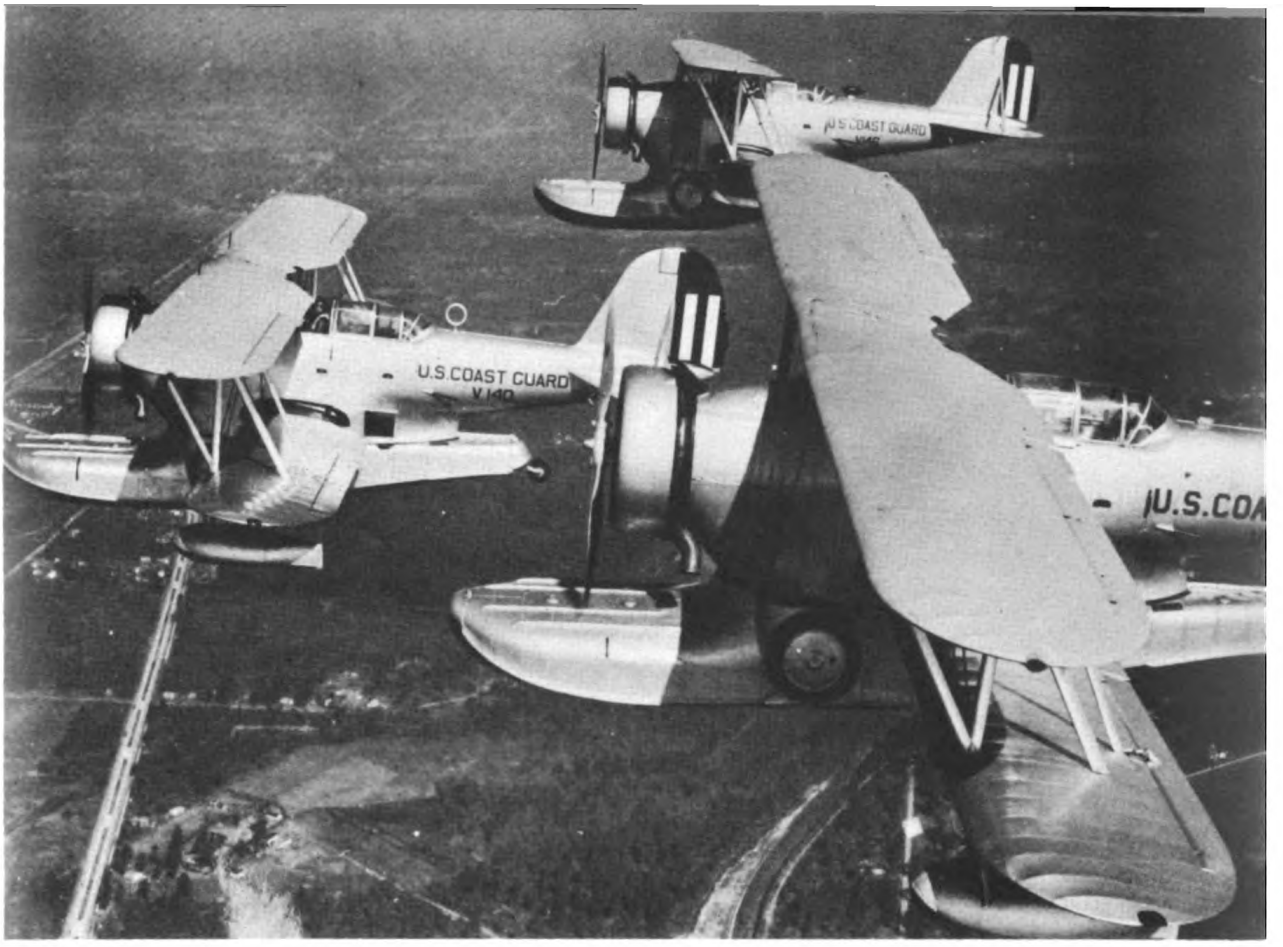
The Navy lists this plane as a utility amphibian—which means that it is probably used for practically any duty, including reconnaissance, coastal work, ship-to-shore liaison, shoot spotting, etc.

The fuselage is of all-metal construction, with a single "shoe horn" hull beneath the body proper. This hull is not only used for water landings, but it also takes the retracted landing gear and fixed tail wheel for normal landings aboard aircraft carriers or airports.

A crew of three is normally accommodated. The pilot and rear gunner-observer are under a transparent canopy, and the third man is lower and in the float hull.

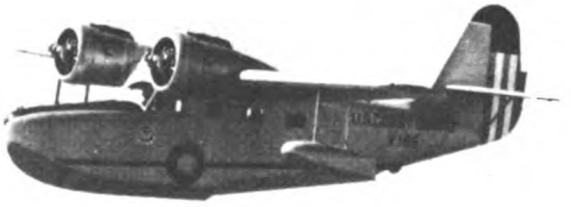
The biplane wings are staggered and are of equal span. Metal structure is used, with fabric covering. Single "N"-struts brace the wings interplane. Wing floats are on the lower panels near the tips.

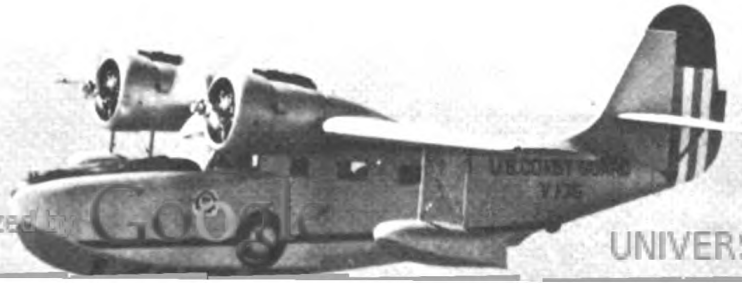
Power is supplied by an air-cooled radial Wright Cyclone engine of 750 h.p. at 2,100 r.p.m. at 1,700 feet, giving a top speed of 180 m.p.h. Cruising speed is 150 m.p.h., and landing speed is 64 m.p.h.



The Navy has found the Grumman utility amphibians excellent for miscellaneous duties. A crew of three is normally accommodated. The wings have a span of 39 feet and are fabric covered. Top speed is 180 m.p.h.

Basically the commercial G-21A with military markings, the Grumman JRF-1 amphibian is used by both the Navy and Coast Guard. For service duties, the usual interior accommodations are replaced by other equipment.





Other data: Span, 39 feet; length, 34 feet; height, 12 feet 4 inches; wing area, 409 square feet; range, 780 miles; loaded weight, 6,170 pounds; ceiling, 21,000 feet.

GRUMMAN JRF-1

Originally designed as a six-passenger commercial amphibian for private use, the JRF-1 type (designated G-21A by the company) has been purchased by the U.S. Navy, the Air Corps (OA-9, for amphibian-observation), and by the Royal Air Force as an ambulance ship to pick up airmen shot down over the English Channel and to rescue crews of sinking surface vessels. For military duties, the usual spacious seats and other interior accommodations are replaced by other equipment.

The JRF-1 is a high-wing cantilever monoplane of all-metal construction. The lines blending the wing root into the hull behind the deep rounded windshield continue back to a cantilever tail that grows smoothly from the hull streamlines. The deep, rugged, all-metal hull is divided into six watertight compartments.

The wing is of all-metal structure and uses the box beam construction principle. The center section is integral with the hull to a point just outboard of the engine nacelles. The outboard panels are fabric covered aft of the box beam to further facilitate inspection.

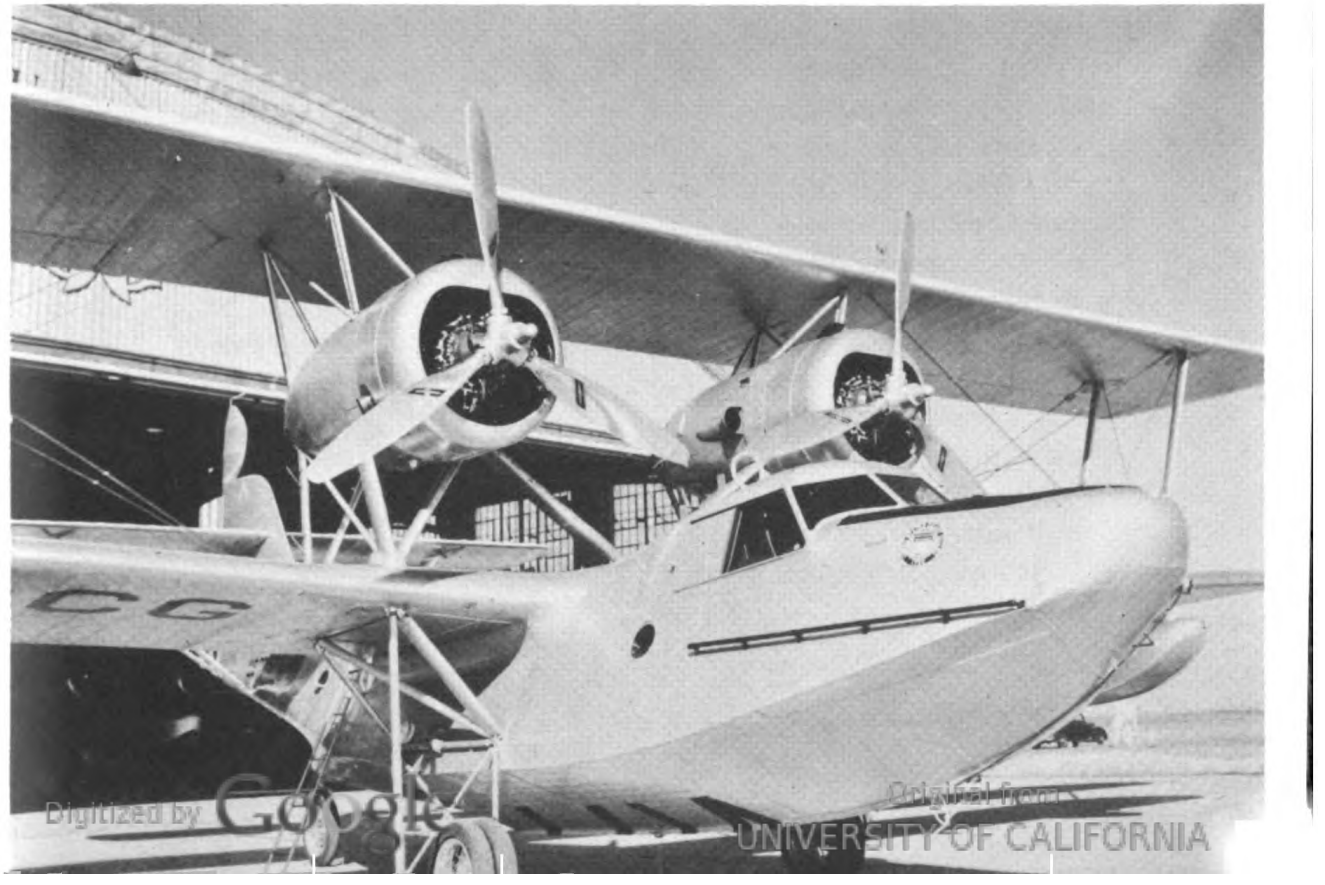
Wheels for land set-downs are retracted in the usual Grumman style, lying flat against the hull when in the "up" position. The tail wheel folds into a well behind the second step in the hull bottom.

Power is supplied by two air-cooled radial Pratt & Whitney Wasp Junior engines of 400 h.p. each at 5,000 feet, giving a top speed of 201 m.p.h. Cruising speed is 190 m.p.h. at 9,600 feet, and landing speed is 62 m.p.h.

Other data: Span, 49 feet; length, 38 feet 4 inches; height 12 feet; wing area, 375 square feet; range, 1,000 miles; loaded weight, 8,000 pounds; ceiling, 22,000 feet.

In Air Corps service, the twin-engined Grumman is known as the OA-9. Power is supplied by Pratt & Whitney Wasp Junior engines of 400 h.p. each. Top speed is 201 m.p.h. and cruising speed is 190 m.p.h.

Coast Guard pilots always have a good word for their Hall-Aluminum PH-2's. Used for patrol and rescue duties, the machine is very seaworthy. As far as can be determined, there are no provisions for gun stations.



HALL-ALUMINUM PH-2

Although there is nothing particularly new or different in the general design of this plane, it is used most effectively for both patrol and rescue purposes. In the latter role it has been employed numerous times by the U.S. Coast Guard.

As far as can be observed, no provisions are made for gun locations. Considering this, and considering that no bomb racks are normally mounted, it must be assumed that the PH-2 was designed merely for peace-time military duties.

The hull is of all-metal construction and is covered with metal sheet. A crew of from four to seven is carried and the control pit is housed-in by a transparent covering. Beaching gear is provided for docking the plane in standard-type hangars. The wings are of two-spar metal structure, fabric covered.

Power is supplied by two air-cooled radial Wright Cyclone engines of 750 h.p. each at 1,950 r.p.m. at 3,200 feet, giving a top speed of 159 m.p.h. Cruising speed is 136 m.p.h., and landing speed is 60 m.p.h.

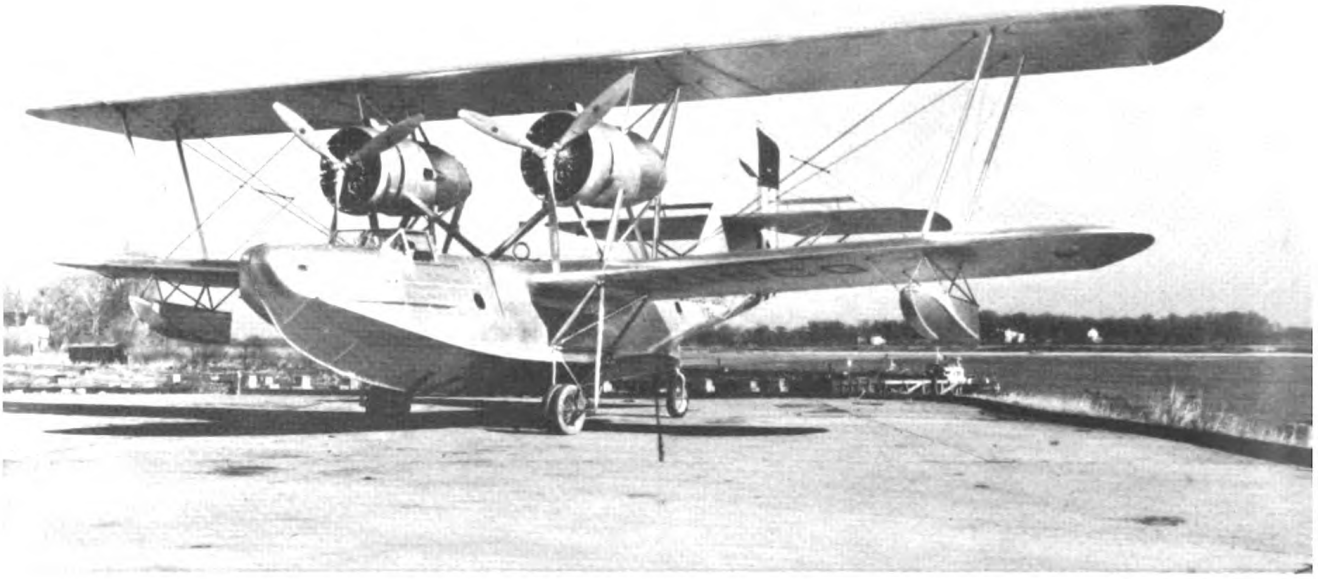
Other data: Span, 72 feet 10 inches; length, 51 feet 4 inches; height, 19 feet 9½ inches; wing area, 1,170 square feet; range, 2,300 miles; loaded weight, 17,679 pounds; ceiling, 21,350 feet.

MARTIN PBM-1

This giant "flying battleship" is the current answer to the U.S. Navy's demand for a powerful air arm to cooperate with the Fleet as a patrol-bomber. In time of war, equipment of this type would be invaluable because of its long-distance reconnaissance and bombing abilities. It can, for instance, in 21½ hours completely scout the distance it would take a surface destroyer a full 24 hours to patrol.

This is supposed to be the first American military machine to feature power-operated machine gun turrets. From its four turrets, one of which is in the tail, it is said that a full twelve machine guns may be operated for defensive and offensive operations. Additional guns, in all probability, are manned from ports in the hull sides.

As a patrol-bomber, it carries up to five tons of bombs and, on



The PH-2 has a top speed of 159 m.p.h., a cruising speed of 136 m.p.h., and a landing speed of 60 m.p.h. The upper wing measures 72 feet 10 inches, the length is 51 feet 4 inches, and the height is 19 feet 9½ inches. Wright Cyclone engines of 750 h.p. each are used.

This Martin PBM-1 patrol-bomber is said to be the first American military airplane to feature power-operated machine gun turrets. A full twelve guns are mounted for defensive and offensive operations. The machine is of all-metal construction and has a wing span of 118 feet.

paper, a squadron of these planes would have little difficulty in attacking and thoroughly dealing with any hostile fleet which might be within striking distance. From this it would appear that our shores are completely invulnerable, if the PBM-1 is utilized against enemy vessels. Naturally, however, the claimed advantage of these planes will have to be proven in actual warfare before it can be fully accepted.

Like other patrol-bombers in service with the Fleet, this machine has full living accommodations for its crew, de-icing equipment, galley, soundproofing, heating and ventilating, and all other modern equipment and innovations.

The ship is of all-metal construction with a full cantilever high wing. A twin tail arrangement is carried with the horizontal surfaces on a noticeable dihedral angle. The wing floats are retractable, folding up and out into the undersection of the wing panels.

Power is supplied by two air-cooled radial Wright Cyclone engines of 1,350 h.p. each at sea level. Performance figures have not been released.

Other data: Span, 118 feet; length, 77 feet 2 inches; height, 17 feet 6 inches.

NORTHROP N3 PB

A group of Norwegians that escaped from Norway after the Nazi invasion of that country are training in Toronto, Canada, to again take up arms against the Germans and help free their homeland. One of the American machines being utilized by the group is the Northrop N3 PB patrol-bomber.

The ship is a single-engined, low-wing, full cantilever monoplane of semi-monocoque construction incorporating two pedestal-mounted floats for landing on water and split trailing edge flaps; provisions are made for a crew of three.

The normal armament arrangement includes four fixed guns mounted in the leading edge of the outer wing panels, a flexible gun at the lower rear gunner's station, and a flexible weapon at the upper rear gunner's pit. Also, both internal and external bomb racks give a wide selection of the type bombs desired for

Called the fastest military seaplane in the world, the Northrop N3 PB is seen here with Norwegian markings. It is said that the craft played a large part in cornering and sinking the Nazi battleship "Bismarck."

Vought-Sikorsky's OS2U-1 observation-scout is for use in cooperation with the Fleet. Accommodating a crew of two, it has a loaded weight of 4,724 pounds.

any operation, from 30 pounds in weight to a 1,000-pound bomb.

Power is supplied by an air-cooled radial Wright Cyclone engine of 1,200 h.p. at take-off, giving a top speed of 217 m.p.h. at 16,400 feet. Cruising speed is 150 m.p.h. at 5,000 feet, and landing speed is 64 m.p.h.

Other data: Span, 48 feet 11 inches; length, 38 feet; height, 16 feet 10 inches; wing area, 377 square feet; range, 1,165 miles; loaded weight, 8,500 pounds; ceiling, 24,000 feet.

VOUGHT-SIKORSKY OS2U-1

As with several other airplanes reviewed in this chapter, this craft may be utilized as either a landplane or as a seaplane. Also, as with other machines in this classification, it is usually employed as a seaplane for operation with the U.S. Navy.

Arranged as a low-wing monoplane of all-metal construction, the OS2U-1 carries a crew of two under a transparent sliding canopy. The fuselage is of monocoque design and is spot-welded to make for mass production. No armament details have been released, but it is believed that the pilot has one gun mounted on the wing and that the observer has one gun on a swivel mount. The wing is also of metal construction.

A single main float is slung beneath the fuselage, being held in place by three "I"-struts and cross-bracing of tubing. Wing tip floats are also provided.

Power is supplied by an air-cooled radial Pratt & Whitney Wasp engine of 400 h.p. at 2,200 r.p.m. Performance figures have not been released.

Other data: Span, 36 feet; length, 33 feet 10 inches; loaded weight, 4,724 pounds.

BRITISH

FAIREY SEAFOX

In 1936 the Royal Air Force gave the Fairey Company orders to produce a ship that would stand the thud of continual catapulting—a machine with folding wings for stowage aboard aircraft carrying surface vessels and with a cockpit that would carry complete equipment required in naval reconnaissance work. The Seafox was the final product. And while the craft is not particularly fast, it is said to be very efficient for the duties required. Light and strong, it handles well in all sorts of seas.

The pilot sits high, as usual in the British Fleet Air Arm planes, and the observer is well protected under a streamlined cowling where he can work his radio, camera, machine gun, and other equipment. The pilot's single weapon is synchronized to fire through the propeller arc.

The fuselage is of metal monocoque construction, having sealed metal covering over frames with corrugated stiffeners. The equal-span biplane wings are of two-spar structure with girder ribs and wire drag bracing. The all-metal floats, which have but one step, are fitted with small water rudders.

Power is supplied by an air-cooled in-line Napier Rapier engine of 355/370 h.p., giving a top speed of 124 m.p.h. Cruising speed is 106 m.p.h. at 5,860 feet, and landing speed is 53 m.p.h.

Other data: Span, 40 feet; length, 35 feet 5 inches; height, 12 feet 1 inch; wing area, 434 square feet; range, 440 miles; loaded weight, 5,420 pounds; ceiling, 11,000 feet.

SARO LERWICK

If there was ever an aircraft that appeared to be completely out of proportion, the Lerwick is it. The tail seems to be too high and the body too deep and too short. With all this, however, the Lerwick is apparently a very good ship, for all performance figures have been withheld by the Royal Air Force. It is known, though, that the power plants are air-cooled radial Bristol Hercules engines of 1,100/1,150 h.p. at 2,400 r.p.m. at 5,000 feet.

A crew of six is accommodated—pilot and co-pilot, front gunner,

two amidships gunners, and a tail gunner. Both front and rear gun stations are covered power-turrets. Crew members can freely change stations, and the gunners have various other duties, from navigation to radio, besides operating their weapons.

There is but one step in the boat hull. The peculiar part of the hull is that the "boat" section extends all the way back to within about six feet of the extreme tail of the body. Usually, the hull portion ends much farther forward, with a tapering empennage extending to the rear.

The wing panels, like the body, are of all-metal construction. Exceptionally large wing flaps are provided to facilitate water take-off and landing. Stability at rest or slow speed on the water is made possible by a float attachment under the main plane near each tip. Streamlined "V"-struts join these floats to the wing undersection.

Other data: Span, 81 feet; length, 63 feet; height, 20 feet.

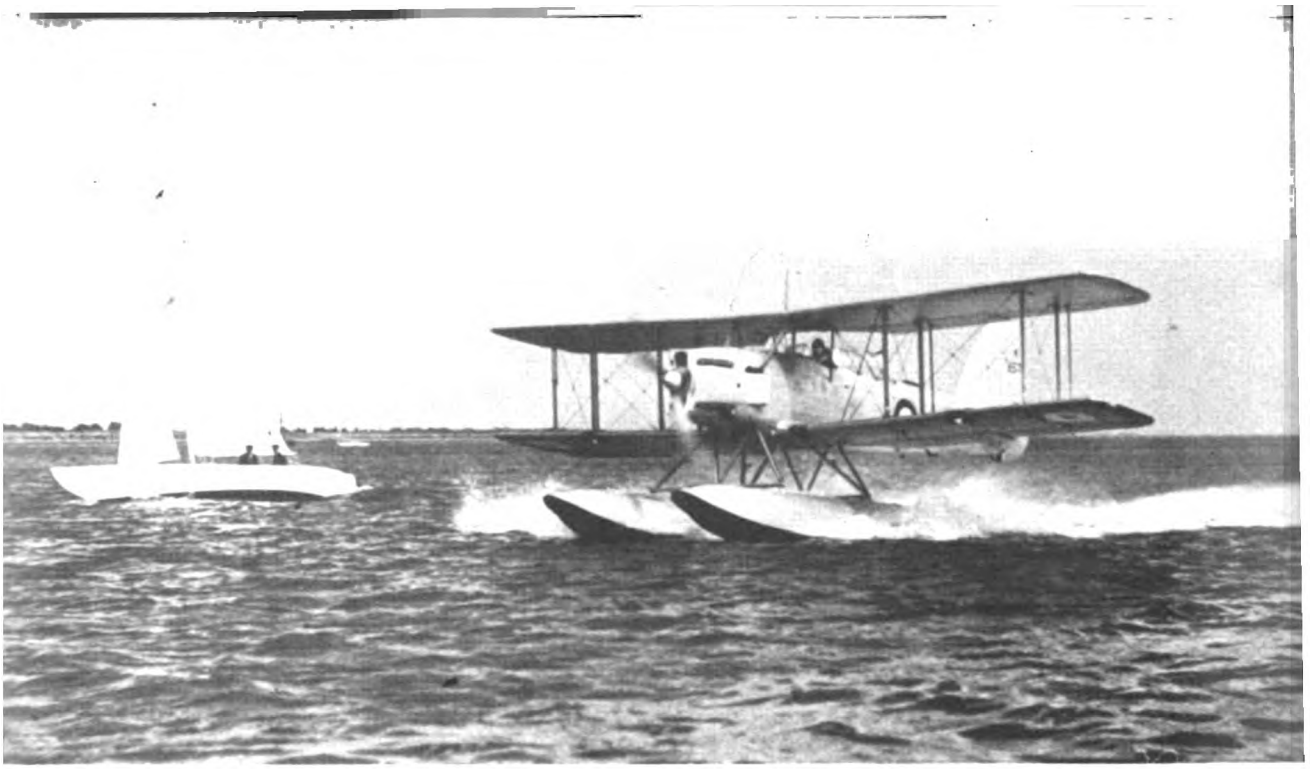
SARO LONDON

Since the Lerwick is so extremely hush-hush, the only product of the Saro (which is a contraction of Saunders-Roe) firm that it is possible to present data on is the well-tried London twin-engined flying boat which is utilized for open-sea reconnaissance, coastal defense and control, convoy, and general-purpose duties.

The two-step hull is of special Saunders-Roe construction and is built-up of frames with stainless steel fittings covered by sheet metal. The bulkheads are so arranged that any two of the three watertight compartments can be holed without loss of the boat.

There are three gun stations of the open type—in the bow, amidships, and in the extreme tail. The bow gunner has a special door to give forward and downward vision. The pilot's compartment is directly behind the front gun station; arrangement is side-by-side seats with dual controls.

The officers' cabin is aft of the pilot compartment and contains two bunks. The engineer's station is aft of the first hull step bulkhead on the starboard side. Behind these positions are bunks for the crew and stowage space. Back of the amidships gun emplacement is stowage space for a collapsible dinghy. Spare engines and



Built in 1936, the Fairey Seafox is for catapult duties. It is powered by a Napier Rapier engine of 355/370 h.p. and has a top speed of 124 m.p.h. The twin floats are of metal construction.

Britain's newest long-distance flying boat is the Saro Lerwick. This picture shows the original prototype being launched for the first time. It has a wing span of 81 feet, a length of 63 feet, and a height of 20 feet. Engines are 1,100/1,150-h.p. Bristol Hercules.

similar items may be carried on the hull decking, especially strong anchorages being provided. A torpedo may also be accommodated, though there are no provisions for releasing it during flight.

Power is supplied by two air-cooled radial Bristol Pegasus engines of 960 h.p. each at 2,475 r.p.m. at 3,500 feet, giving a top speed of 155 m.p.h. at 6,560 feet. Cruising speed is 137 m.p.h., and landing speed is 66 m.p.h.

Other data: Span, 80 feet; length, 56 feet 9 inches; height, 18 feet 9 inches; wing area, 1,425 square feet; range, 1,740 miles; loaded weight, (normal) 18,400 pounds, (maximum) 22,000 pounds; ceiling, 19,900 feet.

SHORT SINGAPORE

The prototype of this machine was built in 1930, and up until about five years ago the British were playing up the craft as one of the best of its type. Then came the Sunderland (which is explained immediately following) and the Singapore was promptly written off the publicity list.

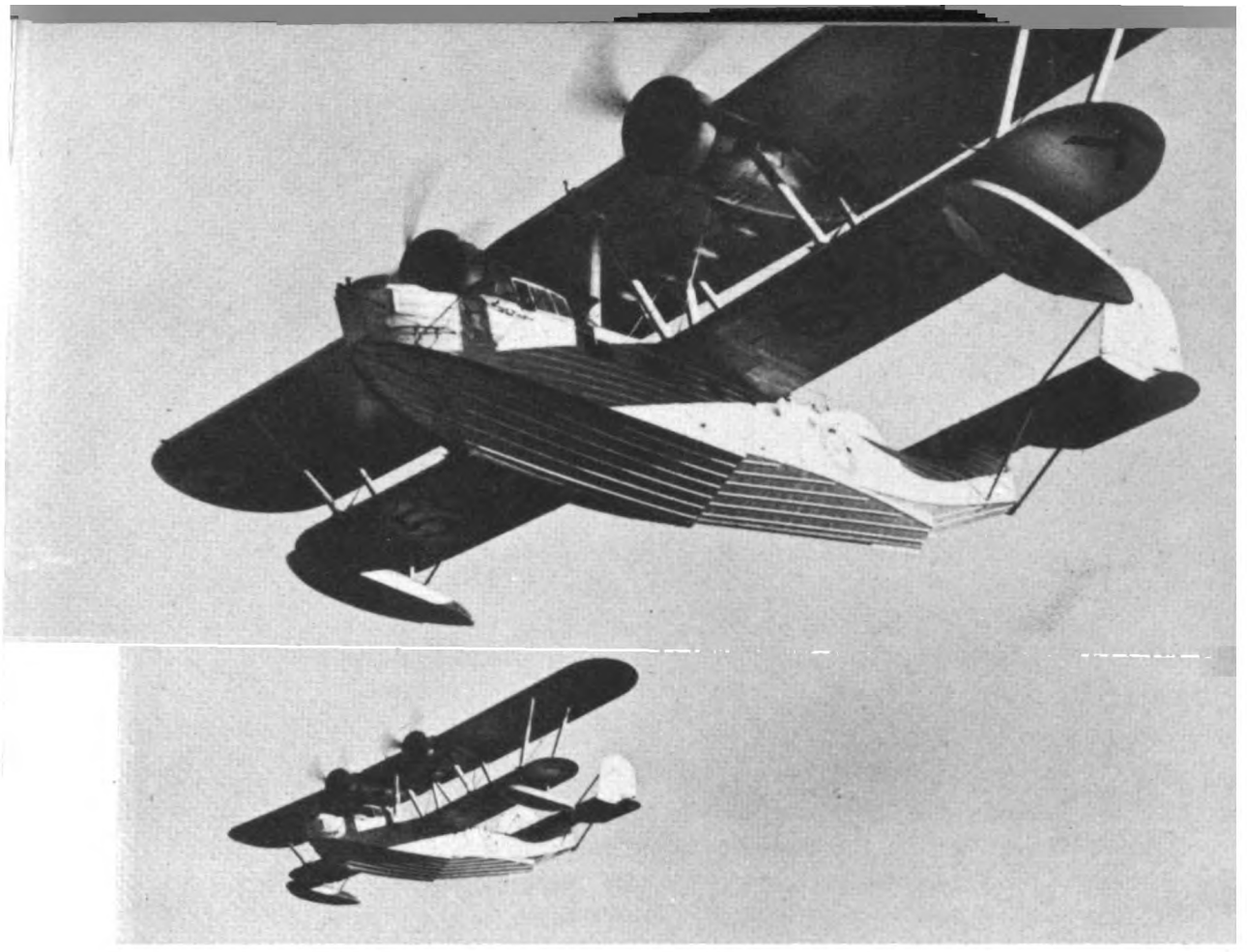
The two-step type hull is of special underwater planing surface to prevent any tendencies to porpoise while landing or running on water, and metal skin is attached to stiffened frames which provide the hull shape.

One set of interplane struts brace the wings, and the four engines are slung between the wings and braced by two struts. Huge radiators extend upwards from the tractor engines, for cooling purposes, which sorely impede the general streamlining.

There are the usual three gun stations, all open.

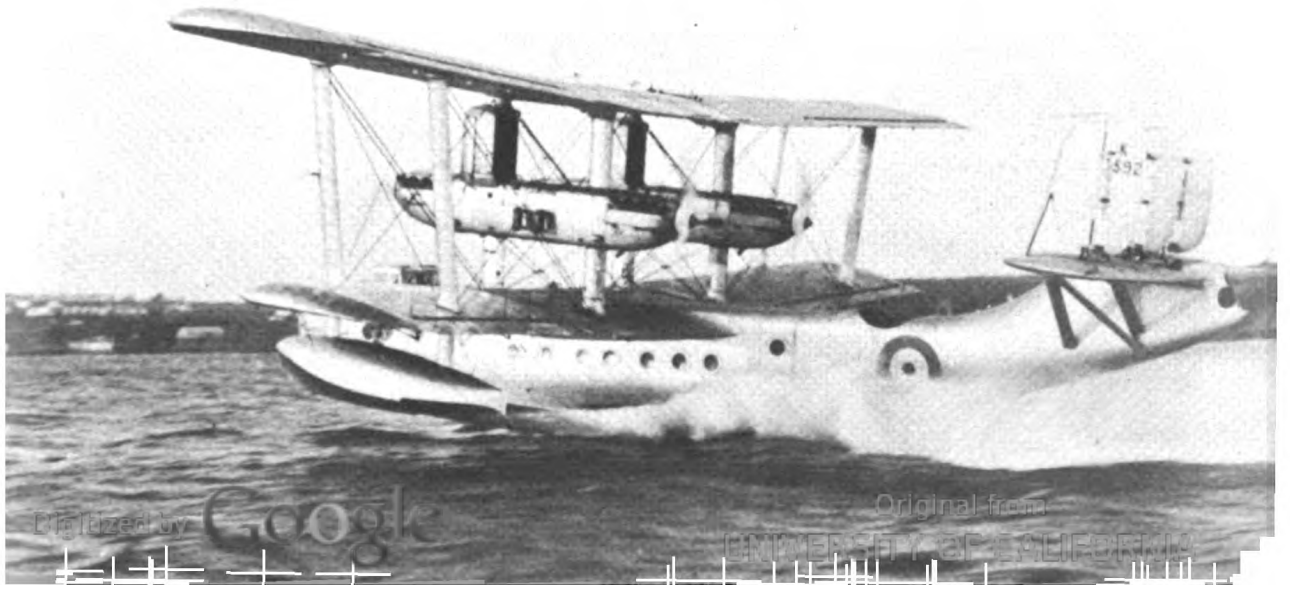
Power is supplied by four liquid-cooled in-line Rolls-Royce Kestrel engines which develop a total of 3,000 h.p., giving a top speed of 210 m.p.h. at 6,250 feet. Cruising speed is 178 m.p.h. at 7,000 feet, and landing speed is 69 m.p.h.

Other data: Span, 90 feet; length, 64 feet 6 inches; height, 23 feet 7 inches; wing area, 1,834 square feet; range, 1,000 miles; loaded weight, 27,900 pounds; ceiling, 16,000 feet.



The Fleet Air Arm's old reliable is the Saro London. The ship first flew in 1934, and since then has well proved its worth. It is a comparatively heavy craft, weighing 22,000 pounds loaded. Speed is 155 m.p.h.

Judged by usual standards, the Short Singapore would now be called an obsolete type. Such is not quite true in this case, however, and the plane is still performing useful work. Two tractor and two pusher engines are used, having a total of 3,000 h.p.



SHORT SUNDERLAND

The Sunderland is a four-engined flying boat of rather generous proportions. It was in the process of development for some few years, and it is generally considered to be a large-sized Empire flying boat for military duties. A full squadron of these boats was said to have been designed, built, and test flown before anyone outside the Short factory realized what was going on. It is further stated that by the time photographs of these planes had appeared in print, the first complete squadron had been successfully flown to Singapore. One stretch of 1,250 miles was covered comfortably in eight hours during that flight. Others soon followed, going to Australia and New Zealand.

The Sunderland differs from the commercial Empire boat notably in the design of the hull, particularly in the region of the rear step. Power-operated two-gun turrets are installed in the bow and behind the rudder. There are also ports for two additional guns amidships. Actually, the Sunderland is probably the roomiest machine yet delivered to the Royal Air Force.

There are six fuel tanks in the single high wing, three on each side of the hull. The inboard pair hold between them 1,058 gallons, the intermediate pair contain 711 gallons, and the outer two (employed in overload condition) hold 265 gallons.

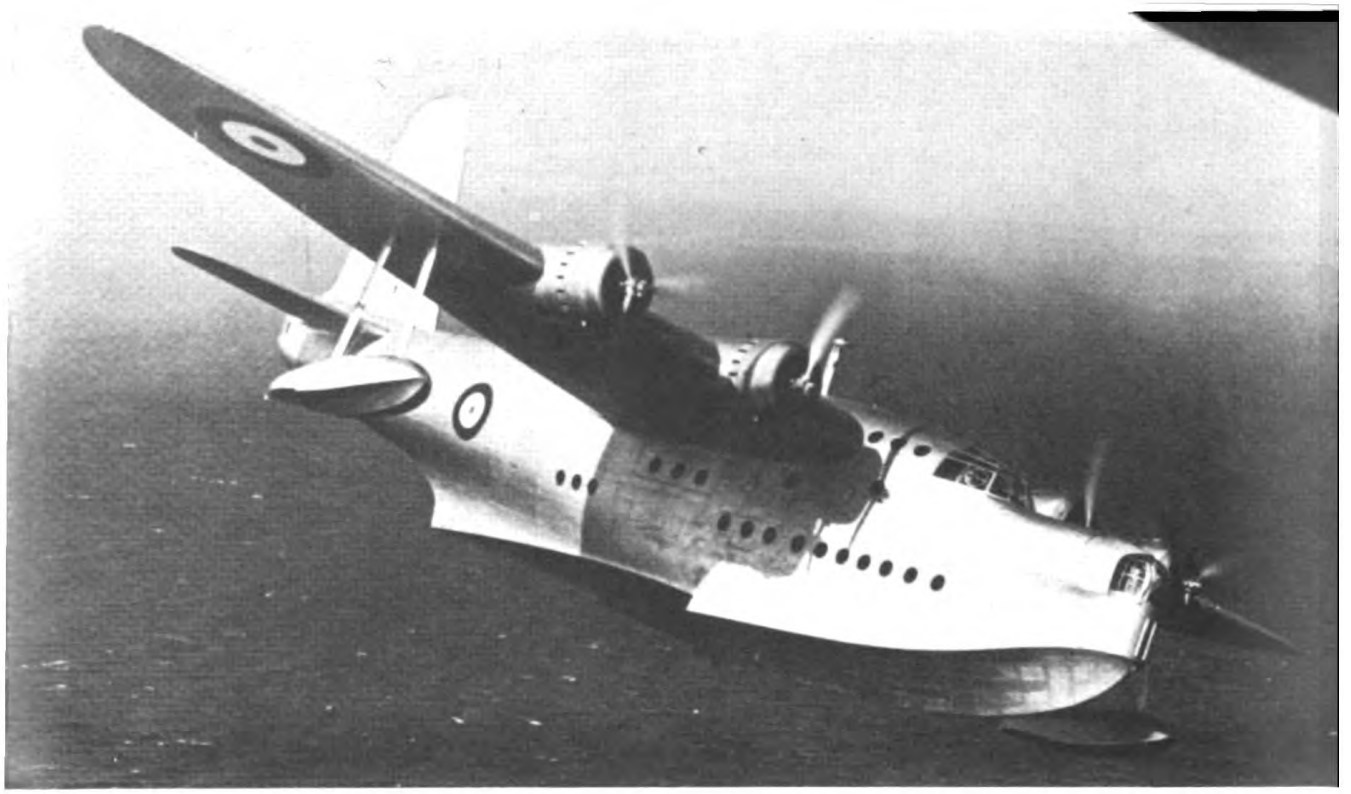
The interior of the hull is arranged in two levels, the pilots' position being on the upper one. The lower deck embodies the mooring compartment, lavatory, officers' wardroom, galley, and quarters for the crew. The wardroom and crew quarters have bunks and folding tables.

Power is supplied by four air-cooled radial Bristol Pegasus engines of 1,010 h.p. each, giving a top speed of 210 m.p.h. at 6,250 feet. Cruising speed is 178 m.p.h. at 7,000 feet.

Other data: Span, 112 feet 9½ inches; length, 85 feet 4 inches; height, 32 feet 11 inches; wing area, 1,487 square feet; range, 2,880 miles; loaded weight, 45,700 pounds; ceiling, 20,500 feet.

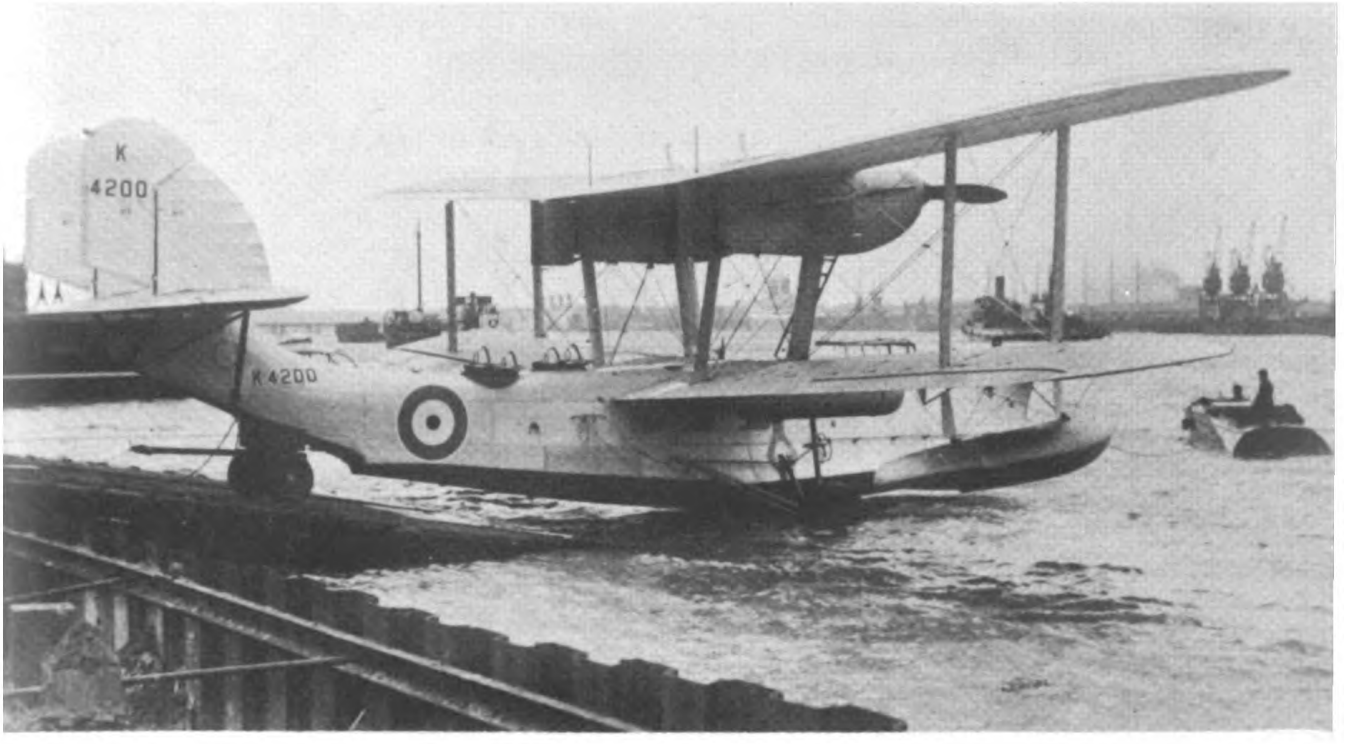
SUPERMARINE SCAPA

Built by the makers of the famous Spitfire, this ship has none of the clean lines of that single-seat fighter. Used solely as a



Short Sunderland long-distance flying boats are often dispatched to escort convoys of merchant vessels and to spot submarines. Mounting several machine guns, it is a formidable foe. On several occasions, it has shot down German fighter planes trying to bomb it, according to Royal Air Force war communiques.

The Supermarine Scapa is another product of the firm building the famous Spitfire fighter. Two Rolls-Royce Kestrel engines of 525 h.p. each provide the power in this model, giving a top speed of 133 m.p.h. Other types use Bristol Pegasus radials.



coastal reconnaissance flying boat, though, the Scapa aptly carries out the duties assigned to it, clean lines or not.

A crew of five is accommodated. The pilot and co-pilot are covered by a transparent canopy, but the pits for the front and amidships gunners are open. The navigator has his station within the fuselage which is equipped with bunks and other comfort devices.

Of all-metal construction, the wings are fabric covered. The engines are directly against the underside of the top wing and are braced by two sets of struts. As in the Saro London, flying and landing wires abound, giving the machine a bird-trap appearance.

Power is supplied either by two air-cooled radial Bristol Pegasus engines of 840 h.p. each or two liquid-cooled in-line Rolls-Royce Kestrel plants of 525 h.p. each. With the Pegasus motors, the top speed is 142 m.p.h. and the range is 1,100 miles. And with the Kestrels, the top speed is 133 m.p.h. and the range is 1,025 miles.

Other data: Span, 75 feet; length, 53 feet; height, 21 feet; loaded weight, 16,040 pounds.

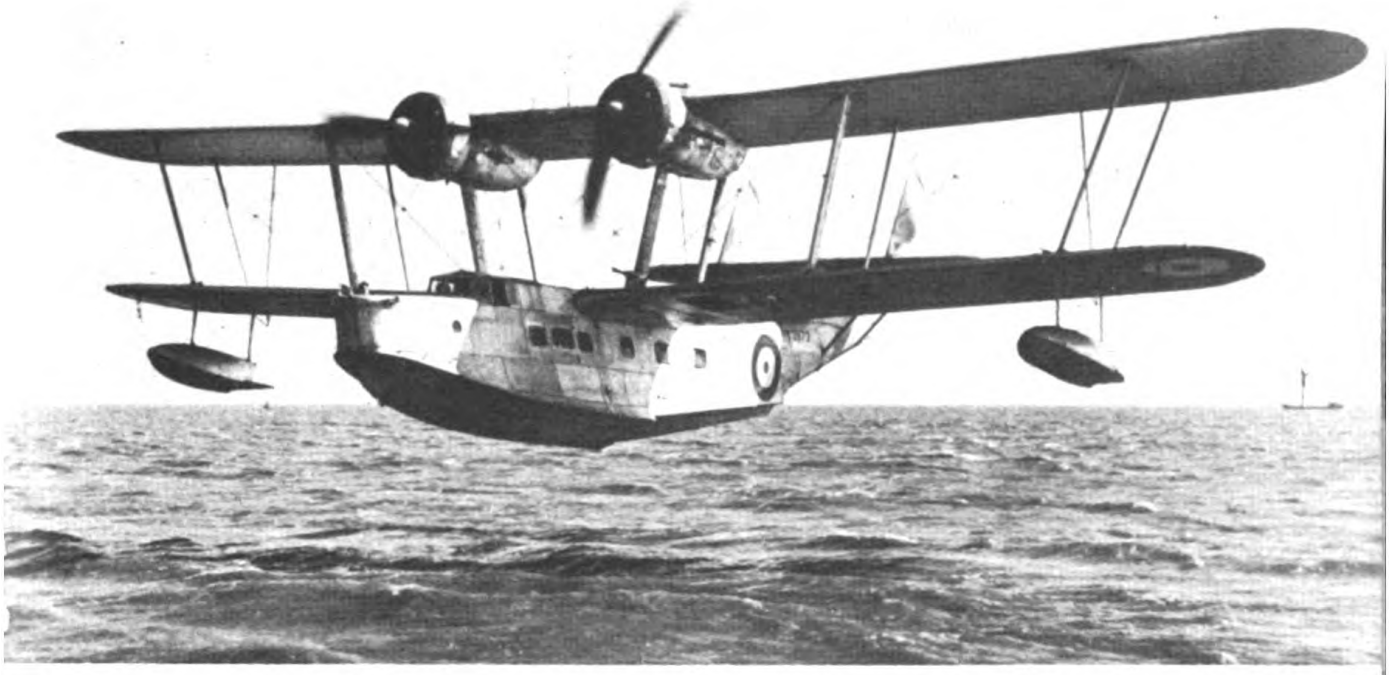
SUPERMARINE STRANRAER

This machine is somewhat similar to the Saro London, although more modern and somewhat cleaner in general appearance.

The two-step hull is entirely of metal, with smooth sheet skin covering over the usual transverse frames and longitudinal members. All main attachments are of stainless steel.

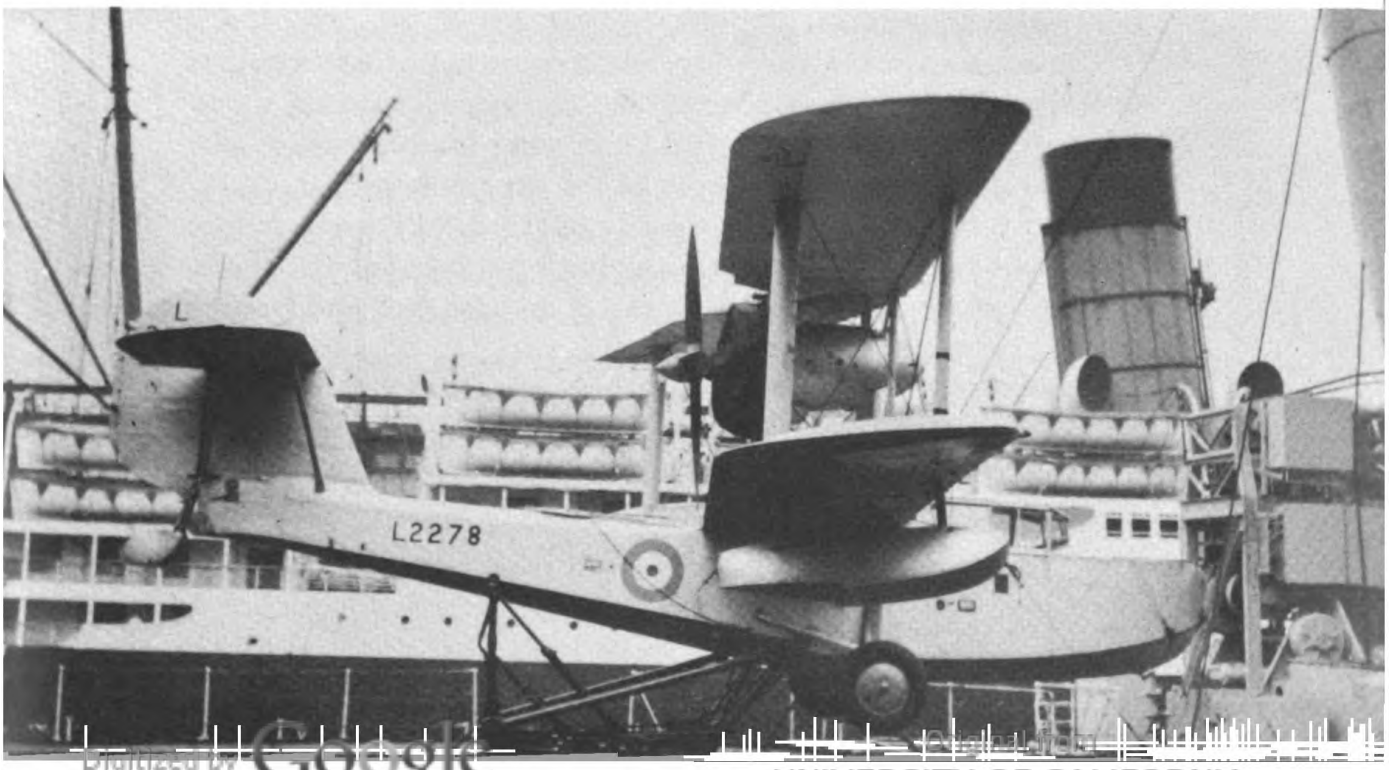
The unequal-span biplane wings are fabric covered metal structures. The upper center section is connected to the body with a pair of parallel struts which extend upward from the ends of the lower center section to support the engine nacelles. The upper and lower panels are joined by parallel struts.

A hinged watertight door is provided in the bow gun pit for bomb sighting; the gun mounting can be slid back for mooring. The pilots' covered cockpit has side-by-side seats with dual controls; the compartment for stowing marine equipment is adjacent to this pit. The navigator's space is immediately behind the control pit and ahead of the front spar frame. Between the spar frames is the radio operator's station.



Stranraer is a peculiar name, but there is nothing peculiar about the performance of the Supermarine flying boat carrying the name. Top speed is 165 m.p.h., cruising speed is 148 m.p.h., and landing speed is 63 m.p.h. A crew of six is normally accommodated.

Largest and heaviest R.A.F. machine for catapult duties is the Supermarine Walrus. It has a span of 45 feet 10 inches and weighs 7,200 pounds fully loaded. The Bristol Pegasus engine is set in pusher style.



Power is supplied by two air-cooled radial Bristol Pegasus engines of 840 h.p. each at 2,250 r.p.m., giving a top speed of 165 m.p.h. at 6,000 feet. Cruising speed is 148 m.p.h., and landing speed is 63 m.p.h.

Other data: Span, 85 feet; length, 54 feet 10 inches; height, 21 feet 9 inches; wing area, 1,457 square feet; range, 1,000 miles; loaded weight, 19,000 pounds; ceiling, 18,500 feet.

SUPERMARINE WALRUS

This ship is normally carried on battleships and cruisers, from which it is catapulted by compressed air. It is reported to be the largest and heaviest R.A.F. airplane which can be launched by this means. Popular in the Fleet Air Arm as a spotter-reconnaissance plane, the Walrus is an amphibian flying boat.

For stowage aboard ship, the wings may be folded to a span of little more than 17 feet. This is a very important feature in favor of the craft, since space aboard ship is so limited. To prepare the machine for flying, it is necessary to merely push the wings forward and snap the hinge locks at the leading edge of the center panel.

The single-step hull has flat sides and is constructed of aluminum alloy. Adjacent with the bow gunner's pit is a compartment for stowage of marine equipment. The gunner has a swivel mount with a single weapon. The pilot's seat is on the left of the enclosed cockpit, with detachable controls for the right seat. Another gun is provided amidships.

The equal-span biplane wings are constructed of two stainless steel spars having tubular flanges and corrugated webs with substructure of spruce and plywood. The wing leading edge is plywood covered and the remainder of the wing is fabric faced.

Power is supplied by an air-cooled radial Bristol Pegasus pusher engine of 680 h.p. at 2,200 r.p.m., giving a top speed of 135 m.p.h. at 4,750 feet. Cruising speed is 95 m.p.h. at 3,500 feet, and landing speed is 57 m.p.h.

Other data: Span, 45 feet 10 inches; length, 37 feet 7 inches; height, 15 feet 3 inches; wing area, 610 square feet; range, 600 miles; loaded weight, 7,200 pounds; ceiling, 18,500 feet.

CHAPTER 5

TRAINING PLANES

PROBABLY the most important aircraft in any air service is the training ship. The average person thinks of airpower in terms of thousands of airplanes and thousands of pilots. But they rarely consider that—even though flying machines can easily be turned out on the production line—complete, thorough, and extensive training, stretched over a period of many months, is necessary to produce a competent war pilot.

But though trainers are the most important ships in service, they never see war action and are the most inexpensive equipment used for flying purposes. Trainers are always stationed at flying fields far behind the actual battle lines, when there is a front line, and are usually of metal tubing construction. This makes them not only inexpensive to construct but also easy to repair in case of crashes or other mishaps which go hand-in-hand with student instruction. In addition, they are invariably powered with low horsepower engines, making them comparatively slow and easy to handle for the student who is still in the process of earning his wings.

Trainers are the real mothers of any air force, for without them it would be impossible to give birth to a military flyer. Many machines in this classification virtually fly by themselves, too, so stable are they built. But by flying in these craft, the cadet is able to learn the various fundamental maneuvers of aviation. Then he passes on to actual service types, after completing his instruction period, and flies planes that are meant solely for war and combat duties.

There is no definite rule or style for training planes. For thirty years the United States Army Air Corps used nothing but biplanes

Symbolic of the entire nation, these Army Air Corps Flying Cadets cast their eyes aloft as they head for their training planes at Randolph Field, Texas, the "West Point of the Air." Uncle Sam plans to train 7,000 pilots annually.

for instructional purposes, and then they turned to low-wing ships for specific types of training. Further, there are twin- and multi-engined trainers in service with some countries to give student work in phases other than actual combat. All in all, then, there is no basic pattern for a trainer, except that in most cases they are used exclusively for students and are not meant for actual fighting.

In appearance and design, we said, trainers differ greatly. However, there seems to be one predominant feature present in the majority of planes of this type. That is, the pilot's cockpit is di-

rectly behind the engine firewall, with the student-pilot in the rear. This system is followed not only to make it more convenient for the instructor to give visual hand instructions when a communication tube is not being used, but also to give the student a feeling of confidence and reliability. The psychological aspect has been found to be much better when the instructor is not located in the rear, watching every move of his student.

In the Air Corps, trainers are divided into three categories. The beginning Flying Cadets receive their instruction on the primary trainers; these are the lightest and slowest, in most cases, of all trainers. The trainee then goes to the basic trainers, which are for transitional work from the light jobs to heavier craft. They are usually faster, heavier, and more powerful than PT's. Still another gap-filler is the basic combat type. It is for instructional work between the BT's and advanced trainers. They, however, are being discontinued and will probably soon work into the advanced trainer class.

The U.S. Naval Air Service, at this writing, utilizes only straight trainers—designated by the letter "N"—and scout-trainers—designated by "SN." For further instruction, the student moves on to standard military types which have been withdrawn from active service squadrons to be utilized as instructional machines.

AMERICAN

BEECHCRAFT AT-10

Walter Beech has been building commercial airplanes for many years but has only recently received contracts from the Government for his products, which are being used for navigation training by the Air Corps and general utility-personnel transports by the Naval Air Service.

The AT-10 is arranged as a low-wing monoplane of all-metal construction, with metal sheet covering. It is said to accommodate from seven to eleven persons, including the crew of two. The wing is fully cantilever and tapers smoothly to rounded tips. The wing panels are built-up in three sections, with the center panel integral with the fuselage. Outer sections are attached to the butt

ends of the center panel at a point just outboard from the engine nacelles.

The landing gear is fully retractable, the legs swinging up and back into the engine nacelles. A door completes the well streamlining when the undercarriage is in retracted position.

The only external change noticeable between the military AT-10 and Beechcraft commercial transports is that the former is fitted with a single fin and rudder. The usual arrangement is twin fins and rudders.

Power is supplied by two air-cooled radial Pratt & Whitney Wasp Junior engines of 400 h.p. each at 2,000 r.p.m. at 5,000 feet, giving a top speed of 230 m.p.h. at sea level. Cruising speed is 220 m.p.h. at 12,000 feet, and landing speed with flaps extended is 61 m.p.h.

(Other Beechcraft military types, which are quite similar to the AT-10, are the AT-7, AT-18R, and JRB-1. The latter is in service with the Navy.)

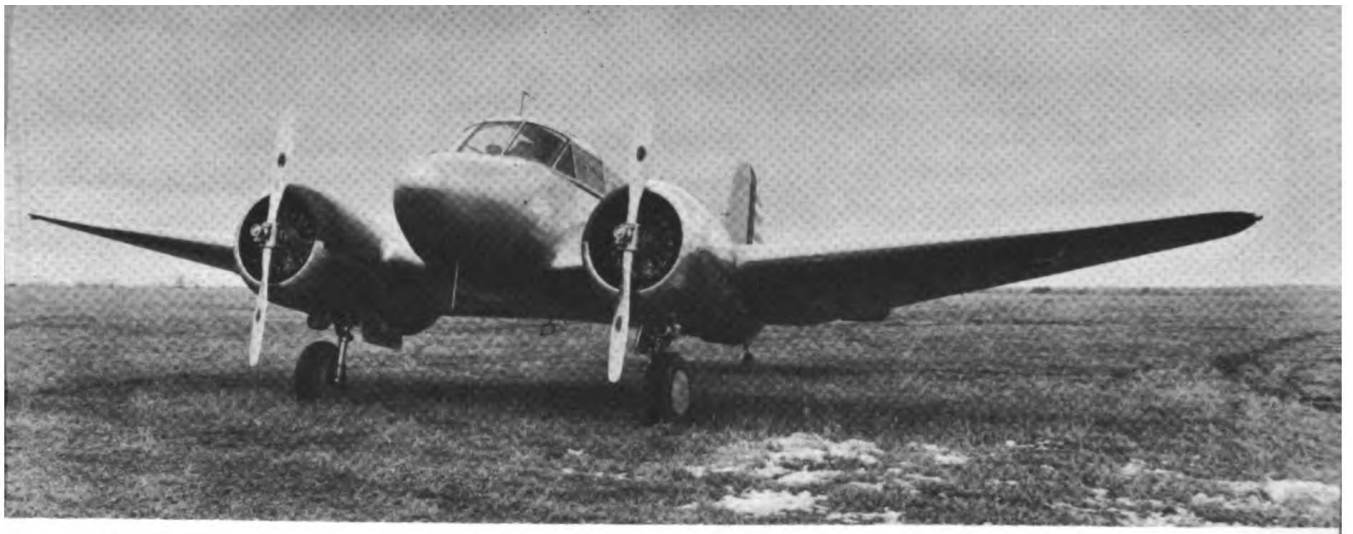
Other data: Span, 47 feet 8 inches; length, 34 feet 3 inches; height, 9 feet 5 inches; wing area, 347 square feet; range, 1,200 miles; loaded weight, 7,500 pounds; ceiling, 27,000 feet.

CESSNA AT-8

Another commercial-type light transport which is being used by the Air Corps as a navigation trainer is the AT-8; it is also for transitional work between single-engined instruction machines and bombers. Numbers have also been delivered to the Royal Canadian Air Force for training in Canada.

The AT-8 carries five persons in its spacious cabin. Generous transparent paneling makes for excellent visibility in all directions. The front seat has dual controls and a throw-over wheel, along with all blind-flying and navigational instruments necessary for student training.

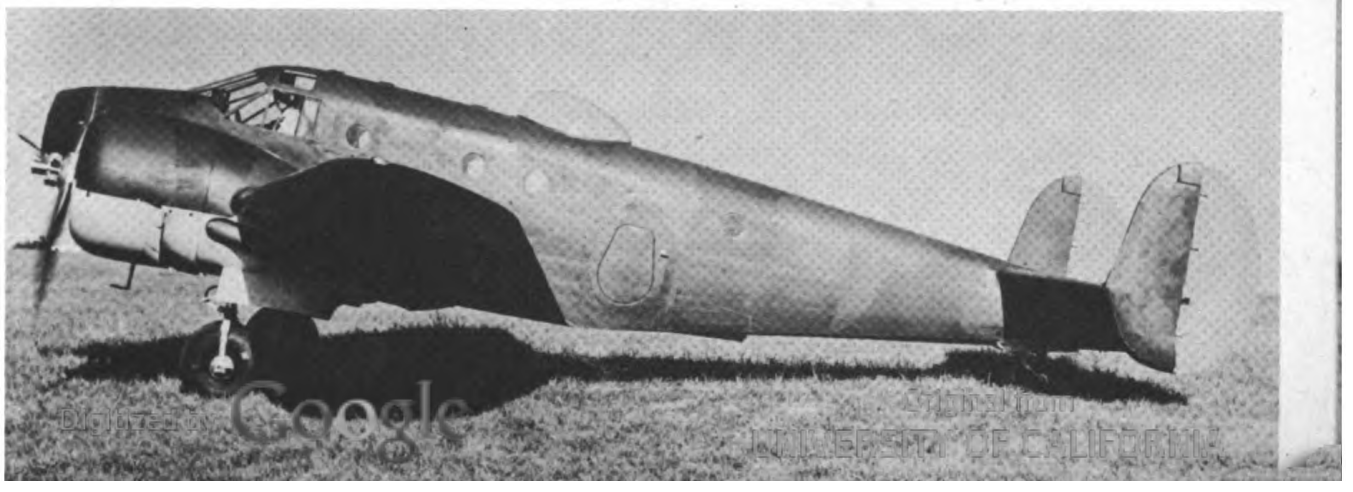
The fuselage is a welded steel tube structure with fabric and metal covering. The extreme nose of the body is faced with a metal sheet cap. The wing is a full cantilever structure of wood construction. There are two laminated spruce spars and built-up spruce ribs. The wing panels are fabric covered except for the



For advanced and instrument training, the Beechcraft AT-10 is a twin-engined low-wing monoplane with retractable undercarriage. With Pratt & Whitney Wasp Junior engines of 400 h.p., the top speed is 230 m.p.h.

The AT-7 is quite similar to the AT-10. Main difference seems to be the use of twin rudders and fins instead of the single type. It is of all-metal construction with metal sheet covering. The landing gear legs retract into the engine nacelles.

Latest of the Beechcraft line is the AT-18R advanced trainer. Complete details are secret, but the machine appears to be for cross-country and gunnery instruction.



This Cessna AT-8 is a militarized version of the commercial T-50. It is used for navigation training and transitional work between single-engine instruction machines and bombers. Top speed is 195 m.p.h.

leading edges, which are faced with ply. The electrically-operated split type flaps are of metal structure.

The landing gear legs are fully retractable, folding up and back into the engine nacelles which are slung to a great extent beneath the wing.

Power is supplied by two air-cooled radial Pratt & Whitney engines of 450 h.p. each at sea level, giving a top speed of 195 m.p.h. at sea level. Cruising speed is 191 m.p.h. at 7,500 feet, and landing speed with flaps extended is 55 m.p.h.

Other data: Span, 41 feet 11 inches; length, 32 feet 9 inches; height, 9 feet 11 inches; wing area, 295 square feet; range, 1,000 miles; loaded weight, 5,100 pounds; ceiling, 22,000 feet.

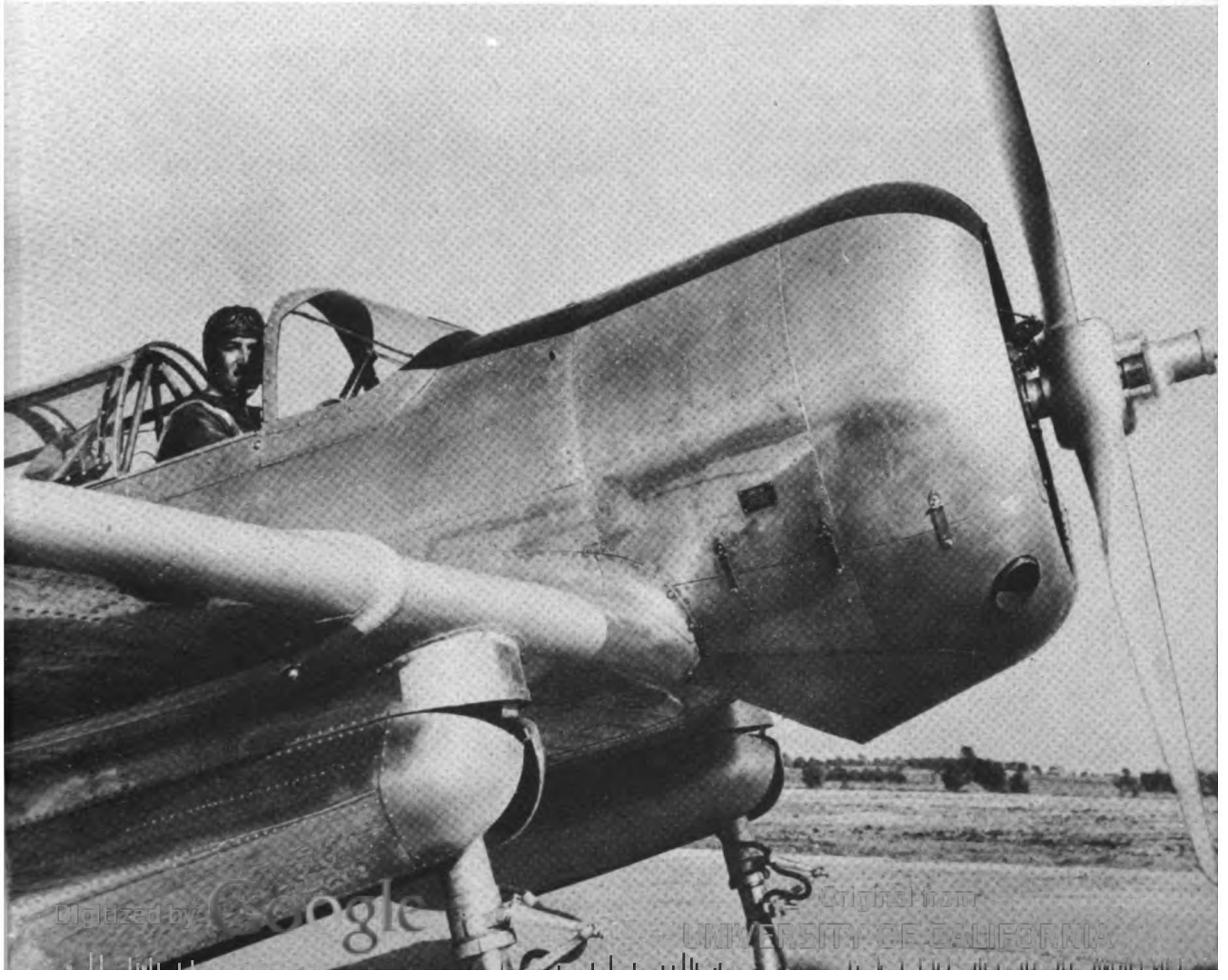
CURTISS SNC-1

Curtiss Aircraft has long been a builder for both the U.S. Air Corps and Naval Air Service, usually turning out only active war airplanes used for offensive duties. Here, however, is a complete change from that practice—the first training craft constructed by Curtiss in many years.

Probably the most startling feature about the SNC-1 is its high top speed. One would not ordinarily expect an instructional machine to have as high a speed as 215 m.p.h. at best operating altitude, but the SNC-1 is in a different category from other trainers reviewed up to this point. That is, it is primarily for the student who has completed his preliminary work and is almost ready to begin active duty with the Navy.

Latest of all scout-trainers ordered and delivered to the Naval Air Service is the Curtiss SNC-1. It is a military version of the Falcon 22 and is powered by a Wright Whirlwind engine of 420 h.p. at 2,500 feet, giving a top speed of 215 m.p.h.

In this view of the SNC-1 many details are apparent. Note crash protector behind pilot, wheel containers, hydraulic line of landing gear, and attachment point of outer wing panels to center section.



The fuselage is of all-metal semi-monocoque construction, with stressed metal skin over the longitudinal stringers, transverse bulkheads, and rings. There are tandem seats with dual controls, covered with a transparent canopy.

The wing is cantilever and is built-up on five spars. The center section is integral with the fuselage, with the outer panels attached to the butt ends at a point just outboard of the landing gear housing.

Power is supplied by an air-cooled radial Wright Whirlwind engine of 420 h.p. at 2,200 r.p.m. at 2,500 feet, giving a top speed of 215 m.p.h. Cruising speed is 195 m.p.h., and landing speed with flaps extended is 58 m.p.h.

Other data: Span, 35 feet; length, 26 feet 6 inches; height, 7 feet 6 inches; wing area, 174 square feet; range, 518 miles; loaded weight, 3,500 pounds; ceiling, 25,900 feet.

FAIRCHILD PT-19

This is probably one of the most economical training planes now in service with the Air Corps. Fabric and ply covering is not frequently used on modern military trainers, but with the PT-19 it is used to good advantage for both economical and ease of construction reasons.

The fuselage is a simple welded tubular structure with fabric covering. The only metal used in covering is on top of the body. Open tandem cockpits accommodate the two-man crew, with a truss crash protector located advantageously between the two pits. Full instruments are carried in both cockpits, with compass and fuel gauges in front only.

The wing panels are cantilever and utilize the two-spar construction principle. The wing is in three sections, with the center panel integral with the fuselage; ply is used for covering. The ailerons are manually-operated and fabric covered. Landing gear legs are fixed.

Power is supplied by an air-cooled in-line Ranger inverted engine of 175 h.p. at 2,450 r.p.m., giving a top speed of 135 m.p.h. at sea level. Cruising speed is 120 m.p.h., and landing speed is 48 m.p.h.

A comparatively new Air Corps primary trainer is the Fairchild PT-19. It has a fixed undercarriage and is powered by an air-cooled Ranger engine of 175 h.p. Top speed is 135 m.p.h. at sea level.

The only stainless steel machine in the Air Corps is the Fleetwings BT-12. Complete flight, propeller, and engine controls are located in the front cockpit while the rear cockpit has primary controls only. The landing gear is fixed and the tail wheel is fully steerable and swiveling.

Other data: Span, 35 feet 11 inches; length, 27 feet 8 inches; height, 7 feet 9 inches; wing area, 200 square feet; range, 480 miles; loaded weight, 2,450 pounds; ceiling, 16,000 feet.

FLEETWINGS BT-12

Here is a trainer of stainless steel construction almost throughout. Aside from that, however, and the fact that spot welding is used instead of the usual rivets, there is nothing really different in the machine's general appearance.

The fuselage is constructed in the usual manner, utilizing stringers and bulkheads. Aft of the front cockpit fabric covering is used, metal forward. The crash protector is located between the two canopied tandem cockpits and is of the tripod type.

The wing center section, which is integral with the fuselage, is built-up on a two-spar principle. The outer panels are of the single-spar type and are detachable at a point just outboard of the landing gear legs. The wing framework is covered with corrugated sheet before attaching the outer skin. Ailerons are fabric faced.

The cockpits for student and instructor are covered in much the same manner as found aboard first-line fighters. The only difference seems to be that the BT-12's canopy is higher. This, of course, is to make for better visibility.

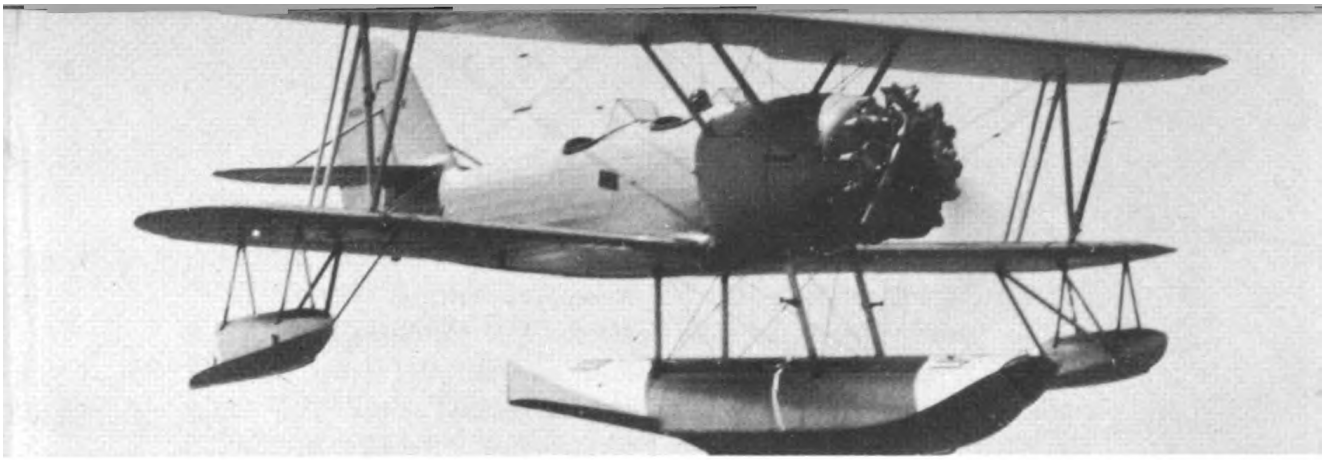
Power is supplied by an air-cooled radial Pratt & Whitney Wasp Junior engine of 450 h.p. at 2,300 r.p.m. No performance figures have been released.

Other data: Span, 40 feet; length, 29 feet 2 inches; height, 9 feet 2 inches; loaded weight, 4,400 pounds.

U.S. NAVY N3N-3

The U.S. Navy is the only airpower in the world that operates its own aircraft factory for the production of service-type ships. And from the Naval Aircraft Factory in Philadelphia have come flying boats, fighters, scouts, observation machines, trainers, and all other types that are used in active service.

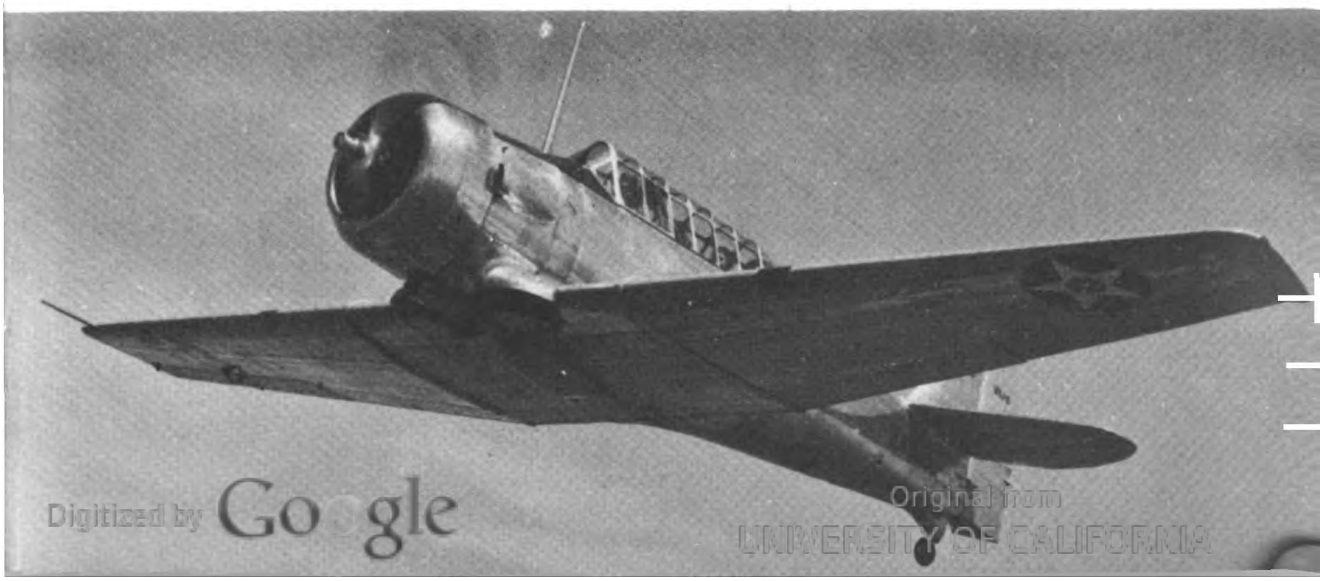
The fuselage is of welded tubing construction and is covered with fabric. The cockpits are set in tandem style and are open. One single main float with wing floats is the usual undercarriage



Built by the U.S. Naval Aircraft Factory, the N3N-3 is a standard air arm trainer and is widely used. Engine, likewise, is constructed at the Philadelphia Naval Aircraft Factory. Top speed is approximately 120 m.p.h.

North American's AT-6 advanced trainer is a high-performance machine and has a top speed of 206 m.p.h. The landing gear legs retract and are flush with the wing under-section in the "up" position.

Naval Air Service version of the AT-6 is the SNJ-2. It has a two-way radio and is fitted for night flying. Crash protector is of the pylon type and is mounted between the two cockpits.



arrangement, but numbers have also been turned out with the standard wheel landing gear for over-land training.

The plane is an equal-span biplane. The top wing is attached to the fuselage by two pairs of splayed-out parallel struts, and the panels are braced interplane by "N"-struts and wires. The wings are fabric covered.

Power is supplied by an air-cooled radial Naval Aircraft Factory-built 235 h.p. engine, giving a maximum speed of approximately 120 m.p.h. Further performance figures have not been released.

Other data: Span, 34 feet; length, 25 feet 7 inches; height, 9 feet 3 inches; range, approximately 450 miles; loaded weight, 2,900 pounds.

NORTH AMERICAN AT-6

North American Aviation is currently producing more training craft for the U.S. Air Corps and Naval Air Service than probably all other companies combined. For the Air Corps they build advanced trainers, basic combat types, and basic trainers, and for the Naval Air Service they are currently fabricating scout-trainers.

These machines are all quite similar in appearance, with minor differences, so here we will review only the AT-6 and list the alterations outstanding in the other types.

The AT-6 is a low-wing monoplane of all-metal construction. The fuselage is covered with metal sheet and is a semi-monocoque structure. A crew of two is carried in canopied tandem cockpits. The crash protector between the cockpits also acts as a head rest for the airman up front. Navy version is called the SNJ-2.

The wing is full cantilever and is of metal structure. The center section is the two-spar type, with single-spar outer panels. The outer panels are detachable and are bolted to the center section butt ends at a point just outboard of the landing gear. Metal sheet is used for covering. Flaps are all-metal and are manually-operated. Ailerons are fabric covered.

Power is supplied by an air-cooled radial Pratt & Whitney Wasp engine of 550 h.p. at 2,200 r.p.m. at 5,000 feet, giving a top speed of 206 m.p.h. Cruising speed is 180 m.p.h. and landing speed with flaps extended is 66 m.p.h.

Other data: Span, 42 feet 5 inches; length, 28 feet 11 inches; height, 8 feet 9 inches; wing area, 253 square feet; range, 730 miles; loaded weight, 5,260 pounds; ceiling, 23,000 feet.

BC-1—General construction similar to BT-9 series. Single engine, bi-place. Welded steel fuselage, fabric covered. Single-spar wing. Has one fixed gun and one flexible gun. Pratt & Whitney engine rated at 550 h.p. at 5,000 feet, with a take-off rating of 600 h.p.

BC-1A—Similar to BC-1 with new wing, embodying integral type fuel tank and other minor changes.

BC-2—Single-engined, low-all-metal winged monoplane. Fuselage of welded tubular steel, fabric covered. Provision for pilot and gunner-observer. Powered with Pratt & Whitney engine driving three-bladed propeller.

BT-9—Two-seat, low-wing monoplane; metal wings. Steel tube fuselage, fabric covered. Fixed landing gear; equipped for instrument landing. Wright 400 h.p. engine.

BT-9A—Similar to BT-9 except that it is equipped with radio, camera, and fixed and flexible .30 caliber guns. Radio, compass, marker beacon, and flight instruments are eliminated from observer's cockpit.

BT-9B—Similar to BT-9 except for slight structural changes.

BT-9C—Similar to BT-9B except for slight structural changes.

YIBT-10—Two-seat, low-wing monoplane with metal cantilever wings and metal monocoque fuselage. It is powered with a Pratt & Whitney 550 h.p. engine.

BT-14—Essentially the same as the BT-9, with longer fuselage and other minor changes.

AT-1—Same as BC-1A, except that armament and camera mount are deleted. There are other minor changes.

REPUBLIC AT-12

Why this machine was ever classified as a trainer is definitely not clear, for it is essentially a fighter-bomber and was designed expressly for that purpose. It is very similar to the standard Army P-35 Seversky fighter and should not be considered as anything but a two-seat version of that ship.

The fuselage is of all-metal construction, with metal sheet covering over the longitudinal stringers and transverse bulkheads and frames. The two cockpits are set in tandem style, with a sliding hatch covering.

The wing is of full cantilever design, with stressed skin covering. The fuel tank is integral with the center section. The ailerons are of stainless steel construction and are fabric covered. Flaps are electrically-operated but may also be operated manually in emergency.

Armament consists of two synchronized machine guns of .30 caliber controlled by the pilot and one flexible machine gun of .30 caliber mounted in the rear cockpit. As a dive-bomber, a load of 1,350 pounds of bombs may be released simultaneously. This consists of one 750-pound bomb cradled under the fuselage center section on a special ejector-type rack and six 100-pound wing bombs.

Power is supplied by an air-cooled radial Pratt & Whitney Wasp engine of 950 h.p. at 2,700 r.p.m. at 14,300 feet, giving a top speed of 315 m.p.h. Cruising speed is 285 m.p.h., and landing speed is approximately 65 m.p.h.

Other data: Span, 36 feet; length, 26 feet 10 inches; height, 9 feet 9½ inches; wing area, 225 square feet; range, 675 miles; loaded weight, 6,022 pounds; ceiling, 30,000 feet.

RYAN PT-21

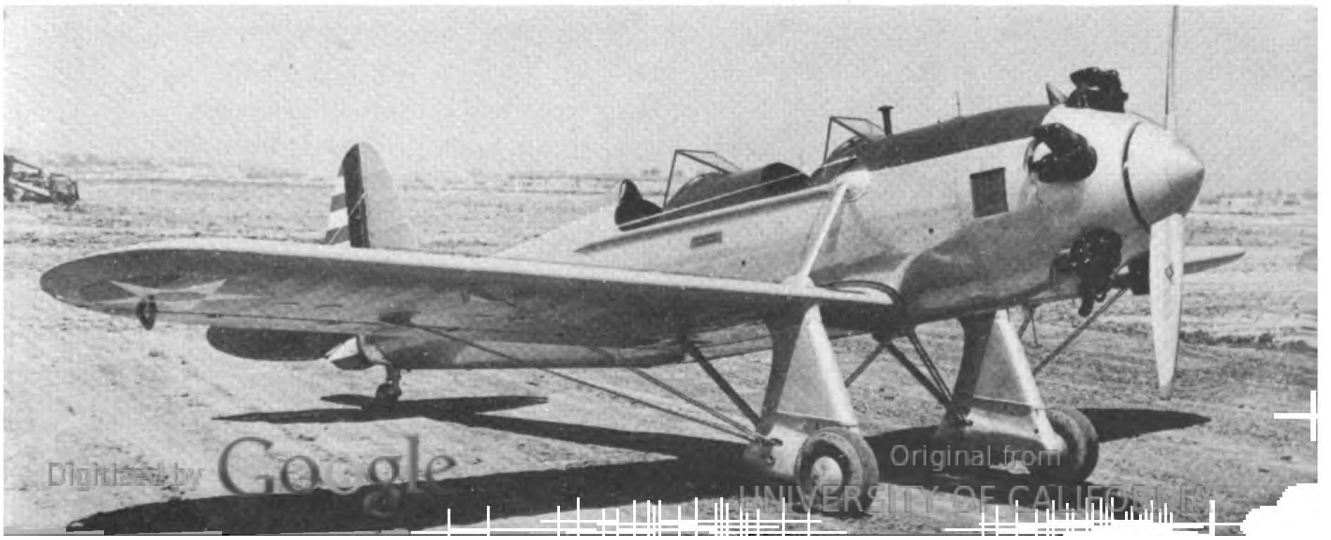
To this company goes the distinction of building the first low-wing trainer ever accepted by the U.S. Air Corps, thus breaking away from the 30-year precedent of biplanes for initial flight instruction of Flying Cadets. By eliminating the former change-over from biplane to monoplane service types, training efficiency has been greatly improved, according to unofficial sources.

The fuselage is of all-metal, monocoque, stressed skin construction. It is elliptical in section and consists of nine aluminum alloy bulkheads and six pieces of metal skin that do not require forming. Ample reinforcement at the cockpit cut-outs is obtained with stamped hat-section aluminum alloy exterior longerons. Heavy floor members are employed for the attachment of seats and con-

Three-quarter left front view of the North American BT-14 basic trainer. It accommodates a crew of two and has a fixed landing gear. The wing is in three main sections, with the outer panels bolted to the center section just outboard of the undercarriage.

Here is the fastest military trainer in the world. The Republic AT-12, classified as an advanced instruction machine, carries a crew of two and has a maximum speed of 315 m.p.h. It mounts both fixed and swivel-type machine guns.

The PT-21 is the latest in a long line of successful and widely used Ryan training planes. Ryan instruction machines, it should be mentioned, were the first low-wing primary trainers accepted by the Air Corps. Top speed is 131 m.p.h. and loaded weight is 1,860 pounds.



trols. Adequate crew protection in case of turn-over is provided by a steel crash protector post forward of the front cockpit.

The wings are non-tapered and are constructed in four units for ease of repair, maintenance, and replacement. The stubs on either side of the fuselage are of riveted aluminum alloy with cantilever rear spar and are entirely metal covered. Spruce spars and aluminum alloy ribs are used in the outer panels, which are fabric covered. Landing gear is of the fixed type and provides for several wheel and brake combinations. Brakes may be operated either hydraulically or mechanically. A long-stroke oleo universally supported strut is employed for taxiing and landing loads.

Complete dual controls, with dual brakes, are standard equipment. A torque tube mounted on ball bearings connects the two sticks for aileron control, and a push-pull tube inside the torque tube provides the elevator connection. Army-type brake pedals, toe operated, are mounted on the rudder pedals which are suspended from a cross-tube and are adjustable for length. A parking brake is located in the rear cockpit.

Power is supplied by an air-cooled radial Kinner engine of 160 h.p. at 1,850 r.p.m., giving a top speed of 131 m.p.h. Cruising speed is 123 m.p.h., and landing speed is 54 m.p.h.

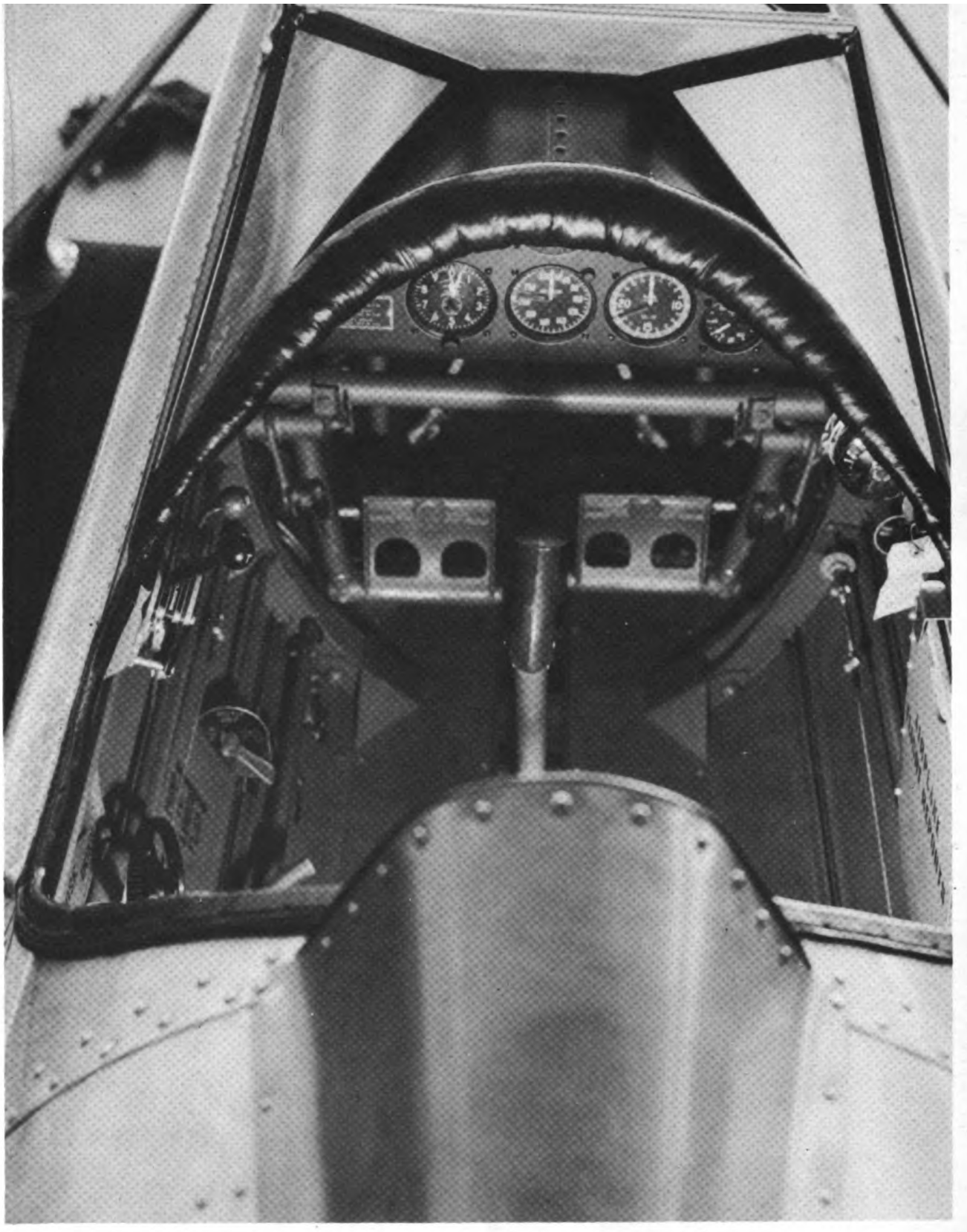
(Other Ryan primary trainers now in service with the Air Corps are the PT-16, PT-20, and PT-20A. The PT-20 and PT-20A, are similar to the PT-21; the PT-16 is identical in structural layout, the main difference being that power is supplied by an air-cooled in-line Menasco inverted engine.)

Other data: Span, 30 feet 1 inch; length, 22 feet 5 inches; height, 7 feet 2 inches; wing area, 134 square feet; range, 352 miles; loaded weight, 1,860 pounds; ceiling, 15,500 feet.

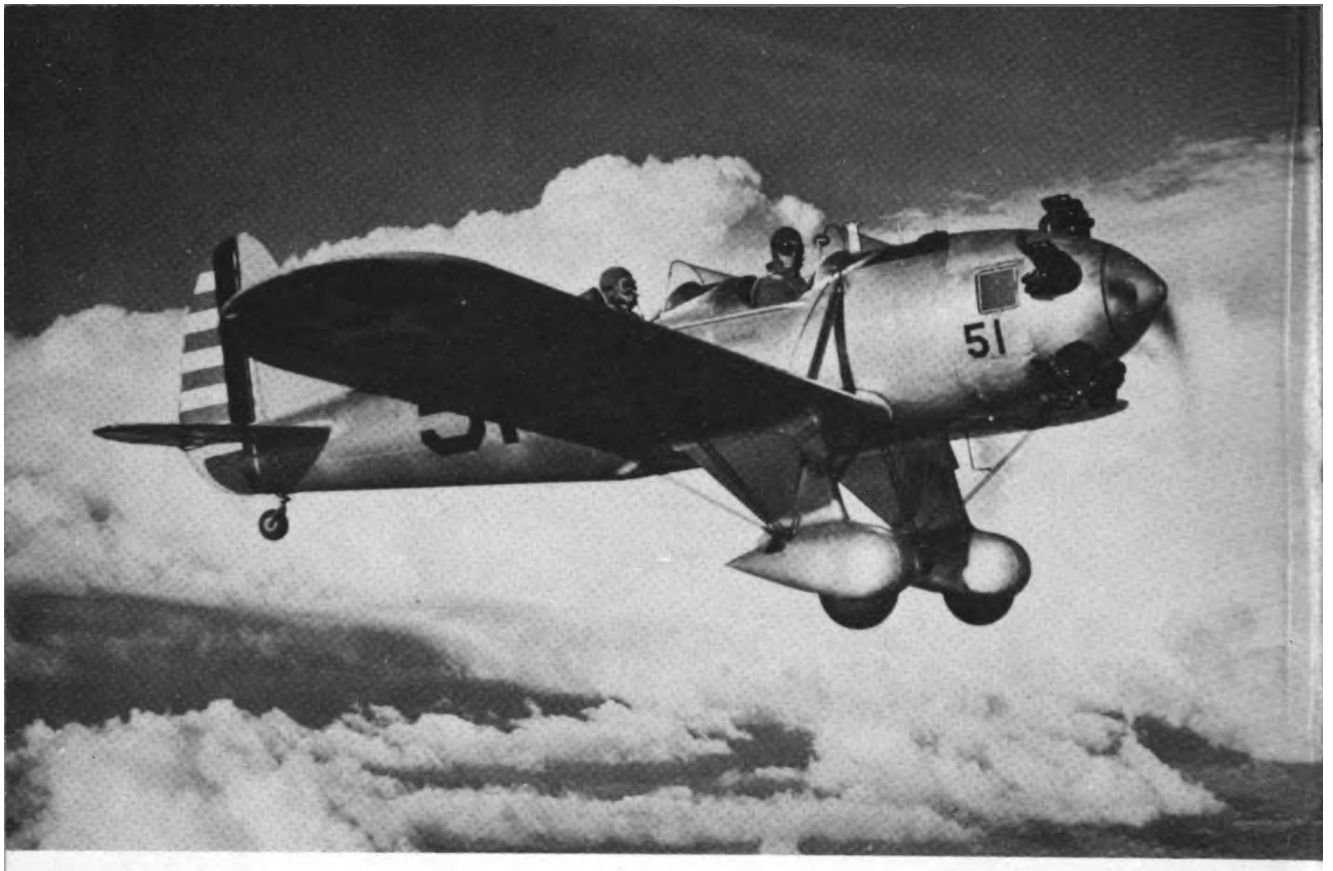
SEVERSKY BT-8

Ordered several years ago, this machine was the first all-metal low-wing trainer ever accepted by the Air Corps for basic instruction purposes. The initial order was said to have been for 35 ships.

The BT-8 is of typical Seversky construction, with an all-metal stressed skin monocoque fuselage, metal sheet covered. Seating arrangement is tandem, with a sliding transparent canopy cover-

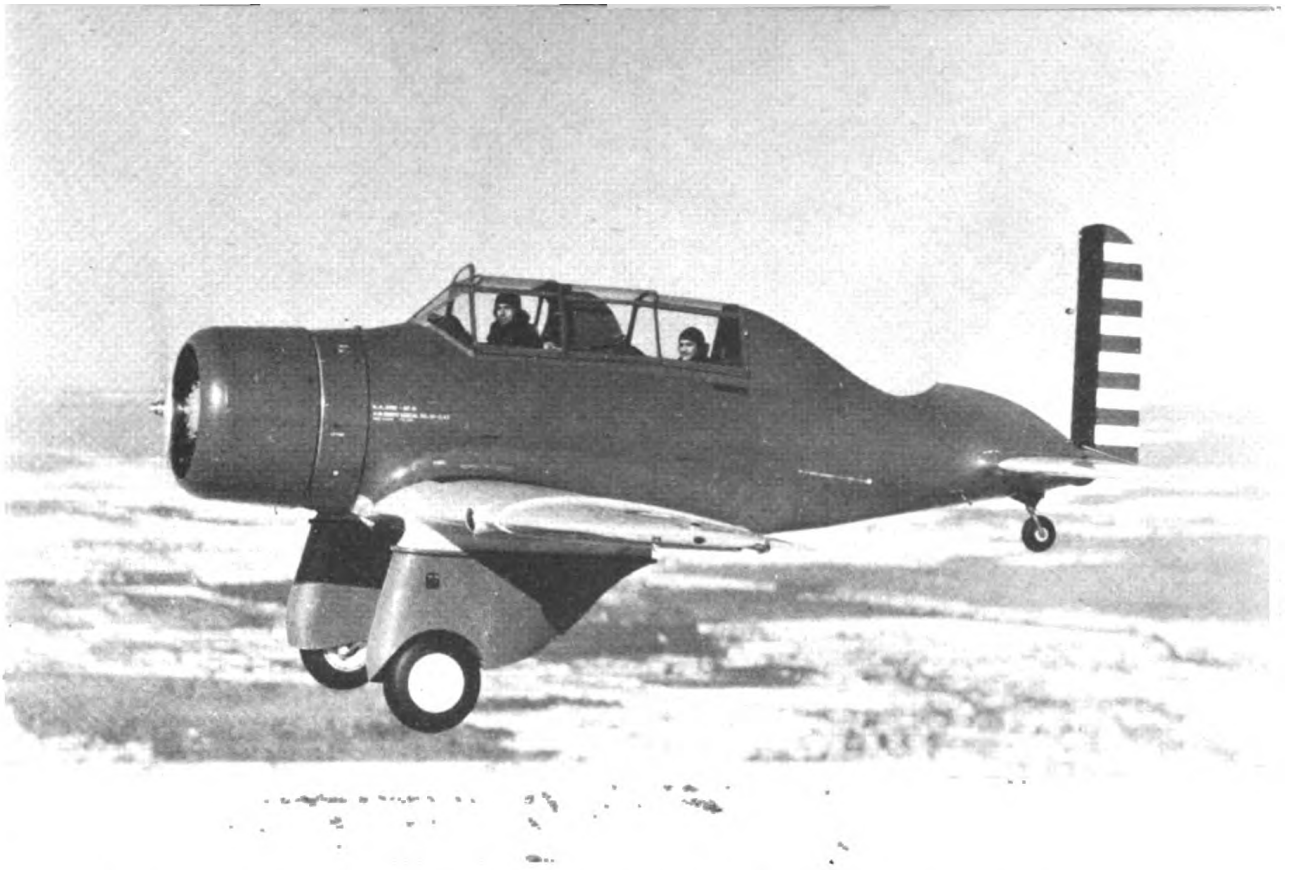


From the outside looking in. The cockpit details of Ryan's PT-21 trainer are clearly shown here. Note control stick, rudder pedals, throttle, mixture control, air speed indicator, altimeter, and other instruments.



The PT-20A was of earlier design than the PT-21. Changes may be seen by comparing photographs.

First of the Ryan low-wing Air Corps trainers was the PT-16. It is merely a military version of the commercial S-T sport-trainer. A Menasco air-cooled in-line engine is used.



Thirty-five Seversky BT-8's were ordered by the Air Corps several years ago and are still in service. The craft is of all-metal construction and has a top speed of 176 m.p.h. In this photograph, Major Seversky is at the controls.

More than 1,000 Stearman PT-18 primary trainers have been delivered to the Air Corps for instructing Uncle Sam's future flyers. The plane is powered by a Jacobs radial engine of 225 h.p. and has a top speed of 124 m.p.h.

ing both cockpits. A large crash protector is behind the front cockpit, acting also as a head rest. Dual controls are fitted.

The wing is an all-metal structure and is built-up in three sections, metal sheet covered. The undercarriage is fixed and spatted. Ailerons are fabric covered, and the flap is of all-metal construction.

Standard instruments include an altimeter, manifold pressure gauge, clock, tachometer, airspeed indicator, turn and bank indicator, rate of climb indicator, compass, sensitive altimeter, suction gauge, thermocouple, directional gyro, and fuel carburetor and suction gauge.

Power is supplied by an air-cooled radial Pratt & Whitney Wasp Junior engine of 400 h.p., giving a top speed of 176 m.p.h. Cruising speed is 154 m.p.h., and landing speed is approximately 54 m.p.h.

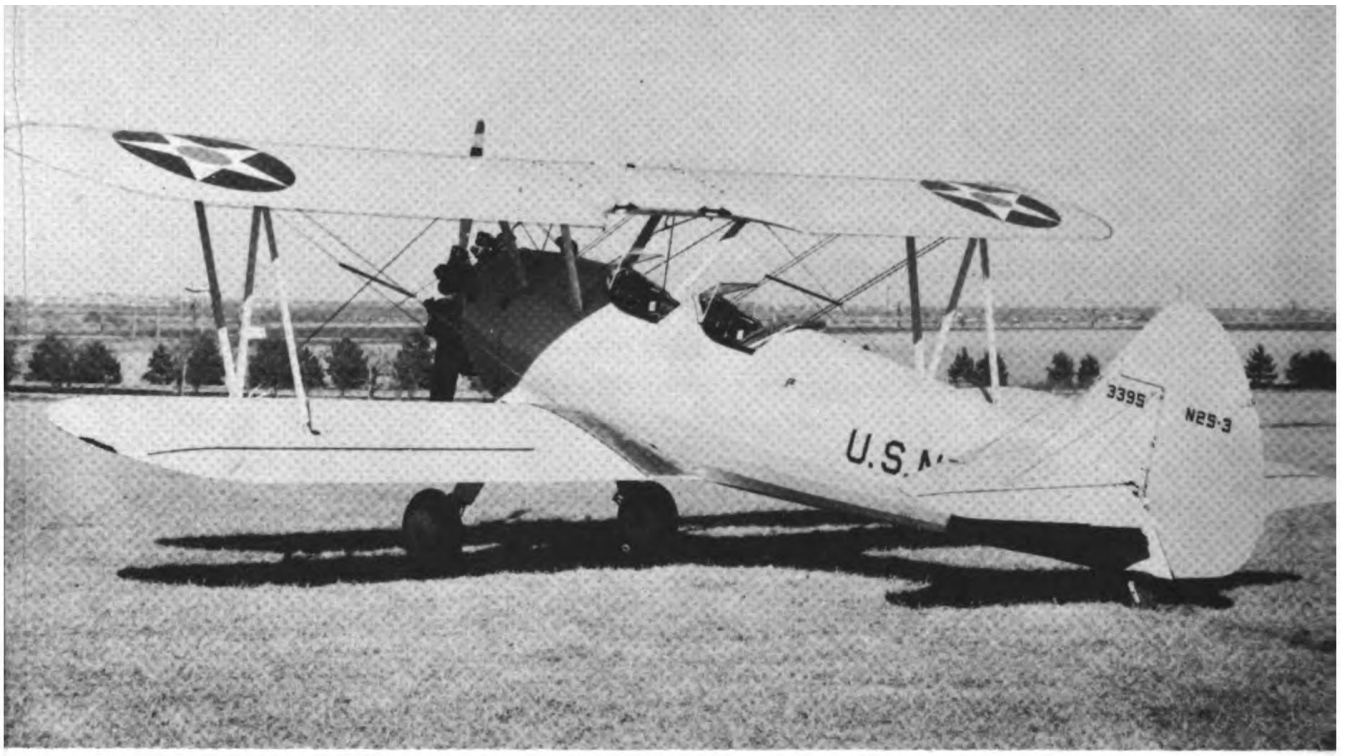
Other data: Span, 36 feet; length, 24 feet 5½ inches; height, 8 feet 10 inches; wing area, 220 square feet; range 725 miles; loaded weight, 4,050 pounds; ceiling, 17,000 feet.

STEARMAN PT-18

One-hundred-and-eighty training planes in sixteen days! That's the record set by Stearman Aircraft Company in producing PT-18 and NS instruction machines for the Air Corps and Naval Air Service, respectively. Working three shifts a day and seven days a week in an accelerated National Defense effort, this production record was made in the midst of their factory expansion which tripled the floor space of the main Stearman plant. But this record did not remain in the limelight very long, for just a few weeks later the company established another record by completing its 1,000th trainer.

The PT-18, which is identical to the Navy's N2S-3, is a conventional biplane with equal-span wings. The fuselage is constructed of welded steel tube structure and is fabric covered. Cockpits are arranged in tandem style and are open. Dual controls are fitted. The wings have solid spruce spars and spruce truss-type ribs and are fabric covered. Landing gear is fixed.

Power is supplied by an air-cooled radial Jacobs engine of 225



The Navy's counterpart of the PT-18 is this N2S-3. Aft of the front cockpit, the fuselage is fabric covered. The rear cockpit is fitted with a hood for blind-flying instruction.

Vultee's BT-15 Valiant basic trainer is reported to be a very popular machine with Flying Cadets. It has a comparatively slow landing speed, 53 m.p.h., and a top speed of 182 m.p.h. at sea level. Engine is Pratt & Whitney Wasp Junior of 450 h.p.

h.p., giving a top speed of 124 m.p.h. Cruising speed is 113 m.p.h., and landing speed is 52 m.p.h.

Other data: Span, 32 feet 2 inches; length, 22 feet 1/4 inch; height, 9 feet 2 inches; wing area, 297 square feet; range, 505 miles; loaded weight, 2,717 pounds; ceiling, 11,200 feet.

VULTEE BT-15

Vultee Aircraft has long been a builder of high-speed military machines for actual war duties, but this is the first trainer that they have built to date. The plane, which is called Valiant by the company, immediately won success in Air Corps competitions and at this writing is being constructed in large numbers for the training of Uncle Sam's future flyers.

Of orthodox low-wing design, the BT-15 does not appear to be unusual in any fashion. The fuselage is composite in construction, the forward section being of welded steel tube, with removable metal panels, and the rear section semi-monocoque. There are tandem canopied cockpits and emergency exits.

The wing is in three sections and is fabricated completely of metal. Fuel tanks are integral with the center section, to which the outer panels are attached just outboard of the undercarriage legs. Ailerons are fabric covered and flaps are of the slotted type. Landing gear is fixed.

Power is supplied by an air-cooled radial Pratt & Whitney Wasp Junior engine of 450 h.p. at 2,300 r.p.m., giving a top speed of 182 m.p.h. at sea level. Cruising speed is 170 m.p.h. at 5,000 feet, and landing speed is 53 m.p.h.

Other data: Span, 42 feet; length, 28 feet 7 inches; height, 9 feet 1 inch; wing area, 239 square feet; range, 730 miles; loaded weight, 3,991 pounds; ceiling, 21,000 feet.

WACO PT-14

Hundreds of Waco biplanes have been constructed for South American military services and thousands have been sold to private American owners, but this is the first machine with which they have been successful to any extent with the U.S. Air Corps.

The fuselage is a wood-faired steel tube structure with fabric

covering. Cockpits are tandem and open, fitted with dual controls. Standard instruments are two compasses, tachometers, airspeed indicators, altimeters, clocks, oil pressure and temperature gauges, and fuel sight gauges.

Wings are staggered and are of unequal span. Fuel tank is in center section of upper wing, which is attached to the fuselage by splayed-out "N"-struts. The lower panels are hinged to lower longerons of the fuselage and are filletted. Interplane bracing consists of "N"-struts and landing and flying wires. The wing panels are fabric covered, as are the ailerons.

Power is supplied by an air-cooled radial Continental engine of 220 h.p. at 2,075 r.p.m., giving a top speed of 138 m.p.h. at sea level. Cruising speed is 123 m.p.h., and landing speed is 51 m.p.h.

Other data: Span, 30 feet; length, 23 feet 1 inch; height, 8 feet 5 inches; wing area, 244 square feet; range, 320 miles; loaded weight, 2,650 pounds; ceiling, 15,800 feet.

With Waco's long years of building airplanes, this is the first craft they have sold to the Air Corps. Designated PT-14, it has a top speed of 138 m.p.h. and a cruising speed of 123 m.p.h.

BRITISH

AIRSPEED OXFORD

Although based on the design of the successful Envoy transport machine, which was once called one of the fastest civil types in the world, the Oxford is, from the military standpoint at least, an entirely new design. It was planned to meet the requirements of an Air Ministry specification for a twin-engined trainer incorporating the majority of features common to modern multi-engined military aircraft.

Structurally, the Oxford is a fine example of what can be done with wood. Of semi-monocoque construction, the fuselage has ply covering. Separating the cabin from the pilot cockpit is a specially reinforced bulkhead for taking the loads of an overturn landing.

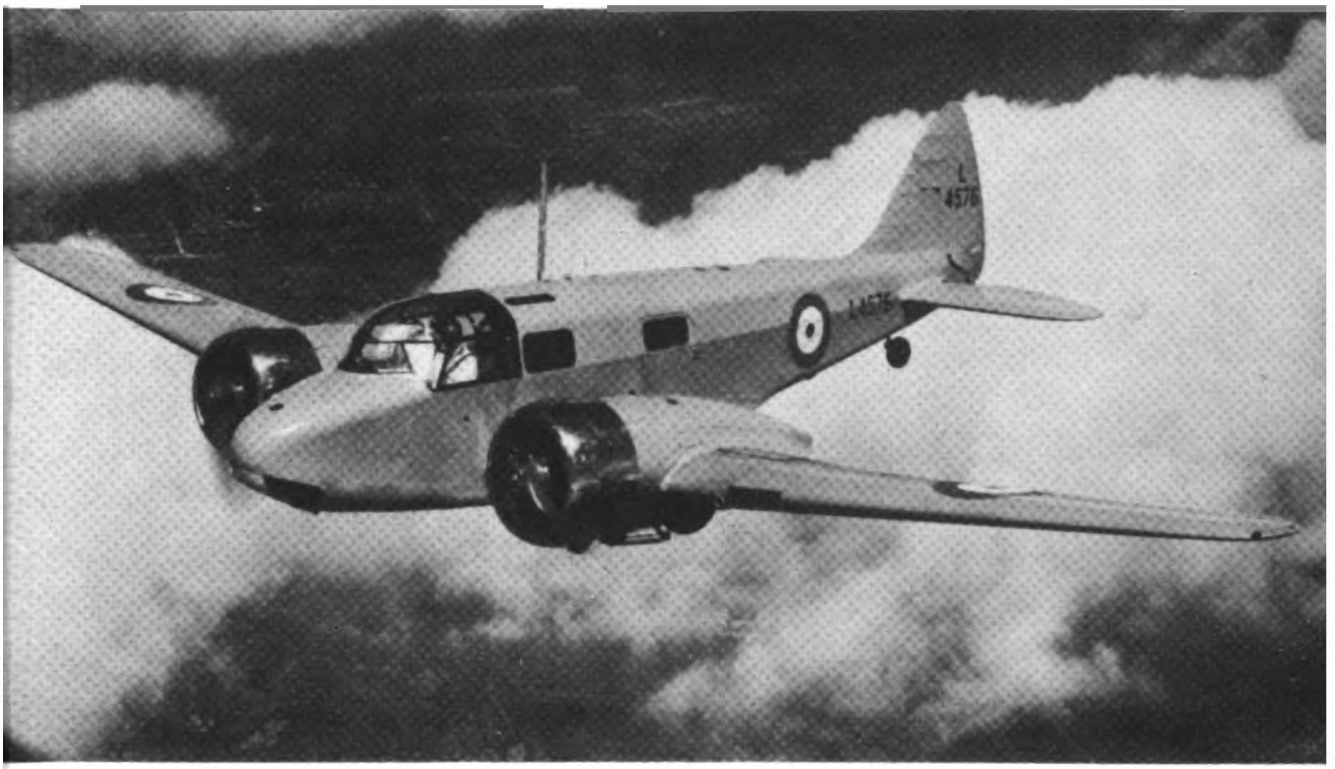
The cantilever low wing is built-up of two box-spars of spruce and three of ply birch with girder-type former ribs. The wing is in three sections, with the outer panels of tapering chord and thickness bolted to the center section.

The extreme nose of the fuselage is of aluminum panelling and has a large window in its underside for the bomb-aimer. The undercarriage is retractable, the landing legs folding up into the engine nacelles.

For gunnery training, a manually-operated turret is mounted. This will accommodate a Lewis, Vickers-K, or Browning gun. In the bomb well are mounts for carrying sixteen eight-and-one-half-pound practice bombs, though racks may be supplied for carrying eight 26-pound or two 220-pound bombs.

Power is supplied by two air-cooled radial Armstrong-Siddeley Cheetah engines of 355 h.p. each at 2,425 r.p.m., giving a top speed of 192 m.p.h. at 8,000 feet. Cruising speed is 164 m.p.h. at 10,000 feet, and landing speed is 66 m.p.h.

Other data: Span, 53 feet 4 inches; length, 34 feet 6 inches; height, 11 feet 1 inch; wing area, 348 square feet; range, 960 miles; loaded weight, 7,500 pounds; ceiling, 23,000 feet.



Designed for advanced and gunnery training, the Airspeed Oxford is a twin-engined low-wing monoplane with a top speed of 192 m.p.h. Wood is employed to good advantage in the construction.

Fabric is used throughout in covering the Avro Tutor trainer. Note sturdy landing gear bracing to withstand shock of poor student landings. A similar model, the Prefect, is fitted for blind flying.

AVRO TUTOR

The Tutor has better lines than the usual biplane trainer and appears to be in the light plane class rather than the military. It is used for elementary instruction and is fitted with dual controls and instruments. It is not utilized for blind flying, but a later model which is almost identical, the Prefect, is used in its stead, carrying full cloud-flying equipment and a blind-flying hood.

The fuselage is of welded tubing structure with fabric covering. The equal-span, single-bay biplane wings contain two built-up spars of sheet steel and dural ribs. The center section is carried on "N"-struts and the wings are braced with streamlined steel "N"-struts. Ailerons are on both upper and lower surfaces.

Power is supplied by an air-cooled radial Armstrong-Siddeley Lynx engine of 240 h.p., giving a top speed of 122 m.p.h. at 1,000 feet. Cruising speed is 105 m.p.h., and landing speed is 45 m.p.h.

Other data: Span, 34 feet; length, 26 feet 6 inches; height, 9 feet 7 inches; wing area, 300 square feet; range, 285 miles; loaded weight, 2,600 pounds; ceiling, 15,000 feet.

DE HAVILLAND TIGER MOTH

Many hundreds of Tiger Moth trainers have been built for the instruction of pilots in England and are in use by all far-flung territories of Great Britain—that is, in all such countries where air personnel is trained. It is intended for *ab initio* training with economy not only in outlay but also in time. It can be used for instruction in fighting (mounting a camera gun), aerobatics, bombing, the use of wireless and photographic apparatus, reconnaissance, and blind and night flying.

Essentially, the Tiger Moth is a two-seat biplane with staggered wings. The fuselage is of welded steel tube construction and the wooden wings are swept back, offering excellent visibility from both cockpits and facilitating exit in case of emergency. Full dual controls are normally installed and the front windscreen is easily detachable so that the machine may be used as a single-seater with the front cockpit covered by a detachable hood.

As a light single-seat fighter, the craft may be armed with a synchronized machine gun or eight 20-pound bombs. Fitted as a

Most famous of all British instruction machines is the De Havilland Tiger Moth. The plane was designed in 1931 and has been standard equipment since that time. Top speed is 109 m.p.h.

This General Aircraft Owlet is the first tricycled undercarriage trainer accepted for Royal Air Force duties. The plane first flew on September 5th, 1940. It is said to be exceptionally safe and easy to handle. Top speed with the Cirrus Major engine is 125 m.p.h.

fighter, the Tiger Moth would undoubtedly not be used against the formidable Nazi and Italian planes, because of its low speed, comparatively sluggish performance, and weak fire-power. Instead, it would be utilized as a coastal patrol reconnaissance plane against submarines and torpedo speedboats.

Power is supplied by an air-cooled in-line De Havilland Gipsy King engine of 130 h.p. at 2,350 r.p.m., giving a top speed of 109 m.p.h. at 1,000 feet. Cruising speed is 93 m.p.h., and landing speed is 46 m.p.h.

Other data: Span, 29 feet 4 inches; length, 23 feet 1 inch; height, 8 feet 9 inches; wing area, 239 square feet; range, 300 miles; loaded weight, 1,825 pounds; ceiling, 13,600 feet.

GENERAL AIRCRAFT OWLET

Britain has not allowed the proverbial grass to grow in her experimental departments, even though she is hotly engaged in battling the Nazi raiders that appear daily over the Isles. And the best example of the "thumbs up" principle of the English is this new General Aircraft Owlet, for it was first rolled through the factory doors for its tests on September 5th, 1940—the month in which German air raids were heaviest.

The fuselage is built-up in two sections, the rear portion being of monocoque structure and the front of box-like formers with longitudinal stringers. The two sections are joined aft of the rear cockpit with four connecting straps bolted on. The top covering of the forward body section is of wood and can be easily removed. The remainder of the fuselage is faced with aluminum alloy sheet.

Like most other tricycle planes, the Owlet pops off the ground like a cork out of a bottle when the stick is pulled back gently at any speed over about 50 m.p.h.

Once in the air, turns can be made steeply in both directions on the stick alone. A violent kick on the rudder bar when flying level merely causes the machine to wag its tail and settle back quickly to the straight and narrow path in rapidly damped oscillations. There seems much to be said for twin rudders, set outside the slipstream, on single-motor types like the Owlet.

The view from the front cockpit, which is on a level with the

leading edge of the wing, is completely unobstructed. Even in the climb the nose is narrow enough to form little hindrance to visibility. When flying level the top of the cowling slopes steeply away.

The cockpits are roomy and easy to get into through folding doors on the port side. The windscreens could be enlarged with advantage and the stick is reported to be a little too short for pilot comfort.

Power is supplied by an air-cooled in-line Cirrus Major inverted engine of 150 h.p., giving a top speed of 125 m.p.h. Cruising speed is 110 m.p.h., and landing speed is approximately 64 m.p.h.

Other data: Span, 32 feet 5 inches; length, 24 feet 7 inches; height, 7 feet 3 inches; wing area, 173 square feet; range, 450 miles; loaded weight, 2,300 pounds; ceiling, 15,000 feet.

HAWKER AUDAX

Designed as an army cooperation machine in 1932, the Audax is now classed as a trainer and is used for advanced instructional purposes.

The rectangular-shaped fuselage is of metal structure with fabric covering. The forward fairing is of oval section, tapering to a smooth point at the nose, and is faced with metal sheet. The open cockpits are protected by windscreens. The instructor's pit is directly under the wing trailing edge, with the student to the rear.

The unequal-span single-bay staggered biplane wings are built-up of metal spars and spruce ribs, fabric covered. The center section of the upper wing is attached to the fuselage by a pair of parallel struts; the wings are braced interplane by "N"-struts and wire. Ailerons are mounted on both upper and lower wing panels.

The landing gear is of the fixed variety, with a spreader bar between the wheels. No serious attempt was made to streamline the undercarriage, and the wheels are without pants. A radiator is slung between the landing gear legs and is used to cool the Glycol engine solution.

The Audax is fitted with a wireless and electrical apparatus and

a message pick-up hook. The message pick-up idea was planned to be used in getting information from front-line infantry groups during war.

Power is supplied by a liquid-cooled in-line Rolls-Royce Kestrel engine of 535 h.p., giving a top speed of 170 m.p.h. at 3,000 feet. Cruising speed is 145 m.p.h., and landing speed is approximately 64 m.p.h.

Other data: Span, 37 feet 3 inches; length, 29 feet 4 inches; height, 10 feet 6 inches; wing area, 348 square feet; range, 440 miles; loaded weight, 4,381 pounds; ceiling, 21,000 feet.

HAWKER FURY

Designed in 1929 as a single-seat fighter, the Hawker Fury saw many years of service as a first-line machine before being reclassified as a trainer for transitional work between two-seaters and modern fighters.

The construction is composite, being partly wood and partly metal. The entire structural frame of the body is metal tubing and angle. This is faired with balsa wood. The fuselage is covered with metal forward of the cockpit and fabric to the rear. The elevated open cockpit is located behind the center section of the upper wing.

The machine is a single-bay staggered biplane of unequal span. The wing spars are built-up of metal truss and the ribs are spruce wood. Covering is entirely of fabric. The center section of the upper wing is attached to the fuselage by cabane struts; interplane "N"-struts and wire bracing are used on outer panels.

The landing gear is of the conventional fixed "V"-type, with oleo shock-absorbing legs and a tubular spreader bar. A radiator for cooling the engine liquid is slung between the undercarriage legs, flush against the fuselage belly.

Power is supplied by a liquid-cooled in-line Rolls-Royce Kestrel engine of 600 h.p. at 2,500 r.p.m. at 11,000 feet, giving a top speed of 220 m.p.h. Cruising speed is 193 m.p.h., and landing speed is 62 m.p.h.

Other data: Span, 30 feet; length, 26 feet 8¾ inches; height, 10

The Audax saw many years of service as an army cooperation plane. When the Nazi War broke out, however, there was a definite need for trainers—so the Audax was reclassified. It uses the Rolls-Royce 535-h.p. Kestrel engine.

Another "old faithful" is the Hawker Fury, which was once a first-line fighter. Like the Audax, it is now a trainer, with most of its former glory forgotten.

feet 2 inches; wing area, 252 square feet; range, 460 miles; loaded weight, 3,609 pounds; ceiling, 29,500 feet.

PHILLIPS AND POWIS MILES MAGISTER

This is another plane that appears to be of the light commercial type rather than military. In fact, many ships similar to this were used by private individuals before the war broke out. Charles A. Lindbergh, for one, had a Miles Mohawk, which is much like the Magister.

The fuselage is of all-wood spruce construction, covered with ply. The open cockpits are arranged in tandem fashion and are fitted with dual controls. Aft of the rear pit is a baggage compartment for stowage purposes. Windscreens are provided for both control stations, and there is a blind-flying hood for the rear pit.

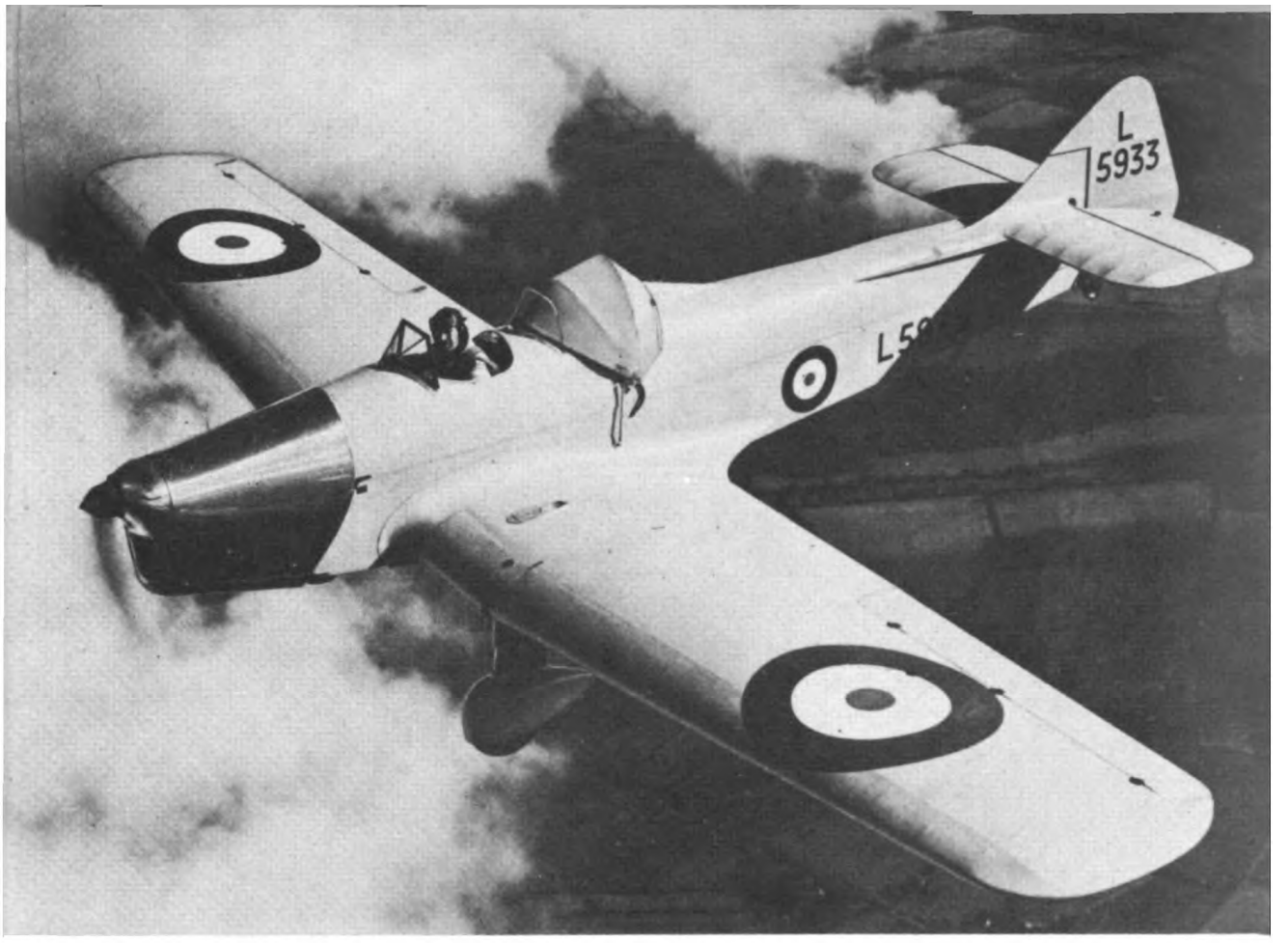
The cantilever wing is built-up in three sections. The center panel is filletted to the fuselage and the outer sections are attached to the butt ends of the stub wing. The center section has two box-spars and box-ribs of the ring type, and the outer panels are of girder-type construction. The wing is covered entirely with ply.

Power is supplied by an air-cooled in-line De Havilland Gipsy Major inverted engine of 130 h.p. at 2,350 r.p.m., giving a top speed of 142 m.p.h. at 1,000 feet. Cruising speed is 124 m.p.h., and landing speed is 45 m.p.h.

Other data: Span, 33 feet 10 inches; length, 25 feet 3 inches; height, 9 feet 1 inch; wing area, 176 square feet; range, 380 miles; loaded weight, 1,845 pounds; ceiling, 18,000 feet.

PHILLIPS AND POWIS MILES MASTER

As a general rule, training craft can be immediately picked out as such at any military airdrome, but the Master is in a class of its own. Instead of having the lines usually associated with instruction machines, this plane is smooth, streamlined, and speedy. Indeed, one might easily mistake it for a formidable fighter, so clean is its construction. However, it is really an advanced trainer and is rated by the Royal Air Force as the fastest plane of its type in any service.



The student under the blind-flying hood of this Miles Magister is now probably flying fighters or bombers against the Luftwaffe. The plane is of spruce wood construction and has a top speed of 142 m.p.h.

Fastest military trainer in the Royal Air Force is the Miles Master. It has a top speed of 250 m.p.h., a cruising speed of 216 m.p.h., and a landing speed of 64 m.p.h. The wing span is 39 feet, the length is 30 feet 5 inches, and the height is 10 feet.

The fuselage is of semi-monocoque wood construction incorporating between the cockpits a strong metal former built out to the window fairing line for the protection of the crew in case of accidental landing nose-overs. Each cockpit has a control unit and brake attachment.

The cantilever low wing is of wood construction and is ply covered. The outer panels are attached to wing stubs which slope down from the fuselage. All electrical leads and air lines are housed in ducts in the wing leading edge and are readily removable.

The undercarriage retracts in two independent units and works in conjunction with a position indicator and warning hooter which comes into action if the landing gear is left in the retracted position after the plane has descended to a certain altitude, thus warning the pilot to lower the legs.

Two 35-gallon fuel tanks are slung in the center section of the wing near the root. These are readily removable through a door in the undersurface and are connected with a large diameter fuel pipe running across the fuselage. Also, an emergency hand pump capable of delivering 120 gallons an hour is installed.

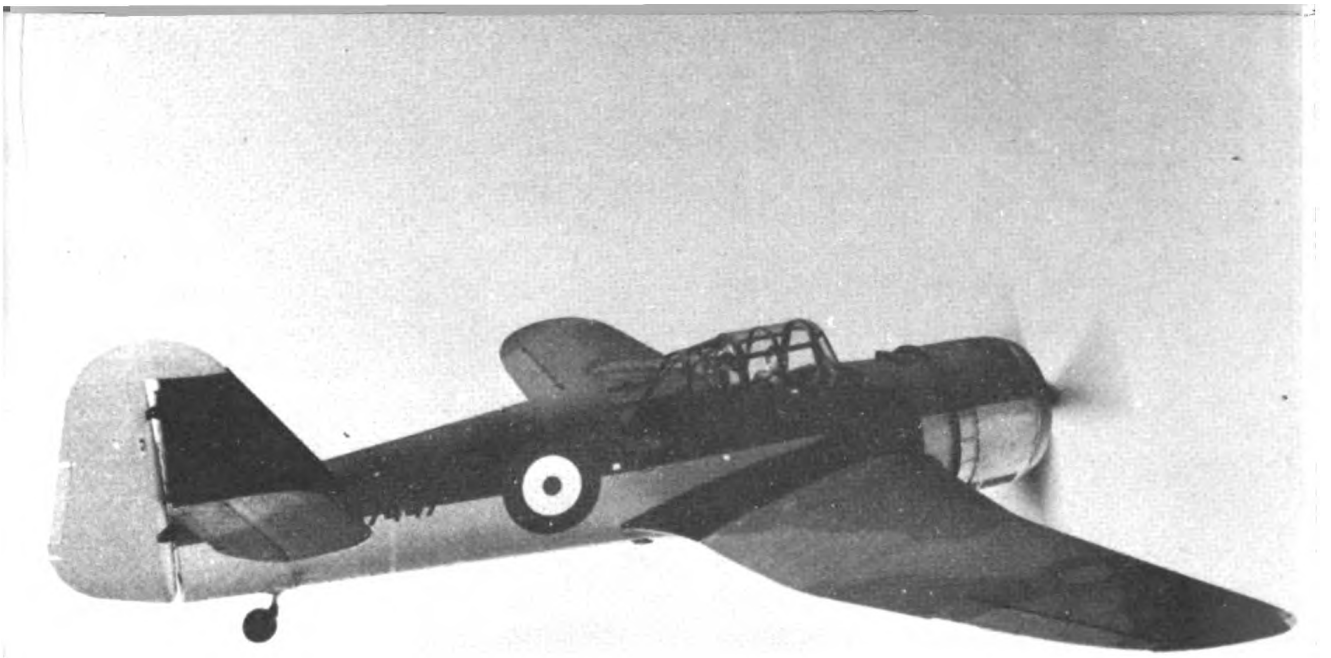
Power is supplied by a liquid-cooled in-line Rolls-Royce Kestrel engine of 585 h.p. at 2,500 r.p.m. at 14,000 feet, giving a top speed of 250 m.p.h. at 15,000 feet. Cruising speed is 216 m.p.h., and landing speed is 64 m.p.h.

(Changes were recently made on the Master and an air-cooled radial Bristol Mercury engine was substituted for the Kestrel plant. Aside from this, no other exterior alterations are noticeable.)

Other data: Span, 39 feet; length, 30 feet 5 inches; height, 10 feet; wing area, 210 square feet; range, 500 miles; loaded weight, 5,500 pounds; ceiling, 28,000 feet.

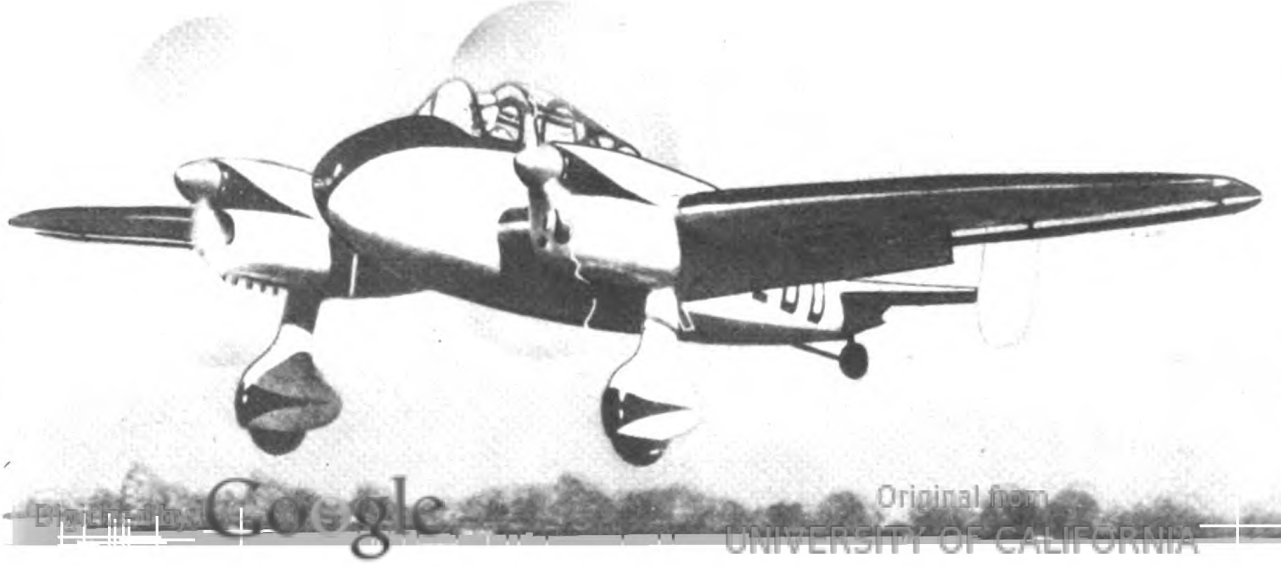
REID AND SIGRIST SNARGASHER

The first impression one gets of this machine is that it is entirely too small to mount twin engines. But the size and weight was kept down to a minimum to facilitate production and to make for more inexpensive construction.



In June, 1941, changes were made in the Miles Master and an air-cooled radial Bristol Mercury engine was substituted for the liquid-cooled in-line Rolls-Royce Kestrel. The new version is called Miles Master II. No other external alterations are apparent.

This Reid and Sigrist Snargasher is probably the only bi-engined trainer of its type in the world. It is of wood construction and has a fixed undercarriage. Engines are De Havilland Gipsy Six plants.



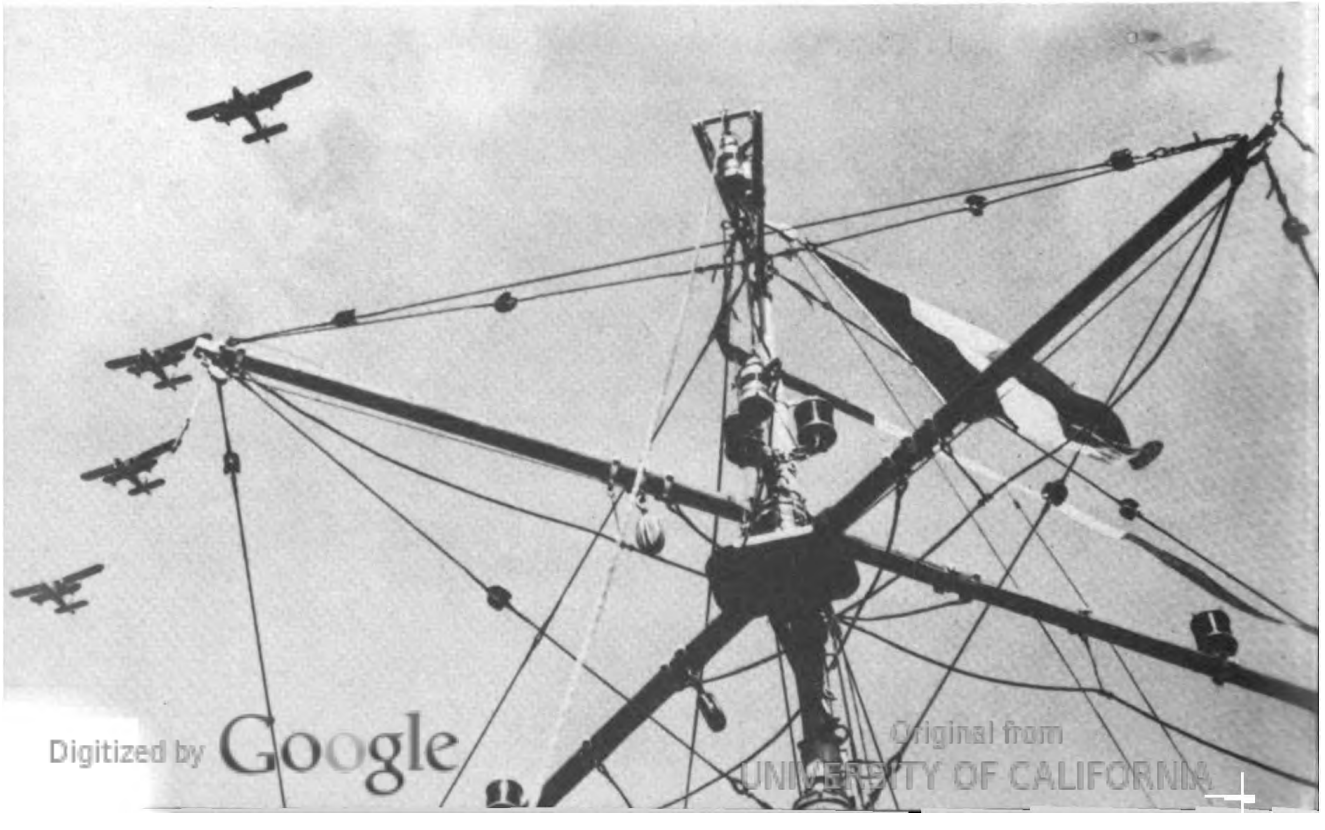
The plane is a mid-wing monoplane of exceedingly racy lines, and both cockpits are covered by sliding transparent hatches to protect the instructor and student. The fuselage is built-up of wood structure and is covered with ply sheet. A crash protector is located between the cockpits. The cantilever wing is also of wood.

The landing gear is fixed and the wheels are covered with pants. Probably the most interesting feature of this craft is its tail arrangement. It is undoubtedly the only bi-engined military trainer of its type in the world with twin vertical fins and rudders. This practice is usually followed only with larger machines.

Power is supplied by two air-cooled in-line De Havilland Gipsy Six inverted engines of 205 h.p. each, giving a top speed of 205 m.p.h. at 1,000 feet. Cruising speed is 190 m.p.h. at 6,000 feet, and landing speed is 65 m.p.h.

Other data: Span, 36 feet 4 inches; length, 25 feet 4 inches; height, 8 feet 11 inches; wing area, 212 square feet; range, 800 miles; loaded weight, 4,900 pounds; ceiling, 18,000 feet.

A well-balanced air force has its correct percentage of fighters, bombers, seaplanes, and other specialized types. However, there are many planes that are cut out for other duties of non-specialized nature.



CHAPTER 6

MISCELLANEOUS TYPES

MANY military airplanes cannot be placed under a specific and really definite heading and must therefore be given a chapter for themselves. Under various circumstances, some of these craft can be called upon to perform bombing, training, reconnaissance, or fighting duties, but as a rule they have their own specific task laid out for them and cannot rightly be designated as bombers, trainers, reconnaissance ships, or fighters. (In some cases, however, airplanes have been included in this chapter which do not come under the headings of other chapters. They are reviewed here simply because they are not numerous enough in types to warrant a separate section.)

In general, the policy of the Royal Air Force and the American Air Services has been to reduce to a minimum the number of special types. If only a few types are selected and used for several varied duties, the production rate is higher than if a specialized type is chosen for every duty. But however earnestly this policy of reduction of types is pursued, there must always be a proportion of special types.

In America, the U.S. Navy has done much more in the evolvement of multi-purpose ships than has the Air Corps. This policy was begun several years ago, more as an experiment than anything else, when stronger fighters were ordered and designated "BF"—bomber-fighters, for both dive-bombing and fighting duties. Later came scout-bombers and torpedo-bombers, and the latest in the line is the "SN"—scout-trainer, as already recounted under Training Planes. The evolvement of these varied-duties ships now appears to be virtually at an end, for it seems highly improbable that that simplification can be carried to any greater extent. To

give a specific example, for instance, it is definitely impossible that an "FPB"—fighter-patrol-bomber—type will ever be developed. Long range, large crews, and other similar patrol-bomber necessities make this inconceivable—unless fighters suddenly grow from their present size and become multi-place ships.

AMERICAN

BELLANCA YO-50

German successes in Poland and France made the United States very conscious of the need for liaison machines, and this Bellanca YO-50, for which a service test order has been let, seems to be one of the most successful models evolved for the Air Corps.

The ship is arranged as a high-wing monoplane with fixed undercarriage, and seems to be almost too similar to the startling German Fieseler Storch. It, however, is undoubtedly similar only by coincidence, and it's more than probable that the YO-50 boasts of even better performance than the completely unorthodox Storch.

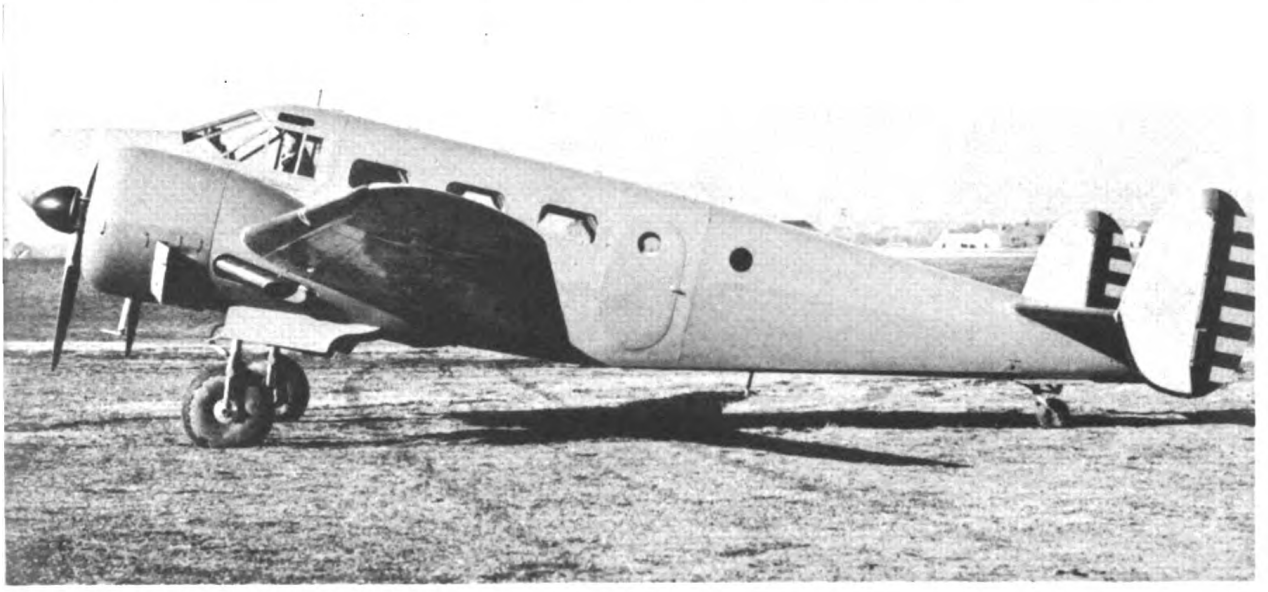
The fuselage is of welded steel tube construction and is covered with fabric. The cockpit is completely enclosed and is fitted to accommodate two persons. Transparent panels are in the top of the fuselage center section, thus making for visibility not usually had in high-wing machines.

The wing is built-up of wood spars and metal and wood ribs. The wing leading edge is metal covered; covering aft of the front spar is impregnated plywood. Leading edge slots are fitted, giving control at much lower speeds, and extend the entire length of the wing panels. Generous flaps are also provided to enhance the ship's performance during take-off and landing. The wing is externally braced by parallel diagonal struts.

Power is supplied by an air-cooled in-line Ranger inverted engine of 305 h.p. at 2,300 r.p.m.

Performance figures and specifications awaiting release by the U.S. Army Air Corps.

Bellanca's YO-50 liaison airplane does not have what one would ordinarily call modern lines, but it is actually modern in every respect. It boasts of astonishing performance, being able to take-off from the smallest of fields. No speed figures have been released.



Used mainly for cargo and personnel transport duties, the Beechcraft C-45 is actually nothing more than a commercial machine with military markings. It is used for the most part to carry officers from one section to another.

The Beechcraft F-2 is similar to the C-45 but is for photographic duties. The craft is of metal construction and has a top speed of approximately 245 m.p.h.

BEECHCRAFT C-45

This craft is basically the commercial 18S for military duties. It is used by the Air Corps for cargo and personnel transport purposes.

The fuselage is of aluminum alloy monocoque construction. A crew of two is normally accommodated for flight duties, and up to nine passengers may be carried. Twin fins and rudders are mounted on the outer ends of the horizontal stabilizer and elevator; the tail surfaces are of metal structure, fabric covered.

The wing panels are of all-metal and are cantilever. They employ steel and aluminum alloy spars and aluminum alloy ribs; covering is metal sheet. De-icing equipment is mounted on the wing leading edge, with flaps and ailerons on the trailing edge. The landing gear legs are fully retractable, folding up and back into the engine nacelles.

Power is supplied by two air-cooled radial Pratt & Whitney Wasp Junior engines of 400 h.p. each at 2,000 r.p.m. at 5,000 feet, giving a top speed of approximately 245 m.p.h. Cruising speed is 220 m.p.h. at 12,000 feet, and landing speed is 61 m.p.h.

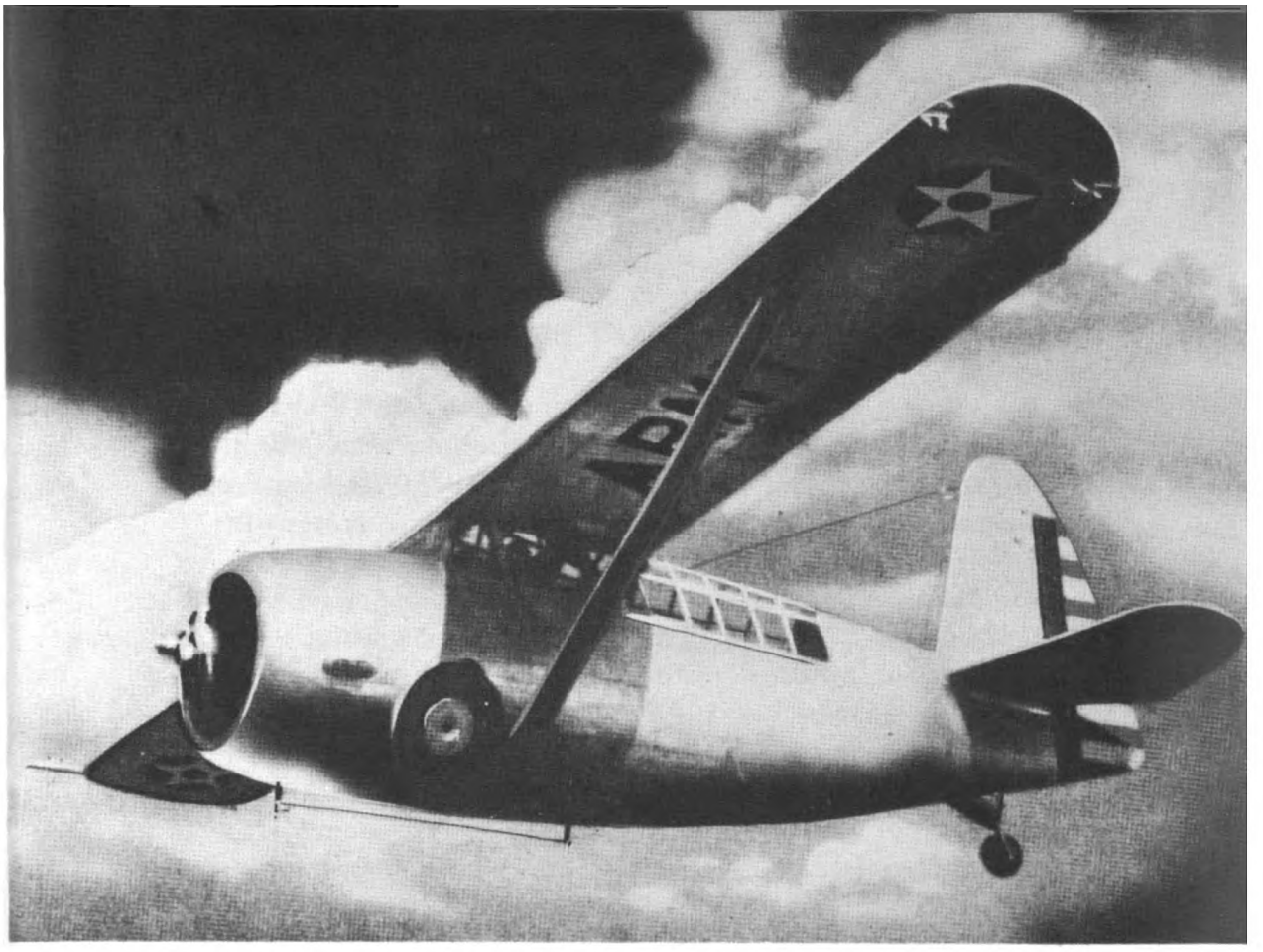
(A similar model, known as the F-2, is in service and is used as a photographic craft. There is very little difference, if any, between the two ships.)

Other data: Span, 47 feet 8 inches; length, 34 feet 3 inches; height, 9 feet 5 inches; wing area, 348 square feet; range, 1,100 miles; loaded weight, 7,500 pounds; ceiling, 27,000 feet.

CURTISS O-52

Latest in the long line of successful Curtiss military machines is the O-52 observation plane. It first flew during the early Spring of 1941 and immediately met with Government favor. It is said that a large number have been ordered for Air Corps observation squadrons.

The crew of two is accommodated beneath a long transparent Plexiglas canopy which fairs cleanly with the aft section of the fuselage. The body is of all-metal construction and is metal sheet covered. Framework is semi-cantilever and incorporates the



Curtiss' latest contribution to the Air Corps observation line is the O-52. It is a braced high-wing monoplane and probably uses a Wright engine. The undercarriage is fully retractable.

Identical to the famous commercial DC-3 transport, the Douglas C-42 is extensively used in the training of American parachutists. Two Pratt & Whitney Twin Wasp engines of 1,050 h.p. each give a top speed of 230 m.p.h. at 8,500 feet.

usual transverse bulkheads and longitudinal stringers. The pilot is located far forward and under the wing. His visibility is good, however, because of the transparent ports in the wing center section.

The single high wing is externally braced by one "I"-strut. It is of metal construction, incorporating aluminum alloy spars and built-up ribs. Flaps are set on the inboard wing sections and may be operated either mechanically or manually. The ailerons are of metal structure and are fabric covered and balanced.

The main undercarriage legs are retractable, folding into wells in the fuselage belly. Retraction works on a worm gear and may be accomplished either mechanically or manually. The tail wheel does not retract and is of the full-swivel type.

Performance figures and specifications awaiting release by the U.S. Army Air Corps.

DOUGLAS C-42

Used by the Air Corps in the first place as a personnel transport, the C-42 is now being pressed into service almost exclusively as a troop carrier and for the training of parachutists. The machine is really nothing more than a militarized version of the highly successful Douglas DC-3, which is used by airlines the world over for passenger carrying.

As a military craft, a crew of two is carried, with provisions for 21 passengers. For parachute training, however, all interior accommodations are probably removed to make for a larger number of chutists.

Arranged as a low-wing monoplane, the ship is of all-metal construction and has metal sheet covering. The fuselage is a semi-monocoque structure, and the wing panels are of the multi-cellular type. Built-up in three main panels, the wing outer sections are attached to the center panel just outboard of the engine nacelles. The undercarriage legs are retractable and fold back and up into the engine nacelles.

Power is supplied by two air-cooled radial Pratt & Whitney Twin Wasp engines of 1,050 h.p. each at 2,550 r.p.m. at 7,500 feet, giving a top speed of 230 m.p.h. at 8,500 feet. Cruising speed is 207 m.p.h. at 15,000 feet, and landing speed is 67 m.p.h.

Other data: Span, 95 feet; length, 64 feet 6 inches; height, 16 feet 11 inches; wing area, 987 square feet; range, 2,125 miles; loaded weight, 25,200 pounds; ceiling, 23,200 feet.

DOUGLAS R3D-1

Like the C-42, this craft is also merely a commercial plane with military markings; the civil designation is DC-5. And, also like the C-42, it is used as both a personnel transport and parachutist carrier by the Naval Air Service. Sixteen passengers may be accommodated.

The fuselage is of all-metal construction and is semi-monocoque. Stressed skin is riveted over the usual frames and stringers. The high mid-wing is fully cantilever and is also of metal construction of the multi-cellular type. Ailerons and other control surfaces are fabric covered.

All three landing wheels are retractable in flight. The nose wheel folds up and back into the nose of the fuselage, immediately beneath the control cabin, and the main undercarriage legs retract away from the fuselage and are housed in wells in the wing undersection.

Power is supplied by two air-cooled radial Wright Cyclone engines of 900 h.p. each at 2,300 r.p.m. at 6,700 feet, giving a top speed of 230 m.p.h. at 7,700 feet. Cruising speed is 195 m.p.h. at 10,000 feet, and landing speed is 67 m.p.h.

Other data: Span, 78 feet; length, 62 feet 2 inches; height, 19 feet 10 inches; wing area, 825 square feet; range, 1,120 miles; loaded weight, 20,000 pounds; ceiling, 23,700 feet.

KELLETT YG-1B

The Air Corps is always on the outlook for new types of airplanes to serve various duties to a better extent than current models. One of these is the YG-1B autogiro, which is being studied for use as a reconnaissance, observation, liaison, command, and message-carrying craft. This ship would undoubtedly be excellent for liaison and reconnaissance, because of its unique ability to hover over any given spot and to land in almost otherwise inaccessible fields.

The fuselage is constructed of welded chrome-molybdenum and steel tubing and is fabric covered aft of the front cockpit; covering from the front cockpit forward consists of removable metal panels. Dual controls are fitted, and both cockpits are of the open type. The rotor blades are mounted on a pylon strut forward of the front cockpit and are of chrome-molybdenum and steel tube construction with ply covering.

The landing gear legs are splayed wide and are braced to take severe landing shocks which autogiros frequently encounter. The tail wheel swivels a full 180 degrees.

Power is supplied by an air-cooled radial Jacobs engine of 225 h.p. at 2,000 r.p.m., giving a top speed of 125 m.p.h. Cruising speed is 100 m.p.h.

Other data: Span, 40 feet; length, 28 feet 10 inches; height, 10 feet 3 inches; rotor blade area, 55 square feet; range, 200 miles; loaded weight, 2,245 pounds; ceiling, 14,000 feet.

LOCKHEED C-40B

Another cargo and personnel transport is the Lockheed C-40B, which was a forerunner of the Hudson (see Light and Medium Bombers). It is smaller than the Hudson and somewhat slower, but from external lines it is obvious, even to a layman, that they are products of the same company.

The fuselage is of all-metal semi-monocoque construction and is fitted to carry a crew of two and five or six passengers. Sheet metal covering is riveted over the usual longitudinal stringers and transverse bulkheads. The pilot and co-pilot are in the nose of the fuselage and are directly opposite the engine nacelles. The body tapers to a rounded point at the nose. Two vertical fins and rudders are carried at the outer ends of an extended stabilizer and elevator. Tail controls are metal covered.

The machine is arranged as a low-wing monoplane of full cantilever structure. There is a single shear spar with built-up ribs, covered by metal sheet. The ailerons are fabric covered, and the flaps are electrically-operated. The undercarriage legs are retractable, folding back and up into the engine nacelles.

The Naval Air Service's Douglas R3D-1, like the C-42, is utilized as a cargo and personnel transport machine. It is a military version of the commercial DC-5 and maximum speed is 230 m.p.h.

Even autogiros have their place in war aviation. This one, the Kellett YG-1B, is being studied for reconnaissance, observation, liaison, command, and message-carrying possibilities.

The Lockheed C-40B has a top speed of 225 m.p.h., a cruising speed of 212 m.p.h., and a landing speed of 65 m.p.h. The wing span is 49 feet 6 inches, the length is 36 feet 4 inches, and the height is 9 feet 11 inches. Engines are Pratt & Whitney Wasp Juniors of 400 h.p. each.

A similar ship, the R2O-1, is in service with the Navy as an executive transport.

Power is supplied by two air-cooled radial Pratt & Whitney Wasp Junior engines of 400 h.p. each at 2,200 r.p.m., giving a top speed of 225 m.p.h. at 5,000 feet. Cruising speed is 212 m.p.h., and landing speed with flaps extended is 65 m.p.h.

Other data: Span, 49 feet 6 inches; length, 36 feet 4 inches; height, 9 feet 11 inches; wing area, 352 square feet; range, 824 miles; loaded weight, 8,650 pounds; ceiling, 22,300 feet.

NORTH AMERICAN O-47B

Standard Air Corps and National Guard observation airplane is the O-47B, which replaced the Douglas O-46A. It is a three-seat mid-wing monoplane of all-metal construction.

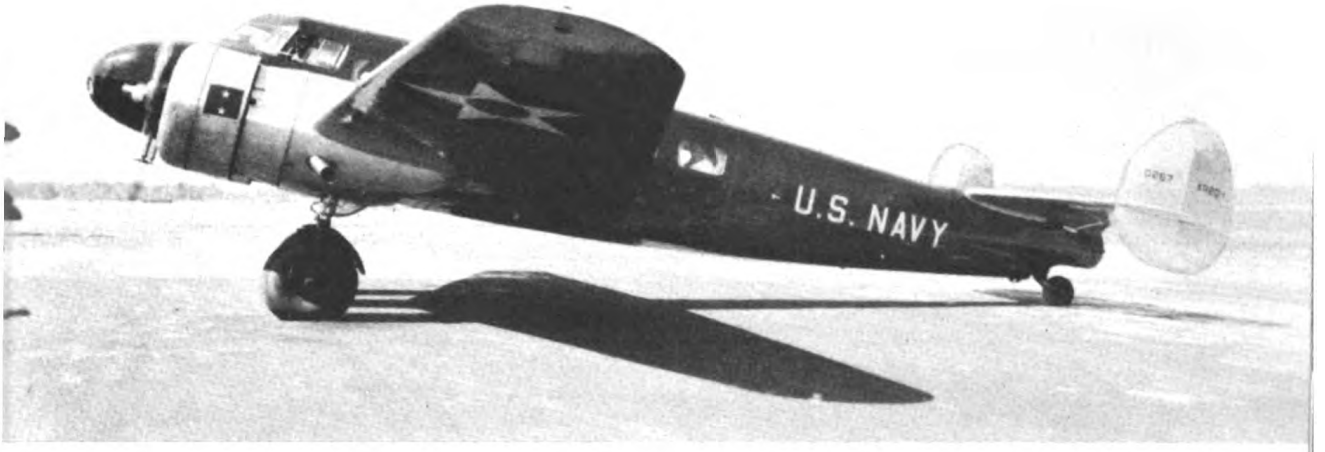
The fuselage is a semi-monocoque structure with tandem seating arrangements. The seats are covered by a transparent canopy which may be separately operated by any member of the crew. The fuselage belly is exceptionally deep and is provided with transparent panels to facilitate downward vision.

The wing is built-up in three sections and is cantilever. The center section is integral with the fuselage and consists of merely a short stub. Sheet metal is used for covering. The ailerons are of metal structure and are fabric covered. Hydraulically-operated split trailing edge flaps are mounted. The undercarriage legs are retractable, folding up and out into special wells in the wing undersection.

Typical armament consists of one fixed .30 caliber Browning machine gun for the pilot and one .30 caliber swivel gun in the rear pit for the gunner-observer.

Power is supplied by an air-cooled radial Wright Cyclone engine of 860 h.p. at 2,300 r.p.m. at 10,500 feet, giving a top speed of 243 m.p.h. Cruising speed is 217 m.p.h., and landing speed with flaps extended is 67 m.p.h.

Other data: Span, 46 feet 3½ inches; length, 33 feet 2 inches; height, 12 feet; wing area, 348 square feet; range, 853 miles; loaded weight, 7,533 pounds; ceiling, 29,700 feet.



Naval counterpart of the C-40B is the R20-1. It has the same specifications and performance and is for cargo and personnel transport duties.

Present standard observation plane of the Air Corps is the North American O-47B. It is a spacious three-seat machine of all-metal construction. The landing gear is retractable, folding into wells in the wing. Note transparent panels in belly to make for better visibility.

RYAN YO-51

The YO-51, or Dragonfly as it has been named by the manufacturers, is one of the Air Corps' newest observation planes and is designed for "operations of a nature requiring an airplane of performance characteristics never before accomplished," according to company publicity.

Arranged as a braced parasol monoplane, the YO-51 most aptly fits the Dragonfly name. The fuselage forward section is of steel tube construction and the rear is of semi-monocoque; metal covering is used throughout. A crew of two is carried in open pits. No guns are mounted.

The wing is of wood, strut braced, and is of the two-spar, nontapering type. The entire upper surface of the wing is covered with ply; the lower surface is also ply covered to a point 8½ inches back of the center line of the rear spar. The control surfaces are of aluminum alloy framework covered with fabric. A huge flap extends the entire length of the wing trailing edge. To this, for the most part, is attributed the machine's startling performance. The wing leading edge is fitted with slots, which also run from tip to tip.

The landing gear is fixed and is braced to take the heavy shock of almost vertical landings which the YO-51 is able to make.

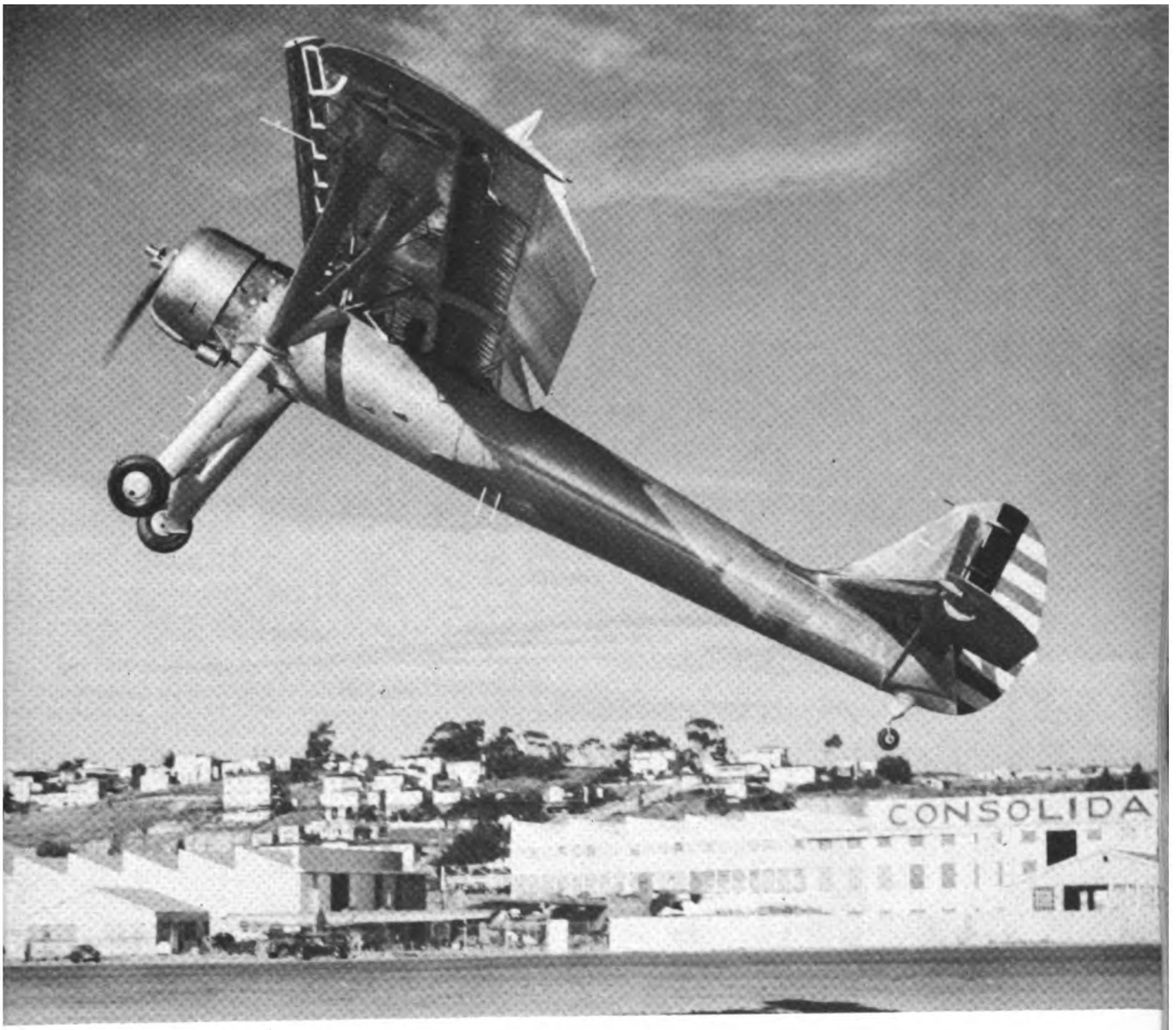
Power is supplied by an air-cooled radial Pratt & Whitney Wasp Junior of 420 h.p. at 2,200 r.p.m. Performance figures have not been released.

Other data: Span, 52 feet; length, 34 feet 5½ inches; height, 11 feet 1 inch; loaded weight, 3,900 pounds.

STINSON O-49

Another short-range liaison-observation plane currently being tested by the Air Corps is this Stinson O-49, which looks more like a commercial light plane than a military type.

The fuselage is of welded chrome-molybdenum steel tubing and is fabric covered. The closed cockpit carries a crew of two in tandem fashion and large transparent panels make for excellent visibility to all sides. The wing panels are externally braced and



Going up! No ordinary airplane—military or commercial—is able to climb from take-off at such an angle. The Ryan YO-51 is able to perform in this fashion because of its leading edge slots and large trailing edge flaps.

Slow-speed ships are now finding more favor than ever before in the Air Corps. They've discovered that a real airpower must have not only speedy planes for combat work but also slow craft for Intelligence duties. This Stinson O-49 has a maximum speed of 133 m.p.h.

are of metal structure; covering is fabric. Both leading edge slots and trailing edge flaps are fitted. The undercarriage is fixed.

Standard instruments include an airspeed indicator, bank and turn indicator, compass, clock, altimeter, rate of climb indicator, air thermometer, tachometer, engine gauge unit, cylinder head thermometer, fuel level gauge, and ammeter.

Power is supplied by an air-cooled radial Lycoming engine of 280 h.p. at 2,200 r.p.m., giving a top speed of 133 m.p.h. Cruising speed is 121 m.p.h., and minimum flight speed while obtaining altitude is 31 m.p.h.

Other data: Span, 40 feet 10¾ inches; length, 33 feet 6½ inches; height, 9 feet 10 inches; loaded weight, 3,322 pounds; ceiling, 20,000 feet.

STINSON YO-54

For the first time in the history of Air Corps military aviation a standard light plane has been accepted for service. This craft is the YO-54 liaison plane, or commercial model 105.

From external appearances, the only difference between the YO-54 and the 105 is the addition of service markings.

The fuselage is a welded steel tube structure with fabric covering. Two passengers are accommodated in a side-by-side cockpit. Dual controls may be fitted. The wing is built-up of metal ribs and spruce spars and is fabric covered. Both wing slots and flaps are fitted.

Power is supplied by an air-cooled in-line Continental opposed engine of 80 h.p. at 2,750 r.p.m., giving a top speed of 115 m.p.h. Cruising speed is 105 m.p.h., and landing speed with flaps extended is 43 m.p.h.

Other data: Span, 34 feet; length, 22 feet; height, 6 feet 6 inches; wing area, 155 square feet; range, 394 miles; loaded weight, 1,580 pounds; ceiling, 10,000 feet.

And even light jobs now have their place in the military scheme! This Stinson YO-54 liaison ship is practically identical to the very popular "flivver plane" private version. Seating arrangement is side-by-side.

BRITISH

AIRSPEED QUEEN WASP

This machine was designed to be shot down! England is probably the only country that has developed radio-controlled target planes to be sent aloft and then fired upon by anti-aircraft gunners, and the Queen Wasp is the finest in the category. In the first place, the idea was to give ground crews experience in handling their arms. In other countries the "archie" crews have nothing to shoot at with the exception of towed target sleeves. This is usually a dangerous procedure, inasmuch as the plane doing the towing is always exposed to the possibility of being hit by shell fragments. The Royal Air Force realized this, and they also realized that when a sleeve is towed it is kept at a standard and uniform altitude, so they developed the radio-controlled machine. This not only eliminates the possibility of striking a more expensive ship with gun fire but also makes for greater anti-aircraft accuracy, since the target planes may be sent aloft alone and put through various maneuvers to confuse the ground gunners.

From outward appearance, the Queen Wasp is very similar to the American Waco commercial planes, although it is probably built more inexpensively. Of biplane design, a single set of "I"-struts brace the tapered wings. The craft is built-up entirely of wood and is covered with fabric and ply. The fuselage is fitted to carry a crew of two when not being used as a target.

Power is supplied by an air-cooled radial Armstrong-Siddeley Cheetah engine of 375 h.p. No performance figures have been released.

Other data: Span, 31 feet; length, 29 feet; height, 13 feet.

AVRO ANSON

In general layout, the Anson is a low-wing monoplane with a retractable undercarriage. It is employed by the R.A.F. on reconnaissance and advanced training duties.

The fuselage is a welded tubular steel structure with fabric covering. The cantilever wing is constructed in one unit and has

two box-spars of spruce and plywood, with ribs of the same material. Balanced ailerons are fitted, along with trailing edge flaps.

A crew of three is normally accommodated. The pilot's seat is in the nose on the port side; when dual controls are installed, a second seat is next to the pilot for the co-pilot. The pilot has control of a fixed Vickers machine gun, which is mounted in the nose, and there is an Armstrong-Whitworth manually-operated turret on top of the fuselage and behind the wing trailing edge. In the extreme nose is the bomb-aimer's position; he is normally stationed behind the pilot as navigator. Internal stowage is provided for two 100-pound and eight 20-pound bombs in the center section of the wing.

Power is supplied by two air-cooled radial Armstrong-Siddeley Cheetah engines of 350 h.p. each at 2,100 r.p.m., giving a top speed of 188 m.p.h. at 7,000 feet. Cruising speed is 158 m.p.h. at 6,000 feet, and landing speed is approximately 63 m.p.h.

Other data: Span, 56 feet 6 inches; length, 42 feet 3 inches; height, 13 feet 1 inch; wing area, 410 square feet; range, 790 miles; loaded weight, 8,000 pounds; ceiling, 19,000 feet.

BLACKBURN SHARK

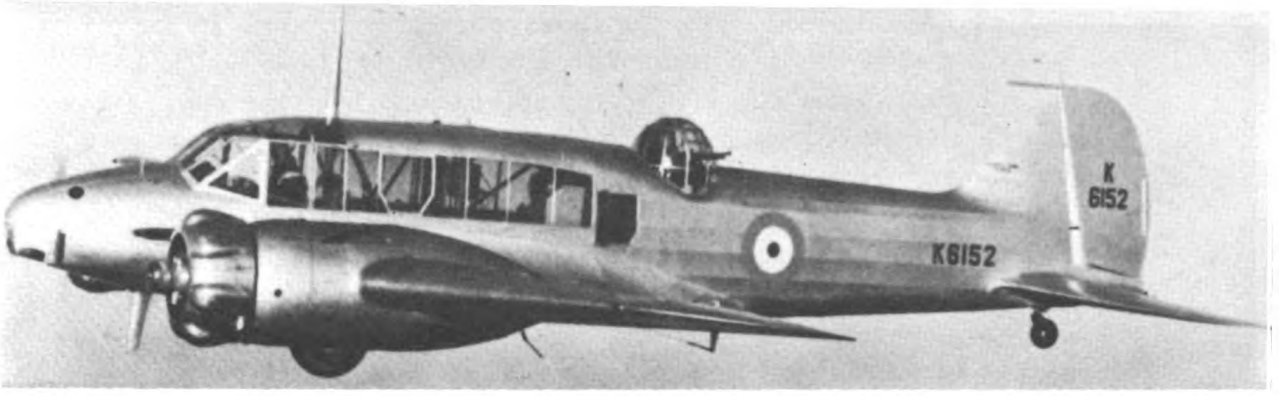
The sesquiplane Shark, the prototype of which was built in 1934, is intended for torpedo dropping, light bombing, gunnery spotting, and reconnaissance. It is in service with the Fleet Air Arm and is usually stationed aboard aircraft carriers.

As a torpedo bomber, provisions are made for mounting a torpedo or a load of bombs weighing about 1,500 pounds, a crew of either two or three, and fuel for about 600 miles. When used for fleet spotting or reconnaissance with no projectile load, fuel is carried for more than 700 miles.

The fuselage is of monocoque construction and is metal covered. Watertight compartments provide flotation in case of water landings. One fixed gun is mounted for the pilot and one swivel weapon is provided for the gunner.

The staggered biplane wings embody two stainless steel spars and dural ribs, fabric covered. The upper and lower panels are braced interplane by "N"-struts and inclined struts.

Details of the Airspeed Queen Wasp are closely guarded secrets, but it is known that the craft is radio-controlled and is used for target practice. Engine is Armstrong-Siddeley Cheetah of 375 h.p.



Used for both reconnaissance and advanced training, the Avro Anson is one of the best examples of "flying greenhouses." It is generously panelled with transparent windows. Construction is metal with fabric covering.

Designed in 1934, the Blackburn Shark performs a multitude of duties. It has a cruising range of more than 700 miles and a top speed of 152 m.p.h. Slots are mounted on the wing leading edge. It is used almost entirely from aircraft carriers.

Power is supplied by an air-cooled radial Armstrong-Siddeley engine of 600/700 h.p. at 2,150 r.p.m., giving a top speed of 152 m.p.h. at 5,500 feet. Cruising speed is 118 m.p.h., and landing speed is 64 m.p.h.

Other data: Span, 46 feet; length, 35 feet 2 inches; height, 12 feet 1 inch; wing area, 489 square feet; loaded weight, 7,446 pounds; ceiling, 20,400 feet.

BRISTOL BOMBAY

This Bristol machine is so constructed that it can be used either as a regular long-distance bomber or as a normal troop carrier accommodating 24 armed soldiers and a crew of four.

The Bombay is exceptionally well armed and has three turrets. In its Frazer-Nash automatic nose turret, a gunner is provided with from one to four guns. An emergency turret, located amidships, can be raised above the fuselage level if required. In the tail, between the dual rudders, is another turret from which a gunner can battle attacking planes approaching from the rear.

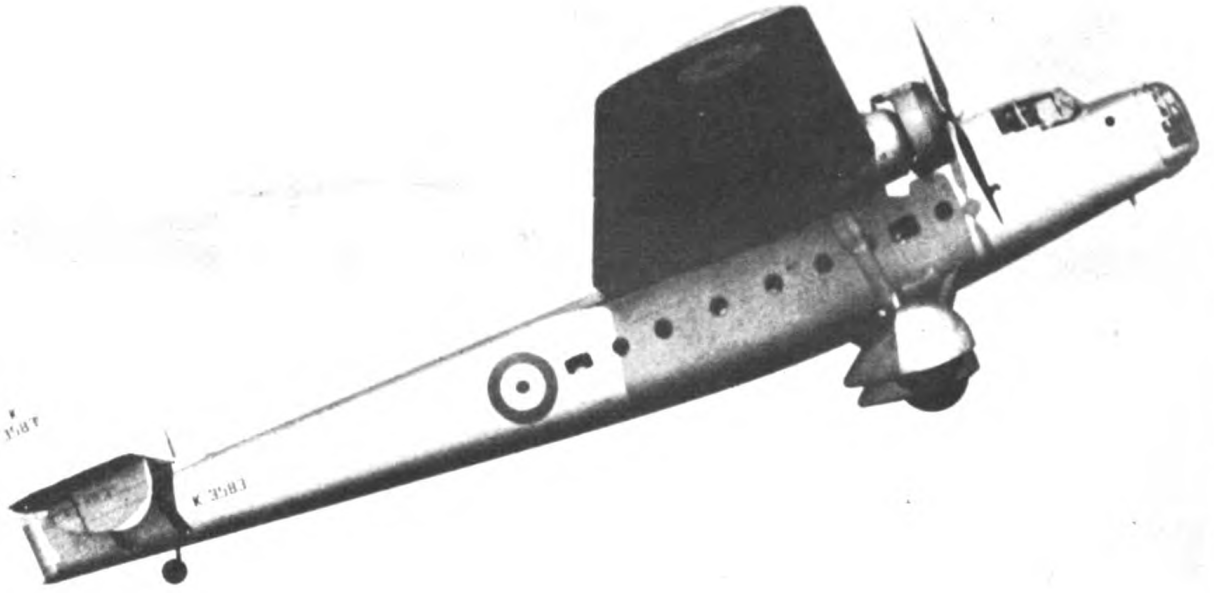
Of all-metal construction, the Bombay is an exceedingly strong plane and is braced to carry heavy loads. However, even though the prototype was built just one year before the Hawker Hurricane, it definitely does not have what would be called modern lines. The fuselage is box-like and has a sunken appearance amidships. Moreover, the undercarriage does not retract.

Power is supplied by two air-cooled radial Bristol Pegasus engines of 780/815 h.p. each at 2,350 r.p.m., giving a top speed of 186 m.p.h. at 6,500 feet. Cruising speed is 154 m.p.h. at 10,000 feet, and landing speed is 62 m.p.h.

Other data: Span, 95 feet 9 inches; length, 69 feet 3 inches; height, 19 feet 6 inches; wing area, 1,340 square feet; range, 2,230 miles; loaded weight, 20,000 pounds; ceiling, 25,000 feet.

FAIREY ALBACORE

When the second World War began, the Fairey Albacore was a bare few weeks old; it is now in production as a three-seat biplane dive-bomber likewise designed for reconnaissance, torpedo carrying, and aircraft carrier duties. It is obvious that in the Al-



The R.A.F., too, has its troop carriers, the most recent of which is the Bristol Bombay. Armed as well as the average bomber, having both nose and tail turrets, it can accommodate 24 troops and a crew of four.

Britain's latest multi-purpose Fleet Air Arm machine is the Fairey Albacore, which was designed just a few short weeks before the war began. Although it doesn't have the appearance one would expect in a first-line war machine, it has well demonstrated its prowess.

bacore the Fleet Air Arm has attempted to get a craft fitting a multitude of purposes.

The fuselage is of all-metal, stressed skin construction. The rudder is balanced and is covered with fabric. The landing gear is fixed and spatted to cut down drag. Wings are of equal span and are braced by a single set of interplane parallel struts. The wings are of metal structure and are covered with fabric. Diving flaps are mounted on the inboard sections.

There is a special cradle between the undercarriage legs for a Whitehead 1,000-pound torpedo. A single bomb, mounted on an ejector-type rack for dive-bombing, may be substituted for the torpedo.

The Albacore is designed for the peculiar stresses and demands of torpedo dropping. The folding wings allow for stowage aboard aircraft carriers, and the craft is fitted with a large number of watertight compartments to provide flotation in case of water landings.

Three machine guns are mounted. One is fixed and fires forward and the other two are on a swivel mount in the gunner's rear pit. Both cockpits are canopied.

Power is supplied by an air-cooled radial Bristol Taurus 14-cylinder sleeve-valve engine of 1,065 h.p. Performance figures have not been released.

Other data: Span, 50 feet; length, 39 feet 10 inches; height, 14 feet 2 inches.

FAIREY GORDON

Designed in 1932 as a general-purpose plane, this ship is now being utilized as a target tower to give gunners actual air practice.

The fuselage is of all-metal construction with fabric covering over stringers and bulkheads. The landing gear is of the fixed type, braced by "V"-struts.

The equal-span biplane wings incorporate two spars and built-up ribs. Ailerons are carried on both upper and lower panels. The wings are braced interplane by two sets of parallel struts joined to the spars.

Combat pilots must have target practice in the air, so target towing planes are used. One of these is the Fairey Gordon, an old-timer of the pre-streamline days of 1932. Performance is low, and the top speed is only 149 m.p.h.

Airpower vs. seapower has long been a hotly discussed topic. Battleship advocates had always pooh-poohed the threat of airplanes, but the Fairey Swordfish gave them a sad awakening. This ship is credited not only with the historic Taranto raid but also with crippling of the German "Bismarck" battleship which sunk the British "Hood."

A crew of two is normally accommodated. The pilot is situated immediately under the wing center section cut-out, with a small windscreen, and the observer's pit is directly to the rear. As a drogue tower, no armament is mounted.

Power is supplied by an air-cooled radial Armstrong-Siddeley Panther engine of 525 h.p., giving a top speed of 149 m.p.h. Cruising speed is 120 m.p.h., and landing speed is approximately 53 m.p.h.

Other data: Span, 45 feet 8 inches; length, 32 feet 6 inches; wing area, 450 square feet; range, 600 miles; loaded weight, 5,670 pounds; ceiling, 22,000 feet.

FAIREY SWORDFISH

Built in 1936, this is one of the most famous of Royal Air Force machines. Its fame, as a matter of fact, is overshadowed only by the Hurricane and Spitfire fighters. For according to official communiques issued by the British Air Ministry, it was the Swordfish that made the historic raid on the Italian port of Taranto; later, the same ship was said to have torpedoed and damaged the Nazi *Bismarck* to the extent that British battleships were able to overtake the speedier vessel and send it to the bottom.

Basically, the craft is a torpedo carrier, and as such it mounts an 18-inch Whitehead torpedo slung between the undercarriage legs. When necessary, it may also be utilized as a light bomber (carrying the explosive load on wing racks), as a fleet spotter, and as a reconnaissance ship.

The fuselage is of faired steel tube construction covered with removable metal sheet in front and fabric to the rear. A crew of two is carried and is provided with two guns—one fixed for the pilot and one on a swivel mount in the rear cockpit. Both pits are of the open type.

The unequal-span staggered wings are fabric covered metal structures consisting of two spars of built-up steel strip, steel drag struts, and dural ribs. The upper wing center section is supported upon a pyramid structure, and the lower panels are attached to center section stubs braced by inverted "V"-struts to the upper

longerons. Parallel struts and wires brace the wings interplane. Fabric covered metal frame ailerons are on both upper and lower wing panels.

Power is supplied by an air-cooled radial Bristol Pegasus engine of 690 h.p. at 2,200 r.p.m., giving a top speed of 154 m.p.h. at 7,000 feet. Cruising speed is 131 m.p.h., and landing speed is given as 67 m.p.h.

Other data: Span, 45 feet 6 inches; length, 36 feet 4 inches as landplane and 40 feet 11 inches as seaplane; height, 12 feet 10 inches as landplane and 14 feet 7 inches as seaplane; range, 720 miles; loaded weight, 7,720 pounds as landplane; ceiling, 19,250 feet.

HAWKER HECTOR

Like the Audax (see Training Planes) the Hector was originally designed as an army cooperation craft. Now, however, the ship is used for target towing.

Probably the most interesting feature of the Hector is its power plant, the Napier Dagger rated at 805 h.p. The Dagger is an engine of unusual design, having 24 cylinders cast in rows of six, an arrangement known as the "H"-type. It has two crankshafts, one each for the upright and inverted cylinders, geared together to drive the propeller shaft. While this does not make for the perfect streamlining achieved with a "V"-type liquid-cooled plant, it presents much less frontal area than the radial type. With the Dagger, the top speed is 191 m.p.h. at 4,750 feet.

The wings are staggered in the conventional manner and are of metal construction, fabric covered. One set of interplane "N"-struts brace the wings, along with landing and flying wires. A crew of two is accommodated. Two forward machine guns, set in troughs along the sides of the fuselage, are provided for the pilot. Either one or two guns may be mounted for the rear gunner-observer.

Other data: Span, 37 feet 3 inches; length, 29 feet 9 inches; height, 10 feet 6 inches; wing area, 350 square feet; range, 400 miles; loaded weight, 4,890 pounds.

VICKERS VILDEBEESTE

This ship, which was designed in 1930, is by no means modern. It is in service with the Fleet Air Arm, though, and appears to be doing excellent work.

Of all-metal construction, the Vildebeeste is a torpedo-bomber designed to carry either bombs or a marine torpedo. It is also used for coastal reconnaissance and defense and aboard aircraft carriers for fleet spotting. As a torpedo carrier, the projectile is slung beneath the fuselage and between the undercarriage legs; as a light bomber, the missiles are mounted in racks on the wing undersection. Covering is fabric.

The landing wheels, which are supported by streamlined "V"-struts, are spatted. The pilot's cockpit is directly beneath the wing leading edge and behind the engine firewall. The second man in the crew, who is probably the navigator, is located behind the pilot and under the wing. And the gunner has his pit amidships. In case of attack, the navigator can make his way through the fuselage to the channel turret in the belly. Only one forward gun is mounted.

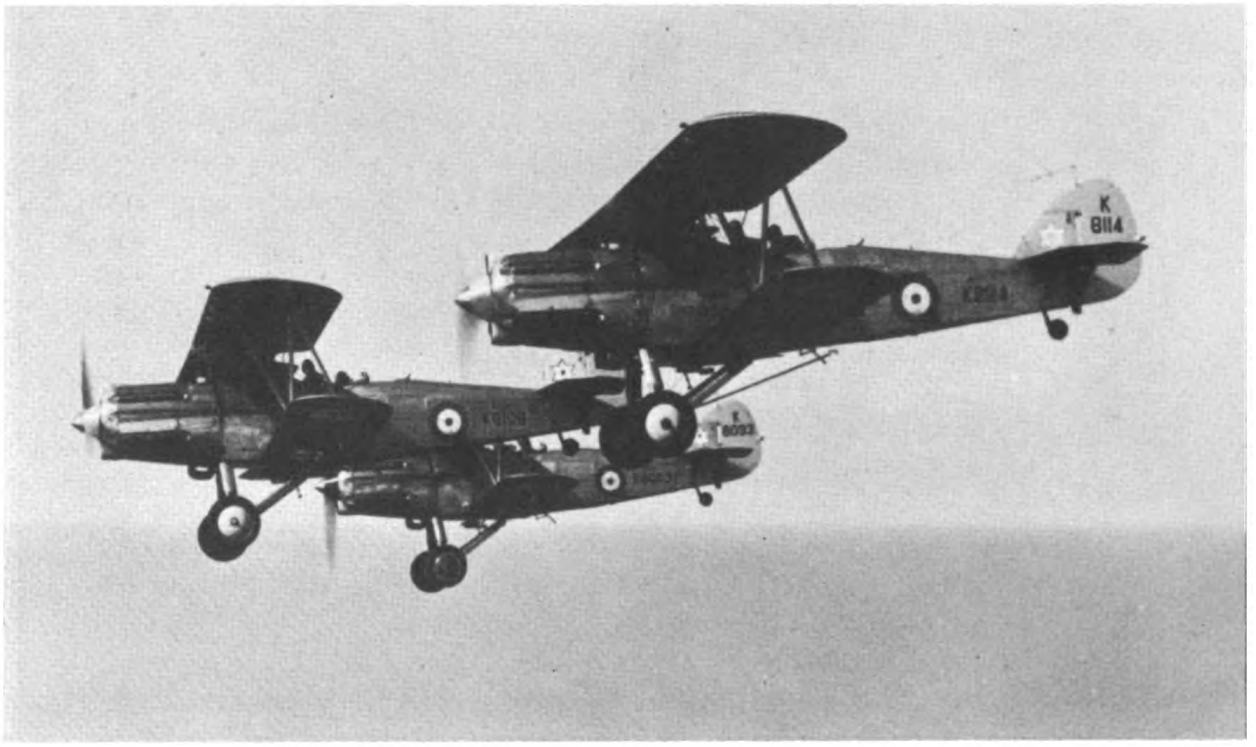
The equal-span unstaggered biplane wings are of metal structure, with two spars and ribs covered with fabric. The wings are braced interplane by one set of parallel struts. Diagonal parallel struts brace the top wing center section to the fuselage.

Power is supplied by an air-cooled radial Bristol Perseus engine of 825 h.p. at 5,000 feet, giving a top speed of 156 m.p.h. at 5,200 feet. Cruising speed is 130 m.p.h., and landing speed is approximately 58 m.p.h.

Other data: Span, 49 feet; length, 37 feet 8 inches; height, 18 feet 9 inches; wing area, 728 square feet; range, 608 miles; loaded weight, 8,500 pounds; ceiling, 17,500 feet.

VICKERS VINCENT

The Vincent is similar to the Vildebeeste and is also classed as a torpedo-bomber. It is of all-metal construction, fabric covered. The biplane wings are of equal span and are braced interplane by one set of parallel struts. Ailerons are on both upper and lower panels.



Another target towing craft is the Hawker Hector. The plane is powered by an air-cooled Napier Dagger engine of 805 h.p., giving a top speed of 191 m.p.h.

Main duty of the Vickers Vildebeeste is torpedo-bombing, although it may also be used on other missions. Top speed is 156 m.p.h. at 5,200 feet. Note torpedo between the landing gear legs.

Power is supplied by an air-cooled radial Bristol Pegasus engine of 660 h.p., giving a top speed of 142 m.p.h. at 4,920 feet. Cruising speed is 120 m.p.h. at 5,000 feet, and landing speed is approximately 54 m.p.h.

Other data: Span, 49 feet; length, 36 feet 8 inches; height, 14 feet 8 inches; wing area, 728 square feet; range, 700 miles; loaded weight, 8,100 pounds; ceiling, 17,000 feet.

WESTLAND LYSANDER

One of the most interesting military aircraft produced in recent years is the Westland Lysander as supplied to army cooperation squadrons of the Royal Air Force. It is notable not only because it was designed specifically for cooperation duties, but because it makes full use of modern high-lift devices.

The front section of the fuselage is constructed of square light alloy tubes joined by gusset plates, and the rear is of welded steel tube. The covering is fabric over wood stringers and formers. There are several detachable panels for inspection. Dual controls are fitted.

Handley Page slots and slotted flaps give full control at speeds just above the stalling point, which is in the region of 50 m.p.h. The Lysander can attain an altitude of 50 feet from the start of take-off in 245 yards.

The wing panels are attached above the fuselage by cabane struts and are braced by "V"-struts to the landing gear. The single spar is built-up from extruded sections joined by flat plate web reinforced by riveted-on units. Sheet metal nose ribs are attached to front flanges and are covered with alloy. Fabric covering is over the tubular light alloy ribs which extend to the rear of the main spar and include fittings and drag bracing for the support of flaps and ailerons.

Power is supplied by an air-cooled radial Bristol Perseus engine of 905 h.p. at 2,400 r.p.m. at 6,500 feet, giving a top speed of 230 m.p.h. at 10,000 feet. Cruising speed is 180 m.p.h.

Other data: Span, 50 feet; length, 30 feet 6 inches; height, 14 feet 6 inches; wing area, 260 square feet; range, 600 miles; loaded weight, 6,015 pounds; ceiling, 26,000 feet.

The Vickers Vincent is similar to the Vildebeeste and is also classed as a torpedo-bomber. It is of metal construction with fabric covering on all surfaces. The wing span is 49 feet and the length is 36 feet 8 inches.

One of the most successful army cooperation ships in the Royal Air Force is the Westland Lysander. It is further said to have shown its superiority over Germany's Messerschmitt 109. It has a much lower speed than that Nazi plane and is therefore able to make shorter turns and thus gain the advantage.

WESTLAND WALLACE

Designed as a general-purpose machine in 1932, the Wallace biplane has seen many years of active surface and is now used mainly as a target tower.

The fuselage is constructed of square dural and alloy tubes, with corrugated sheet covering to the rear of the pilot's cockpit; fabric is laid over this corrugation. The pilot's pit is immediately behind the wing trailing edge, with the gunner's station to the rear. Open or closed cockpits are optional.

The equal-span staggered wings are of metal structure and are fabric covered. The center section of the upper wing is supported above the fuselage by four cross-braced struts. The wings are braced interplane by parallel steel struts. Handley Page automatic slots and Frise-type ailerons are fitted.

The landing gear is fixed and spatted and is braced by "V" struts and one "X"-strut. The Wallace, it should be mentioned, was successful in flying over the 29,141-foot summit of Mount Everest in 1933.

Power is supplied by an air-cooled radial Bristol Pegasus engine of 570 h.p. at 2,000 r.p.m. at 5,000 feet, giving a top speed of 158 m.p.h. Cruising speed is in the region of 134 m.p.h., and landing speed is approximately 57 m.p.h.

Other data: Span, 46 feet 6 inches; length, 34 feet 6 inches; height, 11 feet 6 inches; wing area, 500 square feet; range, 470 miles; loaded weight, 5,750 pounds.

WESTLAND WAPITI

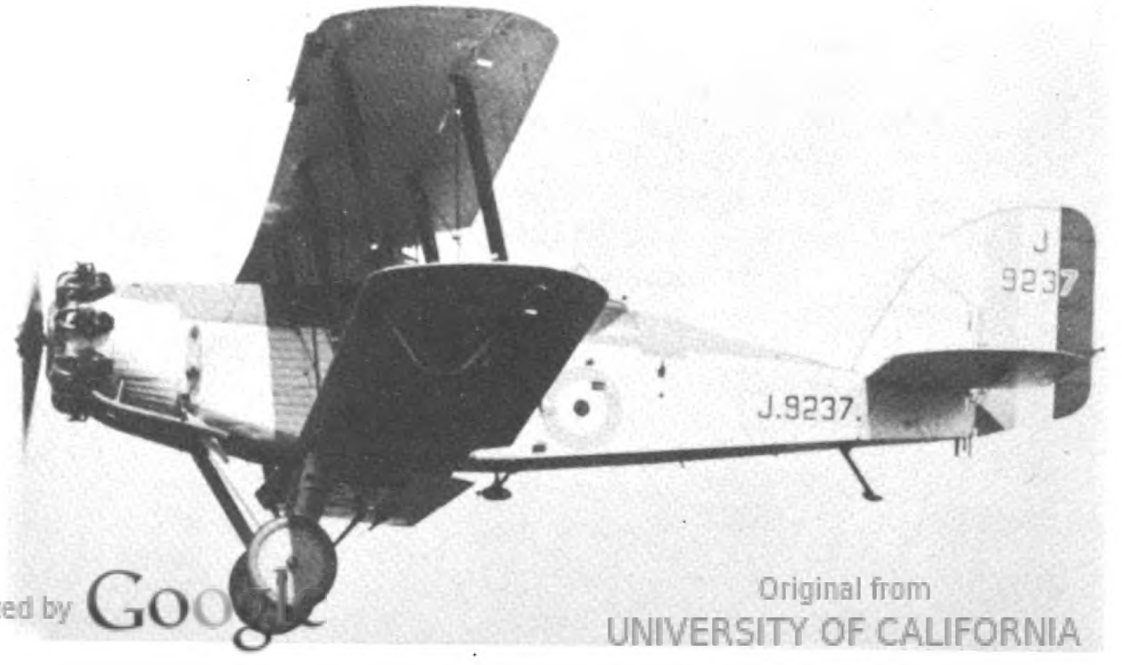
The Wapiti general-purpose and army cooperation biplane was for several years standard service equipment with the Royal Air Force. Now, however, it has been withdrawn almost entirely from Home Service and is being used mainly by overseas units.

The fuselage is of metal structure and is covered with fabric to the rear of the pilot's cockpit and corrugated sheet to the front. The vertical fin and rudder are oversized, fabric covered, and all control wires are external.

The pilot's and gunner's pits are set very close together and are

Still another target towing aircraft is the Westland Wallace, which first flew in 1932. It has a top speed of 158 m.p.h. and a cruising speed of 134 m.p.h. The landing gear is fixed and spatted for streamlining.

Westland Wapitis are no longer to be seen in Britain proper, according to reports, and they are used exclusively by overseas units. Judging from this, it is quite possible that the machine saw service against Italian troops in Ethiopia and Libya.



open. The pilot has one weapon and the gunner has either one or two machine guns on a swivel mount. From his rear station, the gunner has an excellent range of fire on both sides of the plane, but he is practically blind to the rear because of the huge tail surfaces.

The equal-span staggered biplane wings are of metal construction, fabric covered. The lower wing is horizontal and the top panel has a marked dihedral. The upper wing center section is braced above the fuselage by pyramid cabane struts, and the wings are braced interplane with two sets of parallel struts and cross-wire. Ailerons are mounted on both upper and lower surfaces.

Power is supplied by an air-cooled radial Bristol Jupiter engine of 460 h.p. at 4,000 feet, giving a top speed of 140 m.p.h. Cruising speed is 128 m.p.h., and landing speed is approximately 52 m.p.h.

Other data: Span, 45 feet 6 inches; length, 34 feet 3 inches; height, 11 feet 9 inches; wing area, 488 square feet; range, 660 miles; loaded weight, 5,400 pounds; ceiling, approximately 16,000 feet.

CHAPTER 7

AMERICAN PLANES IN THE R.A.F.

THE United States has contributed much toward building up the Royal Air Force to formidable proportions to better stave off the Hitler sky legions and carry the war to the Germans themselves. And in addition to providing a good market for American planes, England is also acting as a much-needed proving grounds. Until the Nazi War began, the only things designers in this country had to go by when planning their ships were speed, range, and maneuverability. Now, however, U.S. craft may be observed in the field, so to speak, in actual combat, and therefore alterations and refinements may be made on future designs, based on actual war performances and adaptabilities.

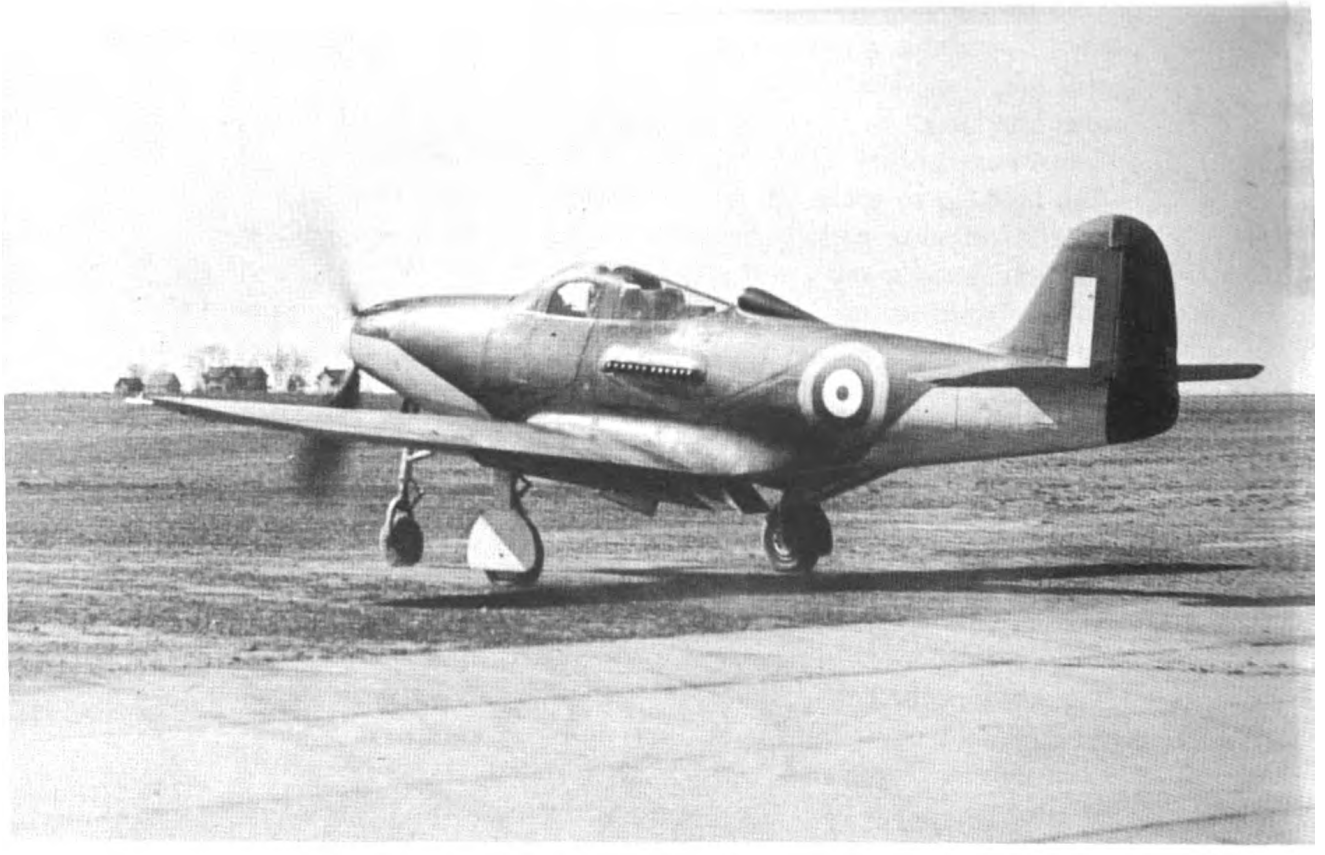
At this writing, more than 26,000 airplanes of various types have been ordered by the R.A.F., 300 to 350 of which are being delivered monthly. Under defense pressure, the rate is expected to rise rapidly within the next few months, and it is believed that we will be able to produce even more than the totalitarian German and Italian plants which are working at top speed. And thus England is after a fashion again helping us, by giving our manufacturers actual wartime conditions to meet. By thus gearing our factories, America will be able to cope with, and out-distance, the manufacturing quota of any combination of nations in the world.

The absolute best that American aero engineers have conceived has been made available to the British Purchasing Commission. Previously, no airwar machines were released for export until after they had been used for a stipulated length of time by our Air Corps, Navy, or Marines. That has all been changed now,

however, and practically every present military airplane is available to the English.

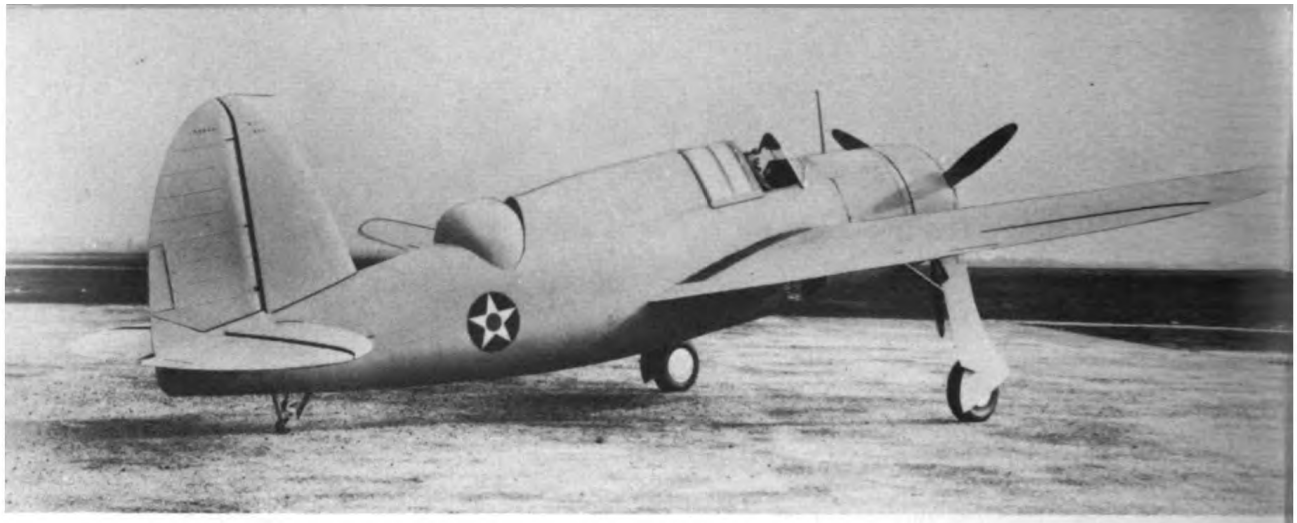
Most of the planes sold to Britain are stock U.S. Army or Navy service types and have been reviewed elsewhere in this book. Therefore, in this chapter only photographs are presented. The list is almost fully complete, with the exception of a very few planes on which pictures have not as yet been released.

The first Bell Caribou fighter for Britain. This plane is similar to the Air Corps P-39 and has a top speed of 400 m.p.h. at 15,000 feet. It mounts a 37mm. cannon in addition to a battery of fast-firing machine guns. The Allison engine is mounted behind the cockpit. Note exhaust ports.

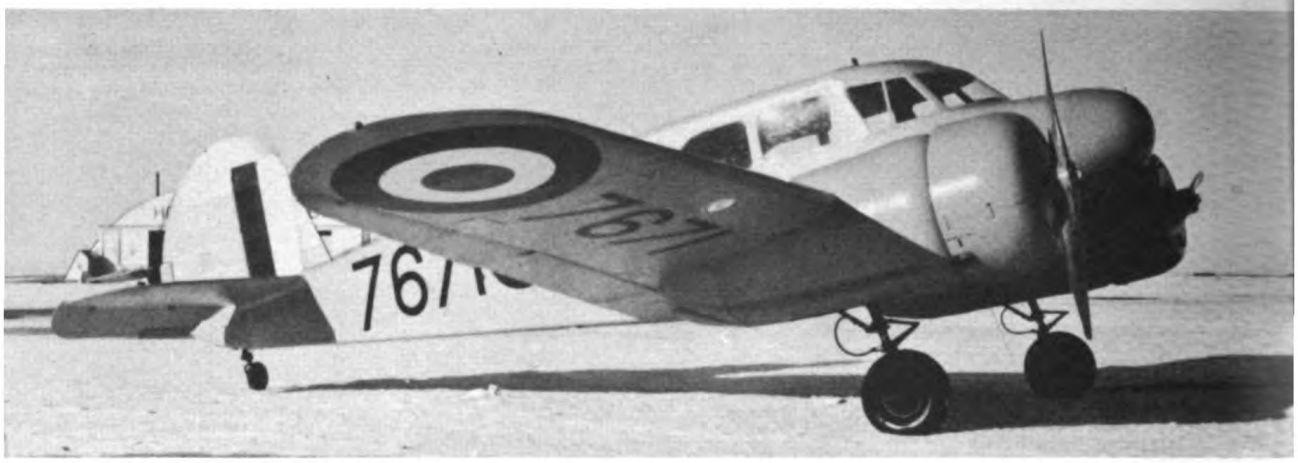


New colors for a famous ship. Boeing's mighty Flying Fortress, long a familiar sight bearing the stars and stripes of the U. S. Army Air Corps, now wears the bull's-eyes of the R.A.F. It is known as the Seattle, has a top speed in excess of 300 m.p.h., and is specially equipped for high-altitude operations.

Royal Air Force pilots can't quite understand the Brewster Buffalo. They admit that it's an excellent ship, but they are not accustomed to having so much room; standard R.A.F. fighters are much more cramped. Flyer has good visibility in this plane.

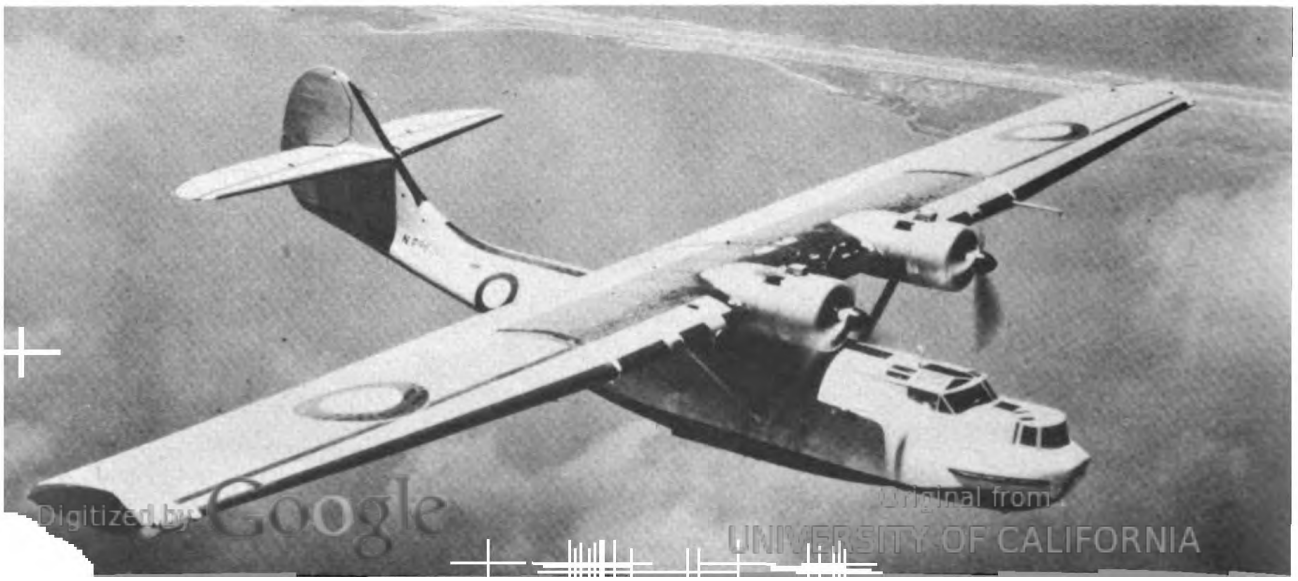


Reports have it that 110 ships of the Brewster SB2A-1 type were ordered by the Fleet Air Arm even before the first experimental plane was finished. The rear gunner is fitted with a power-operated turret. British name is Bermuda.



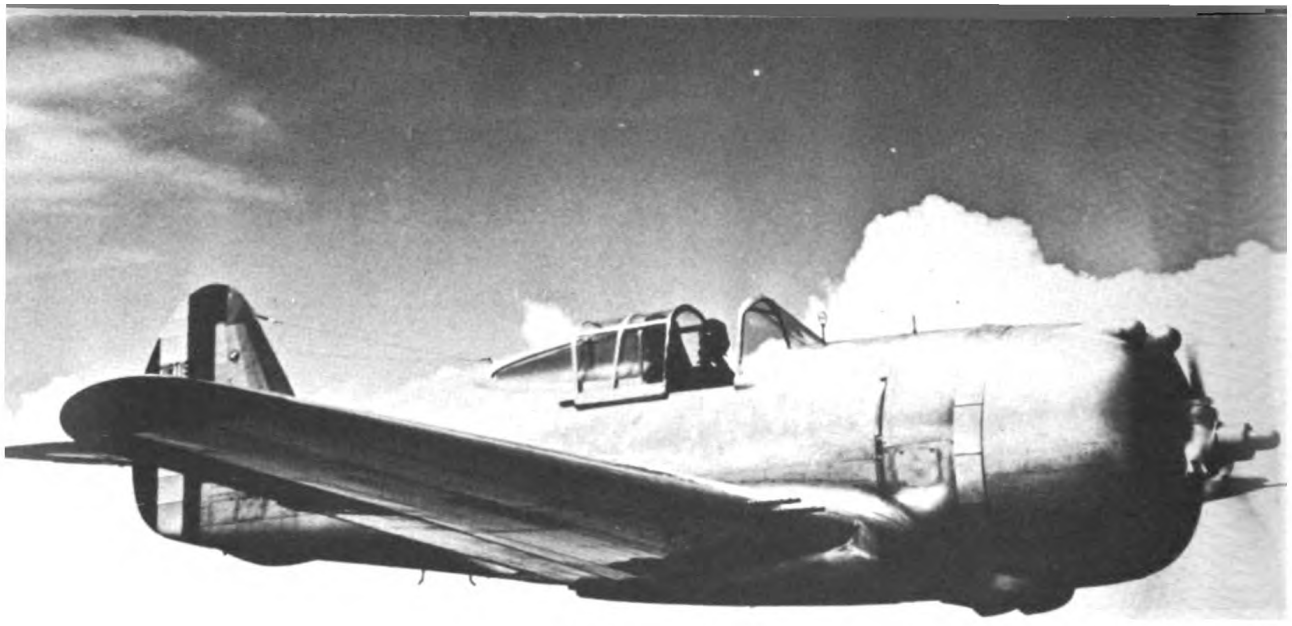
No name has as yet been given to this Cessna T-50 bought by the British. Air Corps version is known as the AT-8 and has a top speed of 195 m.p.h. Engines used are 450-h.p. Pratt & Whitney plants.

This Consolidated Catalina is the first military airplane delivered by flight across the Atlantic. In the Naval Air Service it is known as the PBY-5 patrol-bomber.



Destined for the service of Great Britain. This is a Consolidated Liberator—Air Corps model is called B-24—heavy bomber. The plane is powerful and fast, with a long range to back up its striking power. Delivery made by air across the Atlantic.

Ordered first by France, deliveries of the Curtiss Cleveland were later made to Britain. This ship is substantially the U.S. Navy SBC-4 scout-bomber with R.A.F. markings. It is used by the Fleet Air Arm.

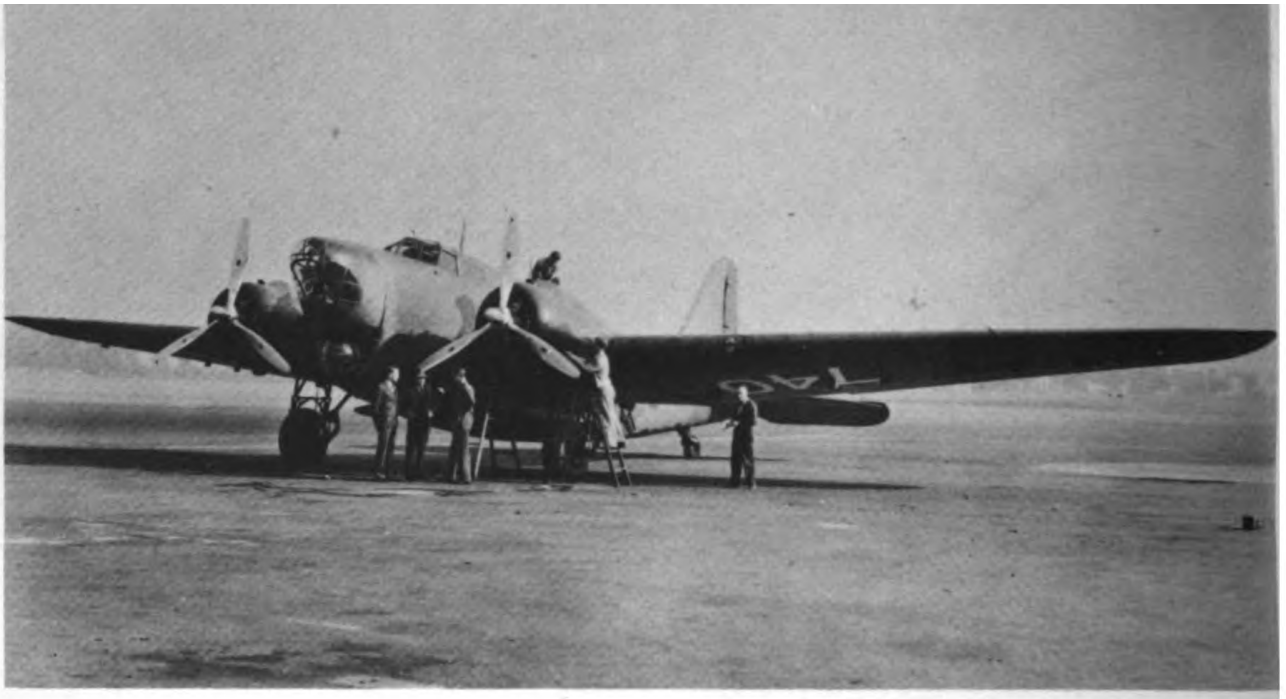


Mohawk is the striking name given by the R.A.F. to this Curtiss P-36A-type. It mounts two synchronized .50 caliber and four wing .30 caliber machine guns. This gives a fire-power of almost 6,000 rounds per minute!

Close-up of the Mohawk's machine guns. The ship originally carried but two cowl weapons, synchronized to fire through the propeller arc, but combat experience in France proved that this did not give a sufficient fire-power. All guns may be fired simultaneously.

Britain would have poor chance of catching up with Nazi Germany in production of airplanes without America's all-out help. One machine being delivered in quantity to the R.A.F. Fighter Command is the Curtiss Tomahawk. It is said that ten ships of this type are being completed per working day.

Pictured here in war paint for the first time is the newly-developed Curtiss Kittyhawk fighter, a large number of which are now being produced for Great Britain's R.A.F. It is an export version of the Air Corps P-40D pursuit type.

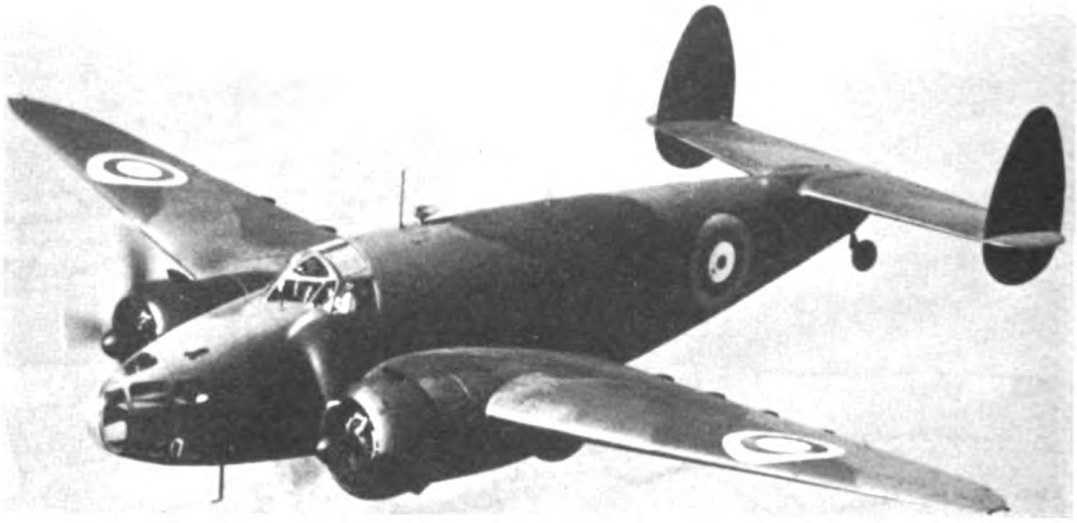


Though not usually known, Douglas Digbys are also being delivered to England by air. This picture was taken in Canada as final tests and checks were being made. Ship is identical to the Air Corps B-18A medium bomber.

Douglas Bostons are used for long-distance reconnaissance and light bombing by the British. Some are also fitted as night fighters and are named Havoc. Air Corps designation is A-20A.

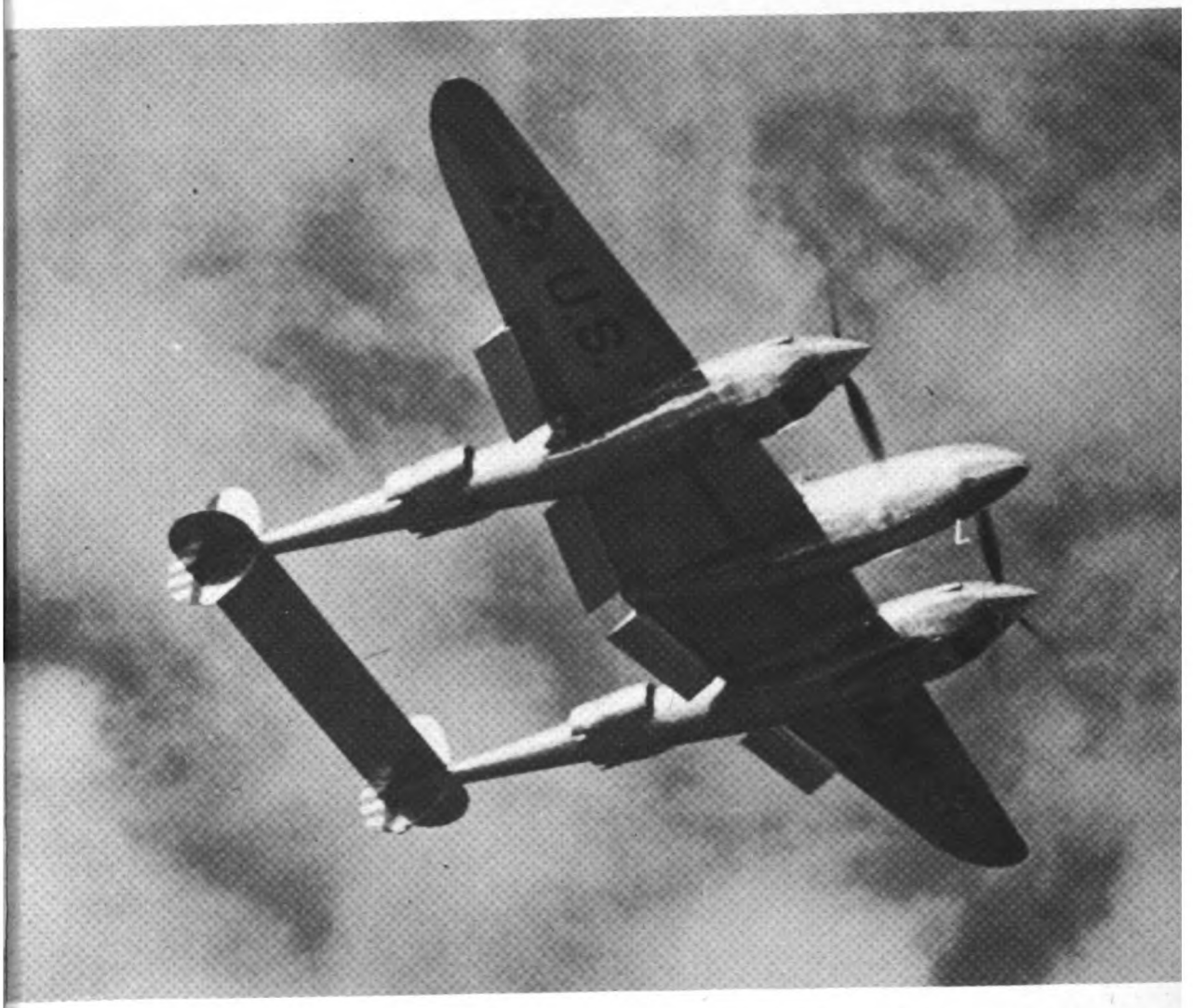
This Grumman G-21A carries Peruvian insignia; the same model was sold to Britain for ambulance and general-purpose duties. The plane is an amphibian and has a top speed of 201 m.p.h.

Grumman's Martlet is a single-seat, all-metal, mid-wing fighter and light dive-bomber. It is in quantity production for the Fleet Air Arm component of the R.A.F. The same plane in U.S. Navy service is known as the F4F-3.



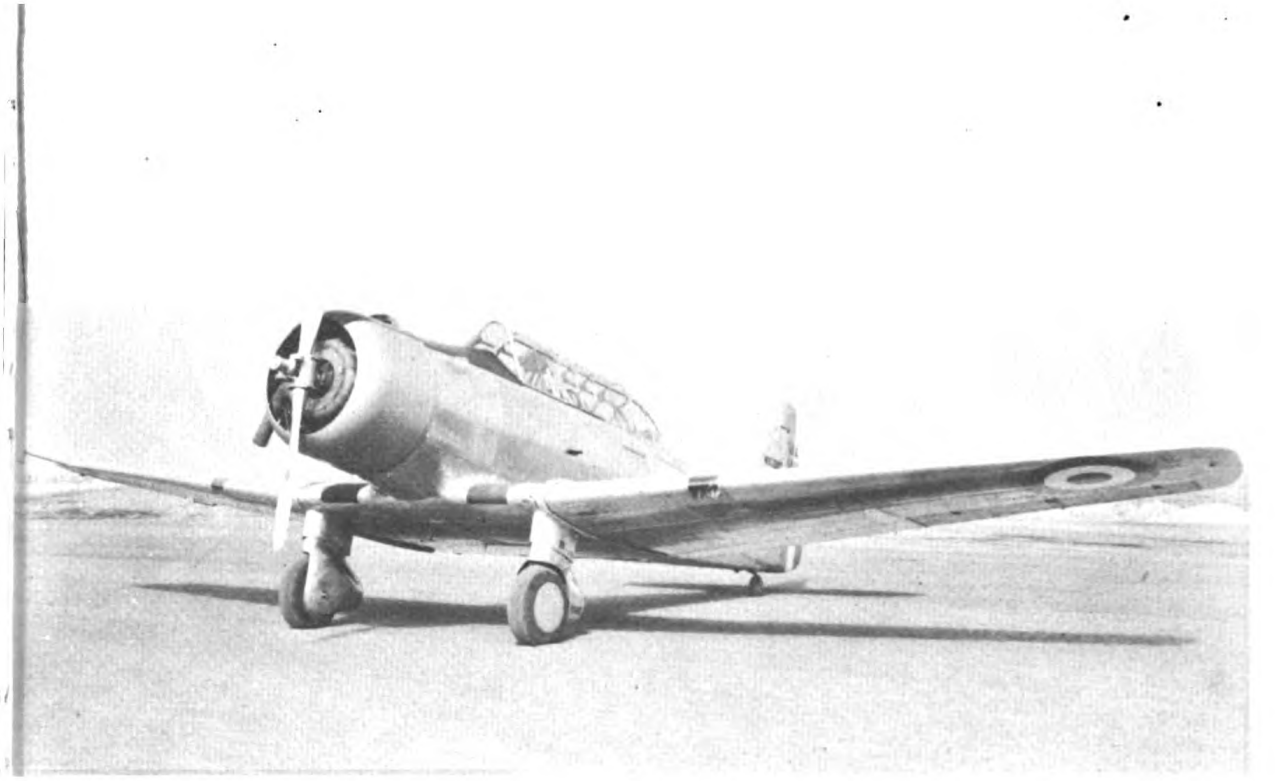
To put it mildly, Coastal Command pilots are astounded at the Lockheed Hudson's dependability. It is used every hour of the day and has become somewhat of a work horse in the R.A.F. Howard Hughes flew a similar plane in his round-the-world record-breaking flight.

At this writing, deliveries of the Lockheed Ventura have just begun. Actually, the machine is nothing more than a military version of the commercial Lodestar and is quite similar to the Hudson. Pratt & Whitney air-cooled radial engines provide the power.



Several hundred Lockheed P-38's have been ordered for R.A.F. service, but no photographs of the plane with British markings are yet available. It is a single-seat fighter and is powered by two liquid-cooled Allison engines. Note large wing flaps. English call ship the Lightning.

Two North American Harvard combat trainers wing their way toward Canada. More than one thousand ships of this type have been delivered to the Royal Air Force, according to the builders. The craft is of all-metal construction and has a retractable undercarriage.



Many hundreds of North American Yale primary trainers have been sent to Britain and Canada for the Empire Training Plan. It has a Whirlwind engine and is similar to the Air Corps BT-9.

Norwegian units of the R.A.F. use this Northrop N3 PB, which is said to be the fastest military seaplane in the world. It has a top speed of 217 m.p.h. at 16,400 feet with the 1,200-h.p. Wright Cyclone engine.

Chesapeake is the colorful name given this Vought-Sikorsky V-156 by the British; U.S. Navy designation is SB2U-2. It can be used for dive-bombing, reconnaissance, and general-purpose work. Engine is Pratt & Whitney Twin Wasp.

Vultee's Vanguard fighter is by no means a small ship. It has a span of 36 feet, a length of 28 feet, and a height of 13 feet 6 inches. The landing gear is fully retractable, folding into wells in the wing undersection.