DOUGLAS XB-19

AMERICA'S GIANT WORLD WAR II INTERCONTINENTAL BOMBER

William Wolf

X-PLANES 16

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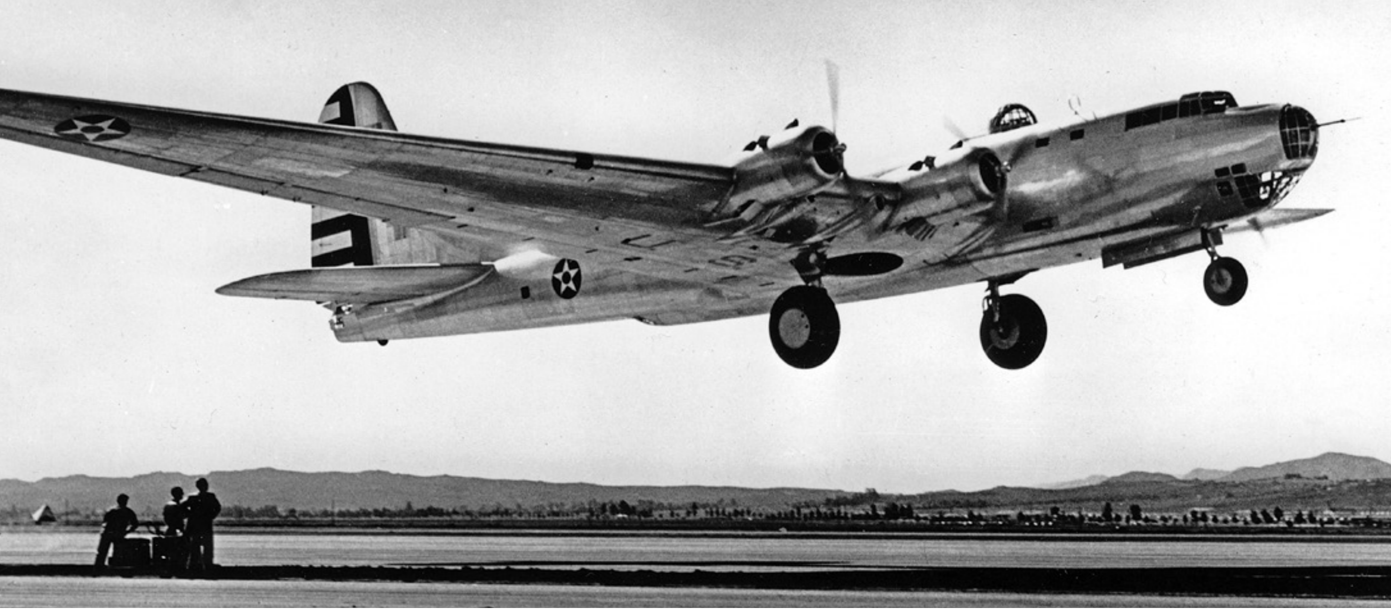


PREFACE

In 1935 the US Army Air Corps (USAAC) contracted the Douglas Aircraft Company to build the B-19, the world's largest bomber. It was intended for potential employment as an intercontinental bomber, the USAAC seeing it as a "Guardian of the Hemisphere." While the B-19 never flew farther than 2,000 miles, or experienced combat, the aircraft's use as a "flying laboratory" saw it influence the development of the Boeing B-29 Superfortress and Consolidated B-36 Peacemaker.

The USAAC was rightly proud of what Douglas had achieved with the B-19, and the company was praised by Chief of the Air Corps, Maj Gen Henry H. "Hap" Arnold, in an article entitled *B-19 – A Dream Come True* published shortly after the aircraft's first flight in June 1941;

"There are forces in the minds of men – in the minds of many men – that permit them to triumph over mere matter. Such a triumph is exemplified in the B-19, the dream that has come true. I wish that I might claim exclusive credit for having dreamed this dream. But I cannot claim the credit, because the dream was not mine alone. Nor was it the sole and single vision of any one man. It was, in fact, the dream of many men, and that it comes true gives credit to as many men, and to hundreds, yes, thousands more, who translated that dream into the B-19. Those greater demands began to be met in 1930, when the first drawings were made for the B-19.

"Space is lacking for a lengthy recital of the difficulties overcome in getting funds to start the B-19 on its way, and of the greater difficulties taken in stride in completing it. Great credit is due to the Douglas Aircraft Company, which built the B-19. Each part was the largest

Groundcrew stand transfixed as the XB-19 takes off from March Field in November 1941. The aircraft's rotation speed was usually 75–80mph, although this varied slightly depending on how much fuel and weaponry it was carrying. (Frederick A. Johnsen Collection)

Chief of the Air Corps Maj Gen Henry H. "Hap" Arnold was a firm advocate of the XB-19. (USAAC)

that ever had been built. It was even necessary to construct the nation's largest airplane hangar for the B-19. There was the great problem of landing fields. It was solved. There was need for engines capable of developing more than 2,000hp each. They were produced. We of the Air Corps think of the B-19 as a "Wright Field on wings," as a flying laboratory for the development and testing of airplane ideas of the future.

"Great things, and the B-19 is a great thing, may be dealt with properly only in terms of humble simplicity. There will be – and there are – other dreams. And they will come true. Today, we stand not at 'Z' but at 'A' in the aviation alphabet. This Bombing Behemoth – this B-19 – is one of the Air Corps' dreams come true."

CHAPTER ONE

PROLONGED PLANNING AND PROCRASTINATION

In August 1934, Boeing was contracted to build the XB-15 (Boeing Model 294) to fulfill the XBLR-1 (EXperimental Bomber Long Range) test bed requirement drafted by the USAAC as part of the development of a large bomber with a 5,000-mile range. Design and construction problems arising from the XB-15's great size would delay its first flight until October 1937. Boeing's then-parlous financial situation also caused the company to be circumspect about fulfilling the XB-15 contract.

Seeing an opportunity to become involved in building future heavy bombers, Douglas put itself forward as the ideal candidate to construct the new XBLR-2 required by the USAAC as a follow-on to the still unready XB-15. The company looked at the prospect of developing the XBLR-2 as a step toward currying favor with the USAAC in the future manufacture of other military aircraft. In February 1935, when Douglas first began talks with the USAAC for a long-range experimental bomber under *Project D* (no XBLR designation had yet been assigned), the company was already accepting large orders for the first of its groundbreaking new DC-3 commercial airliners, construction of which had commenced just two months earlier.

Douglas' first experience of building a four-engined aircraft came with the development of the one-off DC-4E airliner. First flown on June 7, 1938, the aircraft was found to be too large to operate economically and it failed to enter series production. Prototype NX18100, seen here during its in-service evaluation with United Airlines in 1939, was later sold to Imperial Japanese Airways. (Philip Jarrett Collection)

Soon, the company's military business would also improve, with substantial orders for its B-18 Bolo medium bomber derivative of the DC-2 and, over the next three years, ongoing contracts for its SBD dive-bomber and new DB-7 twin-engined attack bomber that would foster the peerless A-20 Havoc light bomber. Douglas' future profitability would be assured by these types.

During a conference held on June 5, 1935, Douglas was delegated to complete plans for the first XBLR-2 test bed as part of Project D. The company's original delivery milestones for the aircraft were as follows:

1. Begin preliminary design by July 31, 1935.
2. Begin detailed design by January 31, 1936.
3. Complete physical article by March 31, 1938.

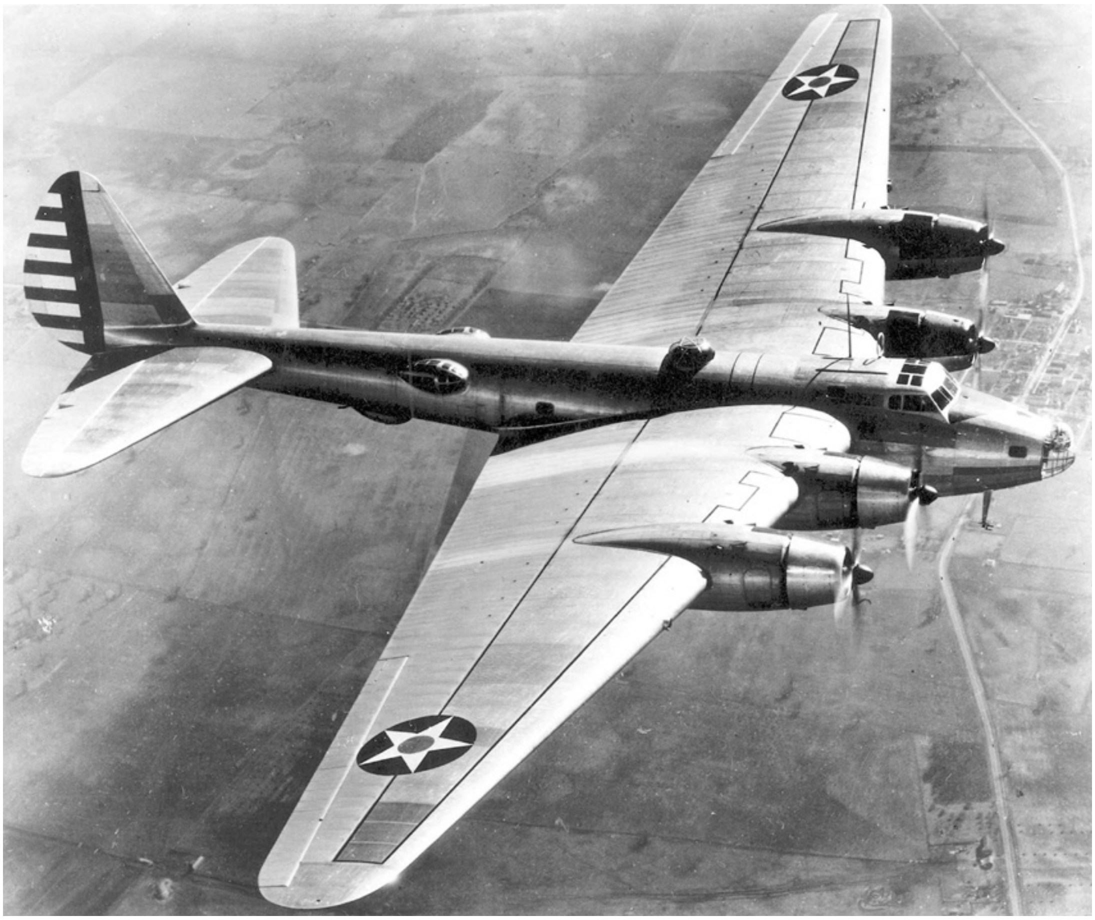
On July 9, the model designation XBLR-2 was officially assigned to the Douglas project, with XBLR-3 being allocated to a Sikorsky design. Both Douglas and Sikorsky submitted preliminary plans to the Materiel Division at Wright Field, in Ohio, and each company was awarded a contract to proceed with their design as per the specifications agreed. They were also to build a mockup of their aircraft. Douglas' experience in the construction of hundreds of military and commercial aircraft proved to be greatly beneficial in the design and subsequent fabrication of the mockup. After three months of work, the expenditure of $100,000 and the employment of 60 engineers and 80 "shop men," the Douglas mockup was ready for presentation to the Materiel Division Mockup Board.

Once the Douglas submission had been officially approved, the company sent the following cost quotations to the Materiel Division on September 17, 1935:

1. Completed design and mockup (Phases 1 and 2) – $102,810
2. Detailed design and partial testing (Phase 3) – $219,160
3. Construction of physical article (Phase 4) – $1,164,460

In the mid-1930s, aircraft companies were disinclined to pursue new designs as, unlike today's cost-plus contracts, the USAAC was by law only allowed to let fixed-price contracts, with no funds paid in advance. Payment was only made once the contracted aircraft was built and had flown. Aircraft companies had to fund the purchase of new materials and tools, and also pay the salaries of their engineers and work force from contract signing through to the first flight of the prototype – a period of time that could last several years. Contracts did not contain cost overrun payment clauses, and there was no guarantee that the prototype would be accepted for production. If it was, manufacturing contracts for the aircraft could actually be awarded to another company! These contract provisions would later be an anathema for Douglas.

On February 10, 1936, the War Department appointed an Aircraft Board at the Materiel Division to consider both the Sikorsky XBLR-3 and the Douglas XBLR-2 proposals. The Board proclaimed the



The performance of the lone, experimental, Boeing XB-15 (Model 294) was hamstrung by the lag in 1930s' aircraft engine development. When proposed, it was to be powered by four 2,000hp engines, but these would not be available for several years, so four 1,000hp Pratt & Whitney R-1830-11 Twin Wasp Senior radial engines were installed instead. Despite being significantly underpowered, the XB-15 would fly numerous test projects until relegated to cargo carrying in 1943 as the XC-105. (USAAF)

Douglas contender to be "superior as a military weapon," canceled Sikorsky's XBLR-3, and recommended that the construction option be exercised for the Douglas prototype, with changes "to improve the utility of the airplane."

Unfortunately, even with the USAAC having confirmed that it was interested in acquiring the XBLR-2 for operational service and stated that it was superior to the existing XB-15, there was little funding available during the Depression to invest in a flying test bed. Therefore, during the 1935–38 period, the XBLR-2 project was marked by no tangible progress, bar a number of minor design changes. However, this lack of headway was probably more attributable to Douglas, which was now hard-pressed to fill large, lucrative orders for its DC-3 and other military types. It should also be noted that the fragmentary progress made on the aircraft from December 1935 to November 1937 was necessitated by the limited budget given to Douglas for research and development.

In October 1937, Maj Gen Oscar Westover, Chief of the Air Corps, stated his preference for the initiation of informal design requisites for a "super bomber" that would succeed the B-17 and curb the development of the "too large" XBLR-2. The super bomber was to be smaller than the XBLR-2, but much larger and heavier than the B-17. It also had to be able to fly farther and faster than the Flying Fortress with a heavier bomb load. Aircraft companies were reluctant to commit to potentially expensive new designs at this time, and only four responded – Boeing, Consolidated, Douglas, and United Aircraft's Sikorsky division. All super bomber design submissions were considered mediocre, and the XBLR-2 remained viable.

During the interval between the first proposal for the XBLR-2 in August 1935 and completion of the XB-19 in May 1941, Douglas had acquired considerable experience building a large four-engined aircraft. Airlines recognized a need for a passenger aircraft twice the size of the DC-3 that was capable of flying 2,200 miles nonstop. In early 1936 Douglas offered a proposal that convinced five major airlines – United, American, Eastern, Pan American, and TWA – to each commit $100,000 to the development of what became the DC-4E. Powered by four 1,450hp Pratt & Whitney R-2180 Twin Hornet engines, the airliner was capable of carrying 42 passengers in luxury.

However, after Douglas had already sunk nearly $1 million into the project, its sponsors found that the DC-4E was too large to operate economically. The company wisely decided to develop a smaller version, designated the DC-4, which, with the outbreak of World War II, led to the production of 1,170 aircraft for the US Army Air Force (USAAF) as the C-54 Skymaster and for the US Navy as the R5D.

CONSTRUCTION DRAGS ON

On September 22, 1937, the government notified Douglas that it would exercise the XBLR-2 option to buy the "complete flying article," and on March 9, 1938, Secretary of War Harry Woodring granted approval. That same month a contract, with no funding, to complete the XBLR-2 was officially issued, allowing actual construction of a flyable prototype to finally get underway.

Aviation technology had changed significantly since Douglas' original 1935 XBLR-2 design proposal, which meant it was no longer an accurate representation of the required 1938 "complete flying article." Furthermore, Douglas was not the same company. Coerced by global militarism, the state of aviation technology was changing rapidly, particularly in respect to general airframe layout and availability of engines of sufficient horsepower. With these changes came the expectation of improved aircraft performance.

With a contract for the XBLR-2 now in hand, Douglas immediately decided to replace the aircraft's powerplants. The slow-developing Allison V-3420 was abandoned and the experimental 2,000hp Wright R-3350 air-cooled radial, also known as the Wright Duplex-Cyclone, was chosen in its place. Following this engine change, the XBLR-2 was officially redesignated the XB-19 on March 8, 1938.

The world order was also changing, as was the status of the slowly reviving global aircraft industry as a whole and, in particular, the part

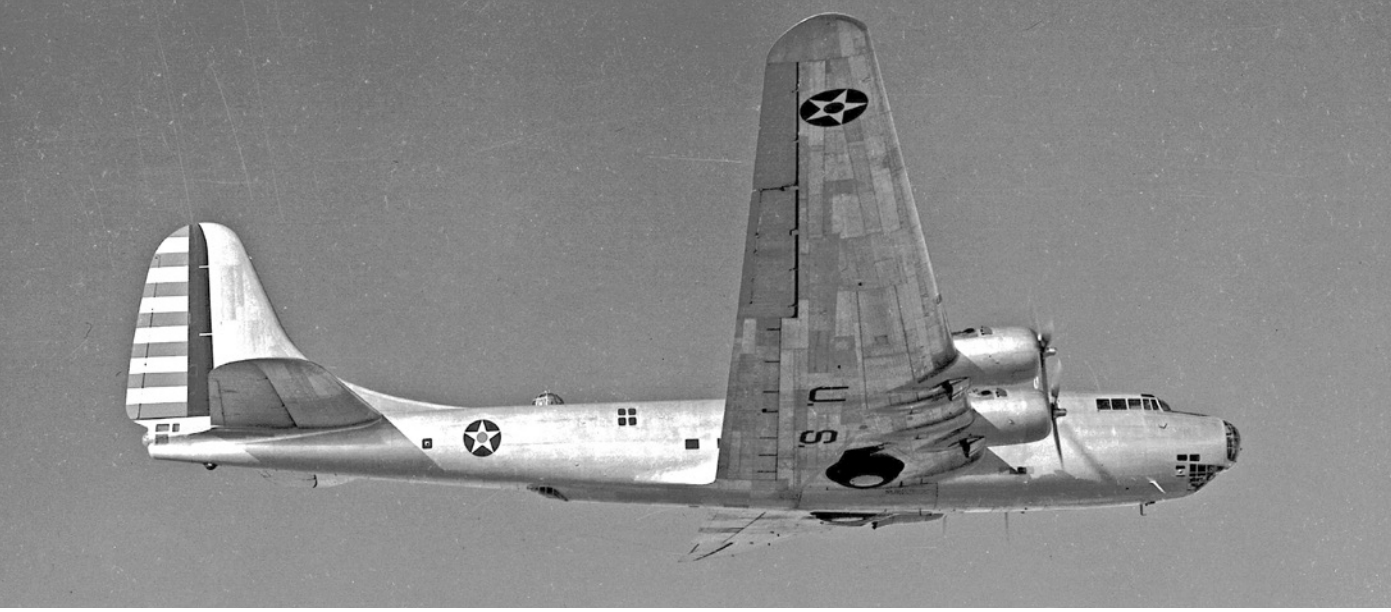
Douglas was to play in it. Fascism had taken hold in Germany and Italy, and by mid-1938 America's aviation industry was swamped by foreign orders principally from intimidated Britain, France and the Netherlands. Douglas had profitable designs in its established DC-3 airliner (indeed, by the end of the decade Douglas-built airliners would comprise 80 percent of all commercial aircraft in service), which also had obvious military potential, while the company's A-20 Havoc light bomber and SBD Dauntless dive-bomber were both approaching production status.

As construction progressed, Douglas, having lavished company money and personnel resources on the XB-19, desperately wanted to be released from its commitment to the aircraft and devote future government funding, its valuable design and engineering staff, and trained workforce to the production of current profitable contracts and the development of promising new designs. Douglas believed the original USAAC design and specifications for the aircraft, dating from 1935, were now obsolete, the currently revised USAAC criteria were also obsolescent, and the proposed bomber's weight was increasing excessively. Accordingly, on August 30, 1938, company president Donald Douglas "recommended" the cancelation of the contract.

Iconic aircraft engineer and entrepreneur, Donald Douglas founded the Douglas Aircraft Company in 1921. His signature achievement was the revolutionary and exceedingly successful DC-3 airliner, which evolved into the war-winning C-47 military transport. (Author's Collection)

Although realizing the XB-19 had lost much of its relevance, and to Donald Douglas' utter exasperation, the USAAC and, specifically, its Materiel Division refused to consider abandoning the aircraft. Instead, perhaps to save face or spite the increasingly belligerent Donald Douglas, the USAAC insisted on an updated test bed. Since Douglas wanted the USAAC to continue to be a major purchaser of his company's products, present and future, he had no alternative but to acquiesce, even though a profit could never be made from the XB-19 "money pit" and the firm's resources could have been better employed elsewhere.

Douglas later reported that the completion of the prototype required 500 engineers, technicians and mechanics, 9,000 drawings "that would cover an area of four acres," 42,000 research and testing hours, 700,000 engineering hours, 1,250,000 shop hours, and, most signicantly, $2.5 million.



CHAPTER TWO

TECHNICAL DESCRIPTION

The XB-19's cantilever, monocoque wing had a total span of 212ft, which was considerably larger than its contemporaries such as the XB-15 (149ft), B-17 (105.75ft) and B-29 (141.25ft). Howard Hughes' one-off H-4 Spruce Goose had a wingspan of 219ft, while the post-war XB-36 Peacemaker's wingspan measured 230ft. (Frederick A. Johnsen Collection)

With the USAAC having denied Douglas' request to cancel the XB-19 project, the construction of the "test bed" finally commenced. During the summer of 1939, the USAAC mandated that the manufacturer issue weekly progress and labor hours expended reports to confirm the maintenance of the aircraft's construction schedule, and to make sure that Douglas was not "borrowing" XB-19 personnel for other company projects.

The completed XB-19 was a truly impressive sight to behold, as Douglas' public relations department explained in the following press release:

"Five years of research and study, three-and-one-half years of engineering, more than two years of construction, and millions of dollars are represented in the Douglas B-19, the world's largest, most powerful, and most completely equipped airplane."

FUSELAGE

The XB-19's 132.3ft-long monocoque fuselage was of all-metal, stressed-skin, flush riveted construction throughout, and the completed aircraft appeared in unpainted natural metal finish. Its empty weight was 86,000lbs, including "modernization equipment" installed after completion of the contract. The normal gross weight was 140,000lbs, design gross weight was 132,000lbs, and the maximum alternate weight was 162,000lbs.

Allowable center of gravity (CG) limits were from 22 percent to 28 percent Mean Aerodynamic Chord (MAC), and the aircraft was flyable between the 20 percent and 30 percent CG positions. The weight of the XB-19 and it crew, fuel, and load were distributed throughout the aircraft, but the airframe's weight can be considered as being concentrated at one given point, referred to as the center of gravity. If the aircraft was suspended at its CG, the XB-19 would be in balance. In aeronautics, chord is the imaginary straight line distance between the leading and trailing edge of the wing, measured parallel to the normal airflow over the wing. MAC is the average length of the chord.

At the time of its construction, the XB-19 was the largest aircraft ever built. It therefore required the largest steel jigs ever used by the aircraft industry. These jigs, lined up and measured with surveyor's transits and calipers, provided the framework in which the major structural components of the aircraft were held in place during assembly. They also helped establish the mathematically correct contours and measurements of the completed aircraft.

The nearly completed XB-19, with its propless engines and dorsal turrets in place, is seen with its empennage still supported by a huge jig. The aircraft's huge proportions can be appreciated by the size of the nearby workmen and surrounding bins containing construction materials. (Philip Jarrett Collection)

WING

The cantilever, monocoque wing had a total span of 212ft and an area of 4,285sq ft, and its tip rose 16ft off the ground. Technically, the wing had an aspect ratio of 10.5, a dihedral and incidence of six degrees each, a root-chord of 33ft, and a sweepback of 13.5 ft. The airfoil section was 23019-08.

The XB-19's unpainted all-metal fuselage measured an impressive 132.3ft in length, which far surpassed its contemporaries such as the XB-15 (87.5ft), B-17 (74ft), and B-29 (99ft). (Philip Jarrett Collection)

FLAPS

The two flaps, called "High-Lifting Devices," were located on the trailing edge of the wing, had a travel of 50 degrees and an area of 373sq ft. They were of the full-trailing edge type, and were divided into inboard and outboard sections that were interconnected to operate in unison. To lower the flaps, the flap control handle was moved to the DOWN position until the desired angle was indicated on the co-pilot's instrument panel, at which point the control handle was moved to NEUTRAL. To raise the flaps, the control handle was moved to UP and then the handle was placed in NEUTRAL.

AILERONS

The two double aluminum alloy frame ailerons were fabric-covered and divided into two interconnected inboard and outboard sections that could be operated in unison by conventional wheel-and-column control. They had an area of 410.4sq ft, an up travel of 20 degrees, and down travel of ten degrees. There were no trim tabs. The control tabs had an area of 41.3sq ft and an up/down travel of 20 degrees each. The wheel was turned to the right for right wing down and to the left for left wing down.

LANDING LIGHTS

Two Type A-10 landing lights were located, one in each wing, just outboard of the outer engine nacelles. A Type B-3 passing light was located in the left-hand landing light compartment.

In an innovation pioneered by the XB-15, the interior of the XB-19's huge wing allowed the aircraft's engineers to crawl through a cramped, electrically lit passageway to each of the four engines via a catwalk extending from their fuselage compartment to beyond the outboard engines as far as the landing lights. The two on-board engineers were able to perform most minor repairs and adjustments to the engines while in flight. An exterior doorway was located in each of the four engine firewalls, affording access to the rear of each powerplant. (Author's Collection)

WING INTERIOR CATWALK

The interior of the wing could be accessed as far as the landing lights by crawling along an electrically lit passageway via a catwalk beyond the outboard engines on either side of the aircraft. Each of the four engines was accessible in flight, and most minor repairs and adjustments could be made while aloft. A doorway was located in each of the four engine firewalls, affording access to the rear of each powerplant.

When Douglas engineers designed the XB-19, the construction of a monocoque wing of this size had never previously been attempted. Despite meticulous calculations using known elements, issues still arose. Among the latter were wing size and load capacity, and Douglas later determined that a smaller wing could have been utilized for the XB-19's proposed load. These findings ultimately led to the development of new standards that made possible substantial savings in the unit weights of future designs (specifically the B-29 and B-36). The USAAF later boasted that such developments were "all part of the aircraft's claim as a Flying Laboratory."

WING JIGS

The bomber's riveted structural steel wing jig was as large as a "fair-sized office building," consisting of seven different working levels supporting 200 workmen. It was more than 200ft long, 48ft high, and weighed 105,000lbs. Work benches, tool racks, lockers, and electric power and compressed air for power tools were built into the jigs. The enormous wing jig needed to be as accurate as the smaller jigs used to fabricate a rudder or aileron.

For the horizontal turning of the wing, Douglas engineers consulted with bridge-building specialists Bethlehem Steel. The wing turning procedure was planned and tested using wires and pulleys on a miniature model of the bomber. When finished, the huge 34,000lb wing and fuselage center section had to be elevated from the steel cradle and rotated into a horizontal position for splicing to the tail and nose sections. The preliminary calculations and arrangements were so accurate that none of the three sections needed to be realigned for joining. Once the wing was out of the jig and into place, three welded steel tube work stands were built around the bomber, after which work proceeded on the powerplants, control system, instruments, armament, and other interior installations.

To construct the XB-19's gigantic 212ft-long, 34,000lb wing, a riveted structural steel wing jig more than 200ft long and 48ft high, weighing 105,000lbs and consisting of seven different working levels capable of supporting 200 workmen, was fabricated. The wing and attached fuselage center wing section were constructed in a vertical position, and the structure had to be turned horizontally upon completion so that the nose and tail sections could be attached. (Library of Congress/Corbis/VCG via Getty Images)

EMPENNAGE

The metal fin towered 42ft off the ground, and had an area of 187.1sq ft. Its rudder was of fabric-covered metal framework and had an area of 200.4sq ft, with right and left travels of 20 degrees. The rudder

The XB-19's fin, towering 42ft off the ground, had an area of 187.1sq ft, while the horizontal stabilizer had a span of 61.1ft and an area of 531.8sq ft. The aircraft's rudder, as per specifications issued on November 1, 1936, was painted with 13 alternate horizontal stripes of equal width, seven red and six white, with one blue vertical stripe forward of the 13 horizontal stripes. (Author's Collection) was operated by conventional control column movement. Its trim tab measured 7.6sq ft, with right travel of 14 degrees and left travel of 14.5 degrees. The tab was operated by turning the wheel left for nose left and right for nose right. The control tab had an area of 21.5sq ft, with right and left travel of 20 degrees in either direction.

The metal horizontal stabilizer had a span of 61.1ft, an area of 531.8sq ft, and was described in a Douglas press release as being "as large as the wing of a ten-passenger airliner." The elevators were of fabric-covered metal framework and had a span of 61ft and an area of 410sq ft. The trim tabs had an area of 15.8sq ft and an up/down travel of 14.5 degrees. They were operated by conventional control column movement. The control tab area was 34.3sq ft, with up/down travel of 20 degrees. The tabs were operated by turning the wheel forward for nose down and aft for nose up.

CONTROL SURFACES

In the July 1941 issue of *Popular Mechanics*, an article titled "B-19 – Man O' War with Wings" colorfully described the XB-19's control surfaces:

"No human pilot has the strength to work the vast control surfaces. The rudder alone has 237sq ft of movable surface. The landing flaps have an area large enough for a transport wing. The pilot could no more push such surfaces around with the strength of his arms and legs than a mosquito could push a barn door open against a hurricane, so a power steering system is used. The pilot's conventional wheel and rudder controls are attached to small control tabs on the respective main control surfaces and the action of each tab starts the big control surface moving, after which hydraulic pressure takes up the work. The ailerons are so long that each is built in two sections to prevent binding, because the wing has an up-and-down tip deflection of 12ft under some flight conditions."

FLIGHT CONTROLS

The *Flight and Operations Handbook* for the aircraft stated, "The flight controls, namely the ailerons, rudder, and elevators, are essentially different from the ordinary type of flight controls in so far as the pilot and co-pilot have direct control of the flying tabs and indirect control of the main control surfaces." Cables from the rudder pedals and the control column assured the direct control of the flying tabs. The latter were installed in the trailing edge of the main control surfaces and were deflected in the opposite direction to the main surfaces. The indirect operation of the main control surfaces was achieved by the boost cylinders and the boost cylinder operating valves.

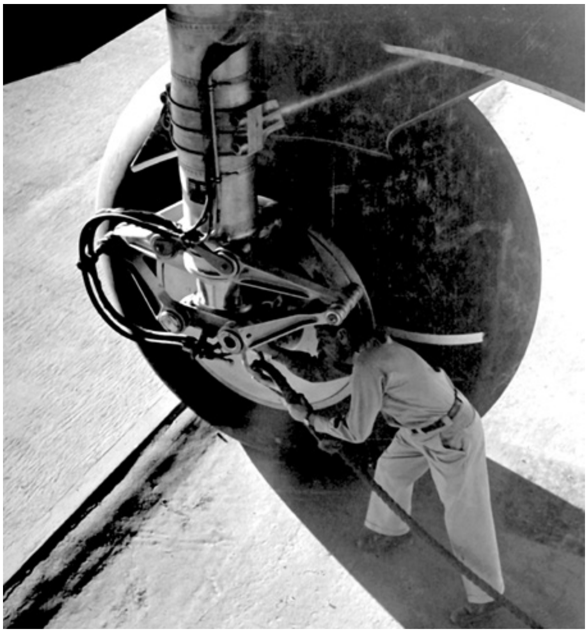
LANDING GEAR

A retractable tricycle landing gear, called "alighting gear" at the time, was fitted to the XB-19. It incorporated three independent, hydraulically actuated units, with two in the wings and one in the nose.

Safety latches were provided for each of the two main landing gear units installed in the wings, and they locked the landing gear linkage when the undercarriage was supporting the bomber.

Warning devices for the landing gear were as follows: a transmitter for each of the tricycle landing gear units; a three-unit position indicator; a throttle-controlled switch that operated a siren which signaled if the engines were correctly throttled when the complete gear was not in the proper landing position; and a green light, located on the co-pilot's panel, that was illuminated when the tricycle gear was in the proper SAFE landing position. A siren sounded as the engines were throttled back if the gear was not in the SAFE landing position.

The two main gear legs folded up into an exposed wing wheel well, while the nose wheel gear was completely enclosed by doors when retracted. A 19in. tail buffer wheel was installed in the fuselage just forward of the tail cone.



The XB-19's independent, hydraulically actuated, fully retractable tricycle landing gear created major engineering and construction difficulties. The two main gear legs folded up into an exposed wing wheel well, while the nose wheel gear was completely enclosed by the nose wheel doors when the undercarriage was retracted. (Peter Stackpole/The LIFE Picture Collection via Getty Images)

The single-strut main gear used 96in. diameter wheels that had a wheel base of 35ft, were stopped by hydraulic disc brakes, and had a 24in. shock stroke. The forked single strut nose gear had a 56in. wheel and an 18in. shock stroke.

The XB-19's main gear, struts, wheels, and brakes were much larger than any previously built. When providing for the fully loaded 164,000lb aircraft, Douglas called on its prior experience creating large tricycle landing gear for the 65,000lb DC-4E. Previous large aircraft, such as the 92,000lb (gross) ANT-20bis Maxim Gorky and the 74,000lb (gross) Junkers Ju 90, were tail-draggers that had two sets of dual main wheels, while the 102,000lb Kalinin K-7 had unusual landing gear pods that contained two sets of dual wheels in tandem.

The construction of the fully retractable tricycle landing gear presented major problems. The oleo struts on the main landing wheels were so large that there were no lathes capable of machining their enormous precision parts except the large naval arsenal lathes used in turning 12 and 16in. naval guns. The Cleveland Pneumatic Tool Company was duly contracted to develop and fabricate the world's largest turret lathe to construct the Douglas oleo struts. Its bed was 27ft long and ten feet wide, and was large enough to turn a metal cylinder 32in. in diameter and 15ft long.

The main and nose wheel landing gear operated simultaneously. To retract the gear, the safety lock had to be moved to the unlatched position and the landing gear control handle shifted to the UP position. After the co-pilot's gear position indicator showed all the wheels to be fully retracted, the control handle was moved to the NEUTRAL position to lock the undercarriage. To extend the landing gear, the control handle had to be moved to the DOWN position, which automatically disengaged the latch lock. There was an electrically powered hydraulic pump and a hydraulic system hand pump available should the gear not retract or extend.

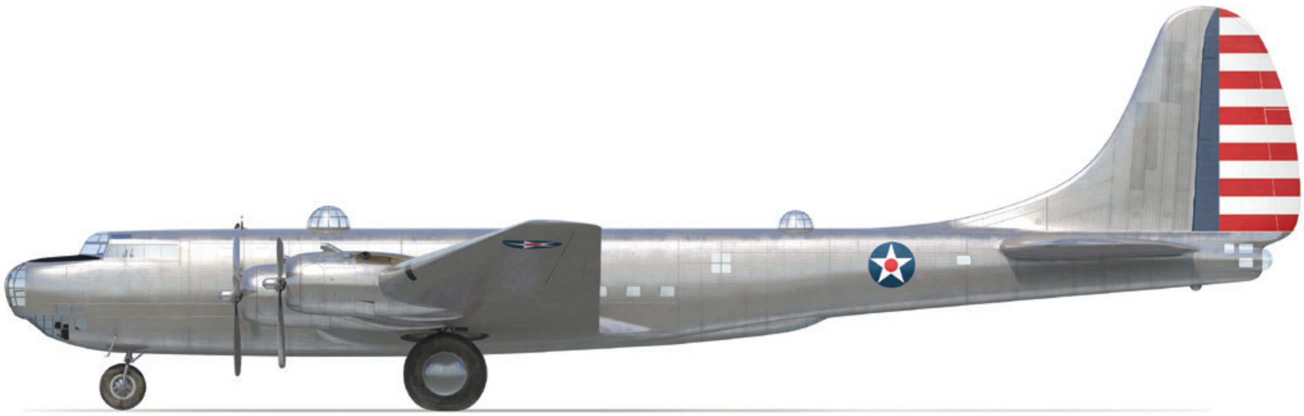
WHEELS, BRAKES, AND TIRES

Bendix Aviation manufactured the XB-19's wheels and brakes. The main wheel body, rated at a capacity in excess of 70,000lbs, began as a magnesium alloy casting weighing more than one ton. Two-thirds of it was machined off during the finishing process. Before fabricating the final wheels, three other seemingly successful castings were also finished, only for them to be cut up into more than 140 samples that were then machined, examined, and tested.

Bendix 30 x 8 dual brakes were installed on each main landing gear wheel. Each wheel carried two, opposing, heavy-duty 200lb magnesium alloy brake drums fabricated from 600lb steel forgings that had more than 400lbs machined off them during their manufacture. The special brake block lining was so thick that it was necessary to bolt the blocks into place rather than use conventional riveting. The brakes were operated by depressing the right or left pedal, and for emergency application there was a reserve brake pressure control handle that could be moved to the Emergency Brake Operation position. To park the aircraft, the brake pedals were held down and the parking brake knob engaged.

The bomber's tires and tubes were manufactured by the Firestone Tire and Rubber Company. The eight-foot diameter, 24-ply, smooth contour, steel wire-reinforced main tires were so large that the air in each weighed 28lbs. The weight of one wheel-brake-tire assembly was 2,700lbs. The 24-ply tires, reinforced with steel wire, were much thicker and stronger than a standard four- to six-ply automobile tire to give them the strength to endure the 82-ton landing impact. However, the 5/8thin. rubber on the XB-19's tire tread was no thicker than that on an automobile tire, as the tire was made for impact, not distance. The nose wheel mounted a Firestone 56in. 14-ply smooth contour tire.

The XB-19's wheels and tires (the latter manufactured by the Firestone Tire and Rubber Company) were great fodder for Douglas publicists, and there were many photographs taken of pretty women and workmen posing with them and, usually, an automobile to provide a sense of scale. The weight of one eight-foot-diameter, wheel–tire assembly was 2,700lbs, with the air in the tire weighing 28lbs. (Library of Congress/Corbis/VCG via Getty Images)

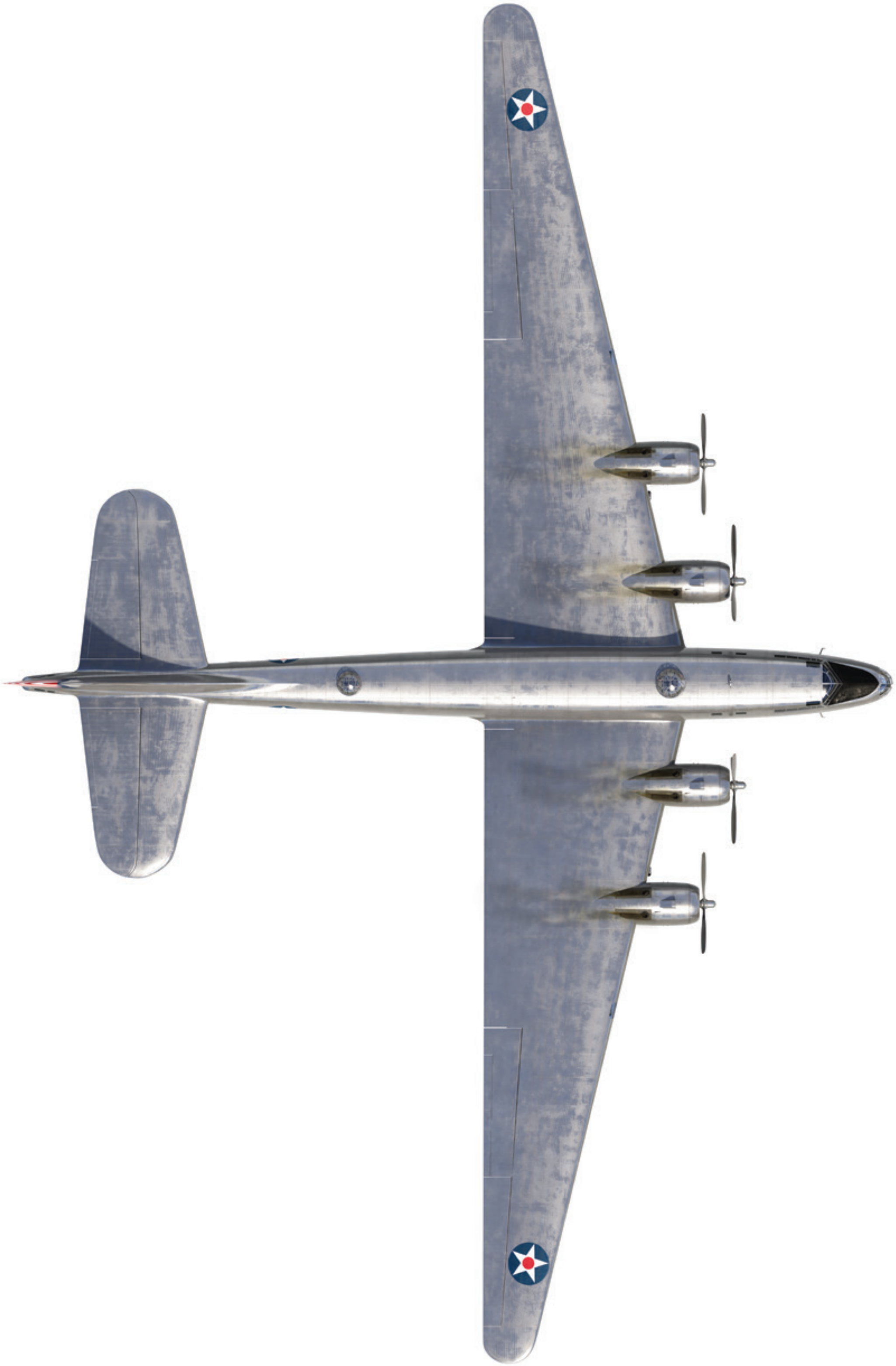


WRIGHT R-3350 DUPLEX CYCLONE ENGINES

The XB-19 was plagued by a problem shared with other contemporary large aircraft of this period – the size of its airframe exceeded engine technology and power at the time, thus rendering the aircraft underpowered from the onset. The proposed use of four 850hp Pratt & Whitney R-1830-11 Twin Wasp, 14-cylinder, two-row radial engines for the first XB-19 immediately encountered a design problem when it was realized that they would only provide the bare minimum power required for the projected weight of the aircraft.

Another feasible powerplant choice was four 1,600hp Allison XV-3420 24-cylinder, liquid-cooled, inline engines that consisted of the coupling of two V-1710 engines together via a single crankshaft to yield a V24 (two V12s). However, this engine had critical developmental problems and was not available until 1940 – it would finally be installed in the XB-19A in early 1944.

Thus, the only viable option was four Wright R-3350s, which were prone to overheating and would normally have to be flown with cowl flaps open, producing added drag that decreased the aircraft's maximum range by as much as 900 miles. Upon installation of the Wright engines, an XB-19 press release stated:



X PLANES

DOUGLAS XB-19, MARCH FIELD, CALIFORNIA, NOVEMBER 1941

"Nothing but superlatives can be used to describe the impressive size of this latest addition to the armed might of the United States. Its four Wright Duplex Cyclone engines develop more than 8,000hp, power equivalent to that generated by the enormous steam turbines of a 10,000-ton ocean liner. Its range is 7,750 miles, or more than three times that of the destroyers used by the United States Navy during the First World War."

The four Wright R-3350s relied on fuel from inboard and outboard wing tanks with a capacity of approximately 3,075 gallons and 2,100 gallons, respectively, giving a total wing tank fuel supply of approximately 10,350 gallons. Two 412-gallon removable bomb-bay tanks gave the XB-19 a total fuel capacity of 11,174 gallons. (Author's Collection)

The Wright R-3350 had been under contract by the USAAC since 1936 for installation in the XB-19, while the US Navy had selected it in 1937 for its flying boats, specifically the Consolidated XP4Y Corregidor, Boeing XPBB-1 Sea Ranger and Martin XPB2M-1 Mars. All three XPs were aircraft whose development was also stifled by the lack of available R-3350s. In the USAAC R-40-B bomber design specification of January 29, 1940, all five bidding companies stated that their proposed aircraft (Boeing XB-29, Lockheed XB-30, Douglas XB-31, Consolidated XB-32, and Martin XB-33) would be powered by the R-3350 because it had the largest displacement of any contemporary engine and offered the greatest potential for development.

The only other large engines available at that time were the Pratt & Whitney R-4360 and, again, Allison's troubled XV-3420-1. Both were eliminated from consideration as they were still in the development phase, were too large and heavy, and did not promise any increase in power over the R-3350. So, once more, by default, on April 15, 1941 the USAAC issued contract No. AC-18971 to Wright for the future production of 30,000 R-3350s – the largest and highest priority engine production program of the war.

Initially, Wright did not have enough engineers to devote to the R-3350 project, as they were needed to concentrate on the company's R-1820 Cyclone and its extensive and profitable employment in the pre-war DC-2 and DC-3 commercial market and, increasingly, in the growing military market as the engine that powered the B-17. Furthermore, the potential market for Wright's R-2600 Twin Cyclone engine in the A-20 Havoc, B-25 Mitchell, TBF Avenger, and SB2C Helldiver was thought to be greater than for the R-3350. However, once the R-3350 contract for the B-29 was signed, it was obliged to concentrate on this new 18-cylinder, 2,200–3,500hp engine that would become the financial mainstay for both Wright and its parent company Curtiss until long after World War II had ended.

The R-3350 was an air-cooled, duplex engine that had 18 cylinders, with two radial rings of nine cylinders positioned around the crankshaft. The cylinder heads of the two cylinder rings radiated outward to be cooled by the air stream from large propellers. The initial R-3350 was rated at 2,000hp for cruising and 2,200hp for take-off. The engine was twice as powerful as the B-17's R-1820, yet its 55in. frontal area was the same size as the radial fitted to the Flying Fortress.

The engine integrated conventional Cyclone steel barrel cylinders with aluminum heads that increased the cooling area. They retained the R-1820's strong steel crankcase and light magnesium nose and supercharger sections. There were two banks of nine cylinders each, with one master rod and eight articulated rods directing piston power into a three-piece crankshaft. A 20-pinion reduction gear directed power into the propeller shaft at efficient speeds and at a weight of just over one pound per horsepower. The R-2600 and the R-3350 had the same bore and stroke, with the additional displacement obtained by adding four more cylinders (in two rows of nine).

FUEL SYSTEM

Four main fuel tanks, with a normal capacity of 8,000 gallons, were located between the wing spars outboard of the wheel well. They were an integral part of the wing structure. Each inboard wing tank capacity was approximately 3,075 gallons, while the capacity of each of the outboard wing tanks was approximately 2,100 gallons, giving a total wing tank fuel supply of approximately 10,350 gallons. The two removable 412-gallon (each) bomb-bay tanks gave the XB-19 a total fuel capacity of 11,174 gallons. If bomb-bay fuel tanks were carried they were to be emptied into the wing tanks as soon as there was sufficient room. A Douglas press release noted that "The fuel capacity of this flying battleship is 11,000 gallons, approximately the same amount of gasoline carried in a standard railway tank car."

The normal source of fuel supply for each engine was as follows: port outboard tank, port outboard engine; port inboard tank, port inboard engine; starboard inboard tank, starboard inboard engine; starboard outboard tank, starboard outboard engine. With their respective cross-feed valves open, any two engines could be supplied with fuel from one tank, providing this tank was the normal source of supply. The bomb-bay tanks were exclusively for storage, and could only be used to replenish the wing tanks when space was available via the fuel transfer manifold.

The normal service fuel pumps, located on the fuel pump drive on the engines, were driven by the latter. The emergency pumps, located aft of the firewall and below the floor in each nacelle, were driven by electric motors. Cross-feed valves and flow meters were mounted near the electric emergency fuel pumps.

Fuel was delivered to the tanks by the refueling manifold, accessible from the main hatch, or by tank filler necks located atop each of the wing tanks that were accessible from the top of each wing and filler necks in the upper outboard side of each of the bomb-bay tanks.

The electrically driven refueling and transfer pump and the refueling and transfer manifold were located in the aft face of the main entrance hatchway. When transferring fuel, the pump inlet port was connected to the suction side and the pump outlet port to the pressure side of the manifold. Six dual valve units, one for each fuel tank, were incorporated in this manifold, each unit having three positions, namely ON (Suction), OFF, and ON (Pressure).

Fuel could be transferred from any one tank to another by setting the necessary valves to the required positions. When moving fuel, the valve from the supplying tank was set to the ON (Suction) position and the valve from the tank to be filled was also set to the ON (Pressure) position. The pump was to be operated until the desired amount of fuel had been transferred. If it became necessary to replenish one of the wing tanks, fuel from the bomb-bay tanks was to be transferred first. The only connection between the bomb-bay tanks and the fuel system was the refueling manifold.

Fuel pressure gauge data was read from a point adjacent to the fuel pressure warning switch in the pressure line at the carburetor. The fuel pressure gauges and warning lights were mounted in the engineer's inboard instrument panel. The normal operating pressure was six to seven psi, and the pressure warning light would be illuminated if the fuel pressure dropped below four to five psi.

A fuel quantity gauge and a fuel quantity warning light for each of the wing tanks were located on the engineer's inboard instrument panel.

When the XB-19 was refueled on the ground, fuel was either pumped from external sources through the bomber's external filler caps on each of the tanks or via the bomber's refueling and fuel transfer system. When refueling via the latter system, the electrically operated pump was removed from the aircraft and connected to the pressure side of the manifold by an auxiliary hose carried for refueling. Another hose with a mesh-shielded intake fitting connected the pump with the fuel source. The refueling valve connected to the tank to be filled was set to the ON (Pressure) position, and the pump could then be operated until the correct amount of fuel was in the tank. The auxiliary refueling hoses were stowed under the main hatch compartment stairway.

OIL SYSTEM

Oil was supplied by four tanks that formed an integral part of the forward section of the wing. Two of the tanks were installed between the left hand inboard and outboard nacelles, and the remaining tanks were in a similar location in the right wing. Each of the outboard oil tanks had a capacity of approximately 90 gallons, while each inboard tank held approximately 98 gallons, providing a total oil capacity of approximately 376 gallons.

The oil tanks were filled through filler necks that were accessible by hand holes in the top of the wing's leading edge. A separate oil transfer filler connection was fitted in each oil tank just below the main filler neck, and this was accessible from the interior of the wing for transfer. Care had to be taken to ensure that the transfer filler was not opened when the oil in the tank was above the level of the filler neck. Each oil tank had a drain valve on its bottom. A portable four-gallon container was usually stowed on the rear face of the main hatch compartment's forward wall, and this was accessible from the stairs to the main cabin in

The four 700lb Hamilton-Standard 17ft-diameter, constant-speed, full-feathering, Hydromatic propellers were the largest to equip any aircraft at the time, dwarfing the DC-3's 11.3ft-diameter propellers. Later, the B-29's R-3350s swung a 16.7ft-diameter propeller. (Peter Stackpole/The LIFE Picture Collection via Getty Images)

the main hatch compartment. This container was used to transfer oil from one tank to the other. Oil could also be manually transferred from one tank to another.

Oil dilution equipment for cold weather starting was included in each main engine oil system. Oil pressure, quantity, and temperature gauges were located on the engineer's inboard instrument panel. The hydraulically operated oil cooler flaps were actuated at the engineer's station by a control handle. Any movement of the control handle transmitted a similar movement to the flaps, which could be set to any intermediate position between OPEN and CLOSED.

PROPELLERS

The Wright R-3350-powered XB-19 was equipped with four 700lb Hamilton-Standard 17ft-diameter, Hydromatic, constant-speed, full-feathering (actuated by four electrical switches) propellers. These were the largest propellers equipping any aircraft at the time (DC-3 propellers, by comparison, measured 11.3ft in diameter). The propellers were fabricated from solid aluminum alloy forgings by United Aircraft's Hamilton Standard Propellers Division of East Hartford, Connecticut. A Douglas press release stated:

"Manufacture of these huge propellers, and the machining of the intricate mechanism by means of which their pitch is automatically adjusted, was a triumph of precision metalworking. Aelous, mythical Greek God of the Wind, would have held his breath in awe at the man-made tempests created by these giants."

LADDERS, HATCHES, AND WALKWAYS

A conventional boarding gangway was unusable when it came to accessing the lofty XB-19, crews instead relying on a stair ladder with a guard rail that dropped down from the main hatchway in the bottom of the fuselage. Before take-off, the ladder was pulled up into the aircraft and hooked in the left-hand side of the bomb-bay aisle.

Although it was sometimes necessary to walk on the wing's surface for emergency refueling, etc., no specified external walkways were provided. The top of the wing was accessible internally from the escape hatches in the nacelles and externally from ladders set on the leading edge of the wing, and "extreme care" had to be taken so as not to damage the de-icer boots by either stepping on them or leaning the ladder against them.

The top of the fuselage and the horizontal stabilizers were accessible from the escape hatch aft of Bulkhead Station 1015. Two step mats, used when servicing the elevator torque tube, were provided on each of the horizontal stabilizers, just inboard of the elevators. One was located fore and the other just aft of the elevator torque tube cover plate.

The aircraft's *Erection & Maintenance Manual* stressed that throw mats, soft-soled shoes such as sneakers or moccasins, or other means of protecting the surface skin were to be used when walking on any external aircraft section. Two life raft support brackets and four assist straps, mounted on the fuselage ceiling, were used to aid in walking along the fuselage aisle during flight. Finally, a two-level, collapsible working platform was provided for servicing the engines. This was stowed, folded up, inside the aircraft when not in use.

EMERGENCY EXITS

Eighteen emergency exits were available:

1. The nose turret emergency escape door was opened by turning its handle and then having the airstream pressure push the door inward. The door needed to be under control upon opening, as the outside air pressure opened it forcefully.
2. The bombardier's compartment emergency escape door, located on the right hand side of that compartment, was opened by turning the handle and pushing out into the airstream, which then swept it away.
3. The main cabin emergency escape doors were opened by turning the top knobs and the bottom handle and then pushing the door out to have the airstream carry it away.
4. The life raft access and emergency door aft of the upper rear turret and the engine nacelles' emergency doors were opened by turning a handle and pushing up and out.
5. The bomb-bay emergency exits were through the opened bomb-bay doors.
6. The main entrance and sleeping compartment entrance doors, as well as the galley side gun doors, were possible emergency exits.

The bridge deck, with its many windows, is shown here with the pilot (Umstead), co-pilot (Bunker) and the flight engineer (Warren Dickerson) directly behind them – they are all wearing their parachutes. The radio operator is seen in the right foreground. The empty seat behind the pilot was usually occupied by the navigator, with the one opposite it assigned to the aircraft commander. (Author's Collection)

7. The tail gunner's escape hatch was located on the port side of the tail cone and was opened by pushing out the end of the rod holding the door hinges and then pushing the door into the airstream.

CREW POSITIONS

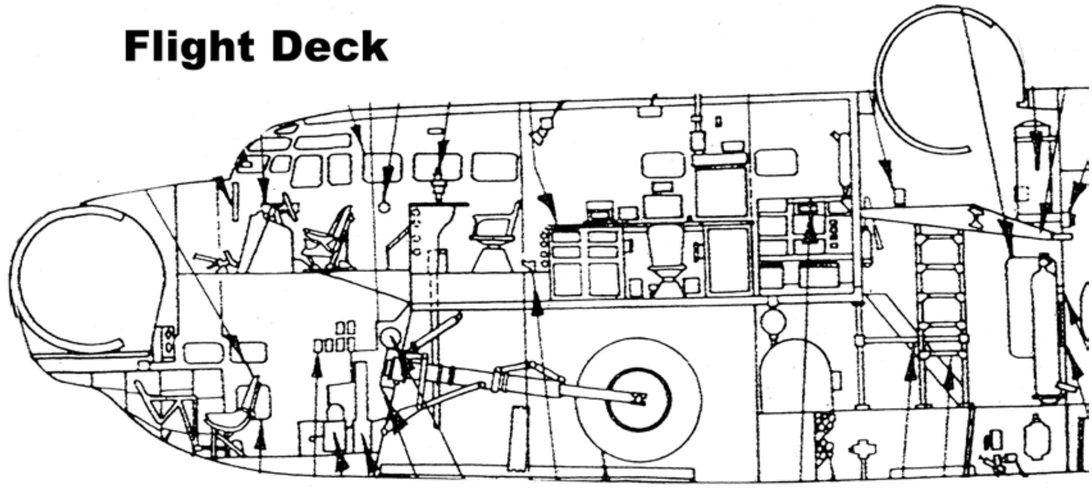
The XB-19 required a 16-man crew, consisting of the pilot, co-pilot, aircraft commander, navigator, flight engineer, radio operator, and bomb aimer (later retitled bombardier), with the remainder of the crew manning the gun positions. On long-range flights, a support crew of two mechanics and six additional relief flight crew could be included and accommodated in the sleeping compartment/ward room.

The pilot and co-pilot sat side-by-side, with the navigator and aircraft commander located behind them at their desks and the radio operator and chief engineer occupying a third row. Douglas referred to this area as the "Bridge Deck."

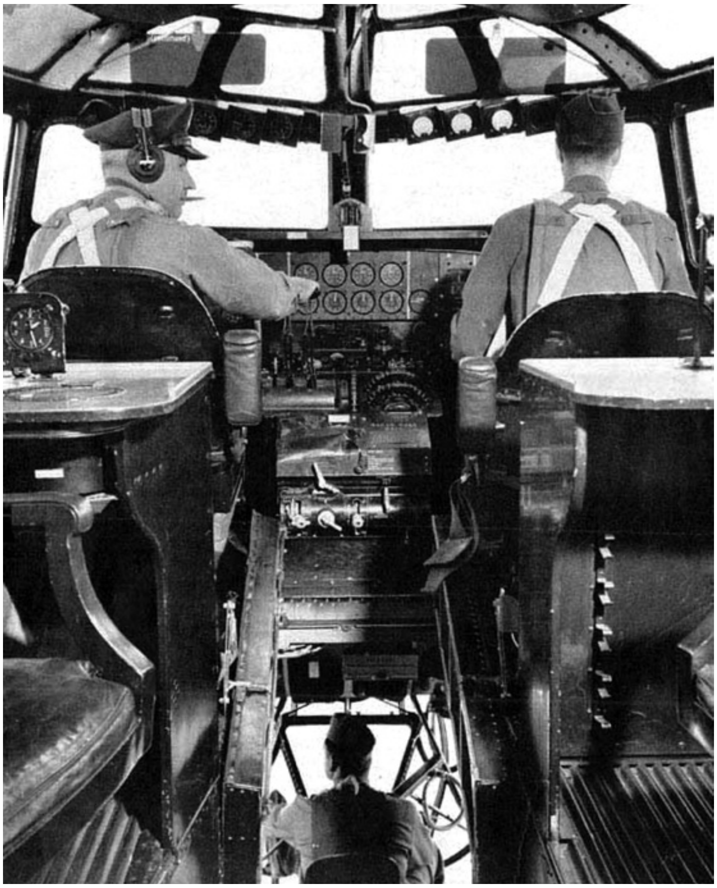
The pilot's and co-pilot's instruments were mounted on three panels, with the left panel for the pilot, the right panel for the co-pilot, and the center panel visible to both. Anti-glare visors were installed, above the pilot's and co-pilot's windshield.

With the XB-19 expected to cover long distances, the navigator's compartment was particularly well-equipped for the time. Amongst the equipment installed here was a Type C-7 Airspeed Indicator, Type B-3 Driftmeter, Type D-12 Long-Period Compass, Type C-10 Altimeter, Type A-2 Pelorus, a Pioneer Panoramic Sextant, and Type B-17 compasses. Another Type B-17 compass was shock-mounted on the V of the windshield cowling above the pilots' center instrument panel, while a fourth one was installed in the bombardier's station.

The navigator's station was comprised of a table that incorporated his instrument panel. The Pelorus (which maintained bearing) was mounted on either of two fixed brackets, one attached to the rear side window sill on the left side and the other on the right side. An airspeed



The pilot and co-pilot were seated side-by-side in the flightdeck, which Douglas dubbed the nautically themed "Bridge Deck." The navigator and aircraft commander were seated at their desks behind them, with the radio operator and chief engineer at the rear of the flightdeck. The large area occupied by the retracted nose wheel immediately beneath the flightdeck is clearly evident in this Douglas drawing. (Author's Collection)



The pilot (Maj Stanley Umstead) and co-pilot (Maj Howard Bunker), separated by the pilot's pedestal, were seated almost 11ft from the tip of the nose, nearly 18ft off the ground, 30ft forward of the wing leading edge, and a distant 110ft from each wing tip. The bombardier is seen here seated in the nose section below the flightdeck. (Author's Collection)

indicator and altimeter were mounted on the instrument panel. The Sextant, which measured the angle between an astronomical object and the horizon for celestial navigation, was mounted in the ceiling just inboard of the navigator's seat. The Driftmeter (used to improve dead reckoning navigation) was installed on a shock-mounted bracket on the floor just aft of the navigator's table, and it protruded through the bottom of the fuselage. Charts were stowed between the navigator's chart table and the cabin wall.

The bombardier's compartment was located in the nose below and aft of the nose turret, and it was accessible from the main cabin. Bomb-releasing controls were installed, but there are no records or photographs indicating that the secret Norden Type M-1

An unobstructed view of the forward cockpit. The flight instruments were mounted on three panels, with the left panel for the pilot, the right panel for the co-pilot, and the center panel visible to both. Both wheel-and-column controls are adorned with Douglas' "First Around the World" company logo on their center hubs. (Philip Jarrett Collection)

The aircraft's fuselage nose section made extensive use of new Rohm & Haas glazing technology, with the unarmed nose turret above and the large bombardier's station below having many sealed Plexiglas sections segmented between metal framework. (Frederick A. Johnsen Collection)

Bombsight was ever mounted in the aircraft. A hand-hole window was located to the right of the bombsight window so as to allow its cleaning in flight.

The bombardier's electrical panel was installed at the front of his compartment above and to the right of the bombsight. It incorporated an indicator light for each bomb station, which disclosed the location of the various bombs on the racks, and a bomb-bay door locator light that was ON when the doors were open. A compass and a Type A-1 Intervalometer were located directly above the bombsight area. The bombardier's aeronautical instruments were above and to the left of the bombsight.

Bombs could be dropped individually by the electrical selective release system, or all at once by manually operated emergency salvo releases. The ARM and SAFE lever and the LOCK and SALVO lever on the inboard side were incorporated in a control box on the floor to the right of the bombardier's seat.

To aid in night ground operations, a portable extension-type taxiing spotlight was mounted in a fixed bracket to the right of the bombardier's switch box.

The sound-proofed and heated mechanic's quarters were aft of the main control cabin, and from there personnel could enter the wing to make adjustments and minor repairs during flight. Aft of the mechanic's compartment were the auxiliary engines, refueling valves, oxygen supply, and other gear. The large bomb-bay was located behind the mechanic's compartment toward the tail of the fuselage.

The radio operator and chief engineer had a wide selection of communications equipment at their disposal on the bridge deck. This included a Set Type SCR-183 radio, Liaison Set Long-Range Types SCR-185 and SCR-187, and a Type RC-21-T2. The latter could be used to call a crew member at any of the 24 interphone jack boxes located at each station. The aircraft was also fitted with a loudspeaker-amplifier system for calling or command purposes. Its control box, located in the main hatch compartment, was connected to five small loudspeakers – two in the main cabin, one for the bombardier, and one each in the sleeping and galley areas. There was also a Type SCR-242-B radio compass mounted above the radio operator's table.

All of the radio equipment, except the liaison set powerpack, was operated by a conventional 12-volt direct current radio system, deriving its power from two 12-volt batteries on the floor in the left side of the main hatch compartment. The liaison set powerpack and the loudspeaker-amplifier were operated by the 120-volt AC system.

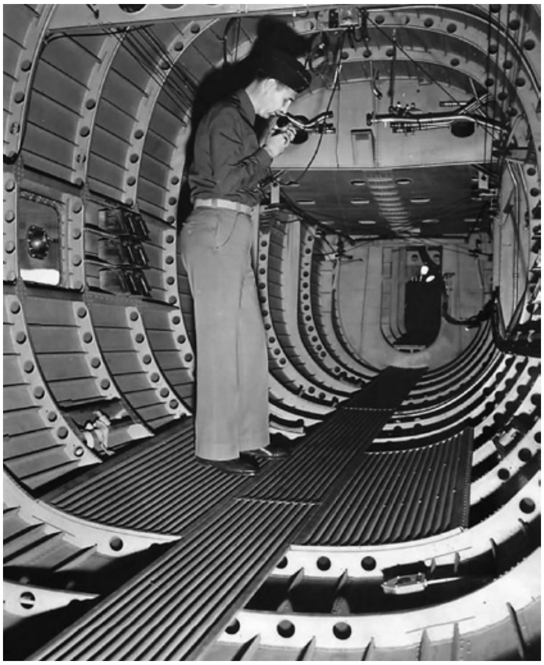
The bombardier's position was located below and aft of the nose turret, being accessible from the main cabin. This photograph of the position was taken looking down the stairs from the bridge deck, with the bomb aimer's seat folded flat. There are no records or photographs indicating that the top-secret Norden Type M-1 Bombsight was ever mounted in the aircraft. (Peter Stackpole/The LIFE Picture Collection via Getty Images)

CREW AMENITIES

With intercontinental missions almost certainly being part of the B-19's operational remit should the aircraft have entered operational service, bunks and a galley "were necessary because of the fact that on long flights the ship may remain in the air for more than two days."

A sound-proofed and heated sleeping compartment was provided with six permanently-installed, full-length, three-quarter-width bunks and a table with four seats, two on either side. Two seats could be converted into a bunk, one on the left side, and the other on the right side. These bunks were assembled by removing the portable

The flight engineer was seated at the rear of the flightdeck, with his back to the rest of the crew that occupied the bridge deck. From here, he monitored an impressive array of dials, gauges, and throttles. (Peter Stackpole/The LIFE Picture Collection via Getty Images)



This interior photograph of the fuselage reveals the XB-19's spacious stressed-skin, belt frame, stringer and bulkhead construction. The circular cavities in the belt frames were called "lightening holes," and they lessened the weight of the structure without affecting its strength. The catwalk floor was removable. (Author's Collection)

table set between the two seats on either side of the aircraft, lowering the seat cushions and filling in the interspace with the back of the rear seat. A locker in the aft left corner stored food and other equipment.

The sleeping compartment was accessed from the main compartment and the bomb-bay. The sleeping compartment floor contained two upward-swinging doors, each hinged on one side. The aft door led to the photographer's compartment, while the forward door, which was similar to the main entrance hatch doorway, led to the auxiliary entrance hatch in the fuselage skin.

The galley was located aft of the sleeping compartment and was provided with utensils, a small electric hot plate-type stove that heated liquids and food, drinking water supply, and portable tables to be installed in place of the convertible seats in the sleeping compartment.

There was a drinking water supply tank in the main cabin, adjacent to the engineer's table on fuselage bulkhead Station 341; a drinking water supply tank on the left side, directly aft of the side gun window; a drinking water supply tank in the sleeping compartment on the left aft wall; and a wash basin and water tank in the galley, just aft of the right side gun window.

Lavatory equipment consisted of a chemical disposal-type toilet installed in the right rear corner of the galley, with a relief tube adjacent to the toilet.

Removable floors were provided throughout the interior of the aircraft for inspecting and servicing various units.

There were tables in the main cabin for the engineer, radio operator, commander, and navigator, who also had a second table specifically for his charts.

The seats for the pilot and co-pilot had three adjusting controls installed below and to the left side of the pilot's seat and below and to the right side of the co-pilot's seat. Manipulation of the forward handle adjusted fore and aft movement, the top rear handle adjusted height, and the lower rear handle adjusted tilt. These three controls allowed six inches of up and down movement in seven adjustments – four adjustments for tilt up to 12 degrees and a fore and aft movement of six inches in seven adjustments.

The bombardier's seat was mounted on a 45-degree angular track that faced forward, allowing it to be moved up and forward or down and back by turning the lever under the front of the seat. When this lever was turned, the seat retaining pins were released, allowing the seat to be moved to the desired position, after which the lever was turned back, reseating the retaining pins.

In the main cabin, the seats for the engineer, radio operator, gunner, and navigator were of the swivel-type. The navigator's chart table and

The radio operator was sat opposite the flight engineer, and from his station he operated a wide selection of communications equipment. Aside from the three SCR-type sets fitted in the aircraft, the radio operator also controlled the Type RC-21-T2 that could be used to call a crew member via any of the 24 interphone jack boxes located at each station within the XB-19. (Peter Stackpole/The LIFE Picture Collection via Getty Images)

the photographer's station in the sleeping compartment were provided with an adjustable stool. The tail side gunner's compartment had no seat as its occupant sat on a seat-type parachute. An adjustable, wide-web belt, permanently fastened on one side and hooked to the other, served as a back rest to support the tail gunner.

Type B-11 safety belts were found on all seats except the convertible ones in the sleeping compartment. Type A-3 gunner's safety belts were at all gunners' stations except the nose, forward dorsal, aft dorsal, and aft ventral turrets, which were provided with Type B-11 safety belts.

Twenty parachute brackets were installed throughout the aircraft, and two Type A-2 life rafts were carried in the compartment aft of the rear turret gunner's station.

Two independent, steam-heated air-type heating and ventilation systems were installed, with each individual system composed of an outside air intake, a boiler, a radiator, air ducts, and the controls necessary for regulating the temperature of the aircraft interior when in flight.

A steam and air control panel for the heating and ventilation system, including all controls, gauges, and valves for the left system, was located just forward of the left wing doorway in the main hatch compartment. A similar panel was located in the same location on the right side of the main hatch compartment for the system on that side of the aircraft. These panels contained the controls and a heating system water temperature gauge so that any selected interior temperature could be reached by regulating the mixture of heated air within the aircraft with cooler air ducted in from outside. For ventilation, cooler

This bank of instrumentation was used to monitor the extensive network of strain gauges that were installed throughout the XB-19. (Peter Stackpole/The LIFE Picture Collection via Getty Images)

outside air could be circulated through the system in regulated volumes.

The individual boilers for the two systems were located within the inboard engine nacelles in the left exhaust stacks just forward of the firewall. The boiler system heated the aircraft, and it consisted of a water tank and pump unit (the latter was comprised of an integral boiler feed pump and a drive motor). The five-quart sheet aluminum tank was covered with stonefelt and cloth insulation, coated with waterglass (sodium silicate binder). The impeller-type boiler feed pump was driven by a 110-volt, 400-cycle, three-phase electric motor, which developed 16hp at 4,000 rpm. The air heated in each system circulated through the ducts to the outlets in the main cabin and in the sleeping compartment. Ducts above the pilot's and co-pilot's windows supplied heated air between the window panes for defrosting.

OXYGEN SYSTEM

Douglas engineers working on the XB-19 were faced with designing the largest and most complex oxygen distribution system ever attempted. It consisted of four large oxygen bottles, an oxygen system control panel, two outlet manifolds, lines from the two outlets to the various stations, outlet valves at each of the stations, and the necessary oxygen masks for the entire crew.

The large oxygen bottles and the oxygen system panel were installed on the forward face of the aft wall of the main hatch compartment. The oxygen system panel was located directly above the doorway to the bomb-bay and incorporated all the valves and controls necessary for its use. The bottles were installed (two on either side of the doorway) so that the four bottles, or the two bottles on any one side, could supply the entire system or one of the aircraft's two outlet manifolds. There were 33 outlet valves for the oxygen system.

The forward dorsal and rear turrets were each supplied with an individual oxygen system composed of a Walter Kidde Company supply bottle, a shut-off valve, and an oxygen outlet. The support bracket under each gunner's seat could hold either a two-hour, 3.5-hour, or five-hour capacity bottle.

ELECTRICAL SYSTEM

The XB-19 was equipped with a 120-volt, 400-cycle, 600-ampere, three-phase alternating current electrical powerplant, supplied by the two auxiliary engine-driven generators "that develop 15 kilowatts – as much electricity as is used by the largest department store in Santa Monica." This AC system delivered most of the electrical current used, with the exception of a 12-volt AC/DC switch mounted on the main junction box that drew current from two batteries when the auxiliary engines failed in order to operate the instrument, running, passing, formation, extension, and landing gear warning lights.

Two Type D-6 12-volt storage batteries were installed side-by-side on the floor of the left side of the main hatch compartment. Two Westinghouse battery chargers, located in the main cabin, supplied DC current to the electrical system that powered the trouble light in the main hatch compartment; fuel mixture indicators; bombardier's selector switches; Intervalometer motor; radio; and camera, RPM, control and hatch signal systems. A volt ammeter at the engineer's station indicated the voltage and current output of the battery chargers.

The electrical system main junction box was installed on the main entrance hatch compartment front wall to the left of the forward dorsal turret floor. The fuse panels on the main junction box cover in the main hatch compartment and at the engineer's station were readily accessible. Enough fuses for 100 percent replacement were provided.

Two auxiliary supercharged internal combustion engines, each driving a 120-volt, 400-cycle, three-phase alternating current generator, were installed in the main hatch compartment. Their fuel was supplied from the main engine fuel system. Each auxiliary engine had its own individual oil system, which incorporated a four-gallon supply tank and an oil dilution system, with a push-button-type oil dilution valve. The auxiliary engine units operated semi-automatically, and they were controlled from the engineer's station.

The ignition system consisted of a Type B-4 switch for the auxiliary engines and two Type B-4A switches for the main engines, and they were located at the engineer's station. The two Type B-4A switches were interconnected by a bar that operated them in unison.

HYDRAULIC SYSTEMS

The following systems were hydraulically operated – wheel brakes, landing gear, wing flaps, flight control surface boost and gust locks, bomb-bay doors, bomb and engine hoist, nose, upper front and upper rear turret systems, and the remote control system. The main hydraulic system was comprised of the supply, pressure, and return systems for all of the above, bar the remote control system.

The main hydraulic system was of the hydraulic accumulator type, and included a hand pump for auxiliary use to supply pressure to any of the units receiving their source of power from the main system. Two engine-driven oil pumps, one mounted on each inboard engine, supplied mineral oil to the system under a normal operating pressure of between 1,500–1,650 psi. When the auxiliary engines were operating, an auxiliary, electrically driven, hydraulic pump could be used to supply pressure to the system without starting the main engines, or as a main hydraulic system function in the event of excessive fluid demand.

The remote control system, which was entirely separate to the main hydraulic system, included a fluid reservoir, a filter, a hydraulic accumulator, a hand pump for emergency use, and a system pressure pump. The latter was controlled by a hydraulic valve, which, in turn, was activated by the pressure in the main hydraulic system. The remote control hydraulic system operated at a pressure of between 1,000–1,100 psi. A low-viscosity solution consisting of 20 percent mineral oil and 80 percent Stoddard solvent (mineral spirits) permitted the fluid's free-flow in the small 1/8th-inch lines that were used to reduce the amount of oil required, and thus prevent the onset of temperature expansion problems associated with using larger volumes of oil.

ANTI-ICING AND DE-ICING EQUIPMENT

The anti-icing and de-icing equipment installed in the XB-19 was referred to as Ice Elimination Equipment in the aircraft's manuals.

The propeller anti-icing system consisted of an 85 percent alcohol and 15 percent glycerin solution held in a 12-gallon supply tank located beneath the main hatch compartment floor just aft of the main entrance hatch at fuselage Station 405. There was an electric motor-driven pump located on top of the tank, and its control switch was mounted in the engineer's station. The latter was also fitted with two dual flow meters on the outboard side of the instrument panel.

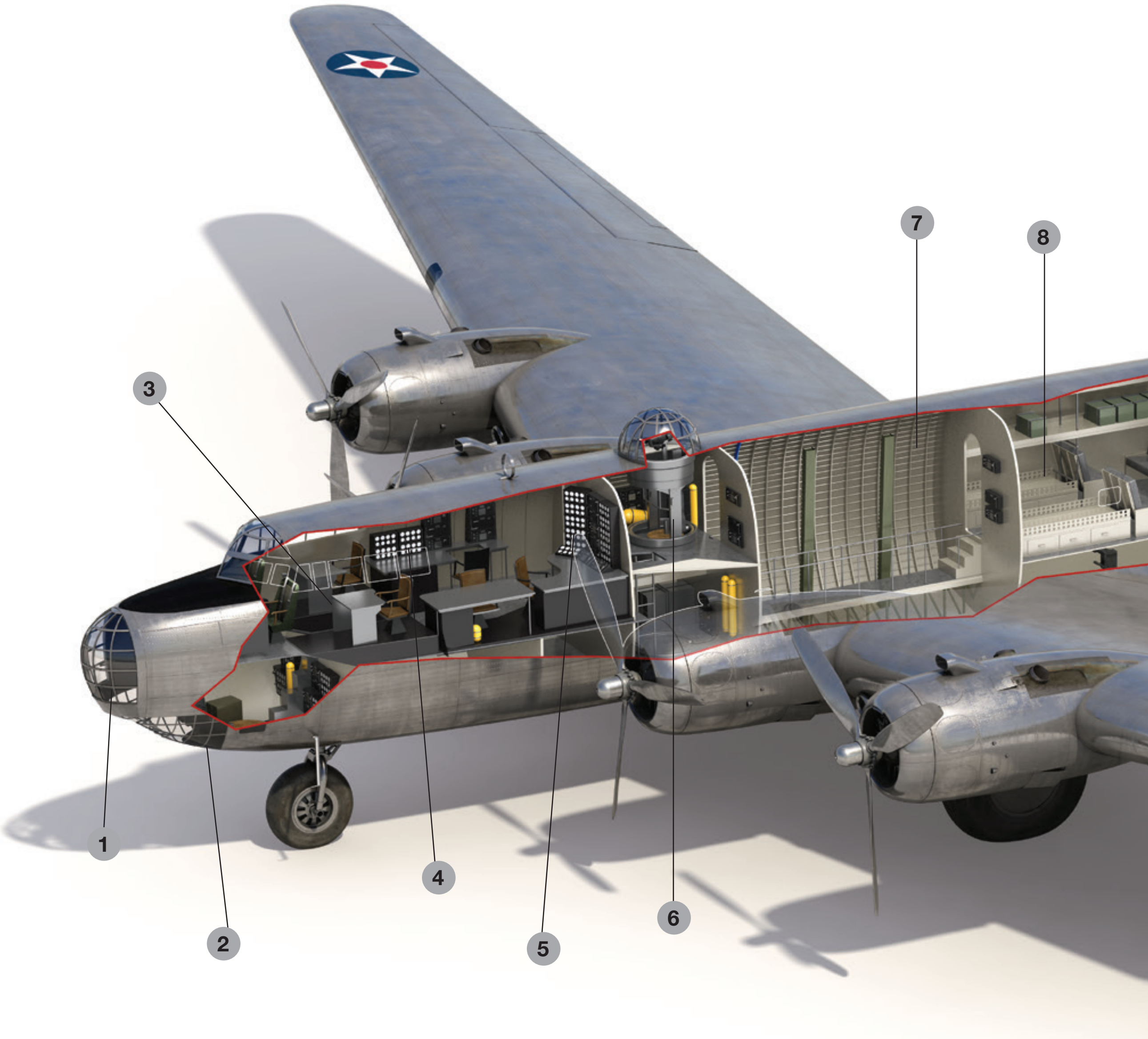
The system was operated by turning the control switch on, which started the motor and pump unit on top of the fluid supply tank. The fluid pump distributed the solution through the lines, metering valves, flow meters and, finally, the propeller slinger rings. The metering valves, one in each of the four distributing lines, enabled the regulation or restriction of the fluid flow through any one of the flow meters. The maximum amount allowed to flow through each of the meters was five quarts per hour.

The windshield anti-icing system supplied alcohol to the two outboard windshields and to the pilot's and co-pilot's front-side windows. This system consisted of a two-gallon alcohol supply tank, a hand pump, four spray nozzles, and three shut-off valves. The latter were installed as follows – adjacent to the supply tank and used to regulate or restrict fluid flow from the tank; on the right hand side of the aircraft adjacent to the hand pump, and accessible to the co-pilot; and on the left hand side, accessible to the pilot. The left and right shut-off valves regulated fluid flow to their respective sides.

Surface de-icing was performed by de-icing boots attached to the leading edge of the wing, horizontal, and vertical stabilizers, pitot masts, and radio loop antenna.

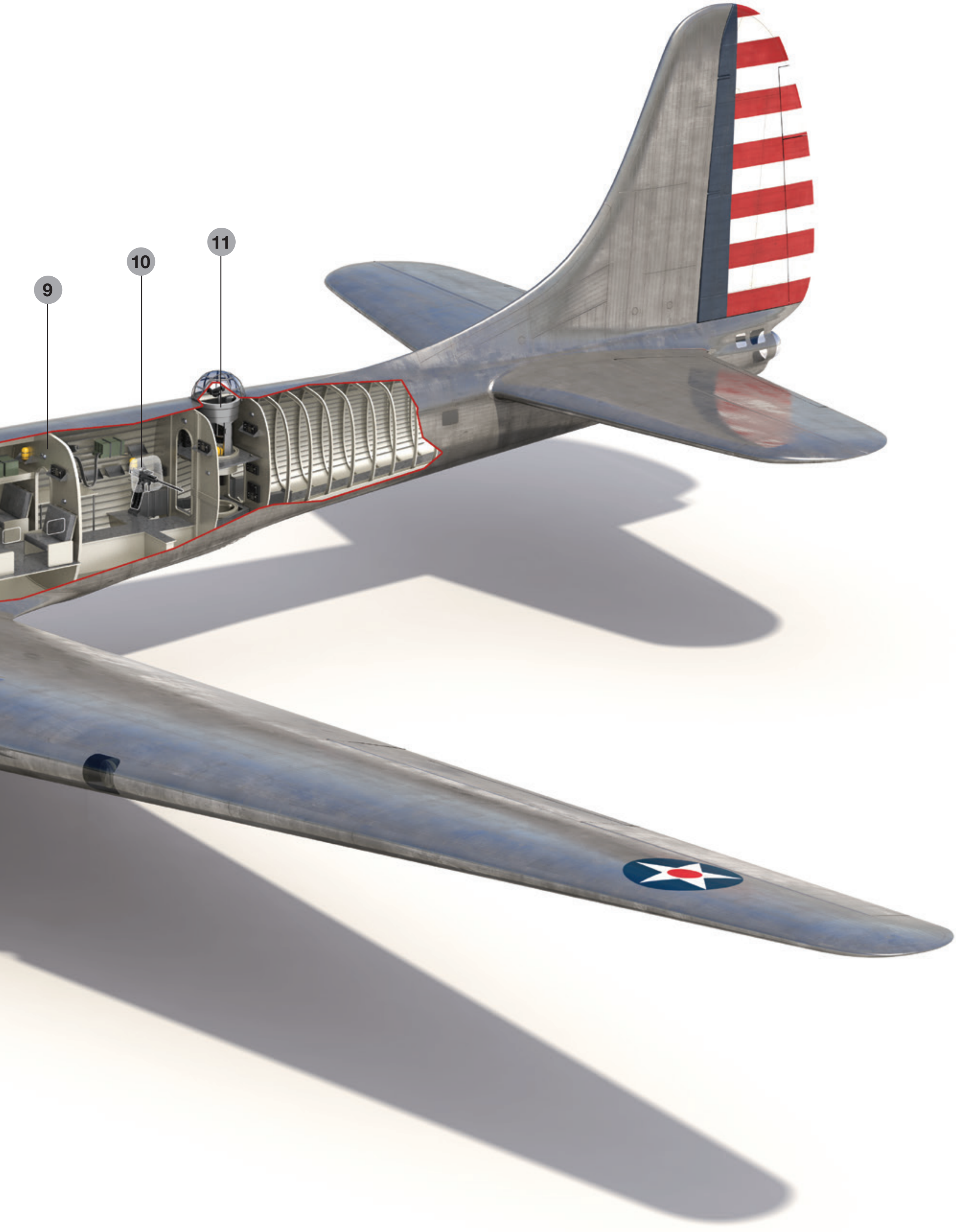
The wing de-icing system incorporated two air filters, two air pumps, a master control valve, three distributor valves, an air inlet check valve, and two air outlet check valves. The two de-icer air pumps were installed in the left and right inboard engine nacelles just aft of the firewall. Each de-icer air pump filter was fitted on the firewall just above the pump.

The master control valve was located under the main hatch compartment floor, as were the upper and lower distributor units, and they were accessible from the main entrance hatchway. The lower distributor valve supplied air pressure to the two inboard wing boots on either side of the bomber, while the upper distributor valve supplied



KEY

1. Nose turret
2. Bombardier's compartment
3. Pilot's seat
4. Radio operator's station
5. Flight engineer's station
6. Forward dorsal turret
7. Bomb-bay
8. Sleeping compartment
9. Galley
10. Aft-fuselage gun position
11. Aft dorsal turret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air to the pitot mast boots, the radio loop antenna boots, and the remainder of the wing boots. The upper and lower valves each had ten outlets for distributing air to the boots, with five on either wing. These various distributor lines operated in a regular cycle, distributing air to the boot pockets at different intervals.

The empennage distributor unit, mounted at fuselage Station 1230, supplied air pressure to the entire empennage de-icing system. The empennage distributor was provided with five outlets on either side of the unit, one of which was plugged. The four open distributor lines on each side supplied air to the empennage boots. This unit also operated on a set cycle, providing air to the boot pockets at different intervals.

FIRE EXTINGUISHER SYSTEM

The Lux Fire Extinguisher system incorporated two CO_2 bottles, a control panel, and Lux perforated tubing around each engine. The selector and operating valves for flooding any desired engine compartment with CO_2 gas were located on the top, outboard side of the engineer's table. Two 9.5lb-capacity CO_2 bottles were located beneath the engineer's table in the main cabin and supplied the fire extinguisher system with gas.

A control panel, also mounted on the top outboard side of the engineer's table, had six fire warning lights, one for each of the main engines and one for each of the auxiliary engines, two pull handles and two selector knobs. Each of the four signal lights for the main engines were operated by two fire warning switches, one at the top and the other at the bottom of each nacelle. The two auxiliary engine signal lights were each operated by a fire warning switch adjacent to their respective engines. In case of fire in any one of the nacelles, the signal lights illuminated, locating the source of the blaze.

There were two fire extinguisher selectors – one for the main engines and the other for the auxiliary engines. To extinguish a fire, the selector was turned to the affected engine as specified on the instruction plate below the control panel. The engineer then grabbed two pull handles for a main engine fire and only one handle for an auxiliary engine fire.

A Type A-14 Fire Guard carbon tetrachloride fire extinguisher was mounted in the main hatch compartment on the outboard side of the entrance door to the main cabin, with another mounted on the floor next to the stairway to the main cabin. Two FYR-FYTER Type A-2 carbon tetrachloride fire extinguishers were located in the main hatchway just below the refuel and fuel transfer manifold. Both extinguishers had an instruction plate for operation.

BOMBING STATION AND EQUIPMENT

The XB-19 was equipped with "the required means for loading and carrying bombs in the fuselage bomb-bay and on the lower surface of each wing." The maximum internal bomb-bay load, combined with the maximum external bomb load, totaled 37,107lbs for short-range missions.

The bomb-bay was located directly aft of the main entrance hatch compartment between the front (Station 425.5) and the rear (Station 622.6) wing spars, and it was divided into two sections by a keel and walkway. There was a doorway at each end of the bomb-bay aisle, one separating the aisle from the main compartment and the other from the sleeping compartment. Each of the two bomb-bay sections incorporated a hydraulically operated door, front and rear bomb racks and a dedicated 2,000lb bomb rack, all of which were located on the inboard wall. A single rail, provided as the aft rail of each front bomb rack, was also used at the forward rail for each 2,000lb bomb rack. The aft rail of the 2,000lb bomb rack was folded when not in use.

The normal useful bombload for the aircraft was 11,000lbs (with a normal fuel load), split as follows:

1. Station A: One 2,000lb bomb (Type M34)
2. Station B: Two 1,100lb bombs (Type M33, Mk III)
3. Station C: Four 600lb bombs (Type M32, Mk IMI, Mk III)
4. Station D: Eight 300lb bombs (Type M31, Mk I, Mk IMI)
5. Station E: Twenty 100lb bombs (Type M30, Mk I, Mk IMI, Mk IMII)

An alternate bombload was:

1. Eight 2,000lb bombs
2. Sixteen 1,100lb pound bombs
3. Thirty 600lb bombs
4. Thirty 300lb bombs
5. Thirty 100lb bombs

The overload bombload (bombload plus reduced fuel load was:

1. Eighteen 2,000lb bombs or
2. Twenty-six 1,100lb bombs or
3. Thirty 600lb bombs or
4. Thirty 300lb bombs or
5. Thirty 100lb bombs

All bombs were loaded with their shackles in place, and they were to be secured to the bomb racks before removal of the bomb hoisting slings.

The hydraulically operated bomb-bay doors were mounted in ball bearing hinges located on the outboard side of each wing and fuselage bulkhead (Station 65). They were opened and closed by an operating lever on the bombardier's control box to the right of the his seat. When closed, the bomb-bay doors were latched to the keel by a cable-controlled latch mechanism. A bungee was secured to the operating mechanism for the bomb-bay doors, allowing them to be lowered in case of hydraulic system failure.

Five bomb racks were provided on the undersurface of each wing, and they could accommodate ten 100lb, ten 300lb, ten 600lb, ten 1,100lb, or ten 2,000lb bombs (the latter on short-range missions only). Two racks were located between the inner and outer nacelles, with the remaining three outboard of each outer nacelle.

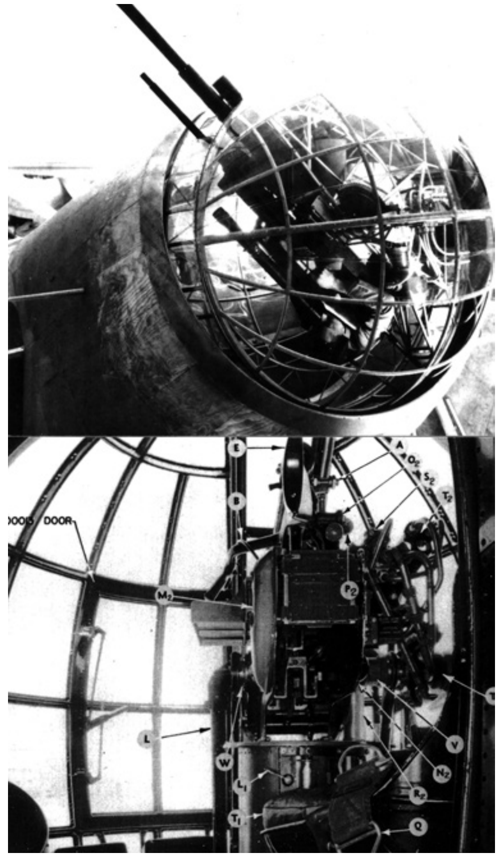
ARMAMENT

The XB-19 was scheduled to be armed with 11 machine guns (six 0.30-cals and five 0.50-cals) and two 37mm cannon, installed in 11 gun stations throughout the aircraft.

Each of the individual gun stations could stow ammunition for their various weapons as follows: each of the six 0.30-cal machine guns was supplied with 600 rounds; each of the five 0.50-cal guns had 200 rounds; and each of the 37mm cannons had 50 rounds apiece.

While the XB-19's armament was considered impressive at the time, within several years it would be found to be an inadequate defense for aerial combat in World War II. The six 0.30-cal machine guns fired rounds that were too lightweight, while the low-velocity 37mm cannon were totally useless against high-speed monoplane fighters. The five 0.50-cals, while adequate, were supplied with only 200 rounds per gun. In comparison, the B-17G would be armed with 13 0.50-cal M2 Browning machine guns in eight positions, each of which was supplied with an average of 500–700 rounds of ammunition (6,500 to 9,100 rounds per bomber).

Two hand-operated 0.30-cal machine guns, one on the left and the other on the right side of the bombardier's compartment, were to have been installed, but there is no documentation or photographic evidence to suggest that this ever occurred. The *Handbook of Service Instructions* for the XB-19 has no information, photographs, or drawings of these gun positions.



The nose turret – seen here in mock-up form – was armed with one 0.30-cal machine gun (with 600 rounds) and one 37mm cannon (with 50 rounds). The latter weapon would prove to be useless against enemy fighters engaging the bomber at high speed due to the cannon's poor rate of fire and the low velocity of its shells. (Author's Collection)

The nose turret was armed with a 0.30-cal machine gun and a 37mm cannon. The turret framework was enclosed within Plexiglas panels fastened with retaining strips and weatherproofed with a special sealing compound. It was constructed of an aluminum alloy frame attached to two steel gun mounts and a strong floor structure that included a large hub with arms extending out fanwise to the aluminum frame. These hub arms supported the floor, as well as the connector for attaching the hydraulic horizontal drive struts.

The forward section of the turret was mounted on roller guides for elevating and depressing the guns. The guns' firing angles were approximately 55 degrees to the left or right from the bomber's centerline and approximately 45 degrees up and down about the horizontal axis of the mount. During its operation, the turret was moved about a vertical axis, and the guns, gunner, and controls moved inside the turret about a transverse axis.

The gunner's seat moved with the guns, and had two fixed positions – STOWED and OPERATING – with reference to the weapons, as well as height adjustment controlled by a lever on the left side, just under the seat. The STOWED position gave the gunner sufficient room to get in and out of the turret. In the OPERATING position, the gunner was seated aft and to the left of the guns, making aiming and

The forward dorsal turret was also armed with one 0.30-cal machine gun (with 600 rounds) and one 37mm cannon (with 50 rounds). The 0.30-cal machine gun lacked sufficient punch to cause any extensive damage for the number of hits it was able to inflict on a quickly passing enemy fighter. (Author's Collection)

firing easier. The gunner's seat could be changed in position by turning the latch lever, located on the seat support post, down and then moving the seat to the desired position. When changing the seat from one position to the other, the latch lever was to be released once the seat had been moved from its first position so that the latch could be reengaged in the new position.

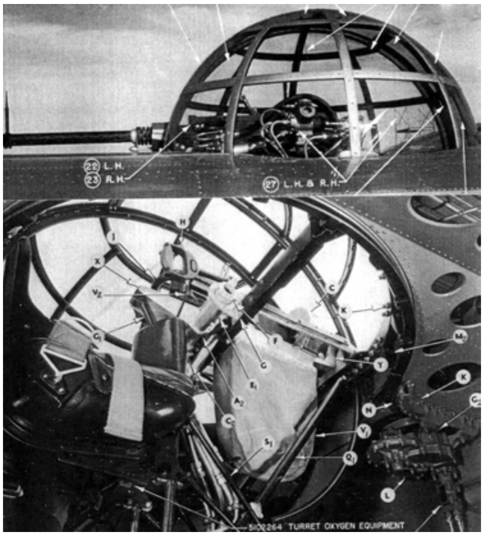
Since the turret was mechanically and hydraulically operated, the gunner was not affected by strong blasts of air, out of balance conditions, or recoil. The forward left side of the turret was provided with a gunner's emergency escape hatch.

Access to the forward dorsal turret was via the turret floor in the main hatch compartment. It was similar in construction to the nose turret in that it consisted of an aluminum alloy frame with sheets of Plexiglas screwed and cemented to it. The turret also incorporated the same type of armament (a 0.30-cal machine gun and a 37mm cannon) and operating mechanism. The forward section was mounted on roller guides for elevating and depressing the guns.

The turret was mounted on a roller and track assembly, and incorporated a large dual V-belt sheave adjacent to the turret ring. Two Y-belts were mounted on this sheave, and they were driven by a pulley and gearbox mechanism (powered by a hydraulic motor) installed just aft of the turret.

A gun fire control mechanism, consisting of layers and two cams, was incorporated in the turret mechanism to control the fire of both guns via the triggers. They were automatically pulled back to the non-firing position when the guns were pointed at any portion of the bomber. One cam was installed around the turret well, just under its track, and the other was fitted on the horizontal axis of the gun. The fire control roller moved on the cam mounted in the turret well, with the elevation of this cam operating the fire control mechanism.

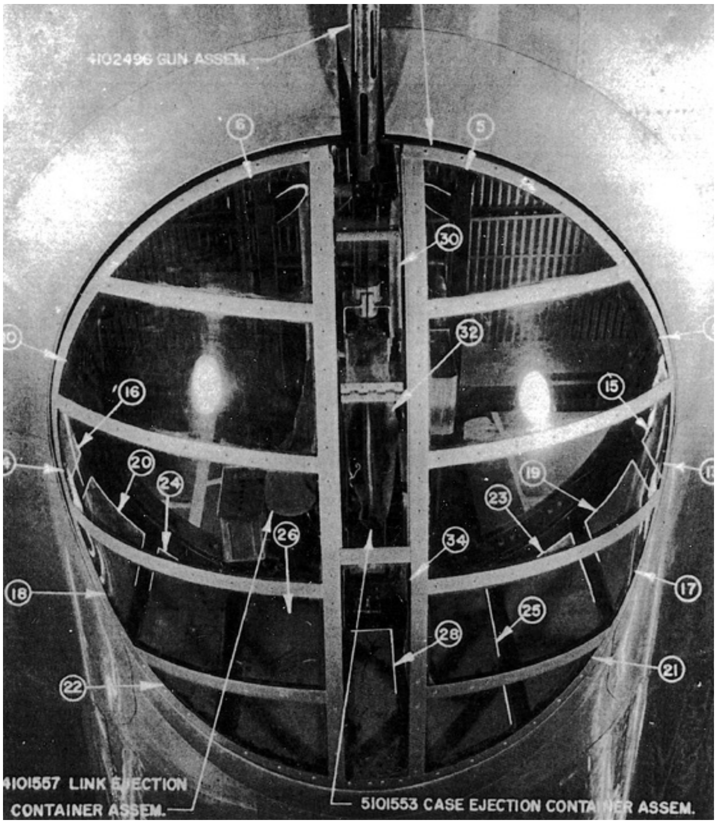
The aft dorsal turret contained a single 0.50-cal machine gun with 200 rounds. (Author's Collection)



There was no escape hatch in the forward dorsal turret, the gunner having to vacate his position via the main entrance hatchway.

The aft dorsal turret, accessed from the turret floor, was constructed of an aluminum alloy frame mounted on the turret ring, and it included a semi-circular curtain mounted on ball bearings to provide elevation for the gun. The turret frame was covered with Plexiglas panels, which were held in place by retaining strips and weatherproofed with a special cement. The turret ring was a strong extrusion supporting the gun mount, belt sheave, seat support structure and guides, and turret roller trucks, which rode on the turret support track.

In operation, the turret moved about a vertical axis and its gun about a horizontal axis. The seat moved up and down on its track, maintaining a normal position to the gun and sights at all times. The turret's single 0.50-cal



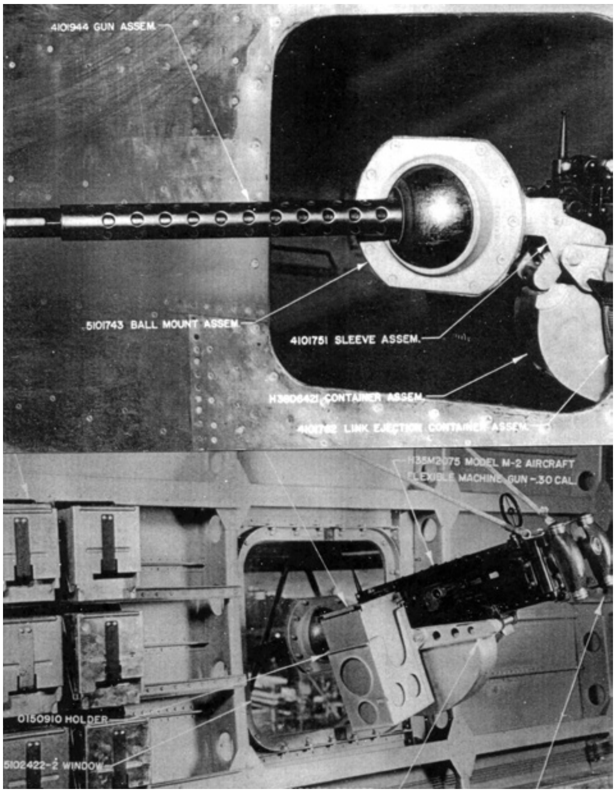
The aft ventral turret was also fitted with a 0.50-cal machine gun with 200 rounds. (Author's Collection)

machine gun was supplied with 200 rounds and was operated by two interconnected control grips, the left one incorporating an adjustable stop and the right one the trigger.

Again, a gun fire control mechanism consisting of cams and levers was incorporated in the turret mechanism to control the fire of the weapon, locking the trigger in the non-firing position whenever the 0.50-cal was pointed at any portion of the aircraft structure. This fire control mechanism, similar to that of the forward dorsal turret, was operated by two cams, one installed around the turret well and the other on the horizontal axis of the gun mount.

The ventral aft turret consisted of an aluminum alloy frame, with sheets of Plexiglas screwed and cemented to it, and a turret ring supporting a 0.50-cal machine gun and its mount, 200 rounds and the gunner's support. This ring incorporated the rollers that held the turret on its support track and allowed it to rotate. A dual stowing latch was included as part of the turret

The mid-fuselage armament consisted of a hand-operated 0.50-cal machine gun (with 200 rounds per weapon) on either side of the aircraft. By contrast, the B-17 waist gunners' 0.50-cal machine guns were each supplied with a 250-round ammunition box, with additional magazines stored in the radio compartment. (Frederick A. Johnsen Collection)



The two aft-fuselage gunner's stations each incorporated a 0.30-cal machine gun (600 rounds per gun) attached to ball-and-socket type mounts. (Author's Collection)

assembly, locking the turret to the fuselage and the gun in the STOWED position.

The gun mount provided a conical angle of fire of approximately 80 degrees to the rear and approximately 45 degrees to the front. The turret was normally operated by the gunner while leaning on his support, which enabled him to push the turret around to the desired position in order to facilitate firing. A gun grip extension arm was provided to improve handling of the weapon.

A hand-operated 0.50-cal machine gun (200 rounds per weapon) was to be installed on either side of the mid-fuselage in the galley area.

The aft-fuselage gunner's stations (located just forward of the horizontal stabilizers) each incorporated a 0.30-cal machine gun attached to a ball-and-socket type gun mount. When operating the guns, care had to be taken not to fire into any part of the aircraft, since there were no stops provided for the weapons.

Although the USAAC did not want a tail gun installed in the XB-19, Douglas insisted, placing a fixed position containing a hand-operated 0.50-cal machine gun directly beneath the massive tail. The M2 weapon was mounted on a Type E-4 adapter, supported by a yoke, giving the gun a conical angle of fire of approximately 40 degrees. Six ammunition boxes with a capacity of only 33 rounds each were provided.

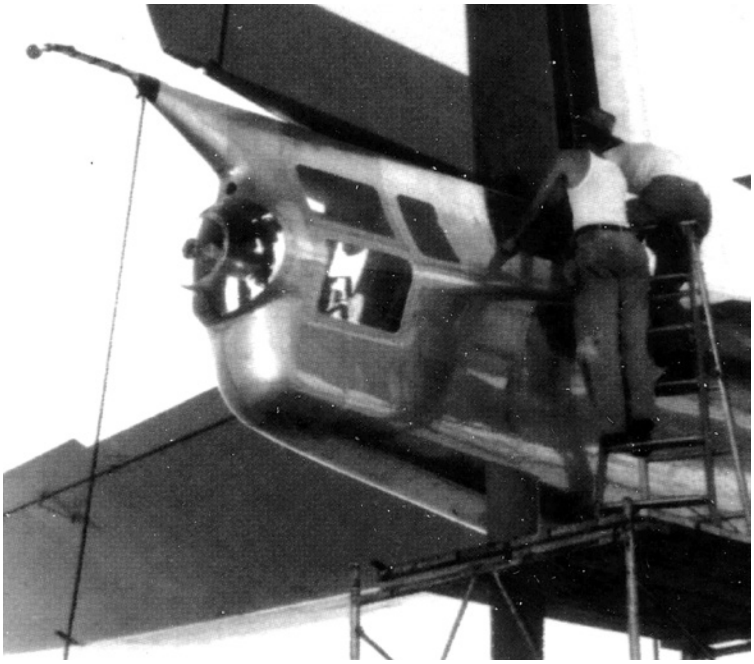
A fixed telescopic sight with a movable reticule was installed approximately 13in. above the gun barrel axis. This sight had a wide-angle field-of-view, with a cross hair pattern appearing in it – the cross hair pattern was also engraved on the reticule to act as a bead. The long cross bar indicated short-range (200 yards) and the short bar corresponded to the trajectory drop at 600 yards. The width of the bars corresponded to the appearance of 37ft of span at those distances. The cross hair pattern moved across the field of view, indicating, at all times, the point at which the gun was being aimed. The reticule was mounted in a housing containing the necessary mechanism for its movement, and was coordinated with the gun by gears, pulleys, and cables.

PHOTOGRAPHIC EQUIPMENT

The photographer's compartment was located in the fuselage keel, just aft of the auxiliary entrance hatch in the sleeping compartment. The camera equipment allocated to the XB-19 comprised a Type T-3A camera, a Type A-5A Fairchild mount, a Type A-2 viewfinder, five Type A-3 filters, a shutter induction coil, and a vacuum valve. The viewfinder was installed just forward of the camera mount, and it had a sliding door for operation.

Before the camera could be employed, a door had to be removed by turning a handle that released three retaining lugs. The photographer's seat was set in a tube-type mount located just forward of the viewfinder opening door.

Each of the 11 gun stations could also mount a Type G-4 gun camera.



The tail gun, placed directly under the massive fin, was a fixed position containing a hand-operated 0.50-cal weapon mounted on a Type E-4 adapter and supplied with 200 rounds. (Author's Collection)

PYROTECHNICS

The XB-19's pyrotechnics array consisted of 12 Type M-8 parachute flares stowed in Type A-3 flare racks, with the release handles mounted in the bombardier's compartment and on either side of the stairway to the main cabin. The aircraft also had one Type M-2 signal pistol and mounting bracket, 15 Type M-11 white star signal flares, ten Type M-9 signal flares, and 36 Type XIC drift flares. Stowage for 30 additional drift flares was provided adjacent to the commander's and navigator's seats. There was a flare-releasing trap door for the above units, as well as a drift signal ejector mechanism that consisted of six pre-loaded tubes for drift flare release.

WARNING (ALARM) BELLS

The alarm bell system control switch was located in the pilot's pedestal switch box. Eight alarm bells were installed, one each located in the bombardier's station, main cabin, wing passageway between the nacelles on either side of the bomber, main hatch, sleeping compartment, galley, and in the tail gunner's compartment.

LINES AND FITTINGS

All lines throughout the aircraft were identified by color-coded bandings painted on each section of line. A description and illustration of the various codes was provided. All lines running adjacent to or crossing each other, except those in the engine sections where temperatures exceeded 150 degrees, were tied together with strips in order to minimize vibration and prevent wear caused by them rubbing one another.

Fittings on the various lines throughout the aircraft were to be made of materials that would prevent electrolysis.

XB-19 CONSTRUCTION INSPECTION

In the company magazine *Airview*, Douglas boasted that during the aircraft's construction "no airplane was ever subjected to more rigid inspection than the B-19. It has been checked and double-checked from the time when this superbomber was little more than a gleam in the eyes of Douglas engineers."

Before construction began, Douglas and the USAAC examined blueprints and drawings with a "fine tooth comb" to determine if they conformed to both company and government standards – "the highest in the world. As the ship began to take form, every bolt, nut, rivet, part, and accessory ran the gauntlet of eagle eyes, not merely once but many times. Some of the more delicate installations went up time and time again against magnetic testing devices and even the X-ray." After passing inspection, valves, pumps, carburetors, plugs and fuel and oil tanks, if not in operation, would be safe-tied, sealed, or locked. Douglas claimed, "Every known method was used to assure the safety of the ship from the inspection standpoint."

Once the aircraft was completed and Douglas inspectors passed it fit for flight status, their USAAC counterparts needed to give their final approval. For this to be obtained, the company had to remove each of the XB-19's 89 internal and 135 external inspection covers. After this inspection was completed, and following the final engine run-up prior to the aircraft's first take-off, USAAC inspectors made a final pre-flight safety check. Only then would the USAAC's final inspection officer "sing out to the cockpit, 'Take her aloft, Maj Umstead!'"

The newly completed XB-19 is seen at Santa Monica shortly after its completion. After five years of development and construction, the completed aircraft was carefully towed out of the Douglas factory onto an adjacent ramp. Door sections had had to be removed before the huge bomber could leave the plant. The XB-19 was surrounded by A-20 Havocs whilst being built, and 14 examples – a mix of USAAC and RAF aircraft – of the highly successful Douglas medium bomber can be seen parked behind the behemoth. (Philip Jarrett Collection)

CHAPTER THREE

XB-19 FINALLY FLIES

Brake deficiencies discovered during taxiing tests would delay the XB-19's first flight. This photograph shows that the dorsal turrets (and other interior non-essentials) were removed to lighten the bomber in preparation for its first flight. The Clover Field concrete runway was also lengthened to ensure there was enough room for the untried, hefty bomber with underpowered engines to lift off in. (Peter Stackpole/The LIFE Picture Collection via Getty Images)

On September 10, 1940, the top secret status of the XB-19 project was removed and the USAAC introduced it to the public as a "gigantic new bomber for American defense," with the bomber designation B-19, rather than as an outdated design that was destined to become a "flying laboratory." Soon, a frenzied media hoopla followed, with the "wonder bomber" being featured in newspapers and magazines ahead of its first flight. Meanwhile, during the winter of 1940–41, the aircraft's construction continued at an increased pace to meet its first flight date.

The *Air Corps Newsletter* of May 15, 1941 likened the removal of the XB-19 from its Douglas plant home after five years of construction to that of trying "to get a boat out of a cellar in which it was built." A portion of the Santa Monica factory building and doors had to be removed to tow the oversized bomber outside by tractor. The *Newsletter* continued by extoling the (obsolete) bomber:

"The XB-19 is a tribute to the ingenuity and ability of the men of the Air Corps and the Douglas Aircraft Company who brought it into being. It is a monument to the farsightedness of the Secretary of War and the Senate and House Military Affairs Committees, who, in 1936, approved such a project and voted for the necessary funds to make the proposed airplane a reality."

Should the XB-19 have encountered problems during its initial flight, Douglas had much to lose both monetarily and in the estimation of Washington military "brass" and politicians. It was reported that a syndicate of insurance firms quoted the chances as 13-to-1 that the XB-19 would remain aloft for at least one minute. Douglas paid an enormous – for the time – $82,000 premium to insure the first minute

The XB-19's maximum gross weight of 162,000lbs, concentrated onto only three Firestone tires, caused the bomber to sink into the recently laid asphalt taxiways at Clover Field. The aircraft also cracked the concrete ramp at the Douglas Santa Monica factory. The problems caused ground testing to be delayed until reinforced taxiways and thicker concrete ramps and runways could be laid. Similar problems arose at March Field after the XB-19 landed there at the end of its maiden flight. Again, the taxiways and runways had to be reinforced. (Peter Stackpole/The LIFE Picture Collection via Getty Images)

of flight for a million dollar policy which was then the largest ever written on an aircraft. After the first critical minute of flight, the premium was reduced to a more reasonable $3,000 per hour on the same million dollar policy for the duration of the test flights until the XB-19 was accepted by the USAAC one year later.

For 11 days from April 14, 1941, in preparation for taxiing and ground tests and the greatly anticipated first flight, scheduled for May 17, Douglas conducted a ground school for USAAC flight crews, mechanics, and Materiel Division engineers. This course consisted of lectures, general discussions, and practical demonstrations that included instruction on all components of the aircraft – controls, structure, engines, auxiliary powerplants, propellers, and armament.

Initial taxi tests began on May 6, but the massive bomber, with a maximum gross weight of 162,000lbs concentrated onto only three tires, caused cracks to appear in the Santa Monica factory's tarmac aprons, taxiways and concrete ramps, imposing delays until thicker sections could be laid. Because the bomber had grown so heavy, it had to be lightened for a shorter take-off run so as to ensure there was sufficient runway to safely achieve flight.

The aircraft was to be flown with its undercarriage down, as the gear housings had been temporarily faired over to reduce drag on take-off. The fuel load was also kept to a minimum. Finally, the adjacent runway at Clover Field had to be lengthened at the cost of thousands of dollars; this undertaking also requiring the rerouting of a main street and the grading of a hill.

The brakes were quickly determined to be inadequate for a flight and landing attempt, as during initial ground runs acute brake "chatter" had caused the nose wheel torque cell walls to buckle near the front bulkhead, requiring their substantial reinforcement and postponing the first flight until May 24. However, further brake problems on the 23rd, which saw two inboard brake spiders fail and the torque bolts shear, delayed the first flight yet again. With the fabrication of new parts requiring several weeks, the first flight date was rescheduled for June 16. Repairs were completed by June 10, but subsequent brake problems caused another postponement.

So, after six weeks of delay, during which time Douglas engineers made many adjustments and modifications, and completed exhaustive trials with the brakes, the latter were finally considered safe enough for one landing. With the addition of 4,000ft of new and strengthened runway at Clover Field, the XB-19 was finally ready for its first flight on June 27. The aircraft was to leave its six-year Douglas Santa Monica/Clover Field home to fly just 22 miles to March Field, near Riverside, California.

Just before noon on the 27th, three blasts from the Douglas plant whistles announced to employees that it was time to leave for nearby Clover Field to view the first flight of "their" XB-19. The workers were only a small part of a large crowd of 45,000 that also included military and Douglas officials, assorted politicians and the general public. During the pre-take-off formalities, sacks of specially marked air mail envelopes, each with a canceled six cent air mail stamp affixed, were placed on board. This first day souvenir cover had the following stamped on the left hand side:

"B-19. Initial Flight of the World's Largest Airplane. The B-19 Douglas Super-bomber for the United States Army Air Corps. Clover Field, Santa Monica, California to March Field, Riverside, California."

With the XB-19 no longer considered "top secret," Douglas employees joined a large crowd of 45,000 on June 17 1941 to watch the aircraft – dubbed a "symphony of engineering genius" by the press – undertake its maiden flight. Donald Douglas was so concerned about the success of this event that he spent $82,000 ($1.4 million today) to purchase a million dollar ($17.6 million today) insurance policy to cover the perilous first minute of flight! (Author's Collection)

Escorting the XB-19 were six P-40C Warhawks of the 20th Pursuit Group's 77th Pursuit Squadron, based at Hamilton Field, near San Francisco, four DC-3s (three supplied by airlines) and a USAAC Douglas B-23 Dragon with photographers on board. Also circling Clover Field were two USAAC C-39s, loaded with specially trained paratroopers who were to protect the secrets of the "Colossus of Santa Monica" in case of a crash or forced landing. Their presence certainly added to the "B-19's" mystique – the press continued to erroneously refer to the XB-19 as the B-19.

The crew was limited to seven, and consisted of chief pilot Maj Stanley Umstead, co-pilot Maj Howard Bunker, Douglas engineers Jack Grant (flight engineer), Merle Steel (hydraulic engineer) and Raoul Escallier (electrical engineer), crew chief Mark Koogler (a civilian employee from Wright Field), and Lt Col James Taylor serving in multiple roles as flight commander, USAAC observer, and chronicler of the flight.

Douglas Vice-President and Chief Test Pilot Carl Cover was scheduled to have been at the controls for this first flight, but at the time he was recovering from the recurrence of a back injury he had sustained more than five years earlier when he skillfully set the XP3D-1 experimental flying boat down on Santa Monica Bay despite jammed controls. He broke a vertebra in the hard landing. The fracture seemed to have healed, but in March 1941 Cover was placed in a body cast and had to be satisfied with being a spectator while Umstead undertook the historic first flight.

Maj Stanley Umstead had entered the US Army in 1917, subsequently graduating from the first Army Air Service Officer Training School. He would eventually be considered the

A P-40C Warhawk of the 77th PS/ 20th PG from Hamilton Field stands ready to accompany the XB-19 to March Field. A total of six Warhawks would escort the bombers, as would four Douglas DC-3s (three supplied by airlines) and a USAAC B-23 photo-aircraft. (Peter Stackpole/The LIFE Picture Collection via Getty Images)

Pilot, Maj Stanley Umstead (left), and co-pilot, Maj Howard Bunker, pose for the camera alongside the bomber's huge nose wheel before climbing up into the bridge deck to start the XB-19's Wright R-3350s. The 46-year-old Umstead was a noted USAAC test pilot who had commenced his military career flying World War I-era Curtiss JN-4 Jenny biplanes. He was considered the "Dean" of American military test pilots during his 34-year career. (Author's collection)

"Dean" of all USAAF pilots, flying 350 different types of aircraft from World War I-era Curtiss JN-4 Jenny biplanes through to the first post-war USAF jets prior to his retirement in 1951.

The press release written by Lt Col Taylor post-flight gave a typical sugar-coated USAAC account of the event:

"The day was clear and a raising wind gave evidence that by noon a brisk wind, most favorable for take-off, would be blowing. A final check was completed and the airplane was searched for subversive activities, stowaways seeking a brief moment of fame, and any previously undiscovered defects or maladjustments. The Douglas Company secured the final, complete approval of the Army Inspectors. At 11:30 the crew entered the aircraft.

"The engines were started quickly and Umstead taxied to the far end of the runway for the scheduled 12 noon take-off. Slowly, the ship began to move down the runway; very slowly, it must have seemed, to those watching but with a tremendous surge of power to those aboard. Considerably before the estimated [take off] distance had been traveled, the huge machine was lunging to get aloft. Umstead was holding it down, 65, 70, 75 mph. It was drawing the huge crowd, thousands of people, which had encircled the end of the field, massed solid for blocks in every direction as far as the eye could see.

"When the pilot eased back on the controls, would it fly or crash ingloriously onto the massed public? Many came to see a Roman holiday, probably, and perhaps their unexpressed wishes would be granted. But when Umstead moved the controls, pulling the wheel back, ever so slightly, he discovered that he was flying a pursuit plane, not a bomber, for the huge machine came off with a rush, climbing at a tremendous rate.

"Quickly, he pushed the wheel forward, and then eased the controls into a normal rate of climb. This caused the bomber apparently to hesitate, to falter uncertainly in flight. Such was far from true, the lightness of the controls and the tremendous power of the 8,000 horses proving difficult to adjust to the feel of the pilot's hands in the first few seconds. We were off, using only 1,800ft of runway, and it was apparent that we could have left the ground much sooner.

"Gathering speed, she climbed rapidly, crossing the end of the runway high in the air with great excess of speed. The engines were throttled back but the landing gear could not be retracted because for this flight the landing chassis was faired in. It was to the great relief to all those aboard that we were flying in a real airplane, abnormal only in its size and potentialities.

"Circling out over the ocean and then back over the adjacent Los Angeles Airport, the El Segundo factory of the Douglas Company, and the waiting crowd took but a few moments for so fast a ship. As we had cleared the runway, we were attended by six P-40 fighters from Hamilton Field which were to clear the way and insure that there would be no interference from blundering or otherwise misguided airplanes. With this escort in close formation, we proceeded on schedule directly to March Field.

"We flew at approximately 4,000ft, flying at greatly reduced speed as we tried out the various controls and forces and becoming more and more satisfied as our tests and quick inspections proceeded that everything was functioning as planned. The view from the windows of the many gun turrets gave assurances that here was a bomber that could and would be defended. The long trip back to the tail gun turret to check the tail seemed the last long mile when undertaken shortly after take-off, but so satisfyingly solid and quiet was the journey that when the inspector arrived at the extreme stern position he was in a much lighter frame of mind.

"With everyone aboard serene, we approached March Field. Then came the big questions: How would she land? How would she handle? As large as March Field is, would it be big enough? How was the wind? Reassuring messages from the control tower reported that ever considerate Mother Nature had swung the wind obligingly down the main runway. The way was clear, all airplanes were down.

"Completing a long, circling approach, we continued straight back toward the field, diminishing our speed. We landed surprisingly short, even though we knew we were at least 30 tons light. No actual jar of contact with the ground could be noticed; it was difficult to know when we had actually landed. Slowly, the huge plane had settled down onto its nose wheel. Gently, the pilot had applied the brakes, wondering if they were alright after all these weeks. They were. Quickly we turned about, taxied back up the runway to the hangars, reached our parking position, and cut the switches. There we were; success at last. A quick look at the clock; 12:55 pm.

"Detailed tests of the myriad mechanisms with which this plane is equipped will continue for some time. These are items which must be completed by the manufacturer, as they form a part of the Douglas Company's contract. As soon as these hours of testing are completed, final acceptance will be made by the Materiel Division and the airplane will proceed to Wright Field for further checking, testing, and development. It will then become, in fact, the flying laboratory which it was designed to be. As the progenitor of its plan, a long life and happy one!"

Taylor's description of the first flight makes no mention of the bomber sinking into the recently laid asphalt apron at Clover Field, the combination of its great weight and the heat of the California summer sun causing the right main gear tire to bury itself several inches into the macadam. Douglas engineers scurried to gather wooden planks, which they placed in front of the large tire. Umstead opened the throttles but the aircraft did not move. Then, with increased power and full rudder, he managed to work the wheel out of the rut and toward the eastern end of the Santa Monica runway.

After Maj Umstead taxied the huge bomber to the far end of the Clover Field runway for its scheduled noon take-off, the bomber slowly lumbered down the runway, its natural metal skin reflecting in the California sun. Midway through its ascent, the aircraft fell into a harrowing drop, which Umstead expertly corrected. The XB-19 subsequently completed the 22-mile flight to March Field without further drama. The same could not be said about the landing, however. (Frederick A. Johnsen Collection)

Taylor's description of the take-off was also not accurate, for when Umstead reached 75–80mph and pulled back on the wheel, nothing happened. He then pulled even harder, at which point the nose began to rise, and then continued to rise at a very steep, unsustainable nose-up angle for such a large aircraft with such a low power-to-weight ratio. Umstead skillfully countered this by easing back on the controls, and this "caused the bomber apparently to hesitate." The "hesitation," however, was a gut-wrenching drop of more than several feet, as can be seen on the films of the take-off. Fortunately, Umstead was an exceptionally experienced test pilot conditioned to flying by "the seat of his pants," and he saved the aircraft by adopting a normal climbing attitude.

Taylor's description of the landing – "No actual jar of contact with the ground could be noticed; it was difficult to know when we had actually landed" – is even less accurate. There is an online *Movietone* newsreel video entitled "The B-19, the Largest Bomber Ever Built, Makes its First Flight," narrated by the inimitable Lowell Thomas, that documents the rather heart-stopping landing. The grainy film shows the aircraft swaying from side-to-side and then bobbing up-and-down on its final approach before touchdown. Then, Umstead bounces the aircraft four times.

The first bounce sees the XB-19 rise several feet above the runway, and then on the way down it touches the nose gear first, tipping the bomber's port wing down while rolling on the nose and port gear, with the starboard gear still off the ground. The *Movietone* narration merely describes the landing as "The rebounds were due to the bomber's vast weight." Despite having test-flown the YB-17 in 1936, Umstead seems to have had problems controlling the XB-19 on its first flight. Nevertheless, his experience as a test pilot almost certainly saved the aircraft from potential disaster on June 27.

The entire nation became aware of the first flight through the extensive banner headline coverage it was given in newspapers, as well as via the *Movietone* newsreels shown in theaters in every American town and city. However, media accounts of the first flight, and subsequent reports that appeared in print, began to demote the B-19's future role to that of a "flying laboratory," rather than "Guardian of the Hemisphere."

President Franklin D. Roosevelt sent the following congratulatory telegram to Donald Douglas shortly after the flight to March Field:

"The flight of the B-19 is indeed an outstanding achievement, and the part you played in this great undertaking is sincerely appreciated in these days of extreme peril."

However, Roosevelt's tribute was probably of little consolation to Douglas, whose company had invested $2.5 million in a project he had wanted to be freed from in order to spend the money on more profitable endeavors.

CHAPTER FOUR

AT MARCH FIELD

The XB-19 rolls along the runway of its new March Field home, which was then training USAAC aircrews as war raged in Europe. March Field had been established as Alessandro Flying Training Field in February 1918 in the wake of America's entry into World War I some ten months earlier. Assigned to the Fourth Air Force during World War II, it would be home to final aircrew training phases for many bombardment (30th, 453rd, and 399th BGs, for example) and fighter groups prior to them being posted into combat in the Pacific theater. (Frederick A. Johnsen Collection)

When the XB-19 landed at March Field on June 27, upon touchdown and during subsequent taxiing the aircraft's massive eight-foot-diameter tires again damaged taxiways and its parking apron. This damage prompted an investigation by the US Army Corps of Engineers that eventually led to the development of new design procedures to enhance compaction of pavement subgrades, which became the Modified Proctor Compaction Test that remains in wide use today in the construction of roads, highways, and airports.

After landing at March Field, the XB-19 had armament and other equipment installed which had been omitted so as to lighten the bomber for its first flight. Two tons of flight test equipment was also added at this time. Orders included an option so that either the USAAC or Douglas, or both, could provide the pilots and crews for flight tests. The contracted 30-hour test program was largely devoted to the Douglas crew instructing the USAAC crew about their new aircraft, and then performing their initial set of flight and handling trials. Douglas was obligated to furnish all flight test and maintenance personnel during the flight test period. A team of approximately 50 company engineers, technicians, and service personnel were on hand to tend to the XB-19 during its testing period until the aircraft was delivered to the USAAC.

The official USAAC public release of data on the XB-19 began by sealing its fate as a flying laboratory:

"This airplane represents a further step toward solving the question of the best combination of size, speed, range, weight, and carrying ability in view of the latest requirements for bombardment airplanes.

The XB-19, with its aft dorsal turret already refitted and weaponry installed in its nose turret, is readied for flight and handling testing during its contracted 30-hour test program undertaken by Douglas. During the early days at March Field, company air- and groundcrews spent much of their time educating and demonstrating their new aircraft to future USAAC crews prior to the XB-19's official acceptance. Approximately 50 Douglas engineers, technicians, and service personnel tended the XB-19 at March Field under USAAC supervision. (Author's Collection)

Once in the air, the great ship will be given the most thorough series of flight tests any airplane has ever had. The Army plans to turn it into a virtual flying laboratory for gathering and checking tactical and structural data from which will come more great long-range bombers and cargo and troop transports of the future."

An article, aptly titled "Flying Laboratory," published in the company magazine *Douglas Airview* on the eve of the aircraft's first flight concisely sums up the XB-19's function at March Field:

"The selected group of U. S. Army Air Corps and Douglas Aircraft company engineers and technical experts who will conduct flight tests of the B-19 have mapped their program in an exacting and matter-of-fact manner, accepting their dramatic role as a routine task that in the normal course of things will follow completion of the super-bomber.

"When the great airplane roars down the runway at Clover Field under the skilled touch of Maj Stanley Umstead and takes wing for March Field, it will already have been equipped with the principal portion of its test equipment. After the landing at March, more will be set in place, to make up the largest quantity of test equipment ever installed in a single airplane – nearly two tons of it.

"How extensive is the test program? Air Corps specifications call for recorded test flights aggregating 30 hours of flying time. This may extend over a total working time of weeks or even months. It involves putting the giant B-19 through rigid proof-testing under the severest conditions, tests that will prove the strength of every inch of its structure and demonstrate the quality of every item of its equipment.

"Much of this testing was done before a single rivet was hammered home. In fact the engineering design of the B-19 and all important parts were 'paper tested' in the blue-print stage. For this reason, unlike the DC-4 procedure, it was not necessary to subject the completely assembled plane to as exhaustive a series of static tests. However, interrelated structures on the finished product were static tested to substantiate the coordinate strength of surfaces and adjacent structures.

"Thus wings and the fuselage were tested to several times maximum load capacity, by sections as well as complete assembly. The wing was also checked to determine its ability to support engine nacelle loads, with approximately 15,000lbs applied to the powerplant assembly's center of gravity.

"Each control surface was static checked for strength and stiffness. Tail surfaces were loaded to 27,800lbs and all tests were made with due consideration for effect of the full wing span. Not only was each portion of the system subjected to separate tests for strength and rigidity, but the complete control system as a whole was tested to Douglas standards and the Army Air Corps requirements. All of this proving was done under the supervision of Rodney Dunbar, whose Department 76T is under the direction of Wilbur Horton.

"Prior to all this, of course, were the wind tunnel scale-model tests to which all planes are subjected. Total time devoted to wind tunnel testing amounted to 800 hours. Vital and successful as these were, they were but preliminary to the "acid test" under service conditions in the air.

"At March Field a group of approximately 50 Douglas engineers, technicians, and servicing experts will groom and handle the B-19 during the period of its flight tests, remaining with the big ship until its formal delivery to the Army.

"Air Corps shops and equipment at the field will be made available for the airplane's servicing and maintenance.

The XB-19 eventually began its test program at March Field after being fully refitted with turrets, armament, and other equipment that had been removed to lighten the bomber for its first flight. Also, nearly 4,000lbs of test equipment was installed, which, according to Douglas, was the largest quantity ever fitted into an aircraft. This photograph was taken from an AT-6C Texan observation aircraft. (Frederick A. Johnsen Collection)

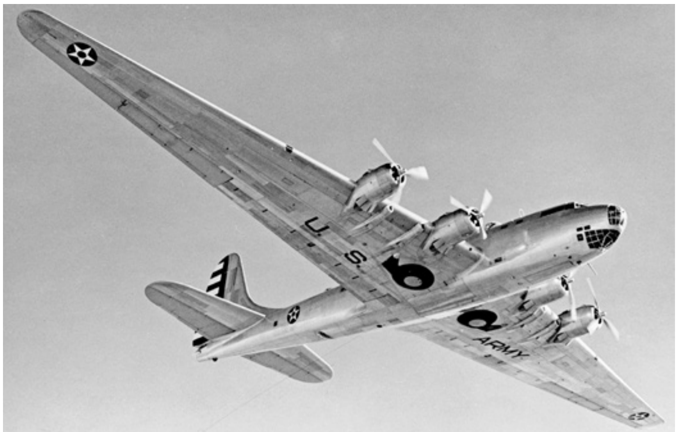
"With Maj Umstead at the controls, and Maj Howard Bunker as co-pilot, a dozen Douglas and Army technicians stationed at various posts in the big plane during its flight-tests will act as observers, read instruments, and record data. Maj Umstead, because of his many years of experience in test and service flying of the largest types of Air Corps bombers and transports, is eminently qualified to take the controls on the first flights of the new super bomber. As Chief of the Flying Branch of the Air Corps' Materiel Division, Maj Umstead has test flown all the Army's 'flying fortresses' and other large-type bombers including the B-15, B-17, and the more recent B-24.

"Flight plans call for one of the most extensive testing programs in the history of aviation. It is a program that will employ equipment costing thousands of dollars and weighing nearly 4,000lbs. To link the multitude of pickup points, instruments, and automatic recorders, nearly ten miles of wires and tubes are required.

"During preliminary flight-tests, engines, propellers, controls, landing gear, brakes, and auxiliary powerplants are to be given every manner of rigorous test. Following this, performance tests for instrument calibrations, speed at various altitudes, landing and take-off distances, range under different load conditions, and climbing at varying power and engine combinations. Third phase of testing will comprise cooling tests for engines and fuel and oil installations.

"Extensive tests also will be conducted in connection with stability and controllability, structural strength, heating and ventilating, and other phases.

"Elaborate equipment will be employed to make readings at literally thousands of pickup points, show these readings on instruments assembled on special panel boards, and automatically record the data by means of still photographs taken at regular intervals and on cine film shot by movie cameras operating continuously and automatically in front of the panel boards.



The XB-19's second public demonstration was organized to complement the dedication of Douglas' Long Beach plant on October 17, 1941. This photograph shows the aircraft, with Col Stanley Umstead again at the controls, headed for the Los Angeles coastline after an uneventful take-off from March Field. (Frederick A. Johnsen Collection)

"To check temperatures and pressures of the powerplants and their accessories, thermocouples at various locations will send impulses along miles of wire and tubing to indicators assembled in special test quarters. The thermocouple is a thermometer-like device that registers heat by converting it into electrical waves which are transmitted to an indicator that gauges millionths of a volt. Through an additional network of wires, gauges scattered throughout the airplane will provide impulses to form lines on graphs, instantaneously recording even the slightest stress or strain.

"Douglas flight-test plans, extensive as they are, do not complete the story of the B-19 as a "flying laboratory," for after USAAC acceptance of the super-bomber it will undergo further checks and tests. From this combined program will come information and data on the design, construction, and operation of large airplanes that augur a new era in the inspiring advance of aviation."

In July 1941, several USAAC Testing Change Orders were implemented that limited the number of flights made by the XB-19 and stipulated the generation of specific testing information. During the flights that were conducted, the aircraft again suffered from brake and engine cooling problems. There were also a few minor rivet failures in secondary structures, together with the "usual" failures of engines and accessories. The test program was delayed many times due to the lack of spare parts for failed equipment, with replacements having to be remanufactured. The paucity of parts was typical for prototypes and experimental aircraft.

Ultimately, support from Douglas dwindled, and the USAAC duly assumed control of the aircraft in October 1941. From that point on, the test program was continued at government "risk," but with Douglas continuing to provide all engineering and maintenance personnel.

This colorized Douglas advertisement from late 1941 shows the XB-19 during its second public exhibition, the aircraft making its second pass over the windowless, blacked-out 200-acre Long Beach plant. The text accompanying the advertisement described the XB-19's pass as "straight and level at full throttle, in front of the viewing stand at a breath-taking 50ft," the pilot then "zooming it skyward like a pursuit plane." (Author's Collection)

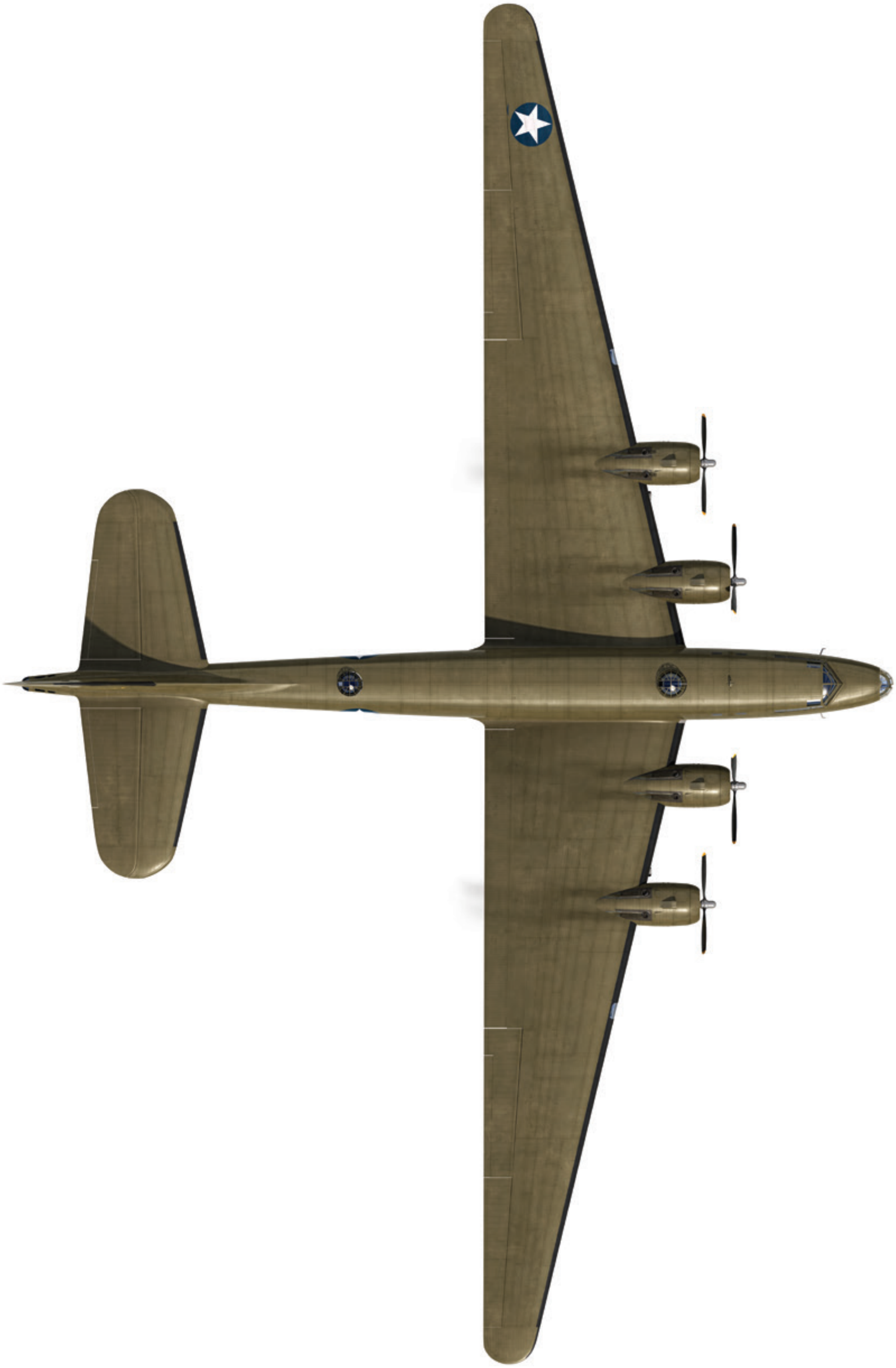
SECOND PUBLIC DEMONSTRATION

Whilst the XB-19 was undergoing testing at March Field, a second public demonstration was arranged on October 17, 1941 to complement the dedication of Douglas' Long Beach plant. Newly promoted Col Umstead was again at the controls, and Carl Cover's back had healed sufficiently for him to act as co-pilot. After an uneventful take-off and 50-mile flight,

the XB-19 was recorded by a *Movietone* crew as it approached the plant. The footage would subsequently appear in a newsreel entitled "Douglas B-19 Fly-Over Long Beach 'Blackout' Factory."

The narrator of the film stridently described the XB-19 as it approached "America's newest and most modern airplane plant" at 200ft and "burst out of a blank sky over the heads of the crowd." Umstead made a second pass at a breathtaking 50ft, straight and level and at full throttle, in front of the crowded viewing stands that were flanked by parked A-20s. As all heads turned at the end of his pass, the *Movietone* narrator reported that Umstead "pointed the ship skyward and [it] went up like a pursuit plane in the most dramatic air show in history." While the Douglas Long Beach Plant would not build a single B-19, its workers did construct 3,000 B-17F/Gs and 1,000 A-20Bs.

Seven weeks after the Long Beach display, America found itself at war with Japan following the surprise attack on Pearl Harbor on December 7, 1941. The USAAC quickly applied Olive Drab and Neutral Gray camouflage over the XB-19's natural metal. The general observation was that the paint made the XB-19 appear much smaller than when it was in unpainted aluminum finish. The aircraft's full armament and ammunition allocation was also added, with trained gunners manning



DOUGLAS XB-19 38-471, MARCH FIELD, CALIFORNIA, SEPTEMBER 1942 the weapons on all flights from March Field during its final months on the West Coast. Precautions were also taken on the ground to prevent potential damage by Japanese saboteurs or by enemy air raids on March Field – sentries and anti-aircraft guns were soon in place, and they remained on alert at all times.

While the XB-19 was at March Field, the public could not fail to see it parked there, and gawk at the spectacle of the huge aircraft flying overhead during its various test flights. In this early war period, the press continued to view the Douglas aircraft as a long-range bomber capable of targeting Tokyo, despite both the USAAC and Douglas insisting that the XB-19 was not a hemispheric bomber but a flying laboratory. The confusion as to the aircraft's exact role also existed in the military, too. There is an interesting telephone transcript in the National Archives that illustrates the ambiguity surrounding the purpose of the XB-19, and what to do about it. A USAAC public affairs officer named Capt Swasey had the following discussion with a Maj Miller:

Swasey – "I have tried to get something straightened out on your B-19. Nobody knows a damned thing about it. I have talked with the executives, Col Ordway, who is Gen Echols' executive, and he has no record of any orders on the B-19 other than the ones I mentioned; now they tell me that the B-19 is in the hands of the Experimental Engineering Section. I contacted Experimental Engineering and they have nothing on it other than the original issues. The upshot of the thing is that I could probably get together with Col Chidlaw and get out some sort of a policy on it."

Miller – "Well, Col Volandt and the now-Gen Meyers know the whole situation because they talked to Gen Kenney or Gen Wolfe, somebody here, and topside should be apprised of the whole thing."

Swasey – "Well, it's funny, they don't seem to know anything about it. I will tell you the biggest objection on the publicity of the B-19 from the public relations' point of view is that a lot of these half-cocked writers have talked about the B-19 as a terrific weapon of warfare, and it is nothing but a laboratory."

Miller – "Yes, that's right."

Swasey – "The public is saying 'If it's that kind of a ship, good God, what are they keeping it around here for? Why isn't it out over Tokyo?'"

Miller – "Well, at the same time, if that has been the case, it seems to me that some good publicity the other way [explaining its role as a flying laboratory] should be put out at the present time."

Swasey – "You are 100 percent right. That's my attitude too, and I talked to Experimental yesterday, and my thought is that any general publicity about the ship of the right nature is perfectly alright. The only thing I think they are entitled to not having, or not

After the impressive factory dedication flight, the company decided it was a good time to publicize "the world's largest bomber to help make America supreme in the air" in a national media advertisement campaign undertaken by Douglas, "the cradle of the airliners." A lone DC-3 and a handful of A-20s surround the XB-19 in this illustration, the twin-engined types being added to lend scale to the bomber. (Author's Collection)

This beautiful overhead photograph, taken from a USAAC C-39, shows a shining XB-19 flying over the outskirts of Los Angeles and the foothills of the San Gabriel Mountains during "one of the most extensive testing programs in the history of aviation." At this time both Douglas and the USAAC continued to refer to the bomber as the B-19, rather than the XB-19. During the initial set of flight and handling trials, the most troublesome items were the brakes and cooling for the R-3350 engines. These issues would continue to plague the XB-19 until it was re-engined. The same problems would later afflict the B-29. (Peter Stackpole/The LIFE Picture Collection via Getty Images)

wanting, are details of any particular experiments that are being conducted at Wright Field at the present time."

REPORT TOWARD FINAL ACCEPTANCE

On February 26, 1942, via a Memorandum Report, the USAAC filed its 689 Inspection of the XB-19 after flight tests. The "aircraft was accepted as to workmanship and conformity with requirements and good practice." However, due to the "cooling deficiencies" of the R-3350 engines, which were considered "impractical to correct," some of the "guaranteed" performance factors were not met. The USAAC was unfazed by these problems, considering the deficiencies as "not representing the practical values to which the airplane is limited."

The tests had been flown with the cowl flaps both opened and closed for operating comparisons:

	GUARANTEED PERFORMANCE	TEST – COWL FLAPS OPEN	TEST – COWL FLAPS CLOSED
High Speed (mph)	210	204	224
Operating Speed (mph)	186	165	186
Cruising Speed (mph)	140	120*	135*
Service Ceiling (feet)	22,200	23,000	-
Maximum Range (miles)	7,750	6,840	7,710
Endurance at Cruise (hours)	42	34**	40**
*Constant speed for 42 hours' endurance gave a range of 5,040 and 5,660 miles			
**Endurance of 34 and 40 hours gave a range of 4,760 and 5,600 miles			

The 689 Report described the XB-19 as having;

"Excellent flying characteristics, and the stability–control combination is satisfactory. The airplane is directionally and laterally stable, and has approximately neutral stability longitudinally. Slight spiral instability exists, but in this respect it is better than most Air Corps airplanes.

"The controls, particularly the elevator, are very light for an aircraft this size. There is a time lag in the order of 0.3 seconds between control movement and airplane response. Response is very positive. Pilots have some tendency to over-control until they are familiar with the feel of the airplane. Thereafter, no trouble was encountered.

"There is sufficient elevator control to stall the airplane at altitude, but due to the large ground effect, a stall cannot quite be obtained within 50ft of the ground. This effect is noticeable in the take-off and landing of the airplane."

The 689 Report concluded:

"The XB-19 has been designed and tested in conformity with requirements. The contractor used great ingenuity and skill in the

After America entered the war, the USAAC quickly applied Olive Drab and Neutral Gray camouflage over the XB-19's natural metal finish and installed its full armament and ammunition allocation. Gunners would man their positions during a number of the test flights from March Field in early 1942, when it was feared carrier-based aircraft from the Imperial Japanese Naval Air Force would launch attacks on the California coast. (Frederick A. Johnsen Collection)

development and construction of this airplane. Limitations imposed on the airplane by the engine cooling difficulties are not the responsibility of the airplane contractor, as tests indicate the defects are inherent in this airplane/engine combination.

"Actual experience in developing this project and the data accumulated during tests of the airplane are of inestimable value to the entire aviation industry.

"The XB-19 project has fully and adequately served its purpose by having greatly simplified the future of large combat and commercial aircraft design and construction. This project forms a large part of the foundation for the current large airplane construction program."

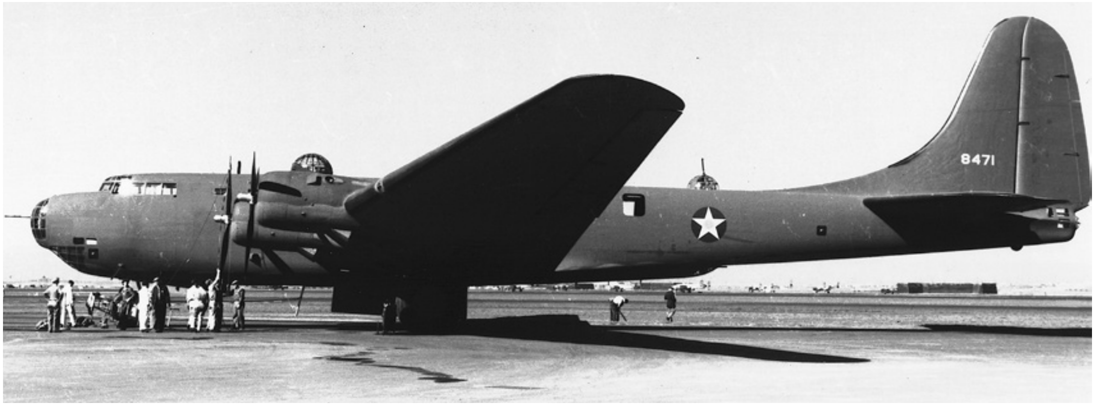
After a total of 55 hrs 30 min of flight testing, final adjustments and modifications were made, test equipment was removed, and the aircraft prepared for final delivery to the USAAC. Following a full year of testing, and prior to the XB-19 being accepted by the USAAF (as the USAAC had been redesignated on March 9, 1942) in June 1942, both Douglas and the USAAF realized that the proposed bomber was obsolete as a combat aircraft. It was a virtual white elephant, upon which $4 million had been spent – a staggering (at the time) $2.5 million came from Douglas company funds.

Since the public was in awe of the aircraft, but still generally unaware of its ultimate purpose, the USAAF felt the need to validate both the B-19 concept and the time and money spent building it. The following press release tried to explain this:

"The B-19 has far exceeded our expectations. As a military airplane, it can immediately be put into several uses besides bombardment. More than one service, in fact, is serious to get a hold of it.

"It is as an experimental flying laboratory, however, in which the greatest value of this airplane lies, and in that respect it has already more than repaid the huge sum of $3.5 million [a figure later revised upward] invested in it. In construction and under brief flight testing, many theories, vague before, have been crystallized into certain knowledge. Much has been learned from this airplane.

"When engineers began to design the B-19, a monocoque wing of 212ft spread had never been used. In spite of calculations based on known factors, it could not be foretold what unknown factors would



After a year of testing and the expenditure of a staggering $4 million (about $74 million today), $2.5 million of which was Douglas company money, the XB-19 was accepted by the USAAF during June 1942. (Frederick A. Johnsen Collection)

enter in or how sound such a structure would prove. It is now positively known that such a wing is thoroughly sound.

"It has been further discovered that the bigger the wing, the greater the carrying power per square foot. Had this been previously known with certainty, a wing of smaller area could have been used for the B-19's proposed load, or a larger load could have been imposed with the present wing. In other words, these discoveries have led to the development of new criteria, making possible enormous savings in unit weights of future designs."

The USAAF specified that much had also been learned regarding the landing gear for very large aircraft, including the required strength of the wheel struts, wheel hubs, and brakes. The B-19 had introduced the installation of power-operated turrets for flexible guns and investigated the feasibility of (gun) fire control.

The USAAF stated that when performance testing had been completed at Wright Field, the "airplane will be used to gain further knowledge on extremely long-range operations under various gross weights and ceiling conditions," although this ultimately never transpired. The release concluded, "It would be short-sighted indeed to assume that under present war conditions, all experiment and research must be halted. In modern war, the research front can no more be neglected than the fighting front."

CONTRIBUTIONS AS A FLYING LABORATORY

The validation of the XB-19 as a "flying laboratory" rather than as a "Hemispheric Bomber" was continued in the popular press by Edward Churchill writing in the July 1942 issue of *Flying Magazine*. His article, titled "What We Learned from the B-19," stated:

"With an estimated $3,500,000 to $5,000,000 invested in the 212ft wing-spread and 82-ton weight of the B-19, and with that giant bomber – the biggest in the world – having undergone a series of USAAF performance tests since it was flown for the first time more than a year ago, America is asking what value the plane has?

"As this is written, the aircraft is at an undesignated airport going through unknown tests, performing unrevealed services. America's millions, given breathtaking statistics, have probably been nursing a secret desire to hear that it has bombed Tokyo. Certainly, to the man in the street, it should be able to do something. Can't it lift its own weight in payload? Can't it carry 18 tons of bombs 7,750 miles?

"From this distance, it is impossible to predict whether or not the 82-ton leviathan, known to the thousands who worked on it as "the flying overcast," will be sent on such a mission. If it isn't, Americans will ponder the fact that four years went into its building while other, faster planes could have been built, and that 700,000 hours of engineering and 42,500 hours of researching and testing were consumed.

"Remember, it was touted by the newspapers as the "hemispheric defense plane," which could fly more than a quarter of the distance around the world without refueling on bombing missions, and could fly 125 fully armed troops across our own continent non-stop. Yes, it can do these things, but it is doing an even bigger job. It's a flying laboratory.

"Those who have been watching the whole-hearted collaboration of the various aircraft companies, the Army Air Forces, and what was once the automotive industry will tell you that new planes are now possible because of what has been learned from the construction and testing of the B-19. The B-19 performance reports show conclusively what can be done with bigger bombers, and that vast airplane is helping to get underway the greatest aircraft construction program in the history of the world.

"If the B-19 has added to the total of our knowledge of large heavier-than-air craft, it has fulfilled a greater mission than it might if it was used to bomb our enemies. If it is leading to advances in the field of aerodynamics, it has achieved far more than it might by flying 125 men somewhere or another.

"Engineering consensus is that the plane is underpowered, but that is not the fault of the plane. It carries four of the largest motors that could be had at the time, each developing 2,000hp. Perhaps it hasn't reached that estimated cruising speed of 186mph, and, if it has, that's lamentably slow. An absolute ceiling, with the air war going higher and higher, of 22,000ft is hardly adequate. But the B-19 is a prototype, its great wings shadowing the things which are to come. Greater horsepower, turbo-superchargers, and other mechanical advances, including perfected pressurized cabins, are being developed and produced by American genius."

With the departure of the XB-19 from March Field for Wright Field, the *Douglas View* company magazine issued the following promising blurb, entitled "Airplanes of Tomorrow":

"From it [the B-19] Douglas engineers and shop men have probably already learned more about large, long-range airplanes, their problems, their performances, and their costs than is known by anyone else in the world. The only ship of its type in the world today, it will in the future become the experimental model from which will come the great transcontinental and transoceanic landplanes of the future, the airplanes that will conquer any distance to any place on the surface of the globe."

CHAPTER FIVE

WRIGHT FIELD FLYING TEST BED

In its role as a flying test bed, the XB-19 was fitted with Allison V-3420-11 inline engines in place of the R-3350s that initially powered the aircraft. It became the XB-19A once the engine change had been made. (Gerald Balzer/Frederick A. Johnsen Collection)

On January 23, 1943, the XB-19 left March Field for Wright Field, in Dayton, Ohio. By the time of its departure at 1520 hrs, the aircraft had amassed just 70.03 flying hours. After seven hours in the air, the XB-19 landed at San Antonio, Texas, for an overnight stop. The following day, it flew a further six hours to Wright Field. America's would-be intercontinental bomber had just made its longest flight, which covered less than 2,000 miles – hardly intercontinental, or even transcontinental.

The XB-19 had been flown by Col Stanley Umstead, who had been the aircraft's only pilot up to this point. His co-pilot, Maj Howard Bunker, had also served in this role on all of its test flights from March Field. For the transfer flight, Umstead and Bunker had been joined by a flight engineer and several members of the Douglas groundcrew.

Upon the XB-19's arrival at Wright Field, the War Department ordered the aircraft's presence to be kept secret, and no visitors were permitted to see it on the flightline. There was to be no publicity to mark its transfer to Ohio, and unlike the present-day media, the local Dayton newspapers and radio respected these orders – indeed, they were deemed by the USAAF to be "especially cooperative in withholding any reference to the airplane whatsoever."

However, the XB-19 was parked on the Wright Field ramp for several days, and the surrounding roads were crowded with automobiles that

On January 23, 1943, the XB-19 left March Field for Wright Field, where its presence was to be kept secret. Hiding the aircraft proved to be an impossible task, both on the ground and in the air, and the USAAF was eventually compelled to acknowledge its giant bomber. Any reference to it in the press saw the aircraft described as “a laboratory rather than a tactical aircraft,” and no details were published concerning the nature of its experimental projects. (Author’s Collection)

slowed to allow their occupants to “rubberneck” at the bomber, which was in easy view. Soon, it became apparent that the local population was well aware of the aircraft’s presence, especially after the XB-19 began routinely flying overhead. The USAAF had no choice but to acknowledge the bomber’s presence, instructing local press to describe the XB-19 as “a laboratory rather than a tactical aircraft. Present experimental projects were not to be disclosed, and information and photographs previously released would form the basis for the general limitations of information to be released.” The USAAF’s previous touting of the B-19 as a “terrific weapon of war” was thus to be offset by “emphasizing the value of the airplane as a laboratory.”

As local interest became more widespread, Brig Gen Arthur W. Vanaman, then Commanding General of the Materiel Center at Wright Field, had to organize a news conference on June 2, 1943, during which he made a brief statement on the value of the aircraft as a flying laboratory. After Vanaman’s statement, a tour of the XB-19 was conducted under the personal supervision of now-Col Howard Bunker, who warned the visitors “not to touch anything” during the tour. The two Dayton newspapers were handed a “guideline” of the “main facts” to publish in their articles, and reported “everyone left the conference pleased.”

MODERNIZATION

Following delivery of the XB-19 to Wright Field, the aircraft was modernized and tested as follows:

1. The most significant change was the substitution of the more effective Bendix disc brakes for the originally installed, chronically problematic, 30 x 8in. drum type, which had delayed the first flight in June 1941.
2. Conversion of 12-volt electrical system to a 24-volt system.
3. Installation of 24-volt auxiliary powerplant, deleting the need for ground-charging batteries.
4. Incorporation of 24-volt engine starters, replacing the original 110-volt system.
5. Partial provision for future conversion to complete 24-volt electrical system, replacing the 110-volt auxiliary powerplant.
6. Installation of eight Stewart-Warner heating system units, replacing the boiler system.
7. Installation of low-pressure, demand-type oxygen system of increased capacity.

8. Tentative provisions for modern dorsal and ventral twin 0.50-cal turrets.
9. Total revision and modernization of radio equipment.
10. Installation of newest Automatic Flight Control System.
11. Installation of improved accessory gearbox clutches.
12. Addition of cylinder base thermocouples.
13. Installation of windshield wipers.
14. Installation of an updated electric hot plate in the galley.

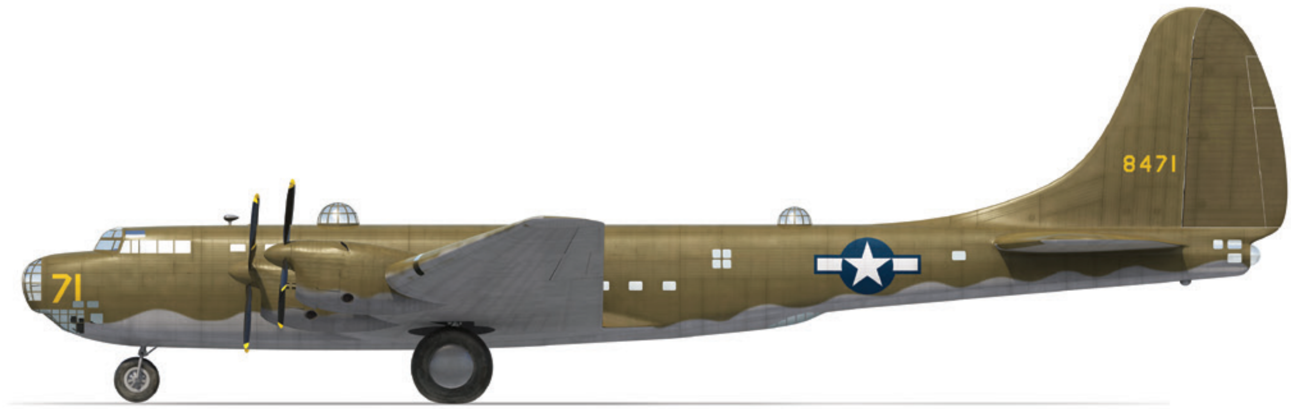
Engine cooling/over-heating continued as the only major problem, and it was prevented by keeping the cowl flaps of the Wright R-3350s open at all times during long flights. This reduced the maximum speed by 20mph to 204mph at 15,700ft.

Six months after the XB-19's arrival at Wright Field, the following USAAF Technical Report from July 18, 1943 officially accepted the aircraft for military service:

"The XB-19 airplane, AAF Serial Number 38-471, is acceptable to the government. Guarantees have been substantially met or exceeded and the airplane is in accordance with Douglas Aircraft Company Specification D5-1670, amended by Changes Nos. 1, 2, 3, and 4 to Contract W-535-AC-8132. The art of aeronautical design has been substantially advanced due to the successful construction and test of this airplane."

Shortly thereafter, Douglas was paid $1,400,064 by the government, which represented a considerable loss for the company, as it had spent nearly $2.5 million of its own funds during the aircraft's design and construction. Despite the money already spent by both Douglas and the USAAF, the costs associated with the investigation into and remedy of the persistent engine overheating problems had not been addressed. However, by this time, Douglas' XB-19 losses had been quickly recouped by the value of the contracts it held for the construction of more than 10,000 C-47s, 1,168 C-54s, nearly 6,000 SBD dive-bombers, almost 7,500 A-20s for Lend-Lease (for the Soviet Red Air Force and the RAF) and USAAF contracts, and, from mid-1944, for 2,500 A-26 attack bombers. Douglas certainly was flush.

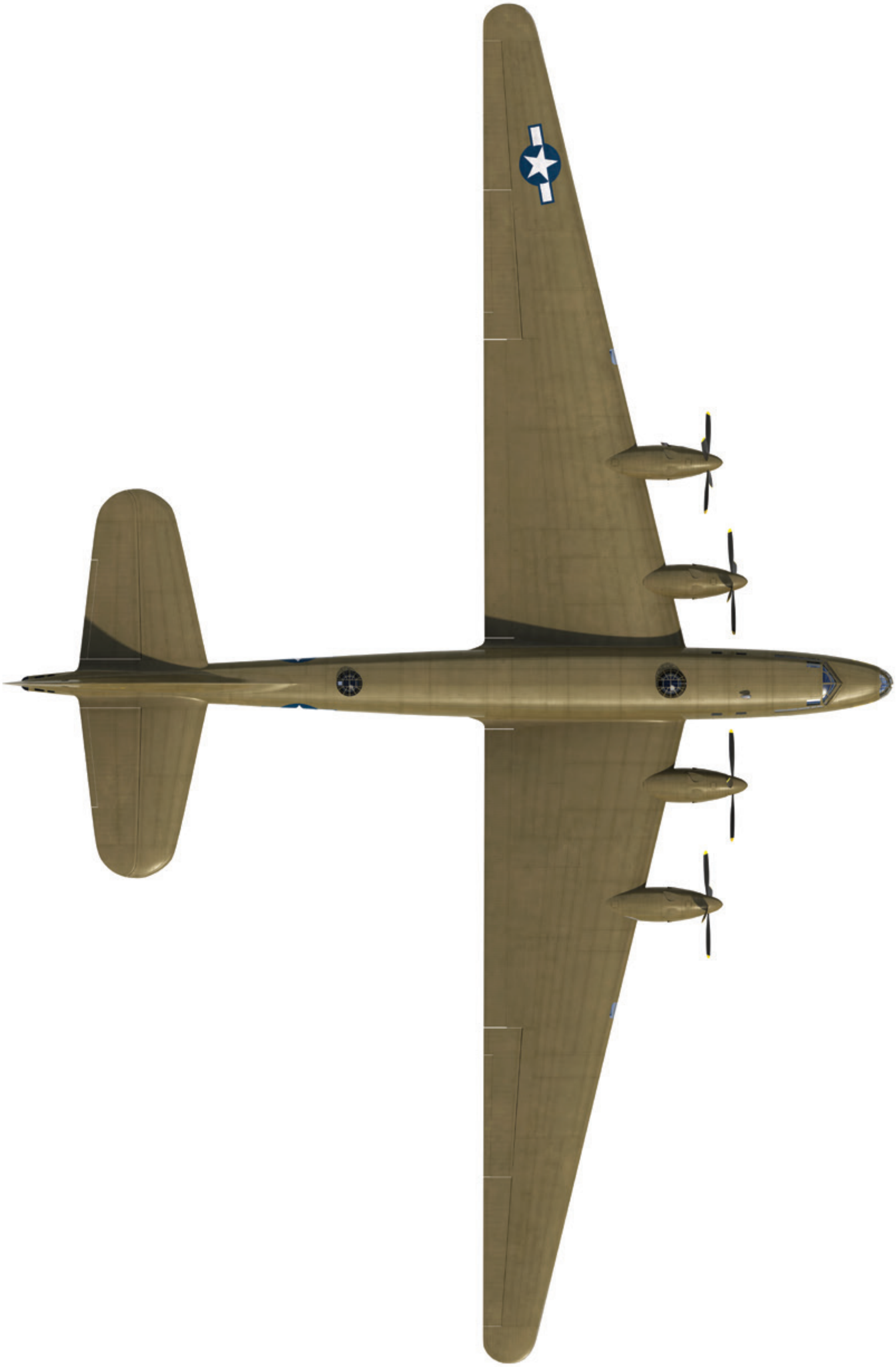
Following the XB-19's delivery to Wright Field, the aircraft (seen here flying very low directly over the airfield) was extensively modernized and tested. (Frederick A. Johnsen Collection)



XB-19A FLYING TEST BED

As a flying test bed, the XB-19 had assisted in the development of the radically new Wright R-3350 Duplex Cyclone powerplant, which was later successful in powering the B-29, B-32, and C-69. Once R-3350 testing was completed, the aircraft was to be flown to Romulus Army Air Field in Detroit (now Detroit Metro Airport), Michigan, where the Fisher Aircraft Division of General Motors was to install 2,600hp Allison V-3420-11 turbocharged, 24-cylinder liquid-cooled engines. These were the powerplants that had originally been intended for the aircraft back in 1935. When the modification was completed, the XB-19 would be redesignated the XB-19A.

During the mid-1930s, the belief was that the next generation of high-powered engines would all be liquid-cooled. In 1936, the USAAC initiated discussions with Allison for the development of just such an engine in the 2,300hp class. This would duly become the V-3420 – the product of the coupling of two V-1720 engines, resulting in a 3,000hp, 24-cylinder liquid-cooled, inline engine. Potentially the most powerful engine available during the late 1930s and early 1940s, the V-3420 was often considered for use either in an original design concept or as a retrofit to improve existing aircraft performance. During its lifespan,



DOUGLAS XB-19A 38-471, WRIGHT FIELD, OHIO, JANUARY 1944 the engine went from A-1-A top priority to suspension, depending on the project de jour, real or fanciful, and, finally, to cancellation.

ALLISON V-3420 DESCRIPTION

The V-3420 was a 24-cylinder, double-V, twin-crankshaft, liquid-cooled engine derived from coupling two V-1710 12-cylinder engines. The V-1710 was the only US-developed V12 liquid-cooled engine to see service during World War II, powering such aircraft as the Lockheed P-38, Bell P-39, and the Curtiss P-40.

Basically, the V-3420 was two V-1710 engines mounted on a single common crankcase, with the two crankshafts geared together as W24 twin-V12s, giving this engine its characteristic letter "W" frontal appearance. Allison was able to utilize most of the V-1720's components in the double-V, as there were only 930 parts unique to the V-3420 out of a total 11,630 parts. Each pair of cylinder banks retained the 60-degree V angle, with the inner banks 90 degrees apart, placing the centerlines of the Vs 150 degrees apart. The major obstacles for Allison when it came to developing the V-3420 were the size of its frontal area small and total weight.

When Douglas began work on its secret XBLR-2 experimental bomber on February 5, 1935, the USAAC specification stipulated that the aircraft was to be powered by four 1,600hp Allison XV-3420-1 engines, and that it had to be completed by March 31, 1938. Because of insufficient funding during the Depression, the USAAC was unable to payroll the XBLR-2 project to meet the specified schedule. As a result, the design underwent a protracted developmental period, during which time many changes were mandated. Probably the most significant of these was the substitution of the radically new and untested 2,200hp Wright XR-3350-5 air-cooled engine for the X-3420-1 with the latter's cancellation in 1936 because of a defective fuel injection pump design. Following the engine substitution, the XBLR-2 was redesignated the XB-19 on March 8, 1938.

While the early XB-19 project labored and Donald Douglas threatened, and was refused, his August 1938 request to cancel the project, Allison's development, at its own expense, of the innovative XV-3420 engine also continued into the late 1930s. By then, the USAAC's Air Materiel Division had scaled back its interest in the engine due to difficult-to-realize design specifications and changes.

One of the areas that significantly delayed XV-3420 testing was the lack of a suitable facility in which to run a very large Curtiss Electric four-blade 18ft 2in. diameter propeller. Eventually, such rigs were built both by Allison and the Air Materiel Division at Wright Field.

At the end of 1939, the only operable XV-3420 engine was displayed at that year's World's Fair in New York City, where it garnered considerable attention. By the summer of 1940, Allison was greatly expanding its engineering and production capacity to manufacture V-1710s to power thousands of P-38s, P-39s, and P-40s. Thus, in September 1940, the USAAC suspended all work on the XV-3420 and, three months later, recommended it for disposal after officially

Once R-3350 testing had been completed, the XB-19 was flown to Romulus Army Air Field, where the Fisher Aircraft Division of General Motors installed 2,600hp Allison V-3420-11 engines. This photograph was taken shortly after the powerplants had been fitted by Fisher and prior to the commencement of flight testing. (Philip Jarrett Collection)

stating that "this engine is of no further value to the Air Corps for either development or for service purposes."

By May 1942, however, priorities had changed once again. The USAAF duly assigned the XV-3420 A-1-A top priority and directed the company – by now the Allison Engine Division of General Motors – to prepare the 3,000hp V-3420-A as a standby replacement for the troubled R-3350 in the B-29; the V-3420 installation for the Superfortress had to be compatible with the aircraft's extant R-3350 mounting. Wright Field classified the project as "Restricted," designating it Classified Project No. MX-309 in late September 1942.

The USAAF investigated both the XB-19 and Curtiss C-46 Commando transport (which was powered by twin Pratt & Whitney R-2800 radials) for engine conversion for V-3420 testing, although it was quickly found that the C-46's wing structure was unsuitable for such a modification. This was unfortunate, as trialing a new powerplant on a twin-engined airframe would have significantly accelerated development. Consequently, the USAAF appropriated the XB-19 for the role of engine test bed for the resurrected V-3420 in an installation "exactly as intended for the B-29 conversion."

However, the 150-hour ground-running type test for the V-3420-A16R engine at Wright Field was not satisfactorily completed until June 1943. With this critical trial out of the way, the engines could at last be installed in the XB-19. The V-3420 had also been delayed by the slow development and non-availability of the new General Electric (GE) Type CM-2

NEXT PAGES

THE SILVERPLATE B-19

In the early summer of 1945, with problems afflicting the XB-29 program yet to be resolved, the USAAF had only a single bomber available capable of delivering the first atomic bomb. During July 1945, the now much upgraded B-19 was flown to North Field on Tinian, in the Northern Mariana Islands, where it was initially given the "Victor" (squadron-assigned identification) number "12." However, on August 1, the "circle R" tail markings of the 6th Bombardment Group were applied as a security measure, and its "Victor" number changed to "82" to avoid misidentification with actual 6th BG aircraft.

The commander of the 509th Composite Group, Col Paul Tibbets, flew the first atomic bomb mission with the B-19 adorned with his personal *ENOLA GAY* titling. The aircraft's obsolete turrets had long since been discarded to save weight.

The mission took Japanese air defenses completely by surprise, with coastal radar sites searching for Allied carrier-based tactical aircraft, which had been sporadically attacking infrastructure and military targets since the spring. The enemy had not suspected the presence of an American strategic heavy bomber over Japan.


82
ENOLA GAY

two-stage turbo-supercharger. Progress with the latter had stalled due to the demands placed on the company by the production of its other contracted turbo-superchargers.

During early 1944, the first YB-29 Superfortress prototype was converted into the XB-39 to serve as a test bed for alternative powerplants in case the aircraft's engine of choice – the R-3350 – encountered developmental and production problems. The first V-3420-equipped XB-39 flights were not performed until December 1944, with the engines fitted lacking turbo-superchargers.

The installation of the V-3420 in the XB-19 was contracted to General Motors' Fisher Body Division of Detroit, which seemed to be an unusual choice. Donovan Berlin, the designer of the P-40, had just left Curtiss following a dispute between that company and the USAAF over the former not being allowed to install the two-stage Rolls-Royce Merlin 61 engine in the Warhawk. At the government's request, Berlin then became Director of the Aircraft Development Section of the Fisher Body Division. While here, Berlin was to design and supervise V-3420 quick engine change installations in the XB-19 and XB-39. He was also chief designer of the unsuccessful V-3420-powered Fisher P-75 Eagle interceptor.

The XB-19 was flown to Fisher Body/Romulus Army Air Field after having accumulated 147 hours of flight time by the USAAF, as well as an unknown figure when operated by Douglas during the June to November 1941 period. Four 2,600hp V-3420-11 (A16R) engines were installed in the XB-19, each equipped with the GE Type CM-2 turbo-supercharger and an intercooler forward of the engine-stage supercharger. The Type CM-2s were very much "new technology," being two-stage superchargers rated for high-altitude use with engines producing a nominal 2,000hp.

For XB-19 installation, the V-3420s required new, longer, streamlined nacelles that Fisher Body designed and manufactured. Although the V-3420 installation greatly improved the marginal performance of the R-3350-powered XB-19, it would never again be considered as a combat bomber. As previously noted, the engine swap would change the XB-19's designation to the XB-19A, just as had the XBLR-2 been redesignated the XB-19 with the March 1938 engine change to the R-3350.

Remaining as the world's largest (160,000lbs) and most powerful (9,200hp) aircraft, the XB-19A made its first flight with the new engines and four new GE Type CM-2 turbo-superchargers fitted with Minneapolis Honeywell Regulators in January 1944. A specially designed test panel for the No. 2 engine continuously monitored and recorded air flow, pressure differentials, and temperatures taken from 140 different points. USAAF and Douglas engineers considered the test data collected during the flights as "probably the most complete ever gathered."

With the change to the V-3420 engines, the cooling problems that had plagued the R-3350 engines immediately disappeared. The aircraft's maximum speed also increased from 224mph at 15,700ft to 275mph at 20,000ft.

The XB-19A's handling was also vastly improved with the addition of a boost control system and supplementary flying tabs. Furthermore, the automatic synchronization of the four new Curtiss Electric four-blade 18ft 2in. diameter propellers, with a blade angle range of 18.5 to 53 degrees and a reverse pitch angle of -20 degrees, meant that the pilot no longer had to tune each propeller individually. On landing, the reverse pitch of the inboard propellers gave "backward" thrust, which assisted in the braking of the aircraft to the point where the XB-19A could alight on most "ordinary" municipal airfields.

V-3420 development had always been an off-and-on "back-burner" project, and its application was a popular choice for concept aircraft that were destined either never to leave the drawing board or were prototypes or pre-production machines such as the Boeing XB-39, Fisher XP-75 Eagle, and Lockheed XP-58 Chain Lightning. The engine never fulfilled the role it was designed for, as none of the "X-series" aircraft that utilized the V-3420 as part of their design ever attained series production.

MORE FLIGHT TRIALS

The V-3420-powered XB-19A would return to Wright Field to continue its role as a flying laboratory under the patronage of the Air Technical Service Command (ATSC). The aircraft was primarily used to "gain further knowledge on extremely long-range operations under various gross weights and ceiling conditions." Once at Wright Field, the XB-19A carried out a number of performance flight tests under the auspices of Aircraft Projects, Service Engineering Section, managed by Project Engineer Capt J. M. Buren and renowned Chief of the Flight Section, Col Leonard "Jake" Harman. Since these obscure tests were classified as secret, there is very little information available about the XB-19A's activities at Wright Field.

Typically for tests flown during this period, the aircraft weighed 105,715lbs with empty fuel and oil tanks, while the gross weight was approximately 135,000lbs. Although no armament was installed for the trial flights, the forward turret dome remained in place during early tests. All take-offs were made with full oil tanks, but the fuel load and crew number were adjusted according to the desired gross weight for a particular test.

All flights were made with the flaps in the neutral position, landing gear retracted, and all cooling flaps in automatic position. A deflector was installed under the wing forward of the wheel well to protect the wheel and tire from the Nos. 2 and 3

With the V-3420s installed, the XB-19A returned to Wright Field to continue its role as a flying laboratory under the direction of the ATSC. The aircraft was then primarily used for a number of extremely high-altitude performance flight tests that provided data on airframe structures, new airborne equipment, and powerplants. The ATSC credited the XB-19A with making the B-29's success "possible through these efforts." (Author's Collection)

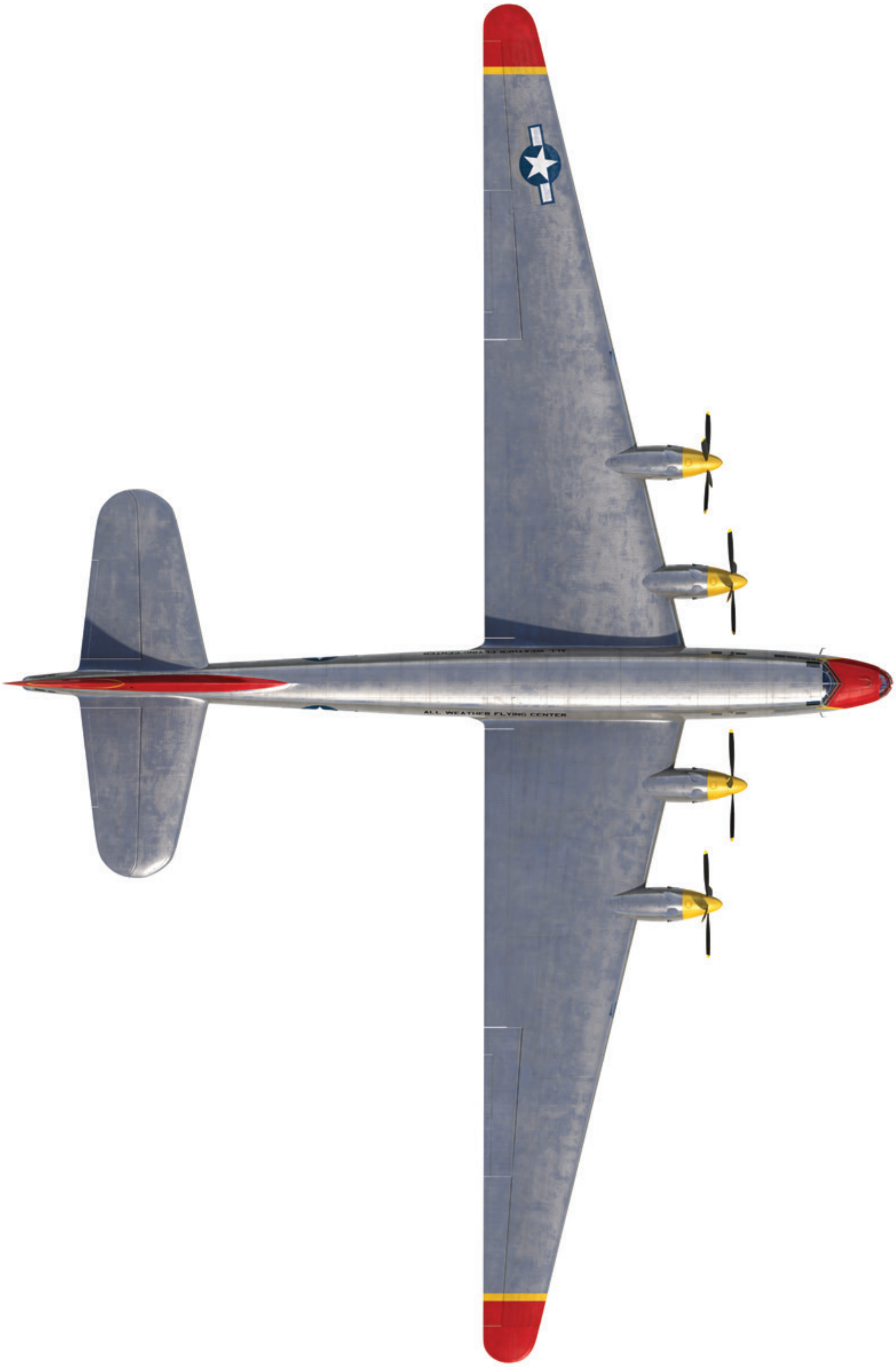
engine exhausts. The intercooler flaps remained in the closed position at all points in the flight, and all speeds were arbitrarily corrected. The maximum speed of the aircraft in military power (3,000 rpm) and 46in. of manifold pressure at 25,000ft was a respectable 284mph.

The XB-19A aided research efforts by furnishing test data on airframe structures, airborne equipment, and powerplants. The new long-range B-29 and, later, B-36 bombers owed their success to data gained from the XB-19. The USAAF made one last statement on its flying laboratory just prior to the aircraft's retirement from this role:

"After flying three years of flight tests without a major mishap, it produced mountains of priceless and time-saving data. The B-29 was made possible through these efforts."

CARGO CARRIER

The XB-19A was flown with its original four V-3420-11 (A16R) engines for about 32 hours. After the completion of the aircraft's flight trials at Wright Field, the USAAF was at an impasse as to how to next employ its perpetual and expensive white elephant. Following the 1943 conversion



DOUGLAS XB-19A 38-471, LOCKBOURNE ARMY AIRFIELD, OHIO, DECEMBER 1945

of its other white elephant – the XB-15 – into a cargo aircraft, the USAAF decided to also convert the XB-19A into a similar configuration. So, following an allegedly successful test program, the XB-19A was again modified in March 1944 into the world's then-largest cargo aircraft. At this point, the engines were removed and exchanged for updated V-3420-17(A18R)s in Cleveland, Ohio, during August 1944.

Prior to assuming its cargo-carrier duties, the aircraft was given a reprieve and returned to Wright Field to conduct Curtiss propeller vibration testing. Once this was completed, the XB-19A continued to undertake performance and flight testing with the new engines in the flying laboratory role into spring 1945.

The XB-19A's delayed conversion into a cargo carrier was announced in the following ATSC press release, dated March 8, 1945:

"Although the huge warplane has never dropped a bomb on enemy territory or fired a gun in combat, it has contributed much to the war effort by providing important engineering and flight data for other big bombers, and has contributed more to the war effort than any other single modern airplane. At present it is entering a new phase of its military career as the largest cargo-carrying airplane in the world."

Brig Gen Franklin O. Carroll, chief of the experimental engineering section at Wright Field, and also commandant of its Engineering School, added:

"Experience we have gained with the XB-19 and XB-19A, and the questions they have enabled us to answer, have considerably accelerated our programmed long-range heavy bombardment aircraft. It is typical of the contributions of this aircraft for it to continue to serve by speeding supplies whenever and wherever they are needed."

The conversion of the aircraft into a cargo carrier was completed by the Fairfield ATSC at Patterson Field, near Dayton, Ohio. Here, it was stripped of experimental and laboratory test equipment and fitted with a cargo door, tie-down racks, a new reinforced floor, and a loading ramp. It was estimated that a 45,000lb payload could be carried, although this weight varied with the length of the flight.

Photographs show that the aircraft's new V-3420s were initially flown with yellow cowlings, although they were later resprayed in standard Olive Drab paint. The rest of the aircraft had not been repainted for its new role, and it appeared rather shabby in photographs. The latter also revealed that the forward (gunless) dorsal turret had been faired over.

As a transport aircraft, the XB-19A was to be utilized in a similar manner to the XB-15, carrying cargo and passengers throughout the Continental United States. However, the few existing records show that the cargo XB-19A only ever completed a few local flights, with Maj Richard Midfiff at the controls. It was simply too large to be of any real use, occupying considerable

The weathered XB-19A cargo carrier is seen here with yellow-painted V-3420s and 1944-period national insignia. Stripped of experimental and laboratory test equipment, the aircraft was fitted with a cargo door, tie-down racks, a new reinforced floor, and a loading ramp. Although it was slated to transport cargo and passengers throughout the Continental United States, it appears to have logged only a few local flights from Patterson Field following its conversion. (Frederick A. Johnsen Collection)

The XB-19A was returned to natural metal finish in the early spring of 1945, after which the AWFC was painted in its most distinctive scheme – red nose and vertical stabilizer (with a large yellow forward-facing triangle outline on either side) and yellow cowlings, spinners, nose wheel well covers, and wheel hubs. *ALL-WEATHER FLYING CENTER* was painted in black capital letters on the upper fuselage above the wing. It appears that the aircraft flew no weather reconnaissance or research missions with the AWFC. (Frederick A. Johnsen Collection)

ramp space at Patterson Field. The USAAF soon transferred the aircraft to the new All-Weather Flying Center (AWFC) at Lockbourne Army Airfield, near Columbus, Ohio.

Shortly after arriving at its new home, both the XB-19A and the AWFC were relocated to Clinton County Army Airfield in Wilmington, Ohio. There is no record of the aircraft flying any weather reconnaissance or research missions with the AWFC, and photographs from the period show that it was parked alone and out of the way. By then the XB-19A had been returned to its natural metal finish and painted in its most distinctive scheme – a red nose and vertical stabilizer (with a large yellow forward-facing triangle outline on either side) and yellow cowlings, spinners, nose wheel well covers, and wheel hubs. *ALL-WEATHER FLYING CENTER* was painted in black capital letters on the upper fuselage above the wing.

FINAL DISPOSITION

Almost five years after the XB-19 had left Santa Monica on its maiden flight on June 27, 1941, the USAAF no longer had any legitimate requirement for the aircraft, even though it performed reasonably well with its new Allison engines. Still painted in its final scheme, bar the *ALL-WEATHER FLYING CENTER* titling on its fin, the XB-19A left Ohio and returned to its birthplace, landing on Clover Field on April 24, 1946.

Famed test pilot Col Ben Kelsey of Wright Field had flown the bomber home, via San Diego, accompanied by several other officers and five non-commissioned officers. Kelsey had been instrumental in the testing of the P-38, P-39 and P-51, and had then been assigned to Air Materiel Command at Wright Field as chief of the All-Weather Operations Section to which the XB-19A had been assigned. He would be the last pilot qualified to fly the aircraft.

Before landing, Kelsey made one last low pass over the Douglas Santa Monica plant and Clover Field. The *Los Angeles Times* briefly heralded the return of the “Aerial Guinea Pig” by unobtrusively stating, "Since that time [leaving Los Angeles] the plane has been used as a flying laboratory. Many engineering developments sprang from the tests made in the big plane."

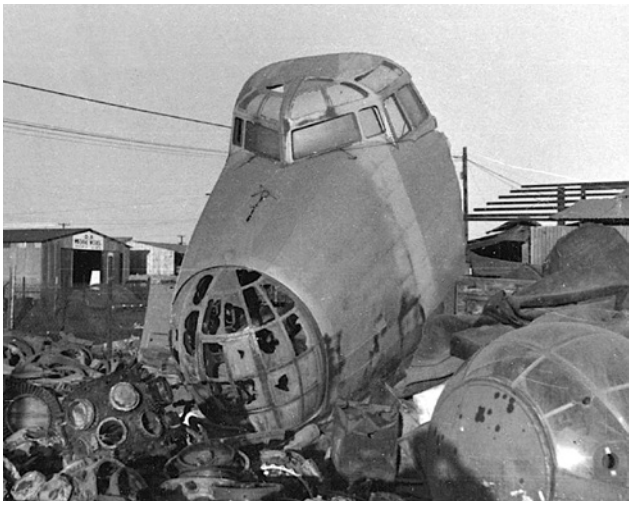
After a brief stay in California, the bomber completed its final flight on August 17, 1946 when it was delivered to the storage center at Davis-Monthan Field near Tucson, Arizona. Originally, it was intended that the XB-19A would be placed in preserved storage as a historic aircraft for the proposed National Air Museum – today's National Museum of the US Air Force. However, three years later, a new base commander at Davis-Monthan ordered a number of stored aircraft that he obviously did not consider to be historic to be removed and scrapped. Amongst them was the XB-19A.

Mobile Smeltering of Los Angeles was contracted to scrap the old bomber, which turned out to be no easy task. Indeed, large trucks fitted with chains could not pull it apart during the first scrapping attempt. Ultimately, cutting torches dismantled the XB-19A into pieces that were then consumed by the smelter. The *Los Angeles Times* recorded the bomber's sentimental eulogy on February 5, 1950:

"The B-19 has come home. Once the pride of the Air Force, with the eyes of the world upon her, she stands today in neatly packed aluminum ingots in the back end of an old bus. Only the forward portion of her nose section can be recognized; a businessman's concession to sentiment. Pushed into the mud of a cluttered yard at 2458 E. 118th Street, its rear a gaping wound to the sky, to the ocean of air where it once sailed as the spearhead of the mightiest winged battleship. The Plexiglas is shattered, faded, yellow and red paint stains the dull aluminum that once glittered in the sun, and the control columns, the cables, the switches that brought life to her massiveness hang in silence, torn and rusted.

"Her historic past dimmed with the march of aviation into intercontinental bombers, jet jobs, rocket planes, and supersonic speeds. She was forgotten until someone, somewhere, ordered her scrapped. The Mobile Smeltering Company here won the job on a bid of $4,000 and rolled its equipment to Davis-Monthan. Acetylene torches went to work on the grand old lady of the skies, furnaces consumed great

Based at Clinton County Army Airfield for only a short time, the aircraft returned to its birthplace at Santa Monica on April 24, 1946. After a brief stay on the West Coast, the unwanted bomber completed its final flight on August 17, 1946 when it was delivered to the newly established 4105th Army Air Forces Base Unit (Aircraft Storage) at Davis-Monthan Field. This unit had been formed specifically to oversee the storage of surplus B-29s and C-47s. (Philip Jarrett Collection)



Despite the XB-19A being earmarked as an historic aircraft for preservation at the proposed Dayton National Air Museum, in 1950 Mobile Smeltering was contracted to scrap the 12-year-old bomber. A company executive saved the nose section to serve as a makeshift scrapping office in Los Angeles, although it too eventually became aluminum ingots when no museum could be found to buy it. (Frederick A. Johnsen Collection)

chunks of her perfectly fashioned metal, smelting down her aluminum and spitting out indigestible iron and steel. In two weeks the job was finished, and the 10.5lb ingots were shipped back to Los Angeles.

"But sentiment caught up with Ralph Huffman, supervisor for the smelting concern. He saw the souvenir hunters carting off bits and pieces of her, talked with men who knew her past and were sorry to see her fate. So he brought her nose section back, the sole remnant of a closed chapter of aviation history. But in the files of countless newspapers her past lives on. The B-19 flew yesterday!"

The remaining nose section was shipped back to Los Angeles and used as an office by Mobile Smeltering. After a while, the nose was unsuccessfully offered to several museums, before it too was smelted sometime in 1950.

The only large surviving items from the leviathan are its main wheels, whose size had so transfixed the news media of the time, prompting venerating words and photographs of women and automobiles posed adjacent to them. One main wheel has been an exhibit in the Hill AFB Aerospace Museum in Utah since 1993, while the other main wheel is displayed in the *Planes of the Past* area of the National Museum of the US Air Force, in Dayton, Ohio.

EPILOGUE

Like the XB-19, the B-29 survived the post-war rush to the scrapyard. Indeed, the war-winning Boeing bomber was developed into the B-50, which served with moderate distinction in the transitioning period to the jet age. The XB-19, however, remained parked, awaiting promised preservation but eventually being ignominiously scrapped. It is virtually unknown today, except as a footnote as a flying laboratory contributing to the development of the B-29 and B-36.

The XB-36, powered by six newly developed Pratt & Whitney R-4360 piston engines, was also obsolete as the war ended – the mock-up had been completed as early as July 1942. Nevertheless, the prototype was rolled out in September 1945, following numerous developmental problems. To increase its performance in the Cold War jet age, four General Electric J47 turbojet engines supplemented the R-4360s.

The B-36 duly became the first US bomber capable of carrying any of the nation's nuclear weapons within its four bomb-bays. Entering service in 1948 with Strategic Air Command, the aircraft's intercontinental range without refueling made it America's primary nuclear weapons delivery instrument until it was replaced by the superlative jet-powered Boeing B-52 Stratofortress from 1955.

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