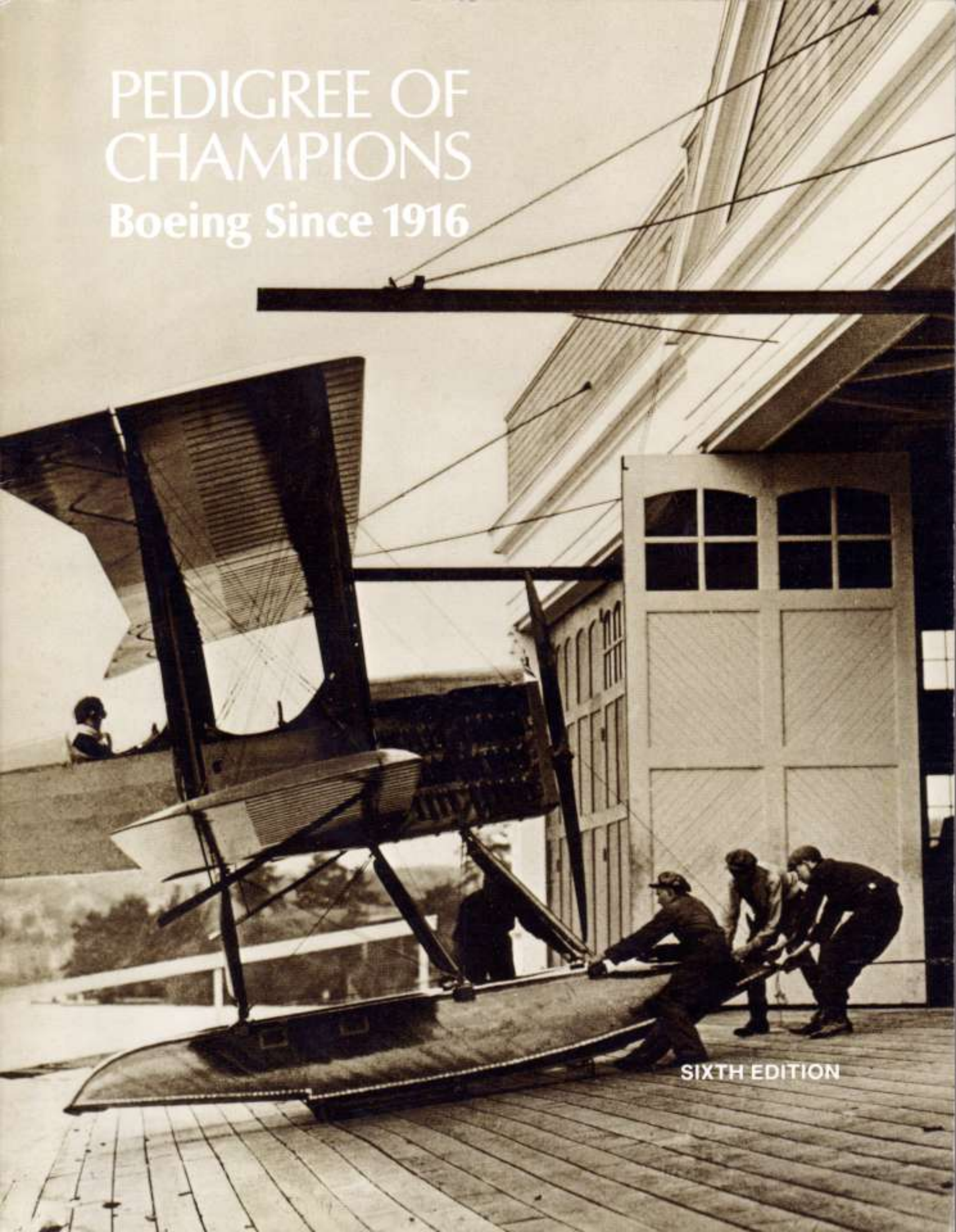
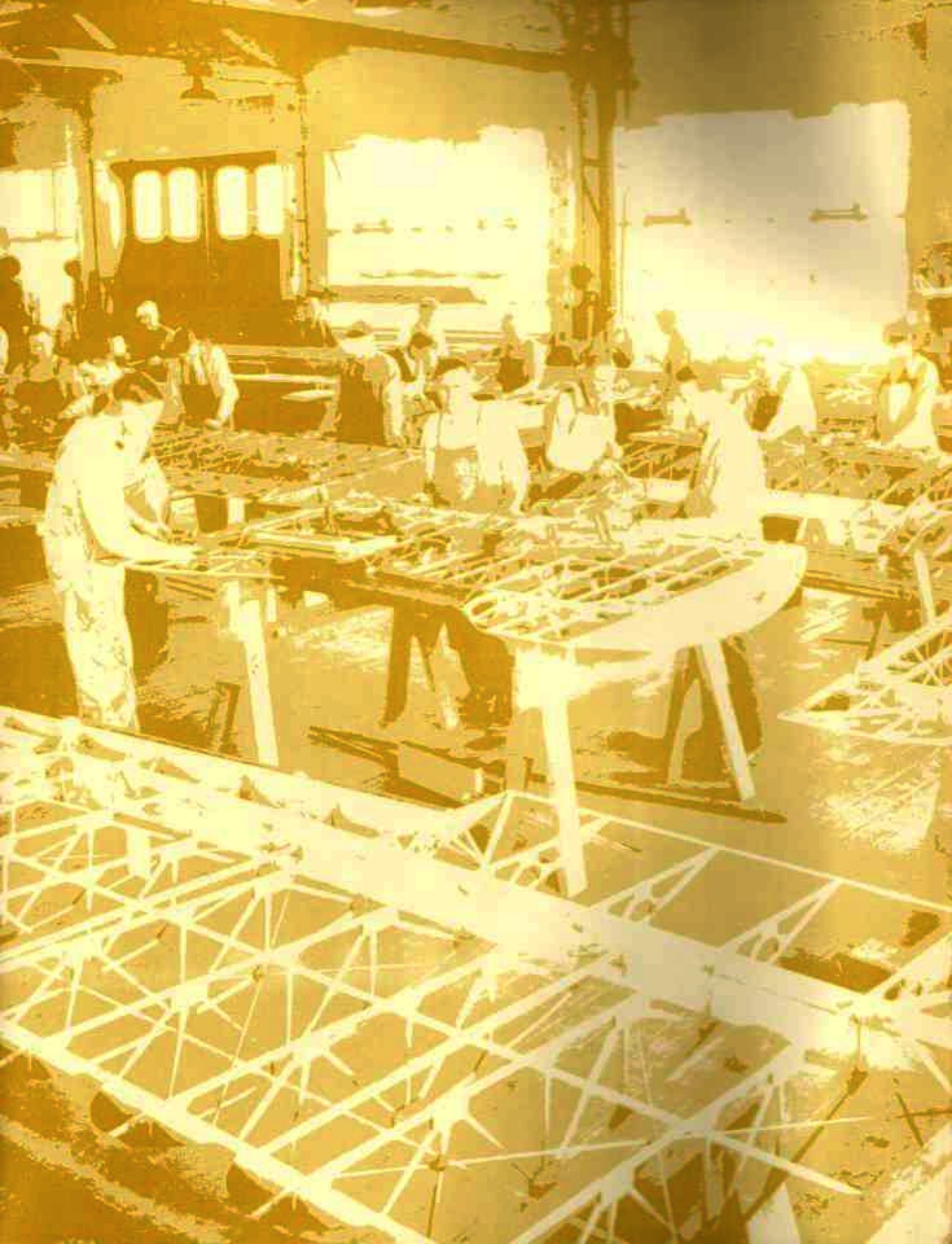
PEDIGREE OF CHAMPIONS

Boeing Since 1916



SIXTH EDITION



PEDIGREE OF CHAMPIONS

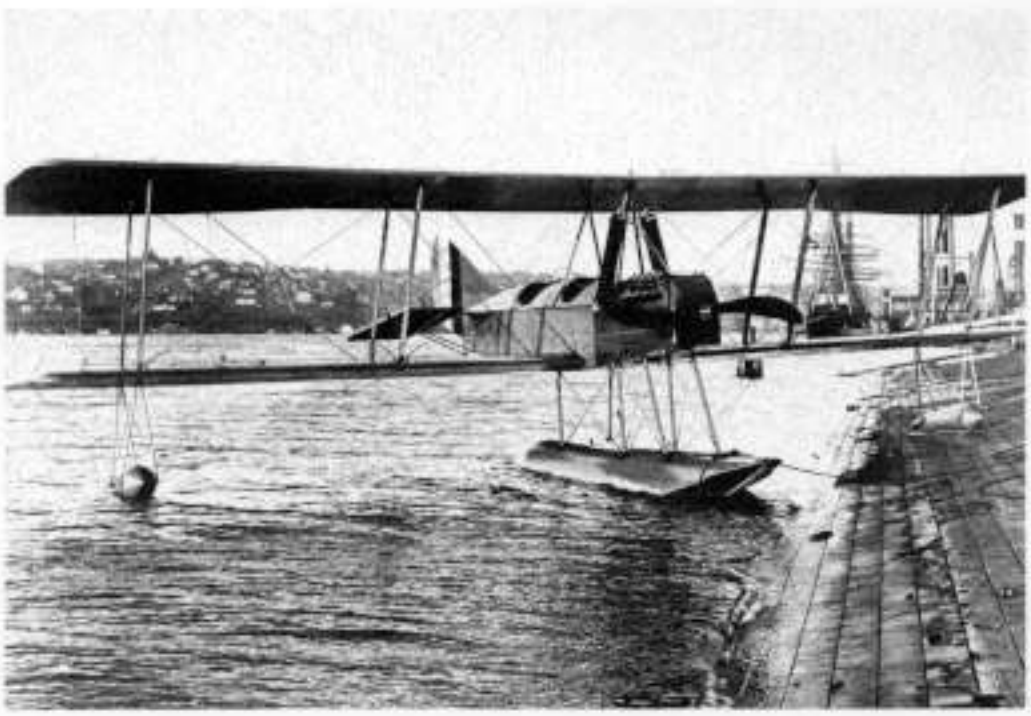
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BOEING AIRPLANE Co
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FOREWORD This book is in a small way a chronicle of man's unceasing efforts to master and use the earth's atmosphere—and in later years, space—for purposes of commerce and defense. It is a capsule history of Boeing design evolution from the stick-and-wire B&W of 1916 to today's globe-girdling military and commercial jets, missiles, and space vehicles.

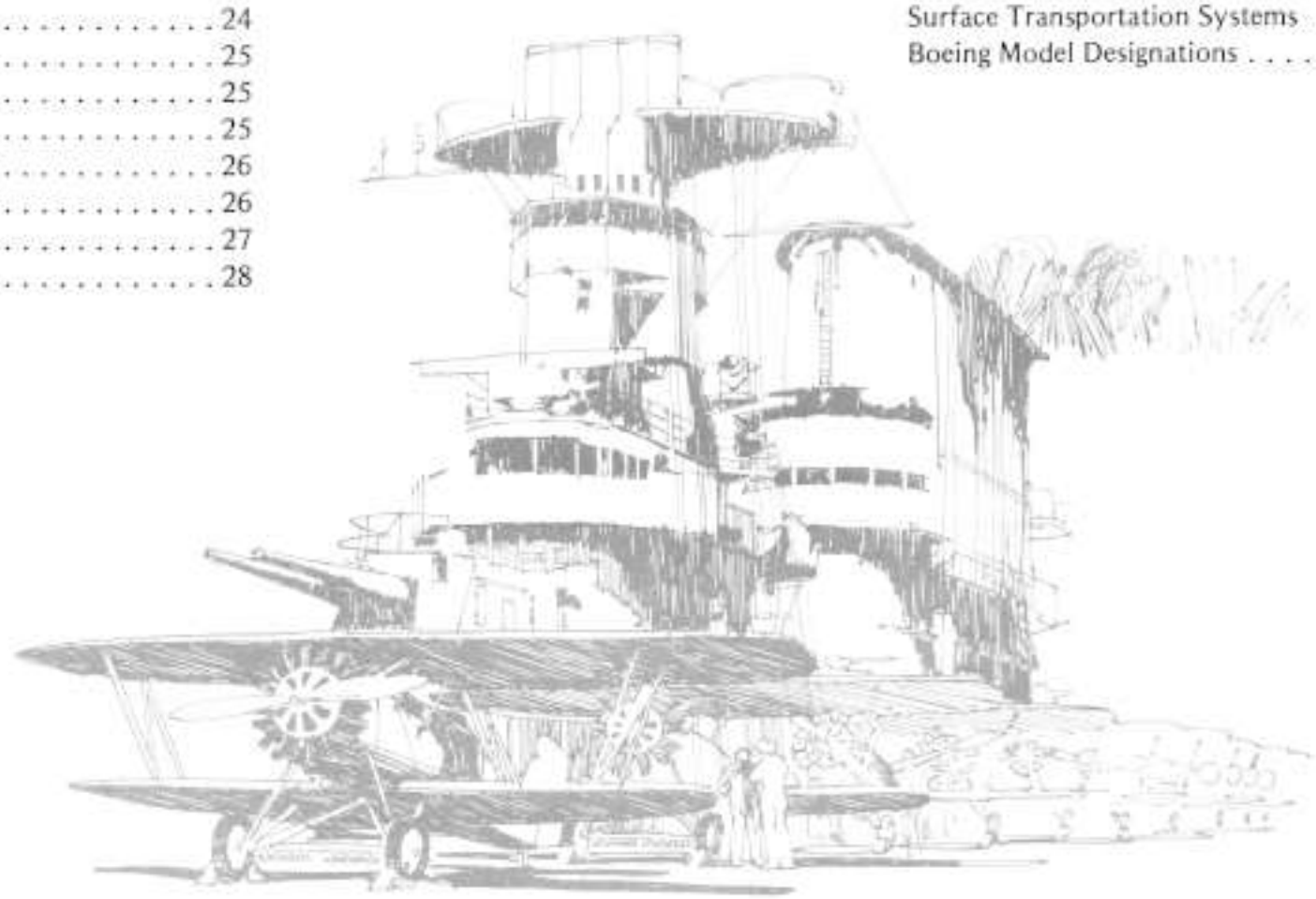
Although no attempt can be made here to list every airplane or product built by Boeing and its subsidiary companies, all major types—either experimental or production—are shown, together with many of the variations which in one way or another helped make aviation history.

Because several "families" of airplanes, missiles, or other vehicles often were in production simultaneously, resulting in an intermingling of models, it is not possible to present them in exact chronological order or in sequence of Boeing model numbers.

Some Boeing airplanes are best known by their factory designations, while others universally are referred to by a military name or number. The most generally accepted nomenclature is used here. Factory and other designations are correlated in a complete table on page 83.

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INTRODUCTION In 1976, The Boeing Company became the first U.S. firm to complete 60 years of continuous operation as a manufacturer of airplanes. Although aircraft work had been in progress since 1915, corporate identity was not achieved until Pacific Aero Products was incorporated on July 15, 1916. The name was changed to The Boeing Airplane Company in April 1917, without change of corporate structure or management.

The small specialty shop, with a 21-man work force, became a major aircraft manufacturer during World War I. The company struggled through the first disastrous postwar years by accepting military orders for the manufacture or modernization of airplanes designed and built by others and the manufacture of Sea Sled boats and furniture. When markets for new airplane designs developed, Boeing was ready with new models and processes. It was the first American manufacturer to use welded steel tubing for fuselage structure, a feature that soon became standard throughout the industry until generally replaced by monocoque sheet metal structures in the mid-1930s. Boeing again demonstrated its technological leadership by introducing this new construction, matched to aerodynamically advanced airplanes, in both commercial and military production with the Monomail, B-9, and 247 models of 1930-1933.

The early fame of Boeing was earned by its position as the leading U.S. supplier of single-seat fighting planes between 1924 and 1936. In the early 1930s, before the fighter business tapered off, emphasis changed to new transports which led in turn to the development of the B-17 "Flying Fortress" and the B-29 "Superfortress," the outstanding four-engine American bombers of World War II.

Preeminence in the transport field came about naturally. In 1927, Boeing bid successfully for the San Francisco-Chicago airmail route, when the government turned its remaining routes over to commercial operators. A subsidiary company, Boeing Air Transport, was formed to operate the route. The success of this operation encouraged the company to develop larger airplanes specifically for the passenger trade. To Boeing Air Transport goes the credit for introducing the now universal stewardess as a regular member of airliner crews.

Boeing expanded rapidly. It established a Canadian subsidiary in Vancouver, Canada, and acquired the Hamilton Metalplane Co. of Milwaukee. The airline was expanded into the Boeing Air Transport System through the acquisition of other airlines. In 1929, the Boeing airplane and airline operations merged with Pratt & Whitney, a leading airplane engine manufacturer, the Standard Steel Propeller Co., and two other airplane manufacturers to form United Aircraft and Transport Corp. Each continued to produce its own specialized product under its own name while the airlines operated under their own names within a holding company known as United Air Lines. Boeing affiliation with United Aircraft ended in 1934 following legislation that divorced airplane and engine manufacturers from airline operations. The airlines of the former Boeing System were reorganized into a new United Air Lines while Boeing, with the Stearman Aircraft Co. of Wichita, Kansas, as a wholly owned subsidiary, took the new name of Boeing Aircraft Company and resumed independent operation.

The production demands of World War II raised the payroll to a high of 44,745 by January 1945. The Seattle facilities were greatly expanded prior to and during the war and a new plant was built at nearby Renton, where B-29s were produced. Stearman had become a division of Boeing in 1939. Its original facilities were used for the wartime manufacture of primary trainers and a new plant was built to produce B-29s. Seattle and Wichita expansion still could not meet military demands for Boeing airplanes, so the Douglas and Lockheed firms undertook the manufacture of additional B-17s while Bell and Martin produced B-29s in new plants built specifically for the purpose.

With major military markets reduced at the end of the war, the Wichita facilities were shut down completely except for a small design staff. The Renton plant was closed, and the Seattle facilities and work force were greatly reduced. Orders on hand for new military and commercial models under development kept the early postwar payroll at 9,000. The need for new markets led Boeing into development of the GAPA interceptor missile for the Army and privately financed research into the field of small gas turbines and other industrial products. While these products were being introduced, the production of large propeller-driven airplanes continued in the Seattle plant. The name Boeing Airplane Company was readopted early in 1948.

(continued next page)

Increased demand for military transports resulted in the reopening of part of the Renton plant for manufacture of the C-97 in 1949. In 1948, the Air Force called for the improvement of many of the wartime B-29s through installation of a British-developed aerial refueling system which used a hose to connect tanker and receiver airplanes. The Wichita plant was reopened for this major modification program. But realizing the limitations of this system, Boeing soon developed one of its own using a "flying-boom" connection—and the system was soon adopted by the Air Force. Conversion activity of the B-29s was, however, transferred to the Renton plant because the Wichita plant's capacity was now being used for B-47 jet bomber production during the Korean War.

GAPA, meanwhile, led to BOMARC, an area-defense interceptor missile, and in turn to the Minuteman ICBM, the Saturn V/Apollo launch vehicle first stage, and the Lunar Orbiter. These placed Boeing firmly in the space age with manufacturing facilities at Michoud, Louisiana, and engineering and test facilities at Huntsville, Alabama, and Cape Kennedy, Florida. This wide diversification of product lines, which included acquisition of the Vertol Corporation, helicopter manufacturers, in 1960, made a change of name desirable. In May 1961, the Boeing Airplane Company became The Boeing Company.

Boeing leadership in the field of large jet airplanes began in 1947 with the introduction of the daring B-47 swept-wing six-jet bomber, which was soon followed by the eight-jet B-52. Experience with these military jets and the propeller-driven C-97s and Stratocruisers, plus a shrewd evaluation of the potentials of the airline business, led Boeing to develop an entirely new jet transport at its own expense. Introduced in 1954, the Prototype 707 (Model 367-80) proved to be as great an aeronautical milestone as was the Monomail of 1930, the 247 of 1933, and the B-47. Large orders were placed by the world's leading airlines and the Air Force ordered military developments of the prototype.

Air traffic growth increased tremendously with the advent of the 707 commercial jet transport, creating customer demand for new aircraft sized to meet specific market requirements. Boeing met this demand with the 727, 737, and 747, becoming the largest producer of jet transport airplanes in the non-Communist world. After acquiring the Vertol Company, Boeing became a major supplier of helicopters for military purposes. It also played a significant role in the space program during the 1960s, building both spacecraft and rocket boosters.

Boeing's participation in the space business declined in the early 1970s, and the company broadened its business base by developing new products for surface transportation systems and energy and environmental programs. Boeing also operates and maintains large plants or facilities, and provides computer services for government agencies and commercial firms.



March 1919 . . . Wm. E. Boeing boarding Model "C" at Vancouver, Canada, with the first international airmail for Seattle.

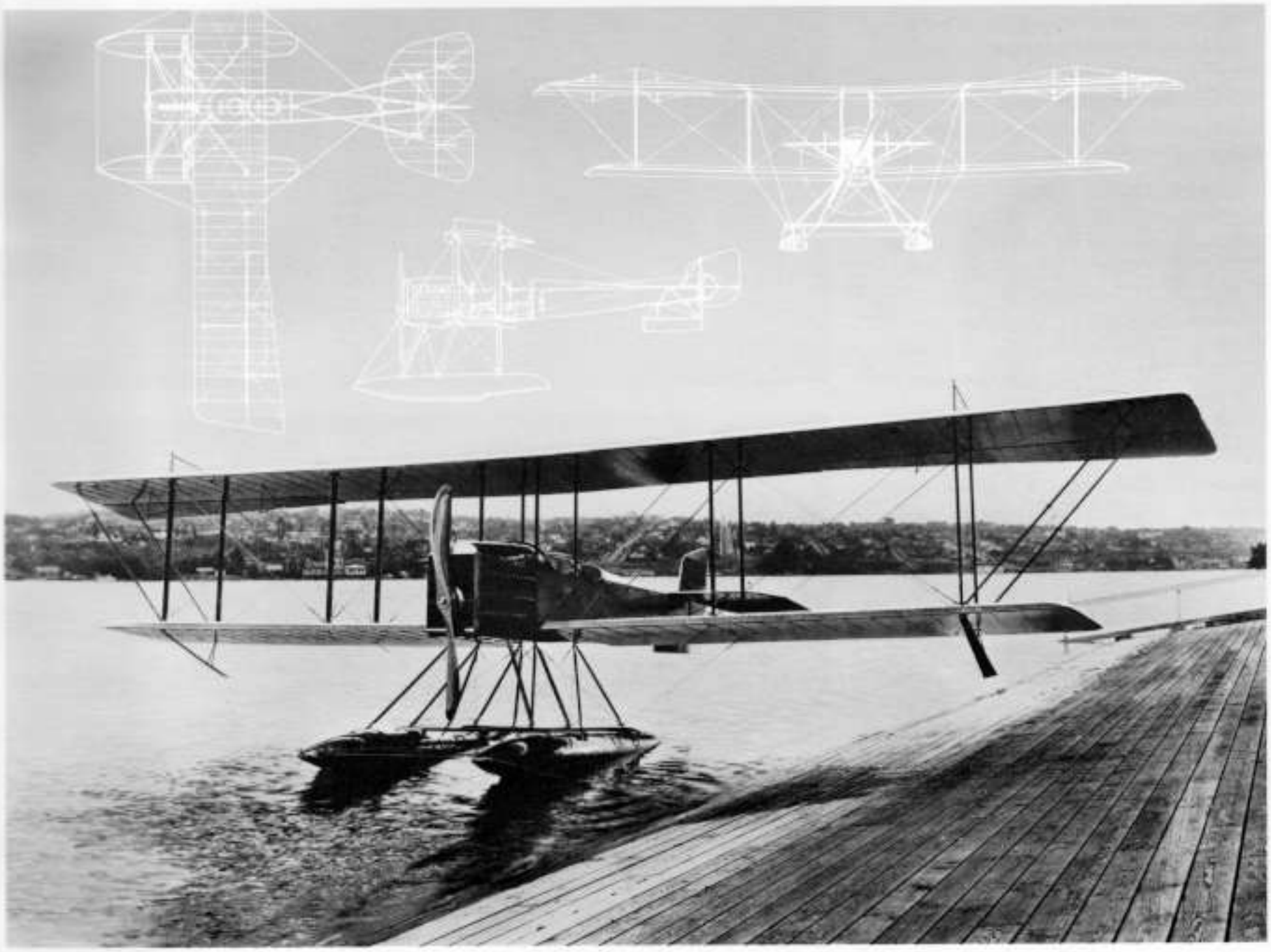
The First Boeing Airplane

B&W OF 1916 William E. Boeing, founder of the company that now bears his name, and Conrad Westervelt, a Navy officer, collaborated in the design and construction of the B&W, a twin-float sport seaplane. The original factory was a boathouse on Seattle's Lake Union; the aircraft workers were skilled carpenters, shipwrights, cabinet makers, and seamstresses. The materials used were fine Washington State spruce lumber, steel wire, and linen fabric.

The B&W established Boeing in the airplane business. Two of the small seaplanes were built. Both were purchased by the New Zealand Government and were used in pilot training and for the first experimental airmail flights in that country. Both the U.S. Army and Navy ordered derivations of this first Boeing airplane. The immediate outcome was a production order for 50 Navy seaplane trainers, the Model Cs—the first large contract for the fledgling company.

B&W SPECIFICATIONS:

Span	52 ft
Length	27 ft 6 in.
Wing Area	580 sq ft
Gross Weight	2,800 lb
Top Speed	75 mph
Cruising Speed	67 mph
Range	320 mi
Power	125-hp Hall-Scott A-5



MODEL C The "C" series followed the B&W and was the first "all-Boeing" design. The Navy ordered two Model Cs for test from the Pacific Aero Products Co., which became the Boeing Airplane Company on April 26, 1917. Fifty additional Cs were ordered as U.S. entry into World War I created a sudden demand for primary training planes. Two experimental EA models, essentially landplane versions of the C but with side-by-side seating and 90-hp Curtiss OX-5 engines, were sold to the U.S. Army.

While the B&Ws and all but one of the 56 C-types built used twin pontoons, one was modified at Navy request to evaluate a single main pontoon with small auxiliary floats under each wingtip. Fitted with a Curtiss OX-5 engine in place of the Hall-Scott, this became the C-1F.

Upon completion of the Navy order, one additional C was built for William E. Boeing. This was logically called the C-700 because the previous airframe had been known in the shops by its Navy serial number, 699. The C-700, used by Mr. Boeing and Eddie Hubbard to carry the first U.S. international contract airmail from Seattle to British Columbia, was redesignated CL-4S following minor aerodynamic refinement and a change to the newer Hall-Scott L-4 engine.

MODEL C SPECIFICATIONS:

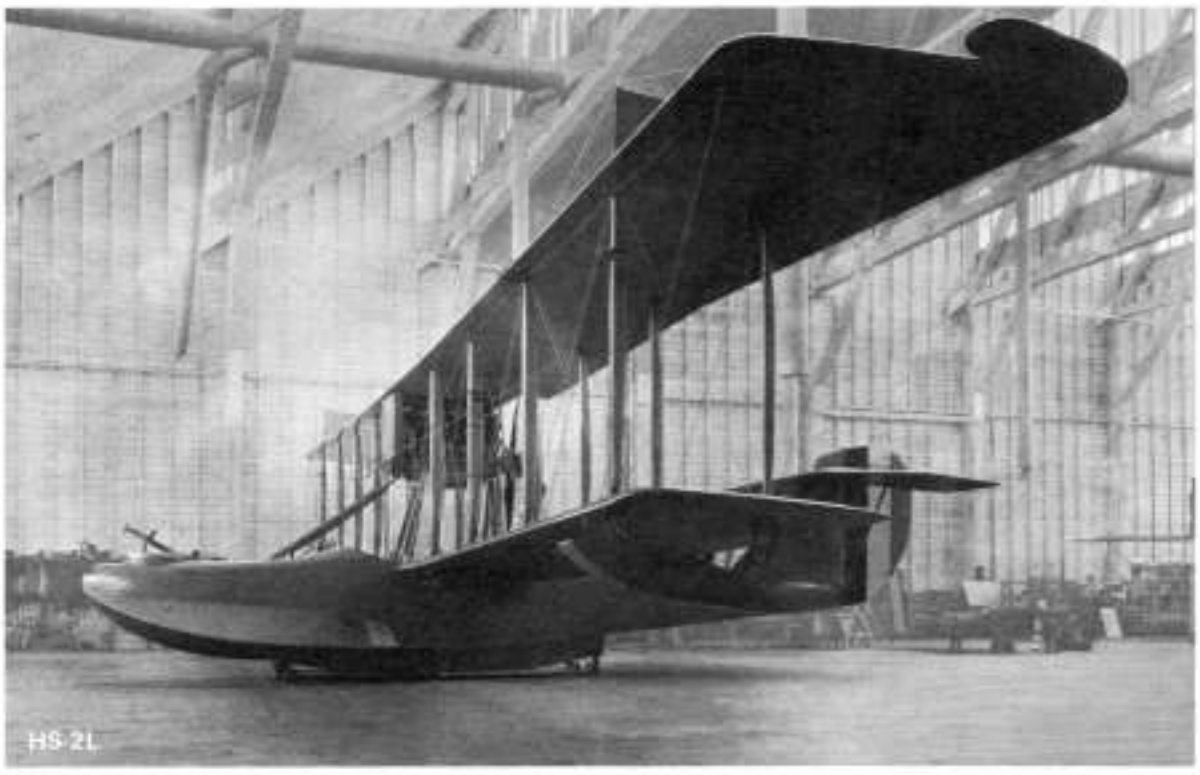
Span	43 ft 10 in.
Length	27 ft
Wing Area	495 sq ft
Gross Weight	2,395 lb
Top Speed	72.7 mph
Cruising Speed	65 mph
Range	200 mi
Service Ceiling	6,500 ft
Power	100-hp Hall-Scott A-7A

HS-2L The HS-2L was a Curtiss design adopted by the Navy as its standard patrol and bombing flying boat of World War I. Since no single factory could produce the HS-2L in the desired quantities, contracts were awarded to four other companies besides Curtiss. Boeing was given an order for 50, which was reduced to 25 when the Armistice cancelled most wartime production.

Although not a Boeing design, the HS-2L was an important milestone in that it provided not only the incentive but the design and production experience that were to contribute heavily to the first postwar Boeing airplane, the B-1 Flying Boat.


C-700


EA


HS-2L



B-1


BB-1

HS-2L SPECIFICATIONS:

Span	74 ft 1 in.
Length	39 ft
Wing Area	803 sq ft
Gross Weight	6,432 lb
Top Speed	85 mph
Service Ceiling	2,800 ft
Power	360-hp Liberty
Armament	(2) Lewis machine guns plus bombs

B-1 SPECIFICATIONS:

Span	50 ft 3 in.
Length	31 ft 3 in.
Wing Area	492 sq ft
Gross Weight	3,850 lb
Top Speed	90 mph
Cruising Speed	80 mph
Range	400 mi
Service Ceiling	13,000 ft
Power	200-hp Hall-Scott L-6

BB-1 SPECIFICATIONS:

Span	45 ft 6 in.
Length	27 ft 8 in.
Wing Area	403 sq ft
Gross Weight	2,699 lb
Top Speed	84 mph
Cruising Speed	75 mph
Range	500 mi
Service Ceiling	10,000 ft
Power	130-hp Hall-Scott L-4

B-1 The B-1, actually Boeing design No. 6, was the first Boeing airplane designed from scratch as a practical commercial vehicle. The flying boat configuration was chosen with the vast water areas of the Northwest in mind, and accommodation was provided for a pilot and two passengers plus mail or cargo. Construction followed the convention of the time: laminated wood veneer for the hull and spruce and plywood frames for the wings.

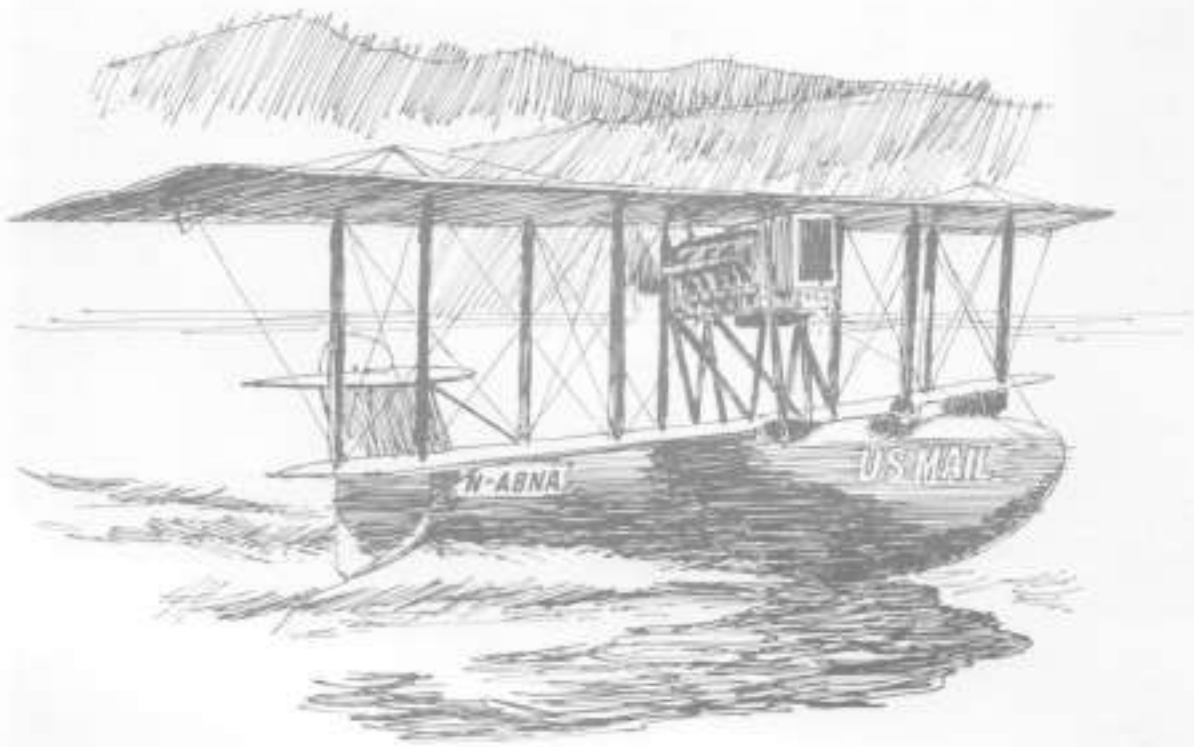
Although a good airplane, the B-1 did not find a quantity market. The sale of new commercial airplanes was almost completely suppressed in the early postwar years by the ready availability of cheap war surplus aircraft, which, while they could not do as good a job as the new designs, were available at prices which were only a fraction of those for new types.

Before the flood of surplus military types smothered the anticipated boom in postwar commercial aviation, Boeing had built two other civil models, the BB-1 (Model 7), a smaller development of the B-1, and the BB-L6 (Model 8), a landplane using the same wings as the BB-1. These encountered the same marketing problems as the B-1, and in each case only the single prototype was sold.

It was not until 1928, when the surplus types largely were gone and commercial aviation was enjoying a boom that had been triggered by Lindbergh's transatlantic flight of 1927, that advanced versions of the B-1, known as B1-D and E, were able to find a market. Produced at first under the original company designation of Model 6, the new versions were so different as a result of 9 years of advance in technology that the final production versions were given the new model number 204 to reflect their more modern design (see page 25).

Starting with a 200-hp Hall-Scott L-6 engine but soon changing to a 400-hp war surplus Liberty for improved performance, the original B-1 wore out six engines on Eddie Hubbard's international contract airmail run between Seattle and Victoria. Eight years later, it was retired after flying 350,000 air miles, a remarkable record for the time.

The venerable B-1 was restored in 1951, and is now on display, complete with its original colors and early markings, in the Seattle Museum of History and Industry.



B8-L6 SPECIFICATIONS:

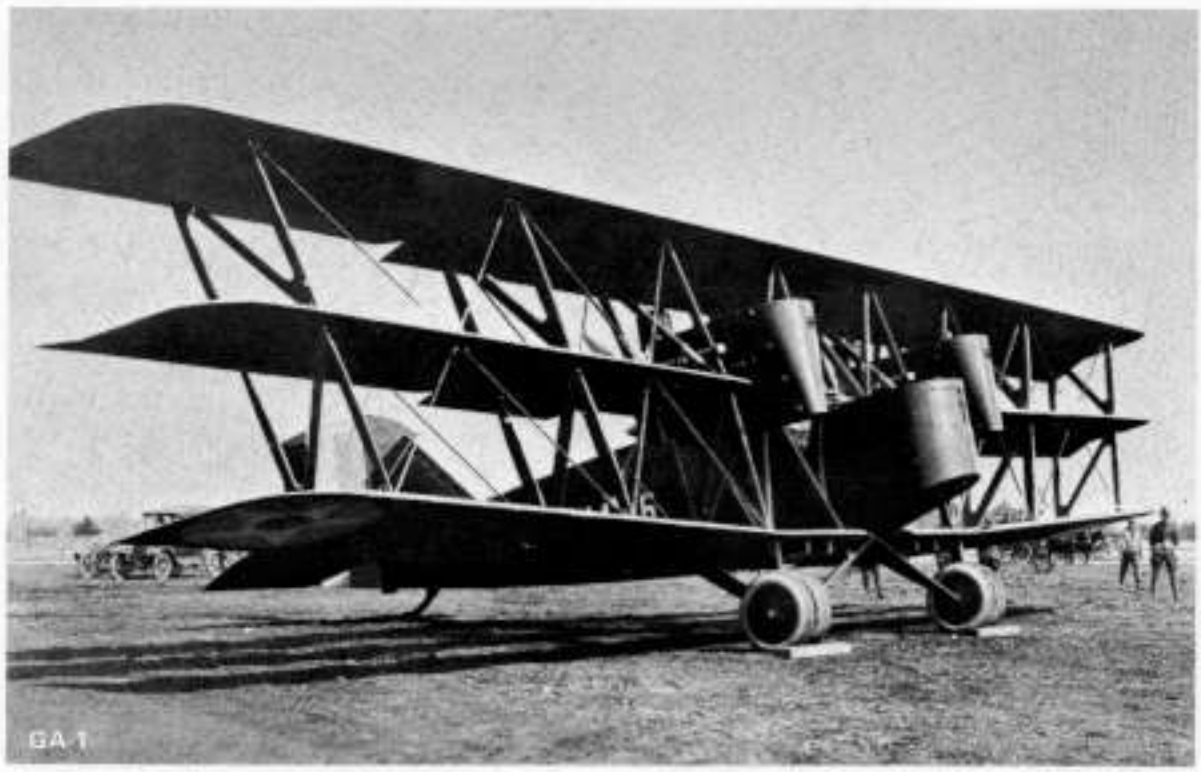
Span	44 ft 9 in.
Length	29 ft 3 in.
Wing Area	465 sq ft
Gross Weight	2,632 lb
Top Speed	100 mph
Cruising Speed	90 mph
Range	450 mi
Service Ceiling	15,000 ft
Power	214-hp Hall-Scott L-6



GA-1 Ten of these unique armored ground attack triplanes were built under an early postwar policy whereby the Army designed airplanes to its own requirements and then contracted for their manufacture by the aviation industry under competitive bidding. Although not a Boeing design, the GA-1 and another Army design, the GA-2, were both given the Boeing designation of Model 10 for recording purposes.

GA-1 SPECIFICATIONS:

Span	65 ft 6 in.
Length	33 ft 8 in.
Wing Area	1,016 sq ft
Gross Weight	10,426 lb
Top Speed	105 mph
Cruising Speed	95 mph
Range	350 mi
Service Ceiling	9,600 ft
Power	(2) 435-hp Liberty
Armament	(8) machine guns 37mm cannon





GA-2 Two GA-2s were built, the first exactly as designed by the Army and the other with extensive revision as a result of Boeing experience with the 10 GA-1s and the first GA-2. The armored attack airplane concept did not prove to be practical so further development of the type was abandoned.

GA-2 SPECIFICATIONS:

Span	54 ft
Length	36 ft 9 in.
Wing Area	851 sq ft
Gross Weight	8,691 lb
Top Speed	113 mph
Cruising Speed	100 mph
Range	200 mi
Service Ceiling	12,000 ft
Power	750-hp Army W-18
Armament	(6) machine guns 37mm cannon



DH-4 After World War I, the struggling airplane industry survived mainly by modernizing obsolescent war planes. In 1920, Boeing rebuilt 111 wooden de Havilland 4 "Liberty Planes" as DH-4B. From 1923 to 1925, 187 were rebuilt with Boeing-designed steel tube fuselages as DH-4M (for Modernized); 30 went to the U.S. Marine Corps under the Naval designation 02B-1, one to the Post Office, and six to Cuba.

DH-4M SPECIFICATIONS:

Span	42 ft 5 in.
Length	29 ft 11 in.
Wing Area	440 sq ft
Gross Weight	4,595 lb
Top Speed	118 mph
Cruising Speed	104 mph
Range	330 mi
Service Ceiling	12,800 ft
Power	400-hp Liberty
Armament	(4) machine guns 400-lb bombload



XCO-7 At Army request, Boeing designed and built new wings for three of the wartime DH-4s in 1924 in an attempt to extend the useful life of this type. The new Model 42 was called XCO-7, for Experimental Corps Observation, design No. 7. The performance improvement was insufficient to justify the cost of producing new wings for the 1916 British design.

XCO-7A SPECIFICATIONS:

Span	45 ft
Length	29 ft 2 in.
Wing Area	440 sq ft
Gross Weight	4,665 lb
Top Speed	122 mph
Cruising Speed	110 mph
Range	420 mi
Service Ceiling	13,050 ft
Power	420-hp Liberty 12A

MB-3A In 1921, Boeing was low bidder among six manufacturers competing for an Army contract for 200 MB-3A pursuit planes. This was the first sizeable order for new airplanes placed by the military since the Armistice. Proximity to prime sources of airplane spruce lumber was an important factor in the bid decision, which was $1,448,000, or $6,617 per airplane, less military-furnished equipment.

The MB-3A was an improved version of the all-wood Thomas-Morse MB-3 which had been built in the closing months of World War I and incorporated the best fighting plane features of the time. Boeing did not assign a number of its own to the MB, although new tail surfaces of Boeing design were fitted to the last 50 built.

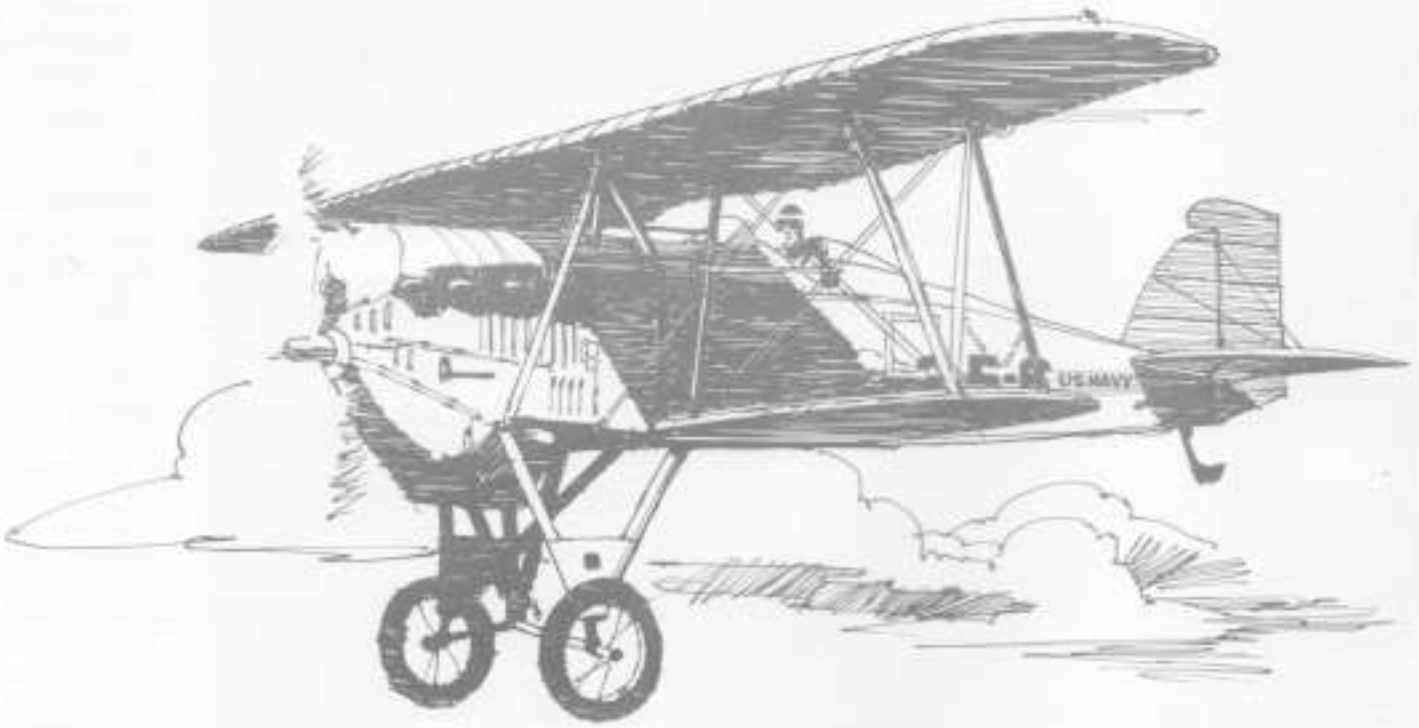
The significance of the MB-3A to Boeing was that it provided design experience that started the company toward a dominant position in the fighter plane business that was to last for a decade and a half.

MB-3A SPECIFICATIONS:

Span	26 ft
Length	20 ft
Wing Area	228 sq ft
Gross Weight	2,539 lb
Top Speed	140 mph
Cruising Speed	125 mph
Service Ceiling	19,500 ft
Power	300-hp Wright-Hispano
Armament	(2) machine guns


MB-3A


Sewing fabric on the MB-3A wing




XPW-9


PW-9D



FB-1

PW-9/FB SERIES Production experience with the MB-3As and careful study of the newest aerodynamic and structural concepts convinced Boeing engineers that they could produce a better pursuit plane than anything then available. Principal source of dissatisfaction with the MB-3A was the wooden fuselage. Welded steel tubing had been used successfully during World War I. The gas welding process with hand torches had disadvantages, so Boeing developed an arc welding process. Financed as a private company venture, the Boeing Pursuit was first flown in June 1923. The new fuselage construction was so successful that the Army gave Boeing additional DH-4 modification contracts that called for replacement of the original wood fuselages with steel.

Powered by a new Curtiss D-12 engine of 435 hp, the Boeing Model 15 was ordered by the Army as PW-9 (Pursuit, Water-cooled, No. 9). Altogether, 123 PW-9s were delivered, ending with the PW-9D (Model 16D) of 1928. The Navy ordered 10 PW-9s for the Marine Corps under the Naval designation of FB-1, for Fighter, Boeing. Two FB-2s, modified to operate from aircraft carriers, had Boeing model number 53 because of the design changes. Three FB-3s with Packard engines (Model 55) and one FB-4 with an experimental Wright air-cooled radial (Model 54) were delivered for test and the Navy ordered 27 production FB-5s (Model 67) powered with the Packard.

(continued next page)

PW-9C SPECIFICATIONS:

Span	32 ft
Length	23 ft 5 in.
Wing Area	252 sq ft
Gross Weight	3,170 lb
Top Speed	163 mph
Cruising Speed	142 mph
Range	390 mi
Service Ceiling	21,000 ft
Power	435-hp Curtiss D-12C
Armament	(2) machine guns (2) 122-lb bombs

(PW-9/FB Series continued)

The basic PW-9/FB design underwent many experimental variations. An Army request for a high-altitude pursuit plane resulted in the XP-4 (the "W" was dropped in 1924 and the Pursuit series started over again from P-1 except for PW-9, which was retained for the military life of that particular airplane), which was a PW-9 fitted with longer wings and a turbosupercharger. It was Boeing Model 58. One PW-9A was completed as a pursuit-trainer under the designation of AT-3, for Advance Trainer No. 3 (Boeing Model 68). Changes included deletion of armament and substitution of a 180-hp Wright E engine for the 435-hp Curtiss. The XP-7 (Model 93) was the last PW-9D, which was redesignated when fitted temporarily with a new 600-hp Curtiss V-1570 engine. The Model 66, which was bought by the Army as XP-8, was a new design patterned closely after the PW-9 and fitted with an experimental inverted Packard engine.

The Navy discontinued the use of liquid-cooled engines for shipboard airplanes after delivery of the FB-5s and tested a new 425-hp air-cooled Pratt & Whitney "Wasp" in the FB-4, redesignating it FB-6.











XP-7



XP-8

XP-8 SPECIFICATIONS:

Span	30 ft 1 in.
Length	22 ft 10 in.
Wing Area	242 sq ft
Gross Weight	2,913 lb
Top Speed	173 mph
Cruising Speed	148 mph
Range	325 mi
Service Ceiling	23,000 ft
Power	600-hp Packard 2A-1500
Armament	(2) machine guns

NB-1 AND NB-2 Seventy-six Model 21 primary trainers were built, 41 for the Navy as NB-1 (N for Trainer in Navy nomenclature), 30 as NB-2 fitted at Navy request with 180-hp Wright E liquid-cooled engines available from wartime stocks, and five Lawrence-engined export models for Peru.

The NBs were designed to operate either as landplanes or as seaplanes using a single main float instead of the twin pontoons of the earlier Model Cs.

NB-1 SPECIFICATIONS:

Span	36 ft 10 in.
Length	28 ft 9 in.
Wing Area	344 sq ft
Gross Weight	2,837 lb
Top Speed	99.5 mph
Cruising Speed	90 mph
Range	300 mi
Service Ceiling	10,200 ft
Power	200-hp Wright J-4
Armament	Machine gun



NB-1



NB-2



NB-3


PB-1

PB-1 The PB-1 (P for Patrol) was built in 1925 to a Navy requirement for a flying boat capable of flying the 2,400 miles from California to Hawaii nonstop. Construction material was primarily metal; the top of the hull being wood and the wing and tail covering being fabric. The designation was changed to PB-2 when the Navy removed the tandem Packard engines and installed experimental Pratt & Whitney "Hornet" air-cooled radials.

PB-1 SPECIFICATIONS:

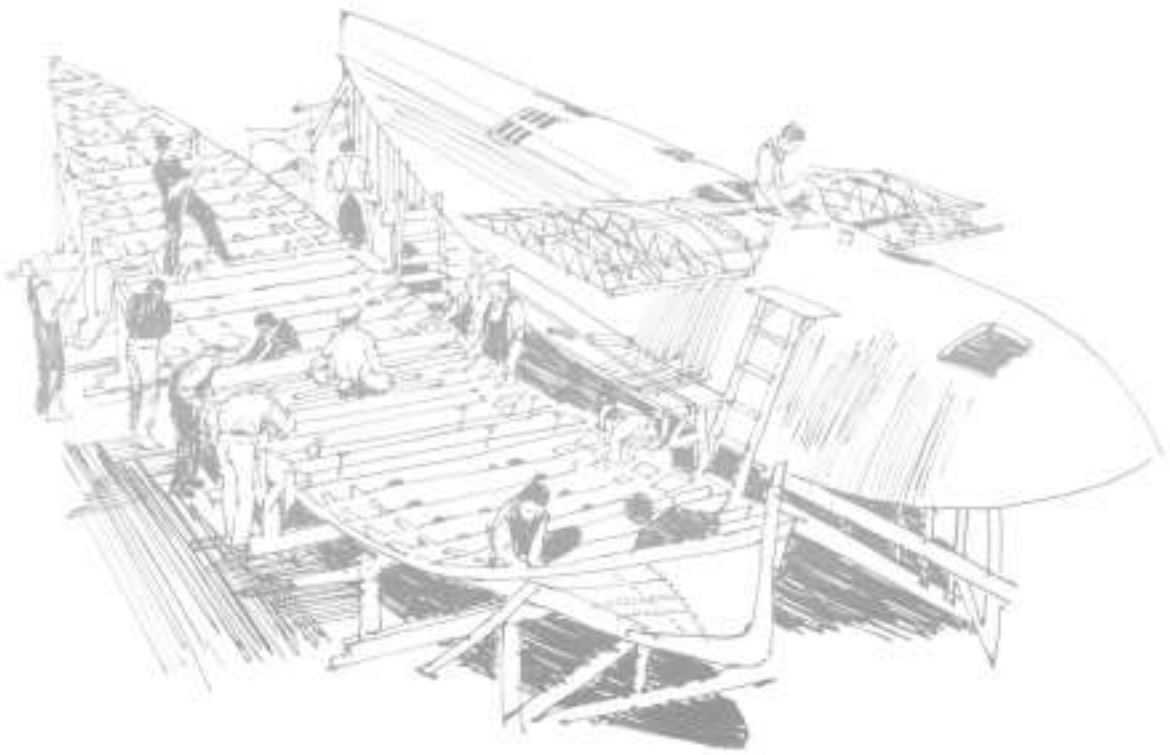
Span	87 ft 6 in.
Length	59 ft 4 in.
Wing Area	1,801 sq ft
Gross Weight	23,500 lb
Top Speed	112 mph
Cruising Speed	94 mph
Range	2,450 mi
Service Ceiling	9,000 ft
Power	(2) 800-hp Packard 2A-2500
Armament	2,000 lb of bombs or depth charges Various machine guns


TB-1

TB-1 Three all-metal TB-1s were designed and built to Navy specifications in 1927. These could be fitted out either as landplanes for operation from carriers (the wings folded as a shipboard space-saving measure) or as twin-pontoon seaplanes. In either form, each undercarriage unit was independent of the other to allow the 1,740-pound torpedo to be carried in an external rack under the belly. Although carrying the T-for-Torpedo designation, the TB-1 doubled as a scouting airplane.

TB-1 SPECIFICATIONS:

Span	55 ft
Length	40 ft 10 in.
Wing Area	868 sq ft
Gross Weight	9,786 lb
Top Speed	115 mph
Cruising Speed	100 mph
Range	878 mi
Service Ceiling	12,500 ft
Power	730-hp Packard 3A-2500
Armament	(2) machine guns 1,740-lb torpedo



MODEL 40 The Model 40 was built for a 1925 U.S. Post Office Department competition as a replacement for the converted military de Havillands that had carried the airmail since 1918. The government bought the single Model 40, but did not award a production contract to Boeing. Since the government was the only customer for mailplanes at the time, the design was shelved.

It was revived late in 1926, however, when Boeing was advised that the U.S. Post Office Department planned to turn transcontinental airmail routes over to private operators in July 1927, with bids to be opened in January. The Model 40 was quickly redesigned to meet the requirements and utilize latest improvements. The war surplus water-cooled Liberty engine was replaced by the 420-hp Pratt & Whitney "Wasp," a new air-cooled radial then being tested by the Navy in the Boeing FB-6 and by Boeing in its new Model 69 fighter. The composite wood-and-tube fuselage was replaced by an all-steel structure. The lighter engine permitted a greater payload, so the basic design was further altered to include a two-seat cabin in hopes of attracting passenger revenue in addition to that of 1,000 pounds of mail.

The low operating costs and high revenue potential of the redesigned Model 40 enabled Boeing to submit the low bid, and the San Francisco-Chicago route was awarded to Boeing Air Transport, a wholly owned Boeing subsidiary. Twenty-four Model 40As were built for the airlines between January and June 1927, and a twenty-fifth was delivered to Pratt & Whitney as a flying engine test-bed.

The 40As were converted to 40Bs when a new 525-hp Pratt & Whitney "Hornet" engine became available early in 1928. A Model 40C was developed simultaneously, using the "Wasp" engine but featuring a four-passenger cabin instead of the original two. Ten 40Cs were built, nine of them for Pacific Air Transport, which had become part of Boeing Air Transport. The major production series was the 40B-4 which combined the "Hornet" engine of the


Model 40



40A





40B-4

40B and the four-place cabin of the 40C. Thirty-nine were built, including a special 40B-4A test-bed for Pratt & Whitney. Five 40B-4s were built by Boeing-Canada under the designation of 40H-4 and several special-purpose 40s were built in Seattle. A number of the 82 Model 40s built were still flying during World War II.

40B-4 SPECIFICATIONS:

Span	44 ft 2 in.
Length	33 ft 3 in.
Wing Area	646 sq ft
Gross Weight	6,075 lb
Top Speed	137.7 mph
Cruising Speed	125 mph
Range	535 mi
Service Ceiling	16,100 ft
Power	525-hp P&W "Hornet"


Model 64

MODEL 64 Designed as an improved land or sea primary trainer to replace NBs, the Model 64 of 1926 was submitted to the Army as a primary or gunnery trainer. A removable rear cockpit fairing structure permitted rapid change from gun ring to padded headrest.

MODEL 64 SPECIFICATIONS:

Span	36 ft 10 in.
Length	25 ft 4 in. (landplane)
Wing Area	344 sq ft
Gross Weight	2,840 lb (seaplane)
Top Speed	98.5 mph (land) 93.3 mph (sea)
Cruising Speed	87 mph (land) 84 mph (sea)
Range	250 mi
Service Ceiling	8,200 ft (land) 7,500 ft (sea)
Power	200-hp Wright J-3 "Whirlwind"
Armament	(1-2) machine guns (military version)


F2B-1

F2B-1 The F2B-1 was a direct development of the PW-9/FB series, designed to use the Pratt & Whitney "Wasp" installation developed by the Navy in the FB-6. In addition to the prototype XF2B-1, the Navy bought 32 production F2B-1s for use from aircraft carriers. Two export versions were sold as Model 69B.

F2B-1 SPECIFICATIONS:

Span	30 ft 1 in.
Length	23 ft
Wing Area	242 sq ft
Gross Weight	2,804 lb
Top Speed	160 mph
Cruising Speed	132 mph
Range	358 mi
Service Ceiling	21,200 ft
Power	425-hp P&W "Wasp"
Armament	(2) machine guns 125-lb bombload

F3B-1 The prototype XF3B-1 (Model 74) was a refinement of the F2B-1 and used the same tapered wings. After Navy tests, it was returned to the factory and extensively redesigned to use new, larger wings for improved high-altitude characteristics. Seventy-three production F3B-1s (Model 77) were delivered to the Navy in 1928.

F3B-1 SPECIFICATIONS:

Span	33 ft
Length	24 ft 10 in.
Wing Area	275 sq ft
Gross Weight	2,945 lb
Top Speed	156 mph
Cruising Speed	131 mph
Range	340 mi
Service Ceiling	21,500 ft
Power	450-hp P&W "Wasp"
Armament	(2) machine guns 125-lb bombload



F3B-1

XN2B-1 Two Model 81s were built in 1927-1928 as developments of the Model 64, one as XN2B-1 for the Navy and one as Model 81A for the Boeing School of Aeronautics. The original Fairchild-Caminez engines were replaced by a Wright J-6-7 in the XN2B-1; an Axelson and later a Wright J-6-5 in the 81A.

81/XN2B-1 SPECIFICATIONS:

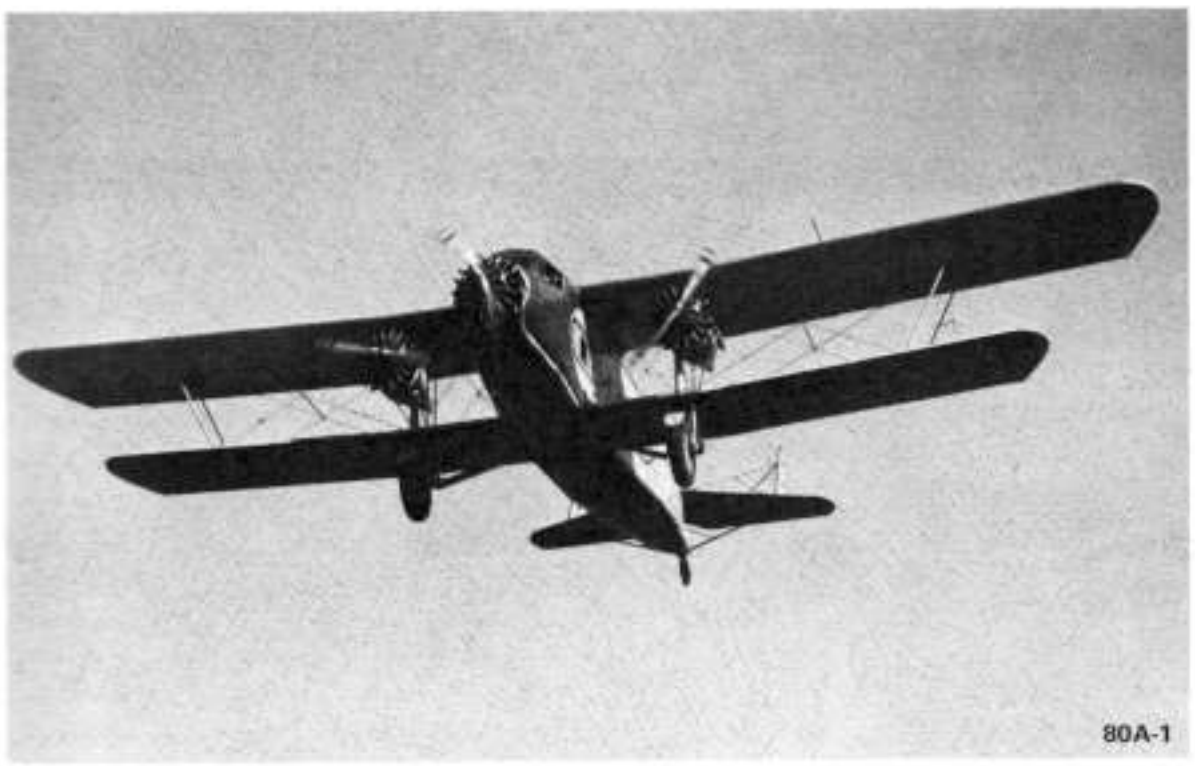
Span	35 ft
Length	25 ft 8 in.
Wing Area	295 sq ft
Gross Weight	2,178 lb
Top Speed	104 mph
Cruising Speed	86 mph
Range	335 mi
Service Ceiling	12,100 ft
Power	127-hp Fairchild-Caminez


XN2B-1





Model 80


80A-1


Model 226

MODEL 80 The success of passenger operations with Model 40s on the San Francisco-Chicago route encouraged expansion of the business through the addition of larger airplanes designed specifically for passenger convenience and comfort.

The first of four Model 80 trimotor biplanes, the last word in luxurious air transportation, was delivered to Boeing Air Transport in August 1928, only 2 weeks after its first flight. Twelve passengers were carried in the large cabin, which was provided with hot and cold running water, forced-air ventilation, leather upholstered seats, and individual reading lamps. The pilot and copilot were enclosed in a roomy cabin ahead of and separate from the passenger cabin.

The needs of a dozen passengers during long flights soon indicated the desirability of a cabin attendant who could devote full time to their comfort. While some European airlines used male stewards, Boeing Air Transport hired registered nurses who became the first of the now universal airline stewardesses.

The original 80s, using 410-hp "Wasp" engines, were followed by twelve 18-passenger 80As fitted with more powerful "Hornet" engines. The twelfth 80A was completed as the 80B at the request of old-line pilots who were not quite sold on the new enclosed pilot cabins. They felt that the pilot needed the wind in his face to tell how the plane was flying. The pilots were soon convinced of the merits of the new idea and the 80B was converted to a standard 80A. All became 80A-1 following service modifications that changed fuel capacity, streamlined engine cowlings, and added more rudder area. The eleventh 80A was completed as a deluxe oil company executive transport under the designation Model 226.

MODEL 80A SPECIFICATIONS:

Span	80 ft
Length	56 ft 6 in.
Wing Area	1,220 sq ft
Gross Weight	17,500 lb
Top Speed	138 mph
Cruising Speed	125 mph
Range	460 mi
Service Ceiling	14,000 ft
Power	(3) 525-hp P&W "Hornet"

F4B/P-12/MODEL 100 SERIES

Early in 1928, all of Boeing's fighter plane experience culminated in two prototypes of a new fighter design—Models 83 and 89. They were built at company expense with confidence that demonstrated superiority over contemporary designs would result in significant production orders. This confidence was justified when the new model proved to be one of the most famous and widely used fighters of the years between world wars. A major innovation was the use of bolted aluminum tubing for the fuselage structure in place of the traditional welded steel tubing.

Following tests of both prototypes as XF4B-1, the Navy ordered 27 production F4B-1s (Model 99) as carrier-based fighter-bombers. The Army, on the basis of Navy tests, ordered nine duplicates as P-12 (Model 102) and one as XP-12A (Model 101). While initial military production got underway, four commercial and export derivatives were developed as Model 100s and a special two-seat 100A was built. Two 100s were retained by Boeing and used extensively in developing improved features to be incorporated in 90 P-12Bs (Model 102B), 96 P-12Cs (Model 222), 46 F4B-2s (Model 223), and 35 P-12Ds (Model 227).

In 1930, a major structural development was tested in the Model 218, which utilized a semi-monocoque duraluminum fuselage patterned closely after those of the experimental XP-9 (Model 96) and the XP-15/XF5B-1 (Models 202 and 205). Both the Army and the Navy tested the 218 as a new prototype and placed more large orders. The single Model 218 was sold to China in 1932.

In March 1931, the Army ordered 135 P-12Es (Model 234) as the result of Model

P-12C SPECIFICATIONS:

Span	30 ft
Length	20 ft 1 in.
Wing Area	228 sq ft
Gross Weight	2,629 lb
Top Speed	178 mph
Cruising Speed	150 mph
Range	675 mi
Service Ceiling	26,200 ft
Power	450-hp P&W "Wasp"
Armament	(2) machine guns



XF4B-1



P-12C



P-12F



F4B-3

218 tests. This was the largest single military order placed since the 200 MB-3As of 1921. The Navy followed with an order for 113 similar Model 235s, 21 as F4B-3s and 92 as F4B-4s—the latter distinguished by larger vertical-tail surfaces. Fourteen of the early F4B-4s were released for export to Brazil, and replacements were built for the Navy. Nine additional export models combining the features of the P-12E and the F4B-3 were sold to Brazil as Model 267s, and three P-12E and F variants were sold as Model 100Es and Fs. The last 25 P-12Es were completed as P-12Fs (Model 251); experimental modifications by the Army resulted in model designations through P-12L.

The last of 586 airplanes in this series and the last Seattle-built Boeing with wooden wings, an F4B-4, was delivered on February 28, 1933. In marking the end of the biplane fighter era for Boeing, it provided the final vindication of the bold gamble of 1928 by establishing a production record for a basic American military model that was not to be equalled until the eve of World War II.



F4B-4

F4B-4 SPECIFICATIONS:

Span	30 ft
Length	20 ft 5 in.
Wing Area	228 sq ft
Gross Weight	2,898 lb
Top Speed	187 mph
Cruising Speed	160 mph
Range	585 mi
Service Ceiling	27,500 ft
Power	500-hp P&W "Wasp"
Armament	(2) machine guns 232-lb bombload

MODEL 95 With the Model 80s devoted almost exclusively to Boeing Air Transport's growing passenger service, a need developed for an all-mail and cargo plane on the same routes. Twenty-five Model 95s of traditional open-cockpit configuration with 89 cubic feet of cargo space were delivered to three airlines in 1929.

MODEL 95 SPECIFICATIONS:

Span	44 ft 3 in.
Length	31 ft 11 in.
Wing Area	490 sq ft
Gross Weight	5,840 lb
Top Speed	142 mph
Cruising Speed	120 mph
Range	520 mi
Service Ceiling	16,000 ft
Power	525-hp P&W "Hornet"



Model 95

XP-9 The XP-9 (Model 96) was an experimental all-metal monoplane fighter designed in 1928 to a specific Army request. The position of the wing on top of the fuselage was a severe handicap to pilot visibility and the configuration was abandoned. Several XP-9 structural features were successfully incorporated in later Boeing models.

XP-9 SPECIFICATIONS:

Span	36 ft 6 in.
Length	25 ft 2 in.
Wing Area	210 sq ft
Gross Weight	3,623 lb
Top Speed	213 mph
Cruising Speed	180 mph
Range	425 mi
Service Ceiling	26,800 ft
Power	600-hp Curtiss "Conqueror"
Armament	(2) machine guns 125-lb bombload


XP-9

MODEL 203 Five Model 203 primary trainers, powered by 150-hp Axelson engines, were built for the Boeing School of Aeronautics. All were converted to the 203A type by installation of 165-hp Wright J-6-5 engines. Two additional 203As were built by students at the school, and three were converted to 203B advanced trainers with 220-hp Lycoming engines.

MODEL 203A SPECIFICATIONS:

Span	34 ft
Length	24 ft 4 in.
Gross Weight	2,625 lb
Top Speed	108 mph
Cruising Speed	92 mph
Range	400 mi
Power	165-hp Wright "Whirlwind"



Model 203B



XP-15

XP-15/XF5B-1 With the end of the biplane fighter era clearly in sight in 1930, Boeing submitted Models 202 and 205, nearly identical all-metal monoplane versions of the established P-12/F4B, to the Army and Navy. While neither was ordered into production, the new semi-monocoque fuselage structure was used on later versions of the P-12/F4B.

MODEL 202 (XP-15) SPECIFICATIONS:

Span	30 ft 6 in.
Length	21 ft
Wing Area	157 sq ft
Gross Weight	2,746 lb
Top Speed	190 mph
Cruising Speed	160 mph
Range	420 mi
Service Ceiling	26,550 ft
Power	525-hp P&W "Wasp"
Armament	(2) machine guns



Model 204

MODEL 204 Eight improved versions of the B-1 (Model 6) were built in 1928, two as B-1D with 220-hp Wright J-5 engines and six as B-1E with 410-hp Pratt & Whitney "Wasps." Because of the great design advances made since 1919, subsequent production versions were designated as Model 204s. One dual-control 204A was built for Wm. E. Boeing, and four C-204 "Thunderbirds" were built by Boeing-Canada.

MODEL 204 SPECIFICATIONS:

Span	39 ft 8 in.
Length	32 ft 7 in.
Wing Area	470 sq ft
Gross Weight	4,940 lb
Top Speed	115 mph
Cruising Speed	95 mph
Range	350 mi
Service Ceiling	9,000 ft
Power	410-hp P&W "Wasp"



XF6B-1

XF6B-1 The XF6B-1 (Model 236) was developed as a possible successor to the F4B-4, but the era of the classic biplane fighter with fixed landing gear was clearly at an end. Major improvement over the F4B/P-12 series was the use of all-metal structure and a twin-row engine.

XF6B-1 SPECIFICATIONS:

Span	28 ft 6 in.
Length	22 ft 2 in.
Wing Area	252 sq ft
Gross Weight	3,704 lb (fighter)
Top Speed	200 mph
Cruising Speed	170 mph
Range	525 mi
Service Ceiling	24,400 ft
Power	625-hp P&W "Twin Wasp, Jr."
Armament	(2) machine guns 700-lb bombload

MONOMAIL, MODELS 200, 221, 221A One of the most revolutionary airplanes in commercial aviation history was the Boeing Monomail (Model 200), which first flew in May 1930. Designed initially as a mail/cargo airplane, it achieved major performance increases not by the addition of brute horsepower but by structural and aerodynamic refinement. The traditional biplane design with drag-producing struts and wires was replaced by a single, smooth, all-metal low wing of clean cantilever construction. The wheels were retracted into the wing during flight, and the drag of the air-cooled "Hornet" engine was greatly reduced by enclosing it in a newly developed "anti-drag" cowling.

A second Monomail, with a six-passenger cabin patterned after that of the famous Model 40, was built as Model 221. Both underwent subsequent revision for transcontinental mail-passenger service and became Model 221A. Major drawback to the Monomail design was that it was too advanced for the current state of the art in powerplant and propeller design. Efficient use of its full performance range required a low-pitch propeller for takeoff and climb and high pitch for cruising. By the time that a controllable-pitch propeller was installed on the Monomail, it was already on the verge of replacement by newer multiengine designs that it had inspired.

MONOMAIL 221 SPECIFICATIONS:

Span	59 ft 1 in.
Length	41 ft 10 in.
Wing Area	535 sq ft
Gross Weight	8,000 lb
Top Speed	158 mph
Cruising Speed	135 mph
Range	575 mi
Service Ceiling	14,700 ft
Power	575-hp P&W "Hornet B"

Y1B-9A SPECIFICATIONS:

Span	76 ft
Length	51 ft 5 in.
Wing Area	960 sq ft
Gross Weight	13,919 lb
Top Speed	186 mph
Cruising Speed	158 mph
Range	1,150 mi
Service Ceiling	20,150 ft
Power	(2) 600-hp P&W "Hornet"
Armament	(2) machine guns 2,400-lb bombload



Monomail 221A


Y1B-9A

B-9 Boeing Models 214 and 215, which became the Army Y1B-9 and YB-9, were logical military developments of the revolutionary Monomail and were built as company-financed projects in anticipation that they would produce the same performance advance in the field of heavy bombers. How well they succeeded is shown by the fact that they raised the speed of bombers, traditionally the slowest of military airplanes, to a point 5 mph *ABOVE* that of contemporary fighters. While this performance was attained through the use of cantilever monoplane design and careful attention to streamlining, the new bombers followed military tradition dating back to World War I by carrying the 2,200-pound bombload externally and accommodating the five-man crew in open cockpits.

Model 215, powered by 600-hp Pratt & Whitney "Hornet" engines, was completed first and flew on April 13, 1931. Model 214, originally powered with 600-hp liquid-cooled Curtiss "Conqueror" engines, was changed to "Hornet" power following Army tests.

A service test order for five improved Model 246s was placed in August 1931 under the Army designation of Y1B-9A, and the two prototypes were purchased at the same time.

Although not ordered in quantity, the B-9 left its mark. Because of it, bomber design concepts were revolutionized and a wholly new type of fighter had to be developed to reestablish the traditional fighter performance superiority.



P-26A

P-26 After the spectacular performance of the Monomail and the B-9, a similar design technique was applied to a fighter. Three all-metal Model 248 monoplanes were built at Boeing expense between January and March 1932. The design was carefully coordinated with the Army to assure meeting its requirements. The engines, instruments, and military equipment were loaned by the Army.

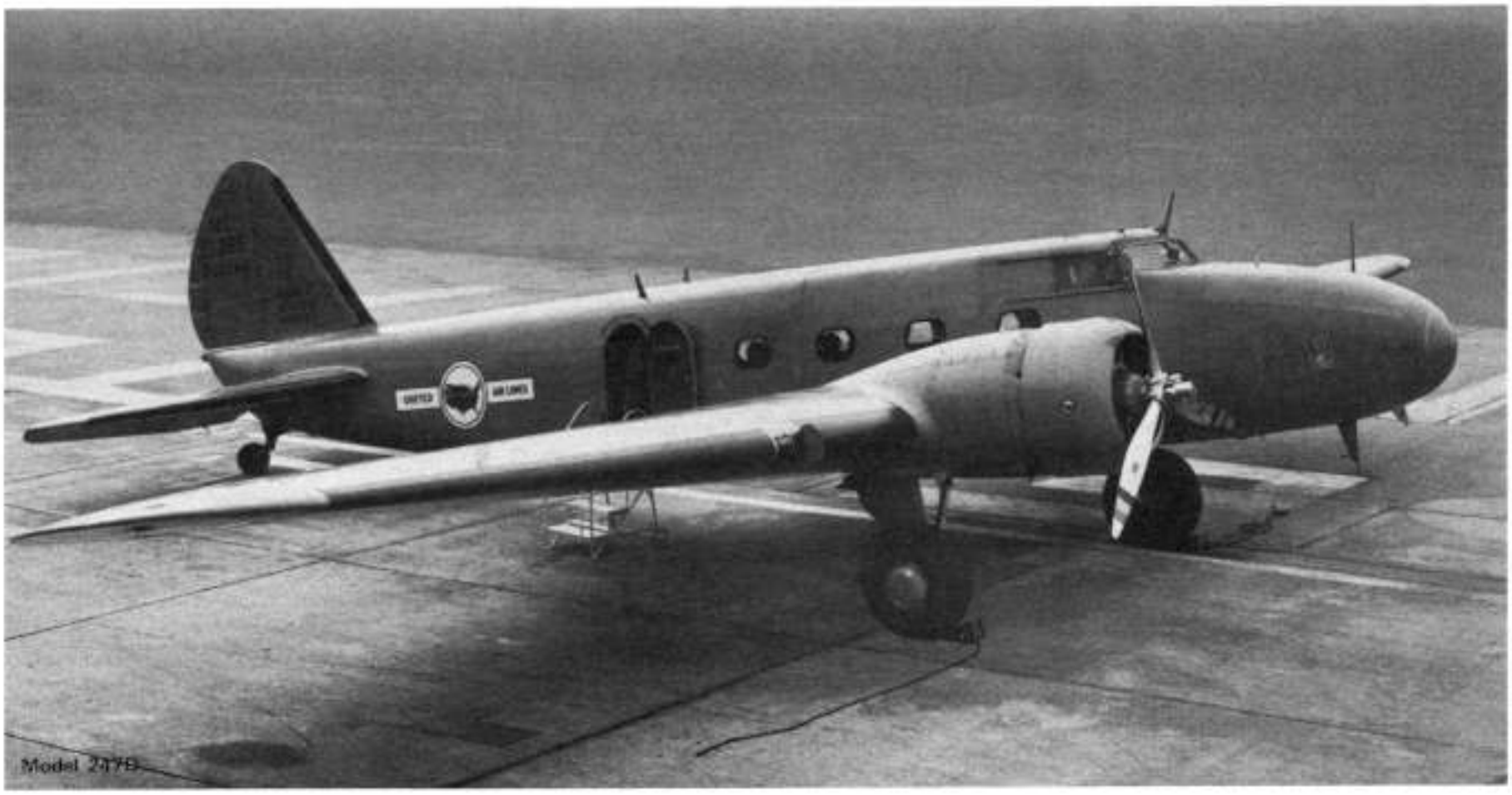
After testing as the XP-936, the Army bought the three prototypes as XP-26. These became Y1P-26 for service test and finally plain P-26. One hundred and thirty-six production Model 266s were ordered, 111 as P-26A, two as P-26B, and 23 as P-26C. The P-26Cs were all remodeled as P-26B while in service and all production P-26s were modified by the addition of wing flaps to reduce their high landing speeds to that of the contemporary biplanes.

Twelve export versions, 11 for China and one for Spain, were built as Model 281. One of a group of P-26As turned over to the Philippine Army late in 1941 was one of the first Allied fighters to down a Japanese airplane during their attack on the Philippines.

P-26A SPECIFICATIONS:

Span	28 ft
Length	23 ft 7 in.
Wing Area	149 sq ft
Gross Weight	2,995 lb
Top Speed	234 mph
Cruising Speed	200 mph
Range	635 mi
Service Ceiling	27,400 ft
Power	600-hp P&W "Wasp"
Armament	(2) machine guns 200-lb bombload





Model 247D



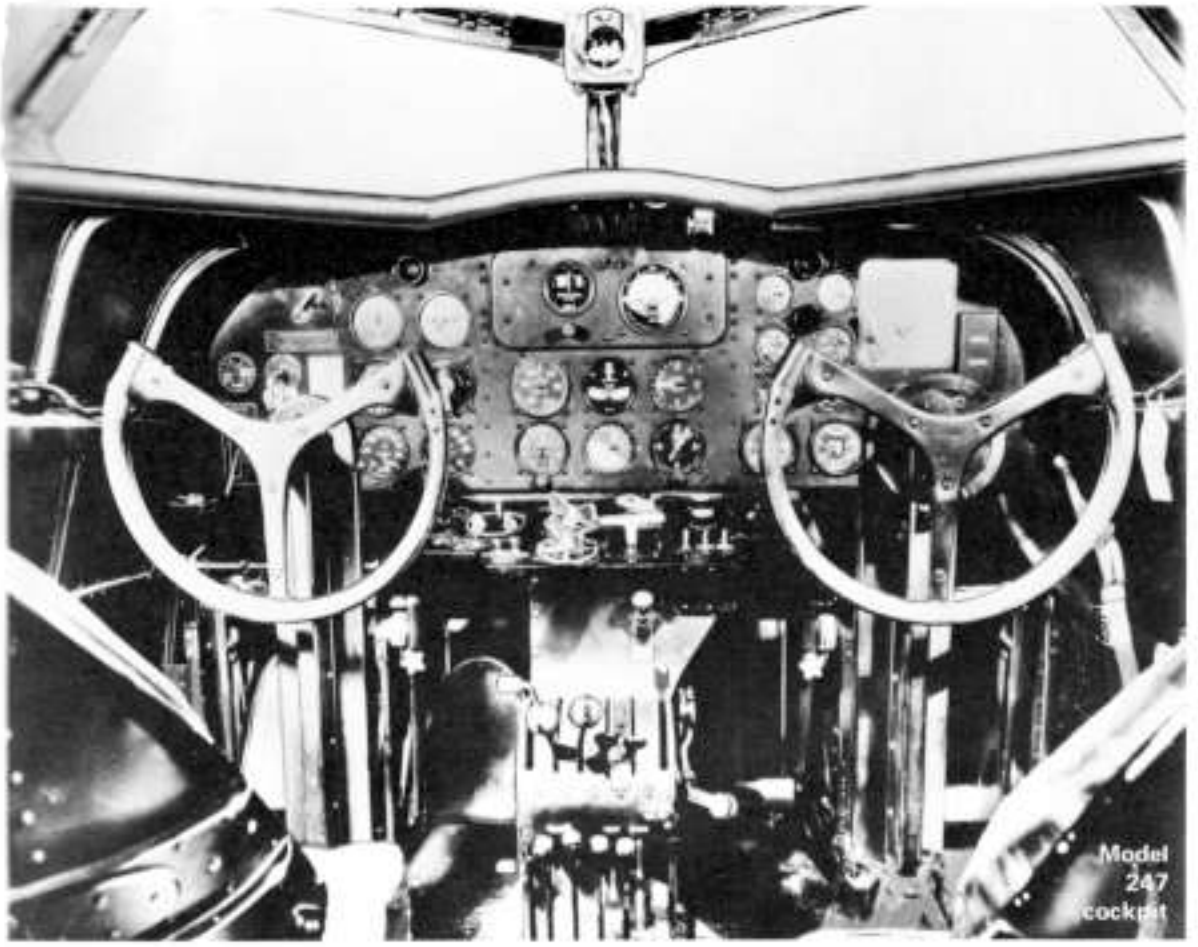
Model 247 passenger compartment

MODEL 247 The final design area influenced by the revolutionary Monomail concept was that of the multiengined transport airplane. A good start had been obtained through the development of the B-9s; the step to an airliner was logical and short. In fact, the transport design was almost complete before the bomber flew. Details were circulated among the airlines that composed the Boeing Air Transport System, soon to become United Air Lines. The result was unprecedented—a decision was made to completely re-equip the airline with the new Model 247s. An order for 60 was placed while the design was still in the mockup stage.

Although smaller than the luxurious Model 80, the speedy 247 retained all of the "Flying Pullman's" comfort for 10 passengers, including a stewardess and two-pilot crew. With no engine in the nose, the space was used for additional radio equipment and 400 pounds of mail. A new feature for airlines was the installation of supercharged engines and pneumatically operated rubber de-icer "boots" on the leading edges of the wing and tail surfaces to remove accumulated ice, formerly the major airline bad-weather handicap. The 247 first flew in February 1933, and all 60 were delivered to the airlines within a year. Further 247 sales brought the total to 75, including a special 247A powered with new 625-hp twin-row Pratt & Whitney engines for United Aircraft Corporation, two for Deutsche Lufthansa, the German national airline, and a special militarized 247Y for a private owner in China.

In 1934, one 247 was modified for Roscoe Turner and Clyde Pangborn as the 247D to fly as an American entry in the MacRobertson race from England to Australia. Other than removal of the airline furnishings and installation of increased fuel tankage, the major changes were modification of the engine nacelles to utilize full NACA cowlings and the installation of controllable-pitch propellers and geared engines. This 247D placed third in the overall race and second in the transport category. After the race, it was returned to a United Air Lines passenger configuration. A commemorative plaque painted on its side proclaimed its racing record.

The improvements worked out for the 247D racer were soon incorporated on most of the airline 247s then in service, which became 247Ds. Like the Monomail, the full potential of the 247 design had

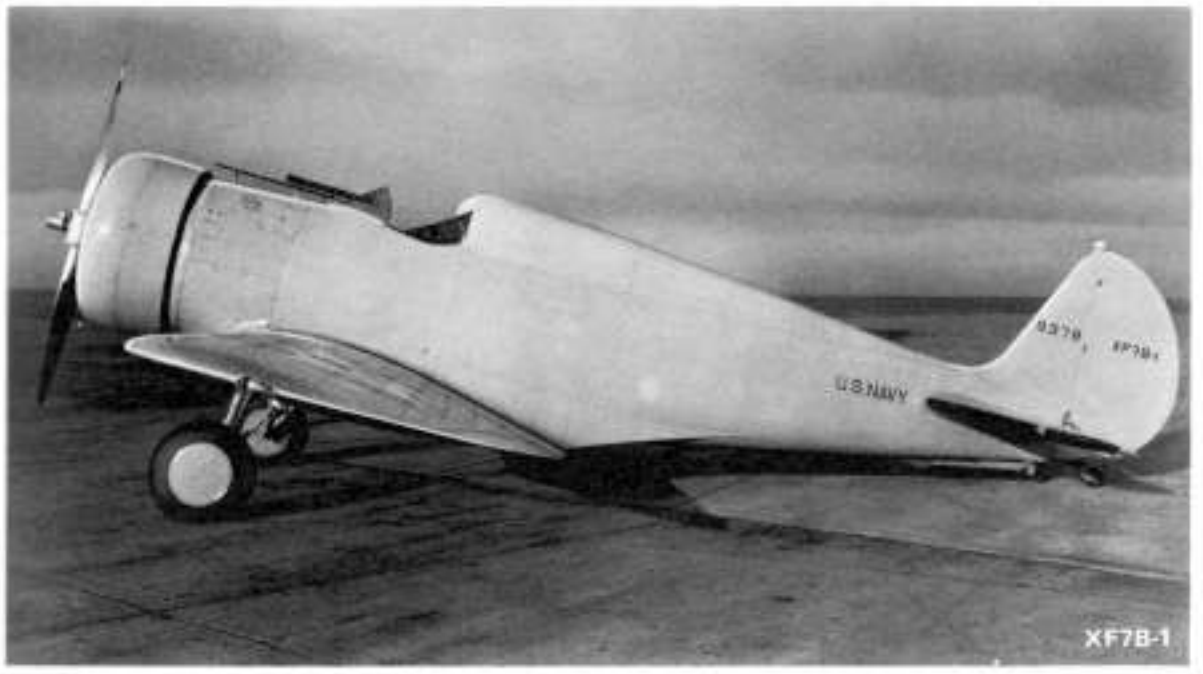

Model 247 cockpit

been restricted by the use of fixed-pitch propellers. The installation of hydraulically controlled Hamilton Standard propellers raised the cruising speed of the 247D to 7 mph above the top speed of the original 247. The 247s remained in airline service until American entry into World War II, when a number of them were drafted into the Army for transport and training duties under the designation C-73. At war's end, the former military models and others released by the trunk airlines went into use on feeder and small independent airlines in the United States and abroad.

MODEL 247D SPECIFICATIONS:

Span	74 ft
Length	51 ft 7 in.
Wing Area	836 sq ft
Gross Weight	13,650 lb
Top Speed	200 mph
Cruising Speed	189 mph
Range	745 mi
Service Ceiling	25,400 ft
Power	(2) 550-hp P&W "Wasp"


YP-29



XF7B-1

YP-29/XF7B-1 Because the P-26, the Army's first standard fighter monoplane, utilized a wire-braced wing and fixed landing gear, there was still room for further performance improvement with the same power through the adoption of cantilever wing construction and a retractable landing gear. Two models were developed simultaneously for the Army and the Navy: the YP-29 (Model 264) and the similar XF7B-1 (Model 273). Aside from slight dimensional variations, the two differed mainly in military equipment and the altitude ratings of their engines. The XF7B-1 first flew in September 1933 and was the first low-wing monoplane fighter tested by the Navy. It proved too advanced for Navy carrier operations, however; monoplane fighters did not join the fleet until 1939.

Both the XF7B-1 and the YP-29 (formerly XP-940) were built with enclosed cockpits, another advanced feature, but the XF7B-1 was modified to the older open-cockpit configuration and the YP-29A and YP-29B were both delivered as open-cockpit models.

YP-29 SPECIFICATIONS:

Span	29 ft 4 in.
Length	25 ft
Wing Area	177 sq ft
Gross Weight	3,518 lb
Top Speed	250 mph
Cruising Speed	212 mph
Range	800 mi
Service Ceiling	26,000 ft
Power	600-hp P&W "Wasp"
Armament	(2) machine guns 170-lb bombload

XB-15 SPECIFICATIONS:

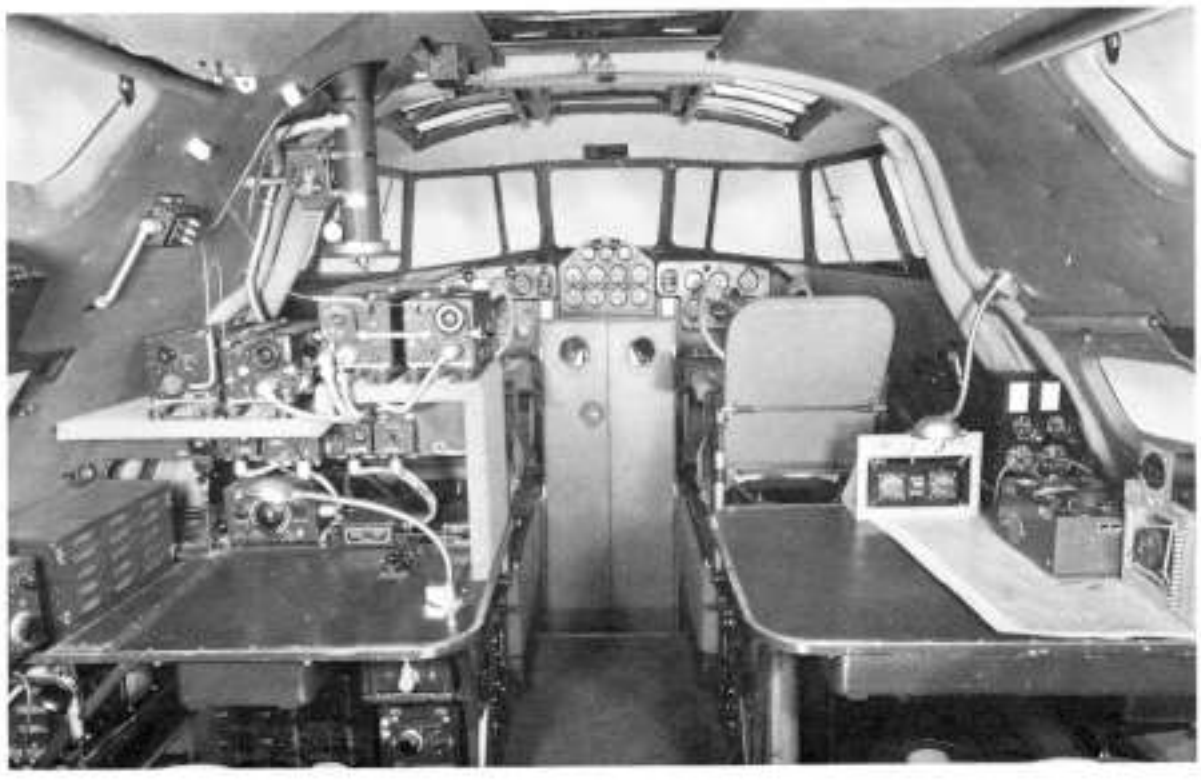
Span	149 ft
Length	87 ft 7 in.
Wing Area	2,780 sq ft
Gross Weight	70,706 lb
Top Speed	200 mph
Cruising Speed	152 mph
Range	5,130 mi
Service Ceiling	18,900 ft
Power	(4) 850-hp P&W "Twin Wasp"
Armament	(6) machine guns 8,000-lb bombload

XB-15 Boeing Model 294 was developed as the result of a design study awarded by the Army in 1934 to determine the feasibility of an extremely heavy bomber, larger than anything built in the United States up to that time. The study resulted in an order for a single experimental XBLR-1, for Experimental Bomber, Long-Range Model 1. The designation was changed to XB-15 before the airplane was completed.

While the XB-15 had been designed to use four 1,000-hp liquid-cooled engines then under development, these were not available in time, so twin-row Pratt & Whitney "Twin Wasp" radials of 850 hp, with 1,000 hp available for takeoff, were utilized. The size of the XB-15 made possible many innovations. Passageways were built inside the wing to enable the crew to make minor engine repairs in flight. The endurance potential was far beyond that of a normal crew, so bunks were installed to permit the carrying of two "watches" in nautical fashion. Since many of the accessories were electrical, two auxiliary generators driven by gasoline engines were installed in the fuselage. Another new feature was the use of a separate crewmember as flight engineer with a station and control panel of his own.

In spite of the power handicap imposed by the engine substitution, the XB-15 set several international load-to-altitude records after its first flight in October 1937. Since it was strictly a research design, the XB-15 was unsuited to combat. Its load-carrying capacity was put to good use in World War II when it was converted to a cargo carrier under the designation XC-105.


XB-15









B-17 FLYING FORTRESS

In August 1934, Boeing was invited to participate in an Army competition for a new multi-engine bomber. This term had generally been used to indicate two engines. After Boeing obtained assurance that the term also covered additional engines, design work and construction were rushed on a new concept for a four-engine bomber that was then being studied. Four-engine bombers were not new, and one, the XB-15, was currently under development at Boeing under an Army contract. Up to that time, additional engines were used mainly to get heavier loads—and bigger airplanes—into the air. The Boeing approach was to use additional engines to give an airplane with the load capacity of a normal twin-engine bomber a great performance increase through the addition of extra power.

While the role of later versions was to be offensive, the Model 299 was conceived for a purely defensive mission: the protection of the American coastline from

(continued next page)

MODEL 299 SPECIFICATIONS:

Span	103 ft 9 in.
Length	68 ft 9 in.
Wing Area	1,420 sq ft
Gross Weight	32,432 lb
Top Speed	236 mph
Cruising Speed	140 mph
Range	3,010 mi
Service Ceiling	24,620 ft
Power	(4) 750-hp P&W "Hornet"
Armament	(5) machine guns 4,800-lb bomb-load

B-17C SPECIFICATIONS:

Span	103 ft 9 in.
Length	67 ft 11 in.
Wing Area	1,420 sq ft
Gross Weight	39,065 lb
Top Speed	300 mph
Cruising Speed	227 mph
Range	3,400 mi
Service Ceiling	36,000 ft
Power	(4) 1,200-hp Wright "Cyclone"
Armament	(7) machine guns 4,800-lb bomb-load

B-17E SPECIFICATIONS:

Span	103 ft 9 in.
Length	73 ft 10 in.
Wing Area	1,420 sq ft
Gross Weight	40,260 lb
Top Speed	318 mph
Cruising Speed	226 mph
Range	3,300 mi
Service Ceiling	35,000 ft
Power	(4) 1,200-hp Wright "Cyclone"
Armament	(9) machine guns 4,200-lb bomb-load

(B-17 continued)

foreign surface fleets. It was this function, and not the formidable defensive armament, that suggested the famous name "Flying Fortress."

In size and configuration, the 299 was midway between the Model 247 transport and the giant XB-15, then on the drawing boards. Unlike the B-9, all bombs were carried internally and defensive armament was comprised of four streamlined machine gun blisters on the sides, top, and bottom of the fuselage and a nose gunner's station. The prototype was powered by four 750-hp Pratt & Whitney "Hornet" engines.

Rushed to completion in just a year, the 299 was flown to Wright Field only a month after the rollout. Average speed for the 2,100-mile flight was an unheard-of 252 mph. The competitive testing was almost completed when the 299 crashed following takeoff with the controls inadvertently locked. Although thus disqualified from the competition, the demonstration to that point had been so impressive that the Army placed a service test order for 13 flight articles and a static test model under the designation YB-17. This was changed to Y1B-17 shortly before the first one was flown in December 1936. The major significant change from the 299 was the substitution of Wright "Cyclone" engines of 1,000 takeoff horsepower for the original "Hornets."

Shortly after the first Y1B-17s went into service, the Army ordered the static test airplane completed as a high-altitude bomber with turbo-supercharged engines. This was delivered as the Y1B-17A and resulted in a production order for 39 similar B-17Bs. Twenty airplanes of a 1939 contract for 38 B-17Cs were diverted to England as RAF "Fortress Is." High-altitude missions over German-occupied Europe in 1941 proved the suitability of the supercharged engines but revealed that armament and armor were inadequate to

B-17G SPECIFICATIONS:

Span	103 ft 9 in.
Length	74 ft 9 in.
Wing Area	1,420 sq ft
Gross Weight	48,726 lb
Top Speed	302 mph
Cruising Speed	160 mph
Range	3,750 mi
Service Ceiling	35,600 ft
Power	(4) 1,200-hp "Cyclone"
Armament	(11) machine guns 16,000-lb bomb-load



B-17E



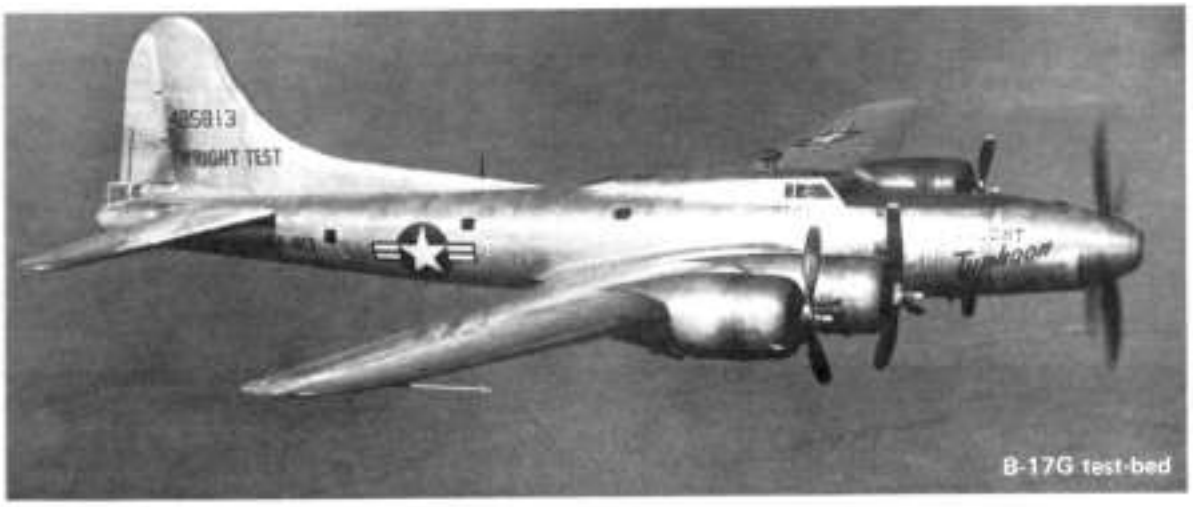
B-17F



B-17G

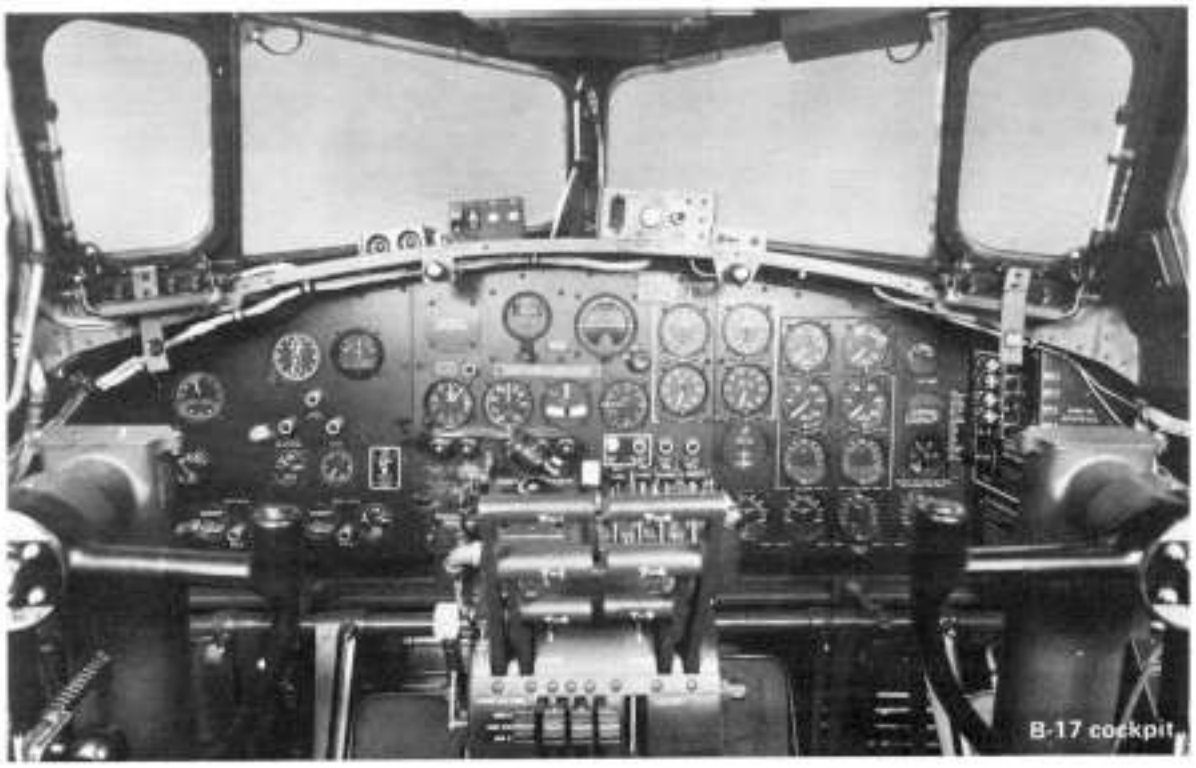


B-17H



B-17G test-bed


PB-1W


B-17 cockpit

meet current requirements. As a result, the 42 B-17Ds were built with self-sealing fuel tanks and minor refinements. The remaining B-17Cs were modified to the B-17D standard.

Results of European combat experience, especially the requirements for defensive armament, were incorporated into the extensively improved B-17E. The .30 caliber armament of earlier B-17s was replaced by eight .50 caliber guns, two each in top and bottom fuselage power turrets and a new tail "stinger" turret. Single .50s were installed at open ports on each side of the fuselage and one .30 was retained in the nose. The most distinctive recognition feature of the B-17E was greatly enlarged tail surfaces that gave better control and stability for high-altitude bombing from an airplane that was now several tons heavier than the prototype. Of 512 B-17Es built, 45 Fortress IIAs were delivered to Britain.

Really large-scale production began with the B-17F, which could be distinguished outwardly from the E by a moulded plastic nose. Boeing built 2,300, and 600 and 500 each were delivered by Douglas and Lockheed-Vega, respectively, in new plants built specially for the purpose. The final production version of the B-17 was the G, with an added two-gun power turret under the nose for defense against direct frontal attack. Boeing built 4,035 Gs and Douglas and Lockheed built 2,395 and 2,250, respectively. At the peak of B-17 production in June 1944, the Seattle plant was rolling out 16 airplanes every 24 hours.

In postwar years, B-17s carrying droppable lifeboats were designated B-17H. A number were diverted to the Navy as PB-1W for antisubmarine and weather reconnaissance work and to the Coast Guard as PB-1G. Wartime reconnaissance versions, originally known as F-9, were redesignated RB-17G. After replacement as standard bombers, B-17s remained in service as trainers and V.I.P. transports. Some were converted to radio-controlled targets and the last B-17 in U.S. military service, a QB-17 drone, was destroyed in 1960, ironically, by a Boeing Bomarc missile.

MODEL 314 The Model 314 was designed to meet a specification issued by Pan American early in 1936 for a long-range four-engine flying boat. The wing and horizontal tail surfaces of the XB-15, then under construction, were adapted almost intact to a newly designed flying-boat hull with accommodations for 74 passengers and a crew of 6 to 10. The major deficiency of the XB-15, insufficient power, was overcome in the 314s by the installation of new Wright "Double Cyclone" engines of 1,500 hp. The initial 314 order was for six airplanes, all with various versions of the name "Clipper" according to Pan Am practice. Collectively, the 314s were known as the "Boeing Clippers."

The first flight was in June 1938, less than 2 years after contract signing; all six were delivered between January and June 1939. Initial service was on the North Atlantic route May 20, 1939, the twelfth anniversary of Lindbergh's famous transatlantic flight. The 314s also added new laurels for dependability on the Pan Am transpacific San Francisco-Hong Kong service.

The first six were followed by a second order for six 314As with provision for three additional passengers and an extra 100 hp per engine. The first six also were converted to 314A standard.

Early in World War II, three were sold to British Overseas Airways Corporation (BOAC) by Pan Am for use on the Atlantic route. They remained in British service until after the war. Three were taken over by the U.S. Navy and operated by Pan Am crews in military camouflage but with civil designations and markings. Two, drafted by the Army as C-98s, were turned over to the Navy for the Pan Am contract operation. These were returned to airline service at the end of the war but were soon replaced by faster postwar landplane designs.

MODEL 314A SPECIFICATIONS:

Span	152 ft
Length	106 ft
Wing Area	2,867 sq ft
Gross Weight	84,000 lb
Top Speed	199 mph
Cruising Speed	184 mph
Range	5,200 mi
Service Ceiling	19,600 ft
Power	(4) 1,600-hp Wright "Twin Cyclone"


Model 314


Model 314 flight deck


Model 314 passenger compartment



Kaydet

KAYDET SERIES When the Stearman Aircraft Company, a Boeing subsidiary since 1934, became the Wichita Division of Boeing in 1941, the famous series of primary trainers that was collectively to be called "Kaydet" during World War II had been in production 7 years. The first, the Model 70, was developed from the original Stearman C Models of 1926-1930. In 1934, the Navy bought 61 Model 73s as NS-1 (Trainer, Stearman) with Wright J-5 engines. The Army bought 26 Lycoming-powered Model 75s as PT-13 in 1937. All subsequent trainer versions for the U.S. Army and Navy were built as Model 75s. Small numbers of a modified version fitted with Pratt & Whitney "Wasp Jr." engines and armament were sold to several Latin American air forces just before World War II as Model 76s. Counting equivalent spares, 10,346 Model 70-76 Kaydets were built from 1933 through 1945.

At the end of the war, approximately 4,000 Kaydets were converted to crop dusting/spraying planes, most of them with 450-hp Pratt & Whitney "Wasp Jr." engines for better performance at high gross weights. More than twenty years later, nearly 1,600 Model 75s were still in service with agricultural airplane fleets.

PT-13D/N2S-5 SPECIFICATIONS:

Span	32 ft
Length	25 ft ¼ in
Wing Area	298 sq ft
Gross Weight	2,810 lb
Top Speed	122 mph
Cruising Speed	107 mph
Range	440 mi
Service Ceiling	11,700 ft
Power	220-hp Lycoming

Boeing Model	*Army Model*	*Navy Model*
75	PT-13	–
A75	PT-13A, B, C	–
B75	–	N2S-2
E75	PT-13D	N2S-5
A75J1	PT-18	–
A75N1	PT-17, 17A	N2S-1, 4
B75N1	–	N2S-3
D75N1	PT-27	–

DB-7B In 1940, Boeing contracted to build 240 Douglas DB-7B attack bombers for France. When completed, these were delivered to England as "Bostons." Night fighter conversions became "Havoc." An additional 140 were built for the U.S. Army as A-20C.

DB-7B/A-20C SPECIFICATIONS:

Span	61 ft 4 in.
Length	47 ft 4 in.
Wing Area	465 sq ft
Gross Weight	20,221 lb
Top Speed	340 mph
Cruising Speed	280 mph
Range	817 mi
Service Ceiling	27,100 ft
Power	(2) 1,600-hp Wright "Twin Cyclone"
Armament	(4) machine guns 2,619-lb bomb-load


DB-7B

PB2B-1 During World War II, the Boeing-Canada facilities at Vancouver, B.C., which had produced British Blackburn Shark torpedo planes for the Royal Canadian Air Force in 1938 and 1939, were expanded to undertake airplane repair and conversion. Also produced were 55 Consolidated PBY-5A "Canso" amphibians for the RCAF and 307 PBY-5 and -6 "Catalina" flying boats under the U.S. Navy designation of PB2B-1 and PB2B-2 for the U.S. Navy and British Empire Services.


PB2B-1

PB2B-2 SPECIFICATIONS:

Span	104 ft 3 in.
Length	64 ft 8 in.
Wing Area	1,400 sq ft
Gross Weight	37,000 lb
Top Speed	165 mph
Cruising Speed	117 mph
Range	2,485 mi
Service Ceiling	14,100 ft
Power	(2) 1,200-hp P&W R-1830-92
Armament	(3) .50 caliber machine guns (1) .30 caliber machine gun 4,000-lb bomb-load







SA-307B SPECIFICATIONS:

Span	107 ft 3 in.
Length	74 ft 4 in.
Wing Area	1,486 sq ft
Gross Weight	42,000 lb
Top Speed	246 mph
Cruising Speed	220 mph
Range	2,390 mi
Service Ceiling	26,200 ft
Power	(4) 1,100-hp Wright "Cyclone"

307 STRATOLINER The Model 307, which was named the "Stratoliner" when it went into airline service, originated as the Model 300. The studies for the 299 bomber and the 300 transport were developed simultaneously with the intention of producing military and commercial models that could use the same wing, tail, and powerplant installations. This philosophy was carried into the final 307 configuration, which differed from early production B-17s mainly in the fuselage design.

An outstanding feature of the 307 was its first use of cabin pressurization for passenger comfort at substratospheric altitudes above much of the rough weather. To resist the differential pressures existing at these altitudes and provide maximum room for the 33 passengers and five crewmembers, the fuselage was built in a circular cross section. Another innovation on an airliner was the use of an extra crewmember as flight engineer to relieve the pilot of the responsibility for maintaining power settings, keeping track of cabin pressurization, and operating various subsystems.

Ten Stratoliners were built: a prototype plus five for Transcontinental & Western Air (TWA, now Trans World Airlines) as SA-307B, three for Pan Am as S-307, and one for Howard Hughes as SB-307B. The S-307s remained in Pan Am service until after the end of World War II. The five SA-307Bs were drafted into the Army Air Transport Command as C-75s and were flown all over the world by TWA crews. After 3 years of service that included 3,000 transatlantic crossings and 45,000 hours of flight, the C-75s were returned to the factory in 1944 for reconversion to airline standards.

The airplanes were almost completely rebuilt. New B-17G wings and horizontal-tail surfaces were installed, the 900-hp Wright "Cyclones" were replaced with later versions used in the B-17G, the passenger capacity was increased to 38, and the pressurization feature was deleted. Redesignated as SA-307B-1s, the Stratoliners remained in TWA service until 1951. Thirty years after they were built, five Stratoliners were still in service.

XA-21 At the time that Stearman became a division of Boeing, the Model X-100 was undergoing evaluation in an Army attack bomber competition as the XA-21. Although not produced, the XA-21 was a milestone in that it was the first Stearman with an all-metal structure.

XA-21 SPECIFICATIONS:

Span	65 ft
Length	53 ft
Wing Area	607 sq ft
Gross Weight	18,230 lb
Top Speed	257 mph
Cruising Speed	190 mph
Range	1,200 mi
Service Ceiling	20,000 ft
Power	(2) 1,400-hp P&W R-2180-7
Armament	(6) .30 caliber machine guns 2,700-lb bombload


XA-21

XAT-15 Two X-120s (the Wichita Division retained the old Stearman Model designating system for current designs) were built for the Army in 1941 as XAT-15 integrated aircrew trainers. Because of the prevailing aluminum shortage, the fuselage was welded steel tubing and the wings and tail were of wood.

XAT-15 SPECIFICATIONS:

Span	59 ft 8 in.
Length	42 ft 4 in.
Wing Area	457 sq ft
Gross Weight	14,355 lb
Top Speed	207 mph
Cruising Speed	185 mph
Range	850 mi
Service Ceiling	18,900 ft
Power	(2) 600-hp P&W R-1340-AN-1
Armament	(4) .30 caliber machine guns (10) 100-lb bombs

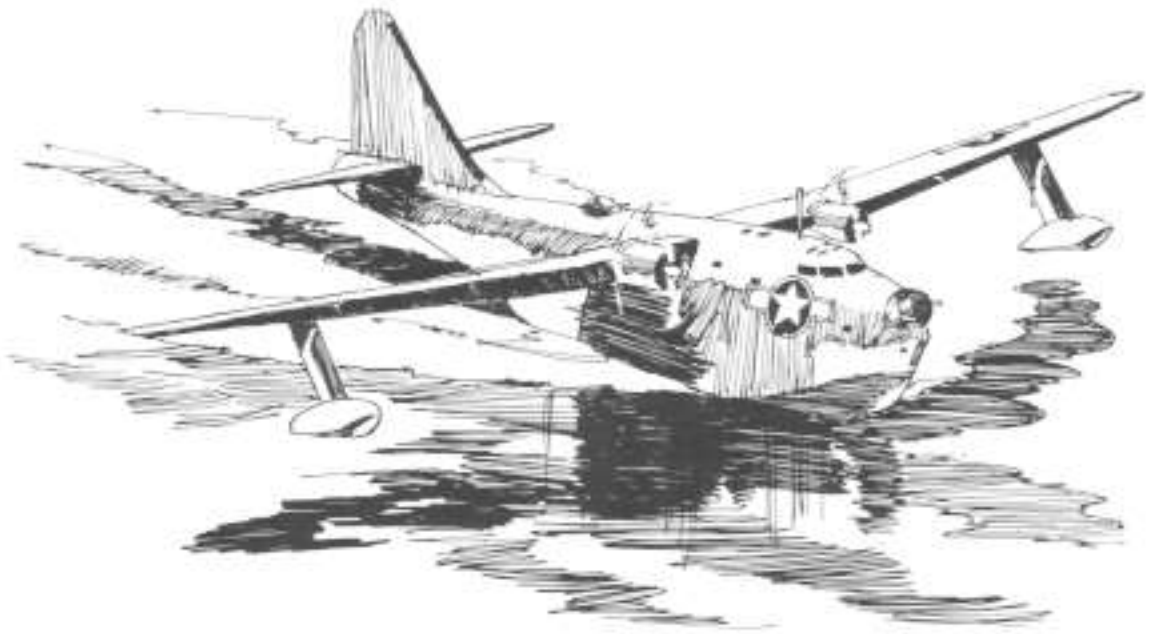

XAT-15

XBT-17 The XBT-17 originated as a dual-purpose design: a primary trainer (Wichita Model X-90) fitted with an uncowled 220-hp Lycoming engine that could be converted to a basic trainer (Model X-91) by substitution of a Pratt & Whitney "Wasp Jr." Critical aluminum was saved by building the wings and tail of plastic-impregnated plywood. The X-91 was sold to the Army under the designation XBT-17.

XBT-17 SPECIFICATIONS:

Span	35 ft 9 in.
Length	28 ft 6 in.
Wing Area	200 sq ft
Gross Weight	4,150 lb
Top Speed	190 mph
Cruising Speed	160 mph
Service Ceiling	20,000 ft
Power	450-hp P&W R-985-AN-1


XBT-17





XPBB-1

XPBB-1 The XPBB-1 (Model 344), using a wing similar to the B-29, was built to a Navy requirement for a very-long-range flying boat patrol-bomber. Need for this type was greatly reduced in 1942, and the Boeing Renton plant, built for the Navy PBB-1 "Sea Ranger" program, was turned over to the Army for B-29 production.

XPBB-1 SPECIFICATIONS:

Span	139 ft 8 in.
Length	94 ft 9 in.
Wing Area	1,826 sq ft
Gross Weight	62,006 lb (101,129 lb with JATO)
Top Speed	219 mph
Cruising Speed	158 mph
Range	4,245 mi
Service Ceiling	18,900 ft
Power	(2) 2,000-hp Wright "Double Cyclone"
Armament	(4) machine guns 20,000-lb bombload



XF8B-1

XF8B-1 The first Boeing single seater since 1935 was the shipboard fighter-torpedo-bomber Model 400, three of which were built for the Navy as XF8B-1. First flown in November 1944, the unique dual-propeller design was dropped as the end of World War II signalled the beginning of the jet era.

XF8B-1 SPECIFICATIONS:

Span	54 ft
Length	43 ft 3 in.
Wing Area	489 sq ft
Gross Weight	20,508 lb
Top Speed	432 mph
Cruising Speed	190 mph
Range	3,500 mi
Service Ceiling	37,500 ft
Power	2,500-hp P&W "Wasp Major"
Armament	(6) machine guns or 20mm cannons 3,200-lb bombload



B-29A

B-29 SUPERFORTRESS

Initial studies that were to result in the famous B-29 "Superfortress" began in 1938 with a Boeing proposal to the Army for an improved B-17 with a pressurized cabin to increase crew efficiency and comfort during long high-altitude missions. There were no military requirements for such a design at the time, but Boeing, with Army encouragement, kept updating the design in the light of anticipated requirements. Finally, in February 1940, an official invitation was received to bid on a high-altitude long-range bomber. After several major revisions to meet constantly changing requirements, the design became Model 345 and three airplanes, with a fourth for static test, were ordered as XB-29.

When the XB-29 first flew in September 1942, it was as far ahead of its contemporaries as the B-9 had been more than a decade before. The 10-gun defensive armament was concentrated in four remote-controlled power turrets on the fuselage and in a single directly controlled turret in the tail, which carried three guns—two .50 calibers and a 20mm cannon. The fuselage was divided into three pressurized compartments: one in the nose for the pilots, bombardier, and flight engineer and one amidships for the gunners and observers. The two were connected by a tunnel over the tandem bomb bays. A separate pressurized area was provided for the tail gunner. Each engine was fitted with two turbosuperchargers. Dual wheels were installed on each leg of the tricycle landing gear to support the 54-ton gross weight. Wing loading was an unprecedented 58 pounds per square foot, which was to be increased by an additional 10 pounds in later models. Satisfactory takeoff and landing characteristics at this weight were achieved with the high-speed Boeing "117" airfoil through use of Fowler flaps, which not only increased lift when deflected but added to wing area by extending aft out of the wing as well as downward.

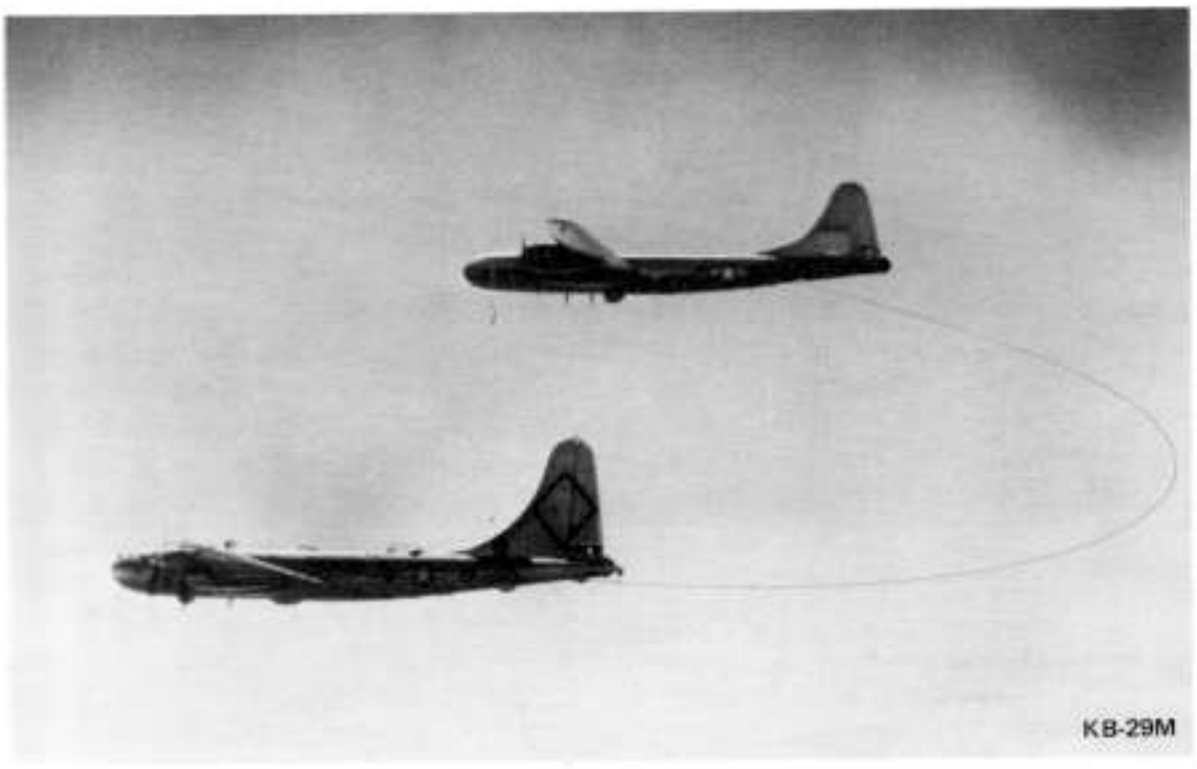

XB-29

Even before the prototype was completed, the Army ordered large-scale production. The Wichita Division plant was expanded for the purpose, and Bell and Martin were ordered to build B-29s in new plants to be constructed at Marietta, Georgia, and Omaha, Nebraska. The Boeing Renton plant, originally built for the Navy PBB-1 flying boat program, was transferred to Army jurisdiction and devoted to B-29A production.

B-29 production became the largest single airplane program of World War II. It entailed not only a multiplant production complex and thousands of subcontractors, but also modification centers where last-minute changes and refinements expeditiously could be made without slowing the expanding assembly lines.

B-29s first bombed Japan in June 1944, less than 2 years after the initial flight of the XB-29. As enemy fighter opposition diminished toward the end of World War II, it was possible to improve the speed of the B-29s by deleting the gun turrets and sighting blisters. These stripped versions







were designated B-29B; B-29A having been assigned to Renton-built aircraft which featured a different type of center wing construction. Altogether, 3,970 B-29s had been built when production terminated in 1946: 2,766 by Boeing, 668 by Bell, and 536 by Martin. The end of the war resulted in the cancellation of an additional 5,092 B-29s on order, after Wichita's production rate had reached 85 per month.

Postwar years saw further development of the B-29 for a great variety of purposes. Like the B-17, it was adapted to carry airborne lifeboats and used on antisubmarine and weather duty. It served as a flying powerplant laboratory with a retractable jet engine mounted in the bomb bay. The P2B-1's size made it an efficient "mother ship" for supersonic research aircraft that had to be carried aloft for launching. Postwar B-29s served the Royal Air Force as Boeing "Washingtons."

An entirely new career was opened for the B-29 with the advent of aerial refueling as a means of extending the range of bombers and fighters. Under the designation KB-29M, 72 B-29s were converted at Wichita to flying tankers with a single large fuel tank filling each bomb bay, a hose that could be unreeled and secured to the receiver airplane, and transfer pumps. Seventy-four B-29s were modified to receive fuel by this method, with one bomb bay used for increased fuel capacity. The B-50A "Lucky Lady II" made the first nonstop flight around the world in 1949 after being refueled by six KB-29Ms at three points en route. The drawbacks of the hose refueling system were overcome by Boeing development of the "flying boom," which permitted a direct mechanical connection between the airplanes and much faster fuel transfer rates. One hundred and sixteen B-29s were modified at Renton as KB-29P flying-boom tankers. The last B-29s in squadron use were retired from service in September 1960.

B-29A SPECIFICATIONS:

Span	141 ft 3 in.
Length	99 ft
Wing Area	1,739 sq ft
Gross Weight	105,000/ 120,000 lb
Top Speed	363 mph
Cruising Speed	220 mph
Range	5,830 mi
Service Ceiling	31,850 ft
Power	(4) 2,200-hp Wright "Double Cyclone"
Armament	(12) machine guns (1) 37mm cannon 20,000-lb bomb-load (max)

C-97 STRATOFREIGHTER

The C-97 Stratofreighter (Model 367) was designed in 1942 as a heavy cargo-transport airplane for military purposes and bore the same aerodynamic and structural relationship to the B-29 that the Model 307 Stratoliner bore to the B-17. Outstanding features were the double-deck pressurized fuselage, large clamshell cargo doors beneath the tail, and an integral ramp and cargo hoist system that permitted unassisted loading of standard 2½-ton Army trucks and even small aircraft (see page 45).

The first of three XC-97 prototypes flew in November 1944. Production was subordinated to the B-29 and the first of six service test YC-97s did not fly until March 1947. Development of the B-50 from the B-29 resulted in the three YC-97As using the 75ST metal structure, Pratt & Whitney R-4360 engines, enlarged vertical tail, and advanced systems of the B-50—as did all subsequent C-97 Stratofreighters. The single YC-97B was built for passenger use with the cargo provisions deleted in favor of airliner seats, windows, and other interior appointments similar to those of the commercial Model 377 Stratocruiser. The 10 YC-97s were built in Seattle and all others at Renton.

The first of 50 production C-97As for the Military Air Transport Service flew in June 1949. Three, using KB-29P experience, were modified as KC-97A flying-boom tankers with a pod containing the boom operator and boom installed in the position normally occupied by the cargo doors. Fourteen C-97Cs were built for MATS as minor revisions of the C-97A with emphasis on interior appointments suited to the evacuation of casualties from the Korean War. Ten VC-97 flying command posts were converted from YC-97As and C-97As. Sixty KC-97Es and 159



XC-97



C-97A



KC-97G



YC-97J



Korean War casualties in U.S.-bound C-97

KC-97Fs were built as production versions of the experimental KC-97As and were followed by 592 KC-97Gs, which were distinguished by the addition of 700-gallon B-50-type external fuel tanks under each wing.

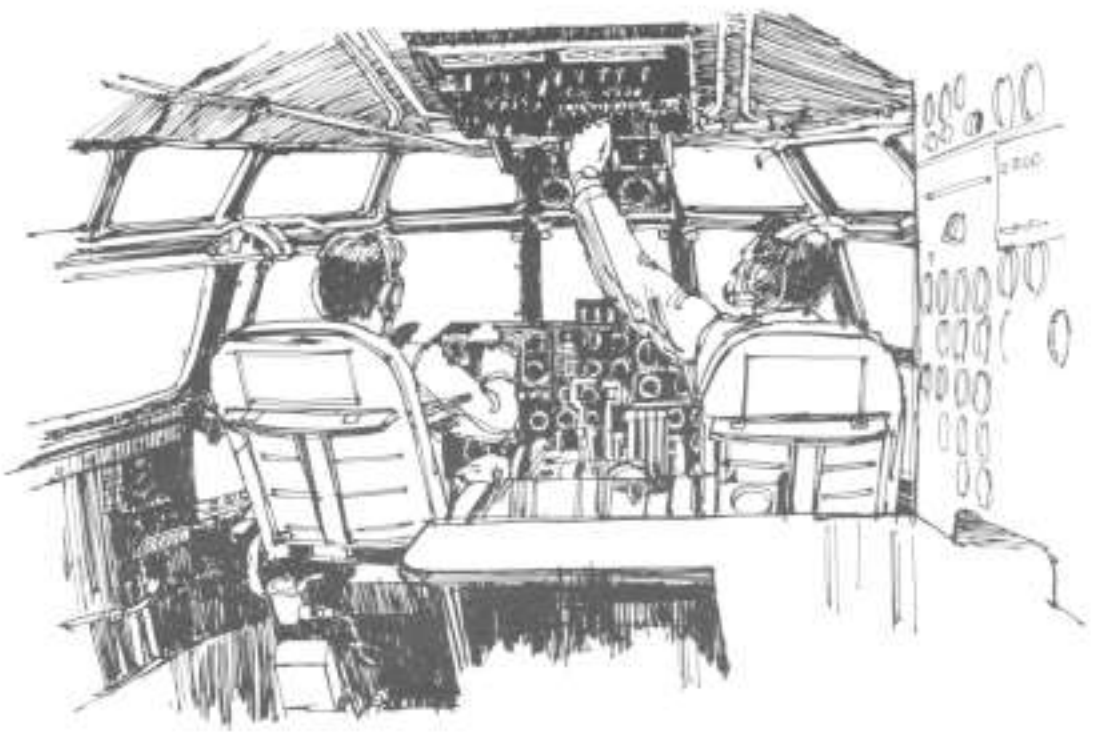
The KC-97H was an experimental tanker using a hose-and-drogue system for refueling fighters. Two YC-97Js were converted from KC-97Gs as flying test-beds to evaluate Pratt & Whitney YT-34 turboprop engines. These produced a great performance improvement in the airplane, but production of the type, then 12 years old, was nearly at an end and no attempt was made to extend its service life by powerplant replacement.

The last KC-97G was completed in July 1956, concurrent with completion of the first KC-135, bringing C-97 production to a total of 888 over a period of 12 years.

A number of KC-97Gs were later modified into KC-197Ls for Air National Guard units by incorporation of J47 jet engines in underwing pods. This change substantially boosted speed and altitude performance for refueling jet fighters and bombers.

KC-97G SPECIFICATIONS:

Span	141 ft 3 in.
Length	117 ft 5 in.
Wing Area	1,769 sq ft
Gross Weight	175,000 lb
Top Speed	375 mph
Cruising Speed	300 mph
Range	4,300 mi
Service Ceiling	35,000 ft
Power	(4) 3,500-hp P&W "Wasp Major"





377 Stratocruiser

377 STRATOCRUISER

The Model 377 Stratocruiser was an airliner counterpart of the C-97 and the first commercial Boeing airplane produced since the 314 Clipper. Fifty-six were built side-by-side with B-50s on the Seattle production lines between 1947 and 1949. Using adaptations of the proven C-97 airframe and powerplants and systems similar to those of the B-50, the competitive advantages offered by the Stratocruiser were long range and unparalleled passenger comfort. The wide cabin allowed extra room for the passengers, who could relieve the monotony of long flights by walking around or visiting the lower-deck lounge, which was reached by a spiral stairway from the passenger cabin. Passenger capacity varied from 50 to more than 100, depending on the length of the route and type of service. A complete galley for hot meal service was installed near the tail, and men's and women's washrooms separated the forward compartments from the main passenger cabin.

377 SPECIFICATIONS:

Span	141 ft 3 in.
Length	110 ft 4 in.
Wing Area	1,720 sq ft
Gross Weight	145,000 lb
Top Speed	375 mph
Cruising Speed	300 mph
Range	4,600 mi
Service Ceiling	33,000 ft plus
Power	(4) 3,500-hp P&W "Wasp Major"


Stratocruiser main cabin


Stratocruiser lower-deck lounge



Stratocruiser Berth



XL-15



Scout being loaded into C-97

L-15 SCOUT The Scout liaison airplane (Model 451) was designed and built in Wichita for the Army Ground Forces. Two XL-15s and 10 YL-15s were completed in 1947 and 1948.

The observer was given an exceptional field of view by virtue of a tubular tail boom that eliminated the bulk of the conventional rear fuselage structure. Versatility was assured by providing for the installation of skis or pontoons in addition to conventional wheels. Extremely slow flight for observation purposes was achieved through the use of a thick airfoil and unique full-span "Flaperons" that combined the functions of flap and aileron. They were mounted below the wing instead of being built into its trailing edge. The Scout was designed for rapid assembly and disassembly in the field and could be carried complete in the back of a standard 2½-ton Army truck. Inward-turning landing gear struts permitted a further width reduction and allowed the dismantled Scout to be rolled into a C-97 cargo airplane for transportation by air.

YL-15 SPECIFICATIONS:

Span	40 ft
Length	25 ft
Wing Area	269 sq ft
Gross Weight	2,050 lb
Top Speed	104 mph
Cruising Speed	95 mph
Range	250 mi plus
Service Ceiling	15,000 ft
Power	125-hp Lycoming



RB-50B

B-50 SUPERFORTRESS

The B-50 series was a direct development of the B-29. The principal outward differences were the installation of four-row Pratt & Whitney "Wasp Major" engines in revised nacelles and the use of a higher vertical tail that could be folded down to permit storage in standard-height hangars. The new power packages were developed by Pratt & Whitney on a test B-29 that was redesignated XB-44 and the high tail was tested on a standard B-29 at Seattle. Less evident improvements were the use of 75ST aluminum alloy instead of 24ST, fast-retracting ball-screw landing gear, hydraulic rudder boost and nose-wheel steering, and heated-wing de-icing.

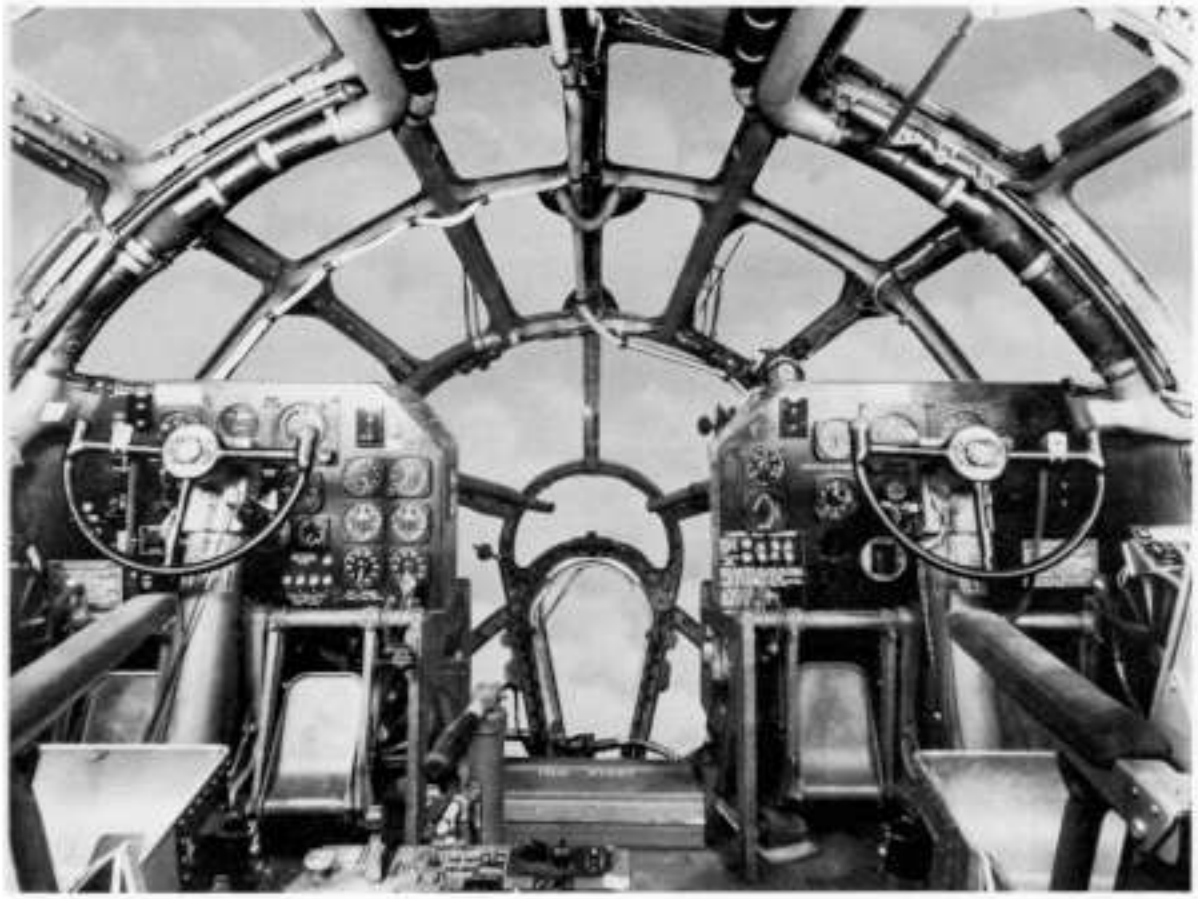
Eighty B-50As were built (Model 345-2-1), 58 of which later were modified in Wichita as receivers for hose-type aerial refueling. These were followed by 45 similar B-50Bs. The 122 B-50Ds had built-in provision for flying-boom aerial refuel-



KB-50J



B-50B



ing, and fuel capacity was increased by the addition of 700-gallon drop tanks under each wing. Numerous B-50As and B-50Bs were converted to special-purpose reconnaissance types under the designations of RB-50E, F, and G and WB-50. The last of the Superfortresses were 24 TB-50H crew trainers completed in 1952.

Rendered tactically obsolete by newer jet bombers, most of the B-50s were converted to KB-50J and KB-50K three-hose aerial tankers for the Tactical Air Command between 1957 and 1959. The piston engines were supplemented by a single jet pod under each wing to increase the maximum formating speed and altitude capabilities.

B-50D SPECIFICATIONS:

Span	141 ft 3 in.
Length	99 ft
Wing Area	1,720 sq ft
Gross Weight	173,000 lb
Top Speed	400 mph plus
Cruising Speed	300 mph
Range	4,000 mi plus
Service Ceiling	40,000 ft
Power	(4) 3,500-hp P&W Wasp Major
Armament	28,000-lb bomb-load (12) .50 caliber machine guns in 5 turrets



TB-50D



Jet engine test



B-47 STRATOJET Boeing development of a jet bomber began in 1943 when the first preliminary requirement was issued by the Army. The design underwent constant revision, the most significant being the 35-degree swept-back wing that permitted great speed increases.

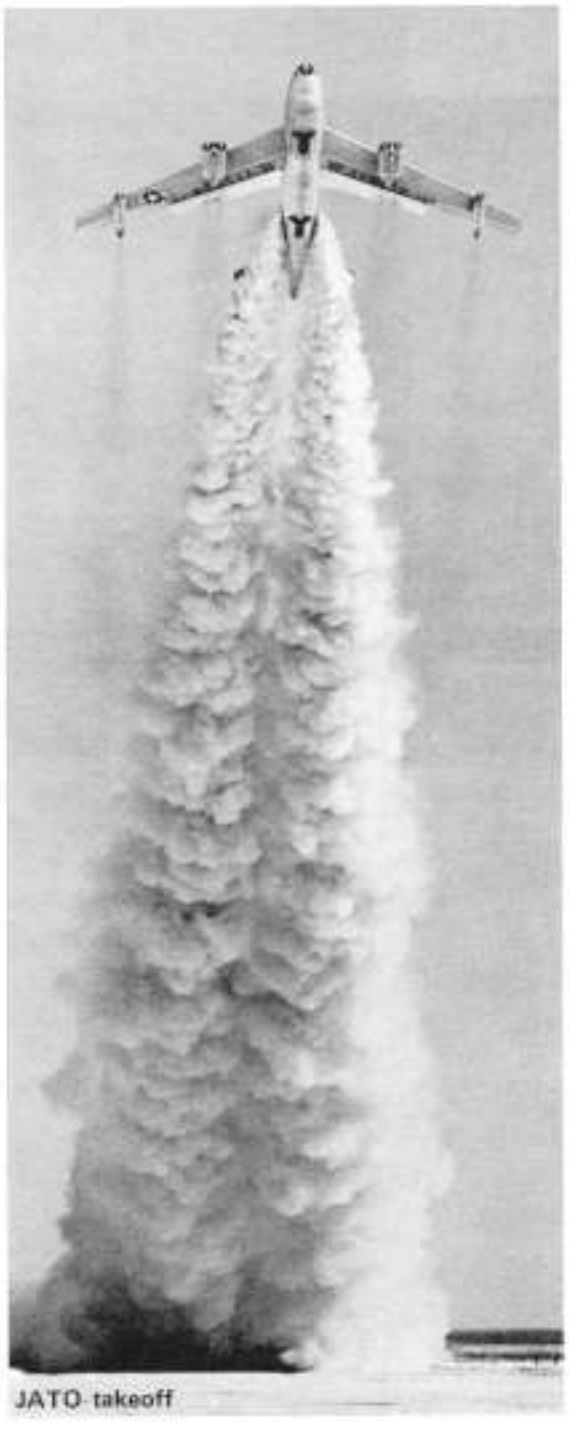
By the time the mockup of the Boeing Model 450 was approved in April 1946, the B-47 had moved even further from the conventional configuration. A tandem "bicycle" landing gear was adopted, and a retractable outrigger wheel was mounted in each inboard jet pod for lateral ground stability. Because of the location of the main wheels relative to the center of gravity, the B-47 sat on the ground in takeoff attitude and took off and landed at the same angle without "rotating" in the traditional manner of airplanes with conventional landing gear.

Because of its high wing loading and the slow acceleration characteristics of the early turbojet engines, 18 JATO rocket units, developed during the war for "jet-assisted takeoff," were built into the sides of the fuselage. On later models, these units were carried on a jettisonable external rack as a weight-saving measure. The heavy weight of these units also resulted in faster landing speeds and a severe braking problem, which was met by deployment of a ribbon-type parachute from the tail just as the wheels touched the ground. On later models, this practice was modified to trail a small drogue parachute while in the landing pattern and deploy the main braking parachute just before the airplane touched down.

Wartime experience with the stripped-down B-29Bs had revealed that bombers with near-fighterplane speeds could be successfully intercepted only from the rear, so the only defensive armament of the B-47 was in the form of tail turret guns that could be aimed and fired remotely from the cockpit or automatically by radar.

Although heavier than the heaviest bomber of World War II—the B-29—the B-47 was classed as a medium bomber. It normally was operated by a three-man crew: pilot and copilot in tandem under a fighter-type canopy and a bombardier-navigator in the nose.

Two XB-47 Stratojets were built in Seattle, the first flying on December 17, 1947. The first of 10 Wichita-built B-47As


JATO takeoff

flew in June 1950. The principal difference between the B-47A and the prototypes was replacement of General Electric J35 engines of 3,750 pounds of thrust with 5,200-pound-thrust J47s. Takeoff weight of later models increased to 198,000 pounds, which could be increased by flying-boom refueling after takeoff.

Major production began with the B-47B, which appeared in several forms for various specialized duties. Principal manufactured versions were the standard B-47B bomber (distinguished from earlier versions by the fitting of 5,800-pound-thrust engines and underwing drop tanks) and the RB-47 reconnaissance-bomber with eight cameras in a removable bomb bay package. The B-47B was also built in pilot quantities by Douglas at Tulsa, Oklahoma, and Lockheed at Marietta, Georgia.

The designation B-47C was assigned to an experimental four-jet model that was not completed. The two XB-47Ds were Bs converted to flying test-beds for Curtiss-Wright T49 turboprop engines, at the time the most powerful ever to fly.

Largest production series was the B-47E. Approximately one out of every three Wichita-built Es was an RB-47E, easily identified by its extended nose that contained photographic equipment. Several hundred B-47Es were also built by Douglas and Lockheed. The YDB-47E was a special conversion used to air launch the Bell GAM-63 "Rascal" missile, which was then guided to the target under radio control by an operator in the YDB-47E. QB-47Es were radio-controlled pilotless drones used as aerial targets to test such interceptor missiles as the IM-99 Bomarc against high-performance airplanes; DB-47Es were director airplanes carrying electronic equipment and an operator to control drone airplanes.

The YB-47F was a B-47B converted as a hose receiver to test the suitability of the hose-and-drogue refueling method for bombers. The single KB-47G was another B-47B converted to a hose tanker. The ERB-47H and RB-47H were built in small quantities and were the last of over 1,300 Wichita-built B-47s completed in October 1956. Fitted with pressurized capsules in the bomb bay, the ERB-47H had a five-man crew and the RB-47H had a six-man crew. The YB-47J was a test-bed for a new radar bombing-navigation system and the dual-purpose RB-47Ks were RB-47Es converted for weather-reconnaissance as well as photographic missions.

In 1957, the majority of B-47s in bomber configuration were modified, principally by strengthening the wings to allow them to use the revolutionary low-level "lob-bombing" technique. This is where the bomber streaks toward the target at maximum speed and tree-top height, releases its bomb during a zooming vertical climb, and escapes the destruction of its own blast by completing an Immelman turn—a half loop followed by a half roll. This increased maneuverability gave the B-47 a mission to match what pilots had called it from the first, "a six-engine fighter."


RB-47E


XB-47D

B-47E SPECIFICATIONS:

Span	116 ft
Length	107 ft
Wing Area	1,428 sq ft
Gross Weight	206,700 lb
Top Speed	600 mph plus
Range	3,000 mi plus
Service Ceiling	40,000 ft plus
Power	(6) 7,200-lb-thrust G.E. J-47
Armament	20,000-lb bomb-load (2) 20mm cannons in radar-directed tail turret



B-52H

B-52 STRATOFORTRESS

The designation B-52 originally was assigned in 1946 to a straight-wing long-range bomber to be powered by six turboprop engines. By October 1948, the design had undergone extensive revision, and at that time the Air Force approved Boeing's request to develop an entirely new jet-propelled bomber under the same designation. The new B-52 was designed and built as Boeing Model 464.

In appearance, the new bomber was a direct development of the revolutionary swept-wing B-47. Eight Pratt & Whitney J57 turbojet engines were carried in four pods under the wings, and the four-unit tandem landing gear could be turned to either side to allow the airplane to crab into the wind on cross-wind landings and still roll straight down the runway. Electrical needs on early B-52s were handled by turbine powerpacks driven by air bled from the second-stage compressors of the jet engines. Fuel was carried in fuselage tanks above the bomb bay and in nylon bladder cells installed between the main wing spars and each pair of interconnecting ribs.

Two prototypes, the XB-52 and YB-52, were built. The YB-52 flew first, on April 15, 1952. The first of three production B-52As flew on August 5, 1954. The B-52A and all the subsequent B-52s differed from the X and Y models in having a redesigned nose in which the pilots sat side-by-side in a cabin instead of in tandem under a plastic canopy as in the B-47s. The fuel capacity of the B-52A was increased by the use of 1,000-gallon drop tanks under each wing, and provision was made for flying-boom aerial refueling.

Fifty B-52Bs were built as dual-purpose airplanes. The 35 B-52Cs were also dual-purpose designs but were built to higher load factors and had a gross weight of 450,000 pounds. Fuel capacity was increased by the use of 3,000-gallon drop tanks. The B-52D was used only as a bomber. The Air Force had designated the Wichita Division as a second source of production, and the first of 69 Wichita-built B-52Ds and 58 B-52Es rolled out in December 1955. One hundred and one B-52Ds and 42 B-52Es were built in Seattle. Seattle B-52 production ended with 44 B-52Fs which were fitted with engine-driven alternators instead of pneumatic powerpacks; 45 B-52Fs also were built in Wichita.

In addition, Wichita also built 193 B-52Gs and 102 B-52Hs that in many ways were greatly different from their predecessors. Vertical tail height was decreased. Wing fuel bladders were eliminated in favor of integral tanks and strike capabilities were increased by mounting two supersonic AGM-28 "Hound Dog" missiles. The B-52H was fitted with TF-33 turbofan engines for improved unrefueled range and a 20mm cannon in the radar-directed tail turret. In all, 744 B-52s were built, 467 at Wichita.

HYDROFOILS In 1958, Boeing began research and development of hydrofoils—boats that fly on underwater wings called foils.

The first Boeing-built hydrofoil was the High Point (PCH-1), a 117-ton patrol craft. Delivered to the U.S. Navy in 1963, it served as a prime research vessel in the Navy's hydrofoil development program.

While High Point was under construction, Boeing built two research vessels. FRESH 1, a 15-ton experimental craft built for the Navy, is still the world's fastest hydrofoil. Little Squirt, built with company funds, pioneered the use of waterjet propulsion on hydrofoils and helped develop an automatic control system for the fully submerged foils.

In 1966, Boeing won a competition to design and construct a Navy hydrofoil gunboat prototype. Tucumcari (PGH-2), a 57.5-ton craft, was launched in 1967. After delivery to the Navy in 1968, Tucumcari served in Vietnam combat waters and toured Europe to visit NATO nations. Designed specifically as a highly maneuverable, heavy-weather craft with speeds above 50 knots, Tucumcari proved Boeing's technological lead and paved the way for the present generation of company hydrofoils.

Two families of advanced hydrofoils continued Boeing's leadership in the field. Both feature waterjet propulsion and fully submerged foils with an automatic control system. PHM is the designation for the 235-metric-ton Patrol Hydrofoil Missile ships built for the U.S. Navy.

Pegasus (PHM-1) was launched November 9, 1974, and successfully completed U.S. Navy evaluation in July 1976. Production of five additional PHMs began in early 1977 and all had been delivered by 1982.

JETFOIL is Boeing's proprietary name for the 90-foot-long, 115-ton commercial passenger-carrying hydrofoils that offer a smooth ride at 43 knots in virtually any sea condition. JETFOILs entered service on April 25, 1975, when Far East Hydrofoil Co. Ltd. began operation from Hong Kong to Macao.

By 1985, 23 Boeing JETFOILs were in service in Hong Kong, Japan, the Canary Islands, across the English Channel, in Indonesia, and in the U.S. between Seattle, Washington, and Victoria-Vancouver, B.C.



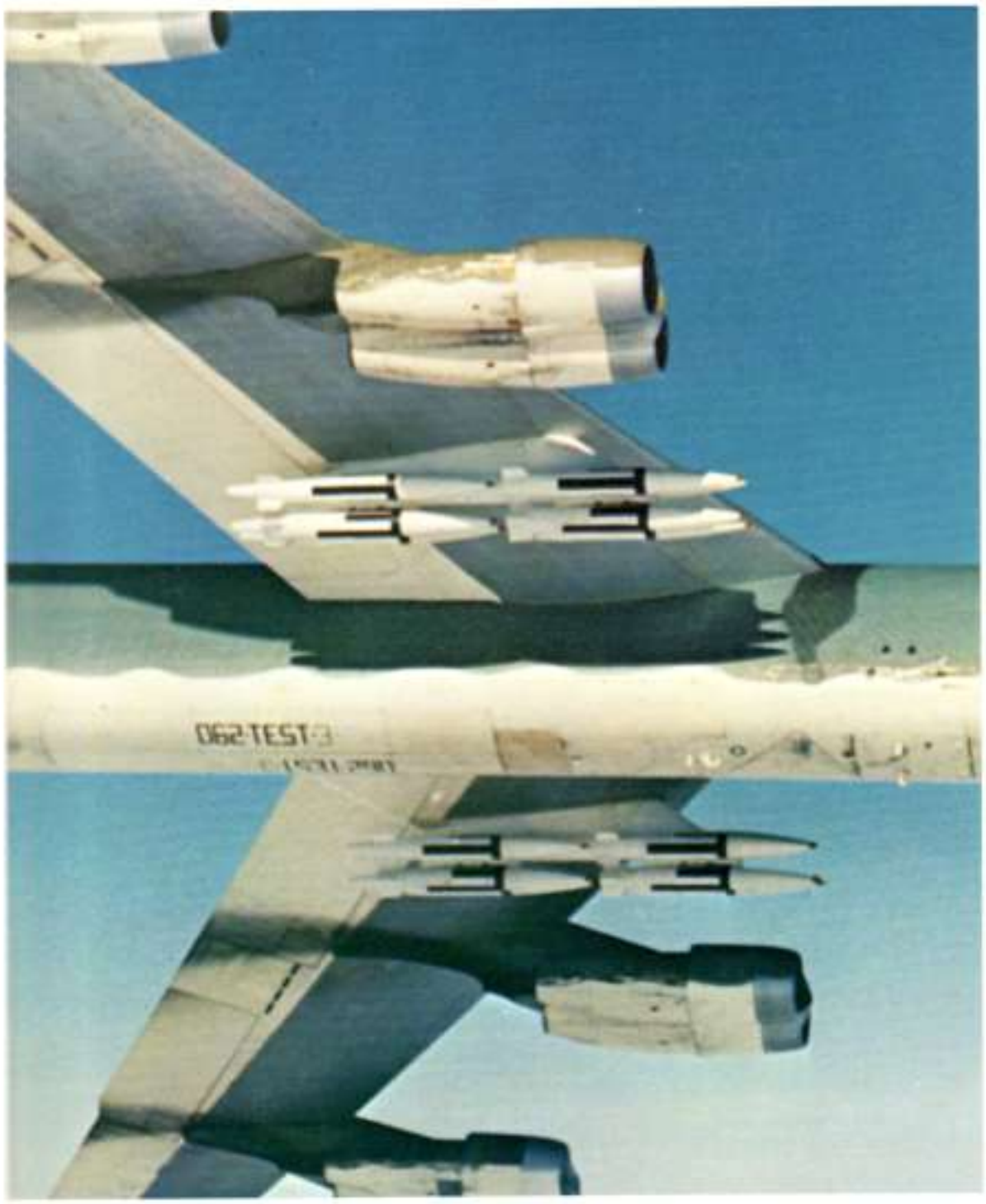
PCH-1 High Point



PGH-2 Tucumcari


PHM-4 Aquila


JETFOIL



SRAM In 1966, Boeing began a design and development program that led to production of SRAM, the Air Force's AGM-69 Short-Range Attack Missile. Completed in 1975, SRAMs were deployed by the Strategic Air Command for use with the G and H models of the B-52 bomber and the FB-111. It is intended as major armament for the supersonic B-1 bomber.

The missile can perform two major missions: It can attack defensive installations, allowing its carrier airplane to penetrate to primary targets, or it can strike primary targets inside terminal defense perimeters.

Providing a new capability for manned bombers, the missiles can be launched at subsonic or supersonic speeds, from high or low altitudes. They can hit targets ahead of their launch airplane, or can turn in flight to strike targets to the side or behind the airplane. After launching, SRAMs can follow a high-altitude semiballistic trajectory, or a ground-hugging terrain-avoidance flight path. Varying ranges and target-approach speeds make SRAMs versatile and extremely difficult to intercept.

The combination of SRAM-manned bombers, land-based intercontinental ballistic missiles (ICBMs), and submarine-launched missiles gives the nation a retaliatory capability difficult and costly to defend against.



T-43A Under a $81.7 million contract, 19 T-43A Airborne Navigator Trainers were produced for the U.S. Air Force Training Command in 1973 and 1974 to replace part of its fleet of T-29s.

The airplane has 19 stations for students and instructors and includes training systems for celestial, radar, and inertial navigation; LORAN; and other radio systems.

Training mission weight is 108,000 pounds, and fuel capacity is 5,961 gallons. Range is 2,700 nautical miles; the powerplants are two Pratt & Whitney JT8D-9 engines.

Changes made in the basic 737 for the T-43A were strengthening of the floor to support electronic consoles, removal of some windows, elimination of two fuselage doors, and installation of overhead sextant viewing ports.

AWACS The E-3A Airborne Warning and Control System (AWACS) was developed by the U.S. Air Force for airborne surveillance, command, and control. The Boeing Company is AWACS prime contractor.

The airborne platform is a modified Boeing 707-320B commercial airframe equipped with four Pratt & Whitney TF-33 turbofan engines. AWACS is topped with a 30-foot-diameter rotating radome assembly housing the long-range surveillance radar antenna.

AWACS employs a pulse doppler radar system to detect and track aircraft flying at high and low altitudes over both land and water. The radar has the ability to "look down" and separate airborne targets from ground clutter. This clutter is caused by undesired radar pulses reflected from terrain features and objects on the ground.

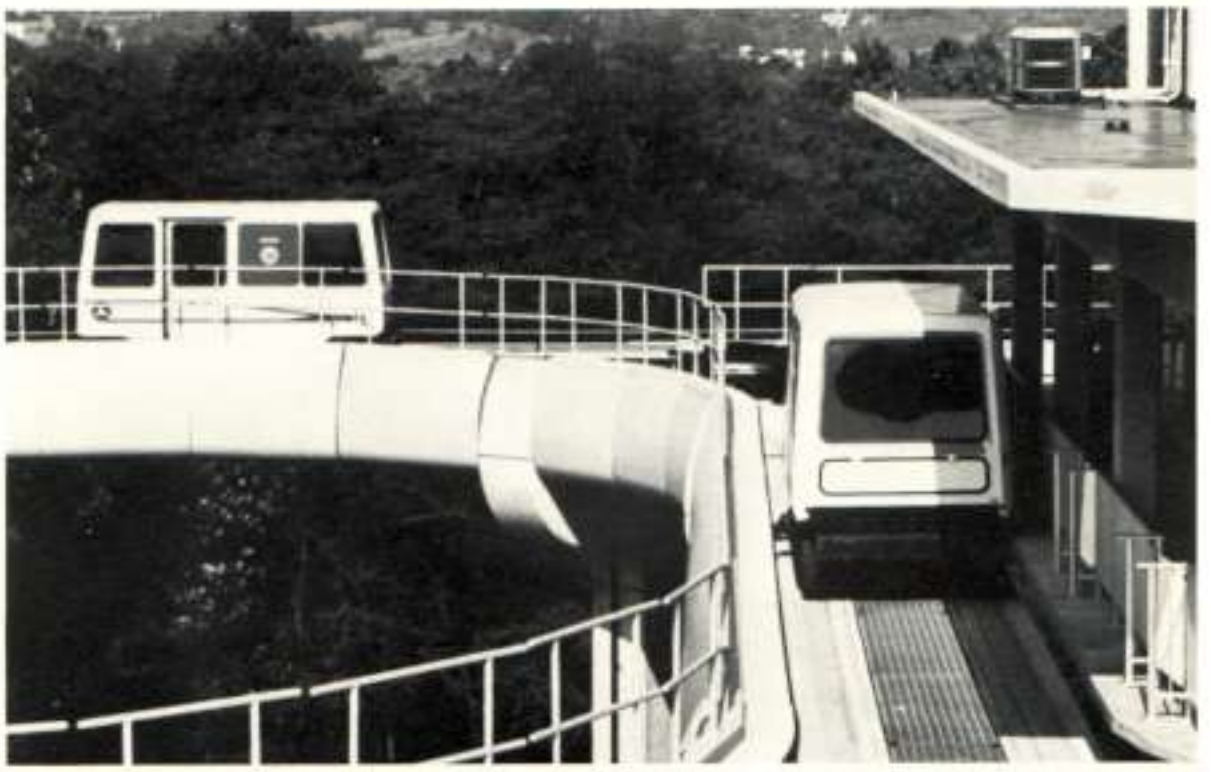
Coupled with the surveillance radar is extensive avionics equipment: navigation, communications, data processing, identification, and displays.

The primary advantage of AWACS is that it centralizes the coordination of complex, diverse, and simultaneous air operations.

Boeing received an AWACS contract in July 1970 for development and flight testing of two competing AWACS radar designs. Radar flight tests aboard two EC-137D AWACS test-bed airplanes were conducted during 1972. In January 1973, Boeing received a full-scale AWACS development contract for construction of three preproduction E-3A AWACS systems that began tests in 1975. In the same year, Boeing began AWACS production. The U.S. Air Force has ordered 34.

The first E-3A was delivered to the U.S. Air Force at Tinker Air Force Base, Oklahoma on March 23, 1977. In December 1978, the North Atlantic Treaty Organization approved acquisition of a fleet of 18 E-3As for airborne early warning. The first NATO E-3A was delivered in January 1982. That same month, an order for five E-3As for the Royal Saudi Air Force was received.





AUTOMATED TRANSPORTATION SYSTEMS In the early 1970s, Boeing entered the surface transportation field, bringing its know-how to bear on the problem of urban traffic congestion. The U.S. Urban Mass Transportation Administration (UMTA) picked Boeing in 1971 as system manager for the development of a Personal Rapid Transit (PRT) system at Morgantown, West Virginia, a national demonstration project intended to determine the feasibility of this new form of automated transportation.

The Morgantown system entered public service in October 1975 with a fleet of 45 driverless vehicles operating on 5.4 miles of concrete guideway. The 21-passenger cars cruise at 30 mph, entirely under computer control, with time intervals of only 15 seconds between vehicles. The system was designed, built, and tested by Boeing. At the conclusion of its first year of operation, UMTA awarded a capital grant to West Virginia University for an expansion of the Morgantown system.

A similar system, derived from Morgantown technology, carried 4 million passengers during the 6-month International Ocean Exposition in Okinawa, the 1975 World's Fair. This system, using 16 cars, was designed by Boeing for Kobe Steel, Ltd. of Japan.



YC-14



U.S. Roland

YC-14 Boeing was one of two companies chosen in November 1972 to build prototype airplanes in the U.S. Air Force Advanced Medium Short Takeoff and Landing Transport (AMST) competition. The Boeing entry, the YC-14, is a high-wing, two-engine jet transport with the ability to operate from extremely short, semiprepared fields and still be capable of cruising with modern jet efficiency.

It is capable of lifting 27,000 pounds of cargo from a 2,000-foot field and has a normal takeoff weight of 170,000 pounds. A substantially heavier weight can be carried from longer fields.

The YC-14 was the first large airplane to employ a concept known as Upper Surface Blowing (USB), using the thrust from the two engines to blow high-speed air over the upper surfaces of the wing and flaps, creating powered lift. The two General Electric CF6-50 turbofans are mounted near the fuselage above and forward of the wing leading edge. Each produces 50,000 pounds of thrust. The engine placement also shields engine noise from the ground and prevents ingestion of dirt and debris.

Many other technological advancements were utilized in the YC-14, including an advanced electronic flight control system and instrumentation and a high-flotation, lever-type, rough-field landing gear.

First of the YC-14s made its initial flight on August 9, 1976; the second of the two prototypes flew on October 21.

YC-14 SPECIFICATIONS:

Span	129 ft
Length	132 ft
Gross Weight (STOL)	170,000 lb
(Conventional)	216,000 lb
Capacity (STOL)	27,000 lb
(Conventional)	69,000 lb
Top Speed	547 mph
Cruising Speed	460 mph
Range (Ferry)	2,990 mi
(STOL)	460 mi
Power	(2) 50,000-lb-thrust G.E. CF6-50

U.S. ROLAND In the early 1970s, Boeing teamed with Hughes Aircraft Company to seek a role in providing a new air defense system for the U.S. Army. After evaluating several candidate systems, the teammates joined with Euromissile, a French-German consortium which was producing the Roland surface-to-air missile system. Roland subsequently won a U.S. Army competition and, in January 1975, Boeing and Hughes were awarded a contract to transfer the European technology to the U.S. and build four test systems. Following the successful program and stringent testing, production was authorized in 1979.

Selection of Roland marked the first time a major foreign weapon system design had been procured for production in the United States and used by the U.S. Army.

The Roland system comprises both missiles and fire-control equipment. The supersonic missiles are about 8 feet long and 6 inches in diameter. The system can acquire and intercept targets during day or night and in any weather. Missile range is about 3.6 miles, and targets can be detected out to about 10 miles.

An independent fire unit, which mounts on a single-tracked or wheeled vehicle, can carry 10 missiles and fire control equipment. It can be operated by a one- or two-man crew. Computer-processed information helps aim the missiles and keeps them on target via radio signals after launching.

Missiles built in Europe or the U.S. can be launched from American, French, or German fire units.

The Army ordered 27 fire units and 595 missiles for air defense of the U.S. Rapid Deployment Force.

HELICOPTERS Boeing's helicopter heritage reaches back to the pioneering Model PV-2 — the second helicopter flown in the U.S. (in September 1943). It was designed and built by P-V Engineering Forum, later renamed Piasecki Helicopter Corporation. The firm then developed the world's first tandem-rotor helicopter, the 10-place XHRP-1. The company was renamed Vertol Aircraft Corporation in 1956 and was acquired by Boeing in 1960.

Boeing Vertol's headquarters and production facilities are located near Philadelphia, and include more than 2.6 million square feet of covered area devoted to the manufacturing of helicopters and aircraft assemblies. Also on site are such valuable research aids as a rotor-blade whirl tower and low-speed wind tunnels, used to test new helicopter and airplane designs.

As one of the world's leading helicopter manufacturers, Boeing Vertol is involved in numerous research and development projects, including those that rely heavily on advanced avionics and computer technology, especially for flight controls. An example is the Advanced Digital Optical Control System (ADOCS), the world's first optically linked, fully computerized flight-control system, which will likely become the standard for aircraft of the 1990s and beyond. Using hair-thin fiber optics, ADOCS promises exceptional flying qualities and very high reliability while reducing to 10, from 192, the number of individual components typically found in a conventional dual-control mechanical system.

Other programs are enormous in scale. For example, in the late 1980s Boeing plans to flight test the XCH-62 Heavy Lift Research Vehicle (HLRV), a 74-ton-gross-weight, tandem-rotor helicopter having a payload of some 35 tons, more than double the useful load of current U.S.-built helicopters.

MODEL 107 Boeing's Model 107 program began early in 1956 and a prototype flew for the first time in April 1958, eventually leading to a new generation of turbine-powered aircraft —

MODEL 107-II SPECIFICATIONS:

Rotor Diameter	50 ft
Fuselage Length	44 ft 7 in.
Max Gross Weight	22,000 lbs
Top Speed	146 kts
Cruising Speed	130 kts
Range	192 nm
Power	(2) 1,400-shp GECT-58-140





the 107-II/CH-46 series and the CH-47/Model 234 series. The first of the Model 107-IIs went into service with New York Airways in 1961, and in January 1966 these aircraft set a helicopter airline record by carrying 44,026 passengers in one month.

In 1961, a special version of the 107, the CH-46A Sea Knight, won a U.S. Navy design competition for the Marine Corps assault transport helicopter and soon was in operation with the U.S. Marines.

In January 1964, the U.S. Navy ordered the UH-46A, a version adapted for vertical replenishment of combat ships while at sea. Deliveries were also made to the Canadian and Swedish armed forces. Model 107s are used today in commercial remote-area logging and utility operations and production of the 107-II continues under license in Japan.

Boeing Vertol is presently engaged in the UH-46/CH-46 Safety, Reliability and Maintainability (SR&M) Program, whose







goal is to upgrade 345 U.S. Navy and Marine Corps aircraft, allowing them to meet their mission requirements at reduced operating costs through the end of this century. SR&M retrofit kits containing new components for 26 major systems' modifications are built by Boeing and shipped to Navy facilities for installation.

CH-46E SPECIFICATIONS:

Rotor Diameter	51 ft
Fuselage Length	45 ft 8 in.
Max Gross Weight	24,300 lb
Top Speed	144 kn
Cruising Speed	138 kn
Radius	100 nmi plus
Power	(2) 1,870-shp GE T-58-16

CH-47 CHINOOK In May 1959, the CH-47A Chinook was selected as the U.S. Army's new medium-lift helicopter. Then, as now, its primary mission was rapid deployment of tactical units in combat areas. The Chinook first flew in September 1961 (as the YHC-1B) and deliveries to field units began in May 1967. The Army has since received 354 CH-47As, 108 CH-47Bs, and 270 CH-47Cs.

In 1980 Boeing Vertol began a program to remanufacture the first of 436 CH-47A-, B-, and C-model Chinooks to the new zero-time standards of the CH-47D. The D-model configuration, which contains 10 new major system changes, extends the life, increases the operational capabilities and lowers the operating costs of this combat-proven aircraft. Its useful load is nearly double that of the earliest CH-47A. Moreover, remanufacturing Chinooks is saving U.S. taxpayers more than $1 billion compared to new helicopter development costs.

Nearly identical to the CH-47D is the all-new-airframe Model 414-100, which is produced by Boeing for its international military customers.

CH-47D/414-100 SPECIFICATIONS:

Rotor Diameter	60 ft
Fuselage Length	51 ft
Max Gross Weight	50,000 lb
Top Speed	151 kn
Cruising Speed	140 kn
Power	(2) 3,750-shp T55-L-712

V-22 OSPREY In June 1982, Boeing Vertol and Bell Helicopter Textron announced a teaming agreement to participate in the Joint Services Advanced

(continued next page)

Vertical Lift Aircraft Program (JVX) competition. Eventual contract awards could result in delivery of 1,000 or more twin-engine, tilt-rotor aircraft of revolutionary design to the U.S. armed forces.

Early in 1985 the JVX aircraft were designated as the MV-22A for the U.S. Marine Corps, the HV-22A for the U.S. Navy, and the CV-22A for the U.S. Air Force.

The V-22 is scheduled to enter full-scale development in June 1985 and achieve first flight early in 1988. First production deliveries to the Marine Corps are planned for mid-1991.

The V-22 is a pure hybrid aircraft. It can be flown as a helicopter and as a conventional aircraft. Mounted at the tips of the ship's 46-foot-span wing are 5,000-shp gas-turbine engines that drive 38-foot-diameter rotors (or prop rotors), which can rotate from zero degrees (horizontal) for high-speed forward flight of 300 knots or more, to a full 90 degrees (vertical) for hovering flight. Even in the helicopter mode, the V-22 will exceed 100 knots.

The V-22 will accommodate 24 troops or 10,000 pounds of cargo carried internally or externally. It will have an unrefueled range of 2,100 nautical miles, giving it worldwide self-deployment capability.

V-22 OSPREY SPECIFICATIONS:

Rotor Diameter	38 ft
Fuselage Length	56 ft 10 in
Max Gross Weight (VTOL)	40,000 lb
Max Gross Weight (STOL)	up to 55,000 lb
Top Speed	350 kn plus
Range (maximum, unrefueled)	2,100 nm
Power	(2) 5,000-shp engines

MODEL 234 COMMERCIAL CHINOOK The Boeing Vertol 234, the world's largest commercial helicopter, entered scheduled service with British Airways Helicopters on July 1, 1981, transporting oil-industry personnel from Aberdeen, Scotland, to distant offshore platforms in the North Sea. Another early 234 customer is Norway's Helikopter Service, which also uses the aircraft to support North Sea oil-production efforts. Additional Model 234s are being used in North American operations and in support of offshore drilling activities in the Bering Sea between Alaska and Siberia. A total of 10 aircraft were in service as of Jan. 1, 1985, and had accumulated a total of 125,817,000 revenue passenger- miles.

The 234 features an airline-type interior with standup headroom, a refreshment galley, inflight music, large 747-type overhead stowage bins, and airline-type lighting.



Model 234


Rapid-rail transit cars

MODEL 234 SPECIFICATIONS:

Rotor Diameter	60 ft
Fuselage Length	52 ft
Max Gross Weight	51,000 lb
Top Speed	150 kn
Cruising Speed	135 kn
Range	530 nm plus w/ 44 passengers
Power	(2) 4,075-shp AL5512

SURFACE TRANSPORTATION SYSTEMS In 1971, in connection with diversification objectives, Boeing Vertol entered a new field—surface transportation systems. It was selected as systems manager for the U.S. Government Urban Rapid Rail Vehicle and Systems Program. One system used current technology, whereas another was an Advanced Concept Train (ACT). The two-car "current technology" train (SOAC) was demonstrated on transit systems in New York, Boston, Cleveland, Chicago, and Philadelphia. Contracts were received for trains from a number of U.S. transit systems. Production units of the Light Rail Vehicles (LRVs) were received from two major U.S. transit systems.

Production of these vehicles ceased in 1980 after 475 had been built.

STANDARD LIGHT RAIL VEHICLE (SLRV) SPECIFICATIONS:

Length	73 ft
Seating	68 persons
Peak Capacity	190 persons
Car Weight	69,000 lb
Max Acceleration Rate	3.1 mph/sec
Max Deceleration Rate	6 mph/sec
Propulsion System	DC traction motors at 230 hp

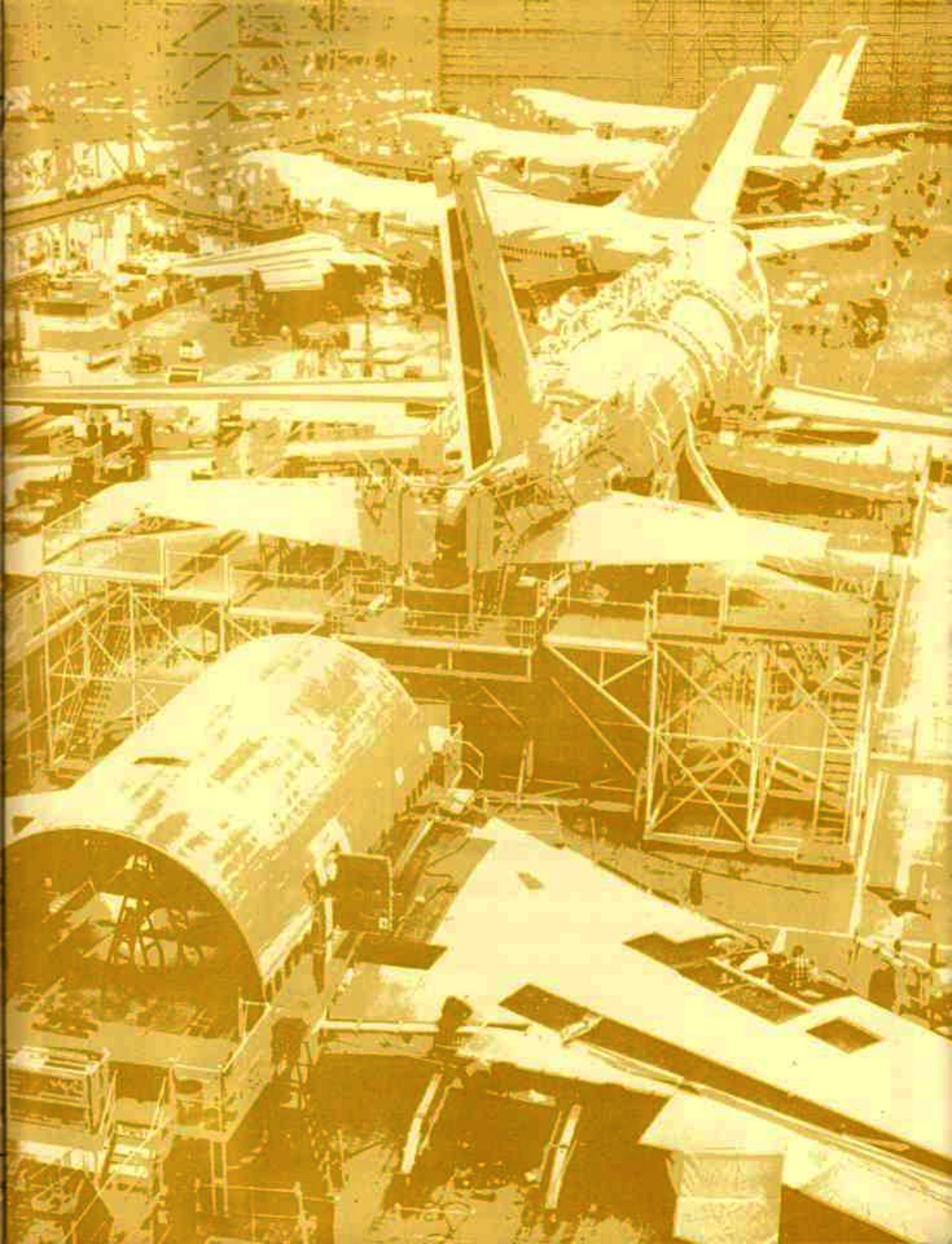
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MODEL NUMBERS AND CORRESPONDING CUSTOMER DESIGNATIONS

MODEL	*USER DESIGNATION*	*BUILT FOR*	*NO. BUILT*	*DATES*
1	B&W	Commercial	2	1916
2	C	Commercial	1	1917
3	C	U.S. Navy, Commercial	3	1917
4	EA	U.S. Army	2	1917
5	C	U.S. Navy, Commercial	52	1918
6	B-1	Commercial	9	1919-1928
7	BB-1	Commercial	1	1919
8	BB-L6	Commercial	1	1920
10	GA-1/2	U.S. Army	12	1920
15	PW-9, FB-1	U.S. Army, Navy	123	1923-1928
16	DH-4, 02B-1	U.S. Army, Marines	298	1920-1925
21	NB-1/2	U.S. Navy, Export	77	1923-1927
40	40	Commercial	77	1925-1932
42	XCO-7	U.S. Army	3	1925
50	PB-1	U.S. Navy	1	1925
53	FB-2	U.S. Navy	2	1925
54	FB-4	U.S. Navy	1	1926
55	FB-3	U.S. Navy	3	1925-1926
58	XP-4	U.S. Army	1	1926
63	TB-1	U.S. Navy	3	1927
64	64	Commercial	1	1926
66	XP-8	U.S. Army	1	1927
67	FB-5	U.S. Navy	27	1926-1927
68	AT-3	U.S. Army	1	1926
69	F2B-1	U.S. Navy, Export	35	1926-1928
74	XF3B-1	U.S. Navy	1	1927
77	F3B-1	U.S. Navy	73	1928
80	80	Commercial	15	1928-1930
81	XN2B-1	U.S. Navy, Commercial	2	1928
83	XF4B-1	U.S. Navy	1	1928
89	XF4B-1	U.S. Navy	1	1928
93	XP-7	U.S. Army	1	1928
95	95	Commercial	25	1928-1929
96	XP-9	U.S. Army	1	1930
99	F4B-1	U.S. Navy	27	1929
100	100	Commercial	8	1929-1932
101	XP-12A	U.S. Army	1	1929
102	P-12/-12B	U.S. Army	99	1929-1930
103-199	Assigned to Boeing-Designed Airfoil Sections			
200	Monomail	Commercial	1	1930
202	XP-15	U.S. Army	1	1930
203	203	Commercial	7	1929-1936
204	204	Commercial	2	1929
205	XF5B-1	U.S. Navy	1	1930
214	Y1B-9	U.S. Army	1	1931
215	YB-9	U.S. Army	1	1931
218	218	Demonstrator	1	1930
221	Monomail	Commercial	1	1930
222	P-12C	U.S. Army	96	1931
223	F4B-2	U.S. Navy	46	1931
226	226	Commercial	1	1930
227	P-12D	U.S. Army	35	1931

MODEL	USER DESIGNATION	BUILT FOR	NO. BUILT	DATES
234	P-12E	U.S. Army	110	1931-1932
235	F4B-3/4	U.S. Navy	113	1931-1933
236	XF6B-1	U.S. Navy	1	1933
246	Y1B-9A	U.S. Army	5	1932-1933
247	247	Commercial	75	1933-1935
248	XP-936/P-26	U.S. Army	3	1932
251	P-12F	U.S. Army	25	1932
256	"1932" (F4B-4)	Export	14	1932
264	YP-29	U.S. Army	3	1934
266	P-26A/B/C	U.S. Army	136	1934-1935
267	267	Export	9	1933
273	XF7B-1	U.S. Navy	1	1933
281	281	Export	12	1934-1935
294	XB-15	U.S. Army	1	1937
299	B-17	U.S. Army	6,981*	1935-1945
307	Stratoliner	Commercial	10	1938-1940
314	Clipper	Commercial	12	1938-1941
344	XPBB-1	U.S. Navy	1	1942
345	B-29, B-50	U.S. Army, U.S. Air Force	3,138**	1942-1953
367	C-97	U.S. Army, U.S. Air Force	888	1944-1956
377	Stratocruiser	Commercial	56	1947-1950
400	XF8B-1	U.S. Navy	3	1944-1945
450	B-47	U.S. Air Force	1,373***	1947-1956
451	XL-15, YL-15	U.S. Army	12	1947-1948
464	B-52	U.S. Air Force	744	1952-1962
500-599	Reserved for Industrial Products			
502-520-551-553-540	Gas Turbine Engines	U.S. and Foreign Military, Commercial	2,500	1946-1968
600-602	GAPA	U.S. Air Force	—	1947-1949
621	F-99 Bomarc	U.S. Air Force	4	1952
623	XIM-99A Bomarc	U.S. Air Force	26	1953
624	IM-99A Bomarc	U.S. Air Force	269	1959-1960
631	IM-99B Bomarc	U.S. Air Force	301	1960-1962
641	AGM-86B (ALCM)	U.S. Air Force	—	1976
707	707	Commercial, Military	813†	1956-
717	KC-135A/B, C-135A/B	U.S. Air Force	806	1956-1965
720	720	Commercial	154	1959-1968
727	727	Commercial	1,832	1962-1984
737	737, T-43A	Commercial, U.S. Air Force	1,092†	1967-
739	RC-135A/B	U.S. Air Force	14	1965-1966
747	747, E-4A/B	Commercial, U.S. Air Force	608†	1968-
757	757	Commercial	57†	1983 -
767	767	Commercial	109†	1983 -
901	YQM-94A Compass Cope	U.S. Air Force	2	1973
929	Jetfoil	Commercial	24	1975-
939	Lunar Orbiter	NASA	8	1966-1967
946	Burner II	U.S. Air Force	—	1965-
953	YC-14	U.S. Air Force	2	1976-

* *Plus 5,745 by Douglas and Vega*
** *Plus 1,204 B-29s by Bell and Martin*
*** *Plus 667 by Douglas and Lockheed*
† *Deliveries as of 3-31-85*



"My firm conviction from the start has been that science and hard work can lick what appear to be insurmountable difficulties."

William E. Boeing

