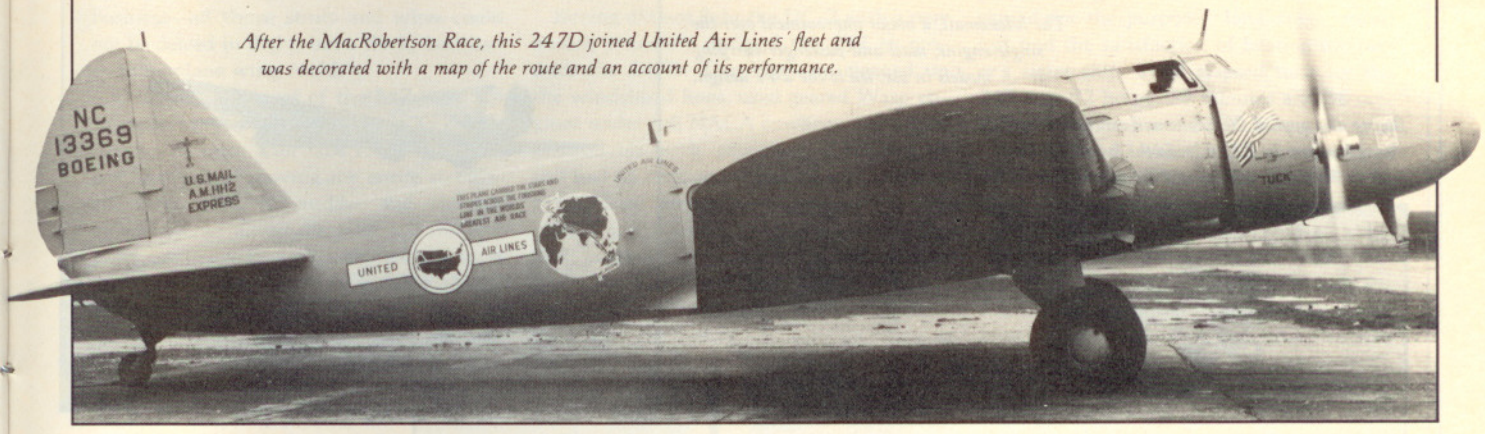


After the MacRobertson Race, this 247D joined United Air Lines' fleet and was decorated with a map of the route and an account of its performance.

The Boeing 247

Mark of a new era in commercial transportation

BY PETER M. BOWERS

The introduction of the jetliner in the early 1950s caused a major technological and economic revolution that ushered in a new era for the world's airlines. Twenty years earlier, an equally significant revolution had changed airliner configuration and performance and set the stage for the jet age.

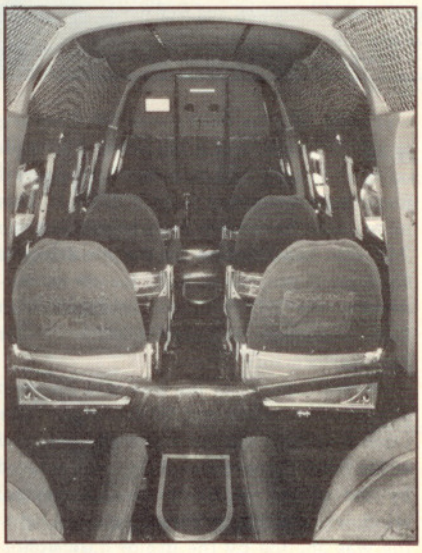
Until the early 1930s, most multi-engine airliners had an 8- to 18-passenger capacity and were big, clumsy and slow, with maximum speeds around 135 mph and cruising speeds from 95 to 120 mph. Their technology was rooted firmly in World War I concepts, and a few were actually civil adaptations of standard Army bombers.

The "Lindbergh Boom," from 1927 to 1929, made the public suddenly aware of aviation and the benefits of air travel, and the industry was quick to improve existing designs and develop new concepts. The profit motive of civil operations resulted in most of the advances appearing first on civil designs; the military was highly tradition-bound and slow to adopt new ideas.

In 1930, the Boeing Airplane Company of Seattle, Washington, introduced the Model 200 "Monomail." This was a major improvement over the single-engine, mail-and-passenger models then in wide use. The Monomail ushered in a big advance in speed by being a clean, all-metal, cantilever monoplane in an era still dominated by biplane designs and operating concepts. Boeing then went a bit further by installing retractable landing gear and enclosing the radial engine in a cowling, or "Speed Ring," to reduce drag and increase speed. Die-hard tradition showed up, however, in retention of an aft-located open cockpit for the pilot.

Technically, no single feature of the Monomail was new. The newness came from the fact that all of these features were combined in a single airplane for the first time. The full performance potential of the Monomail was handicapped both by its being ahead of the available powerplant/propeller technology and by the route of its only airline customer, which included airports at sea level and at 6,000 feet. A compromise, fixed-pitch propeller setting for both of these altitudes sacrificed performance.

Other manufacturers, notably Northrop and Lockheed, soon applied the Monomail concept—clean, all-metal, cantilever monoplane with retractable gear and a cowling—to single-engine airliners of their own and were more successful on low-level routes with "Alphas" and "Orions," respectively. Only two Monomails were built, compared to 17 Alphas and 35 Orions.



The rear spar of the 247 ran right through the passenger compartment with a step on either side.

Boeing then applied the Monomail concept to a different market, the twin-engine Army bomber. Other manufacturers already had come out with clean, twin-engine monoplane bombers, including one with the engines faired into the thick wing instead of being hung under it as was traditional. The significant feature of the new Boeing was the air-cooled radial engines, instead of the liquid-cooled V-12 engines, faired into the thick wing. Previous attempts to mount radials on the wing were handicapped by the turbulence generated by the big round engines disturbing the airflow over the wing and decreasing lift. The use of the new (1929) cowlings smoothed out the airflow and permitted capitalization on the advantages of the radial engine.

After building two prototypes on speculation (Models 214 and 215) in 1931—a huge financial risk in the Depression—Boeing was able to sell the prototypes and five Service Test B-9s to the Army. In spite of a blistering 175-mph top speed, more than 50 mph greater than the contemporary biplane bombers, the B-9s retained open cockpits per obsolete Army specifications.

The new bomber concept caught on, but another manufacturer—Martin, with the B-10—got the big order. Boeing, therefore, turned again to the civil market with a twin-engine transport based on B-9 technology. This was not simply a case of converting an existing bomber to a transport; the new Boeing Model 247 was a separate design.

The 247 was a major departure from most

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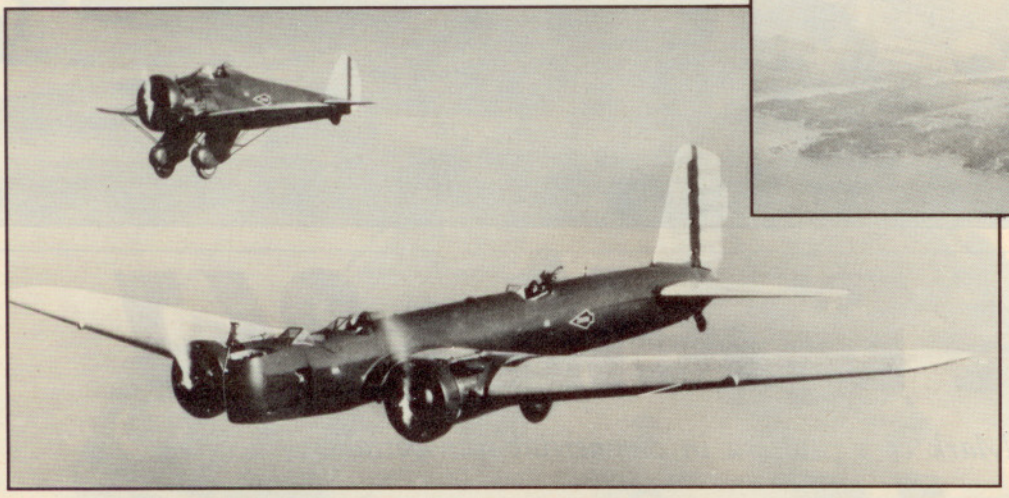
continued

The Monomail, a major improvement over the single-engine, mail-and-passenger-carrying models in use, led to the 247 design.

Boeing also applied the Monomail concept to the B-9 Army bomber. In 1936, even the fastest fighters, such as the P-26, still sported an open cockpit.



When Boeing turned to the civil market, it applied Monomail and B-9 technology and emerged with an entirely separate design—the revolutionary 247.

contemporary multi-engine transports in several areas. For one, it was a twin-engine model when most others—Ford, Fokker and Boeing's Model 80—were trimotors, for reliability reasons. The other twins could not continue flight if one engine (in the 420- to 575-hp range) failed; trimotors could. The 247, with two 550-hp Pratt & Whitney Wasp engines, could climb at gross weight with one engine shut down, thanks to its clean design and low power loading.

The 74-foot wingspan of the 247 was almost identical to that of the contemporary Ford trimotor, the most nearly comparable airliner. But the 247's passenger capacity was only 10; the Ford's was 14. Cruising speed, however, was a big jump, 155 mph compared to the 120 mph that Ford claimed for its fastest trimotor (with 1,275 hp). This jump could have been even bigger, but the 247 was handicapped by the need to use fixed-pitch propellers. Still, for all its modernity, the 247 was not equipped with flaps, which were just coming into vogue for high-performance aircraft.

Seating capacity of the 247 was 13—two pilots, a stewardess and 10 passengers. The cabin was somewhat of a setback compared to the Ford. Passenger visibility was reduced by the use of relatively small individual windows, and this decrease in natural lighting was abetted by the use of dark upholstery on the cabin walls and furnishings. A small galley and a lavatory were located at the rear of the cabin. Baggage was carried in an externally loaded compartment between the cabin and the tail, and the nose cone opened sideways for loading mail.

The principal handicap of the 247's cabin resulted from the thickness of the low wing and the need to run the spars through the cabin. The front spar formed the step-up and the door sill to the raised cockpit; but the rear spar ran right through the passenger area, with the top flange nearly two feet above the floor. A step was provided on either side of the spar, but in the relative darkness, the whole assembly was easy to overlook and stumble over.

Another first for the 247 in the multi-engine field was the use of rubber deicer boots on the leading edge of the wing that greatly enhanced all-weather flying for the

A biplane caught the eye of Peter Bowers, AOPA 54408, when he was 10. Since then, he has not let airplanes out of his sight.

airline. It was ice, more than slow speed, that drove the biplane out of the airline business—all those struts and wires could not be deiced in flight, but a thick, cantilever, monoplane wing could.

Other new features of the 247 were not so apparent. These included cabin air conditioning, elevator trim tabs for longitudinal trim (instead of moving the entire stabilizer), servo tabs for rudder and elevator movement, an automatic pilot and the first supercharged engine on a civilian transport for what then was considered high-altitude operation—15,000 feet. Further, the real production-line, hard tooling permitted complete interchangeability of major components between all 247s instead of the old fit-on-assembly practice used in one-at-a-time building where each part was marked for use only on a particular airplane.

The marketing of the 247 was even more of a sensation than the airplane itself. A single airline, United Air Lines (the holding company for three of the lines that had comprised the Boeing Air Transport System, plus one later acquisition), ordered a total of 60 Model 247s at one time. This was the biggest, single airliner order for many years to come and was financial history in that it was made at the height of the Great Depression, when many established aircraft manufacturers had cut back production or had shut down completely. Further, this order was placed on the basis of paper studies, not the evaluation of a prototype airplane.

The first 247 off the line flew on February 8, 1933, and received Approved Type Certificate (ATC) A-500 on March 16. A single Model 247A, built for Pratt & Whitney as an executive and research model and fitted with 625-hp P&W Twin Wasp Jr. engines, received ATC A-524 on January 3, 1934. Altogether, 61 Model 247s, were built, 59 of them for United Air Lines.

The United order had an unforeseen effect on other airlines and on other manufacturers. Other airlines knew that the 247 would make their Fords obsolete; with United tying up Boeing's production for more than two years, they had to turn elsewhere for a competitive design, but none existed.

Trans World Airlines prevailed upon Douglas to come up with a competitive design even before the first 247 flew. Its details were known well enough to the industry to give the California firm good directions. The shortcomings of the 247 also were known, and Douglas was able to avoid these with what was, in effect, the second generation airliner of the new era.

The Douglas offering was the DC-1, a prototype that was produced as the DC-2. The DC-2 entered service 14 months after the 247 and, with bigger engines, controllable-pitch propellers, flaps and 14-passenger capacity, it promptly began taking business away from the 247. Had it not been for the monopolistic tie-up between United and Boeing, both subsidiaries of the big United Aircraft and Transport Corporation, and had other airlines been given early access to the 247, there might never have been a DC-2 or its illustrious sequel, the DC-3.

Boeing did not fight the DC-2 with a new model; it merely updated the 247 to produce the 247D. The company cleaned up the windshield lines, used geared Wasp engines under full NACA cowlings and added controllable-pitch propellers. However, it still had no flaps and remained a 10-passenger airplane. The new 247D cruised at 189 mph, 7 mph faster than the top speed of the 247, but was still no match for the DC-2 in performance, passenger comfort or economics. The last 247D was delivered in September 1935; the last of 130 civil DC-2s was delivered in July 1937.

The 247D received ATC A-558 on October 11, 1934. The last 13 models, of a total of 75 airplanes, were built as Model 247Ds. All but three of the other 247s (two exported models and the 247A) were modified to the D-configuration, though not all were given the D's new windshield lines.

Only one notable flight can be credited to the 247. A 247D was diverted from United's production for Roscoe Turner and Clyde Pangborn to fly in the 11,333-mile MacRobertson Race from England to Australia in October 1934. In spite of navigation errors that lost precious time, the 247D placed second, by less than an hour, to a stock DC-2 in the race's transport category. It also placed third in the overall speed category, coming in behind the DC-2 and a designed-for-the-purpose, long-range racer, but had the satisfaction of beating the racer's sister-ship. Total elapsed time for the 247 was 92 hours, 55 minutes and 38 seconds; flying time was 85:22:50.

In 1941 and 1942, the U.S. Army drafted 27 of United's 247Ds and designated them C-73 in the Army's cargo series because of their transport status. However, their principal use was as instrument and crew trainers. The C-73s became surplus before the war's end and were snapped up eagerly by airplane-short airlines. These were displaced by Douglas aircraft a second time when C-47s, the military cargo version of the DC-3, came on the surplus market in 1946.

The 247 was a true pioneer in opening a new era for the airlines. Though it was a big step forward technically, the step was not quite big enough for good economics; 10 passengers made a pretty small payload for so much airplane. The competition was able to use all of the 247's advantages in short order, while avoiding its shortcomings and improving on its economics. Its speed advantage over the Fords gave it enormous passenger appeal, but this lasted only until the second-generation DC-2 came on the scene. Still, the 247 is one of the most significant transport designs of all time. □

United's order for 60 Model 247s was the largest, single airliner order at that time and caused havoc for other airlines and manufacturers, who were forced to turn elsewhere for a similar design.

BOEING 247

	Model 247	Model 247D
	Specifications	
Powerplant	Pratt & Whitney Wasp S1D1 550 hp @ 2,200 rpm @ 5,000 ft	Pratt & Whitney Wasp S1H1G 550 hp @ 2,200 rpm @ 8,000 ft
Wingspan	74 ft	74 ft
Length	51 ft 4 in	51 ft 7 in
Wing area	836.13 sq ft	836.13 sq ft
Wing loading	15.1 lb/sq ft	16.3 lb/sq ft
Power loading	11.5 lb/hp	12.4 lb/hp
Empty weight	8,400 lb	9,144 lb
Gross weight	12,650 lb	13,650 lb
Fuel capacity	208 gal	273 gal
	Performance	
High speed	182 mph	200 mph
Cruising speed	155 mph	189 mph
Initial climb	1,320 fpm	1,150 fpm
Service ceiling	18,400 ft	25,400 ft
Absolute ceiling	20,500 ft	27,200 ft
Range	485 sm	745 sm