



Photography by Paul Bowen

Inflight Report

BEECH'S 1900D AIRLINER/EXECULINER

The latest commuter-certified Beech airliner provides stand-up headroom and new standards of safety, while maintaining 1900-series efficiencies.

By RICHARD N. AARONS



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Beech's Model 1900 airliner, in various iterations, has been one of the better success stories in the 19-passenger regional carrier fleet. It also has provided admirable special-mission service for both government and business users.

As of this writing, some 260 Beech 1900s had entered service. Those aircraft were certified under the old SFAR 23/41C, which enabled manufacturers to license heavy aircraft under the light aircraft rule. (The break between heavy and light aircraft, you'll remember, occurs at 12,500 pounds.)

In any event, the FAA ruled production of aircraft certified under SFAR 23/41C had to end on or before October 17, 1991. Airplanes designed to carry 19 passengers and built after that date must be certified under the new FAR Part 23 commuter category. Existing 19-passenger aircraft were grandfathered and are allowed to remain operational with their current owners indefinitely.

Each manufacturer in the 19-passenger aircraft marketplace has taken a unique approach to the post-October world. Wichita-based Beech decided to use the recertification requirement as an opportunity to undertake a major

redesign of the aircraft. The most obvious and important change was to alter the cabin cross-section to provide stand-up, walk-around headroom.

A LITTLE BACKGROUND

The first Beech 1900 airliner flew in 1982. The 1900C—with its rearranged doors and improved systems—was introduced in 1984. Some 23 regional airlines, several corporations and the U.S. government account for the existing Model 1900 fleet.

The airplane has been evolving continuously since its introduction, as evidenced by the fact that the model line is defined by five serial number series—UA-1 to UA-3, UB-1 to UB-74, UC-1 to UC-174, UD—military series C-12J and UE-1 and after. The UA series has dual airstair doors; the UB series has a forward airstair and a rear cargo door. Each UA/UB series aircraft has a total fuel capacity of 425 gallons in wing and center section bladder tanks. Each UC/UD/UE aircraft has a total fuel capacity of 667 gallons, with 482 gallons in the outer wing panels and 185 gallons in auxiliary tanks located in the wing center section.

Of course, the 1900D, or UE series, the subject of this report, is dramatically different from earlier models. It

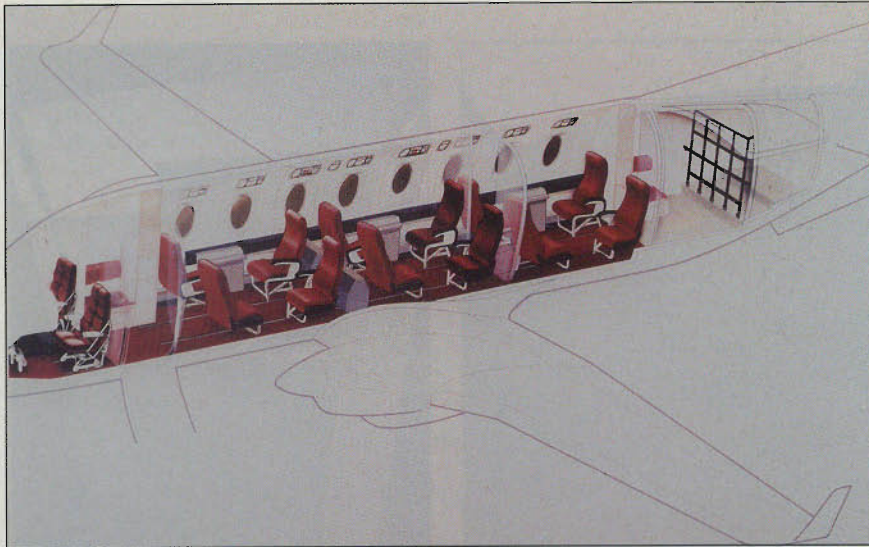
has a 14-inch increase in cabin height, more powerful engines, and new winglets and strakes. Perhaps more important, it is fully certified under the FAR 23 commuter rule.

MAJOR CHANGES

In that the 1900D grew out of the 1900C, it is best understood in comparison to its predecessor. Obviously, the D model is bigger and heavier. The accompanying three-views show the 1900D cross section. As you explore the photos and drawings on these pages, you'll see most of the important differences between the C and the D.

The new cross section creates a stand-up cabin and cockpit. The cabin aisle height is now 71 inches, except at the wing carry-through where a ramp reduces that height to 65 inches. The entrance door is larger than that of the 1900C, so boarding passengers do not have to duck through the portal. The new door design also incorporates improvements in the closure mechanism to reduce the brute force necessary to maneuver it closed or open—a design change in response to the fact that more women are joining regional carrier ground crews every day.

Escape hatches are larger for simple, quick egress. Even the windows are



Several interior options are offered, including a 12-passenger triple club arrangement and an 18-passenger high-density airline type.

larger (and tinted), providing a light, spacious feeling in the cabin, which is free of the "tunnel effect" that bothers some passengers traveling aboard this class of aircraft.

Cabin vibration isolators are included in the 1900D to reduce both noise and vibration. Our subjective impression after two-plus hours in the aircraft is that the isolators do their work well in the cabin.

The real driver in the design of the 1900D was the requirement to certify a 19-passenger aircraft under the new commuter rules. Many of the aerodynamic and systems changes have to do with that certification goal.

For example, the D model has new rotor-burst protection, including separate paths for primary and secondary flight controls, hydraulic lines, fire extinguisher and firewall valve control wiring. The flap system has been simplified too. The D model has three flap positions—zero, takeoff/approach, and land—compared to four on the C model.

Wing and airframe structure has been beefed up in the 1900D to handle the airplane's increased takeoff and zero fuel weights. Beech engineers tell us this strengthening also will result in an improved fatigue life.

The C model has aerodynamic

devices sticking out all over the place; the D model did not escape that treatment. But as we will see later, these devices work together to make the 1900D one of Beech's nicest-handling machines in the regional fleet.

Practically all of this hardware is subject to walk-around inspection. If you look at the accompanying photo of the wings, you'll notice they have been outfitted with an extension and winglets. Just ahead of each wing root is a horizontal surface that generates a vortex to hold flow together through the wing/fuselage intersection.

Additional vortex generators are located at the leading edge of the outboard flaps. These reduce the stall speed. The 1900C's wing fences and inboard wing vortex generators are gone. The D model's wing is wet and holds 4,468 pounds of fuel. Outboard vents have been moved to accommodate the winglets. Two fuel-sight gauges are mounted on the underside of each wing. These measure main-tank capacity and are graduated at 0.50, 0.75 and full. All fueling is overwing, but Beech engineers tell us they can add single-point refueling to the option list with a rework of the Beechjet single-point fueler.

Note, too, that the area of the wing deice boots has been expanded and that the position lights and strobe lights have been repositioned to the winglets. The position lights are dual-bulb units, so failure of one bulb will not prevent dispatch. The recognition lights are standard.

Working aft, you will see the familiar T-tail with its vertical taillets, one at either end of the horizontal tail. These fixed devices create an increase in effective vertical tail surface. Note that they now sport deice boots. The D model's horizontal stabilizers create an effective increase in horizontal tail surface and a significant increase in c.g. range. In fact, with the 1900D, crews can offer their passengers random seating without concern for c.g. problems. The c.g. envelope of the D is four to 40 percent of MAC. Note the D model's stabilizers are mounted significantly higher than those on the C model. This should reduce ground damage on the D model.

New on the 1900D are the large dual ventral fins. These add to stability and control at high angles of attack. A closer inspection of the empennage will reveal a large elevator tab, dual

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pushrod trim-tab actuators, a longer chord rudder (to lower VMC), and a redesigned tailcone to accommodate the new rudder.

Power is supplied by two Pratt & Whitney PT6A-67D engines capable of 1,613 shp each, but flat-rated in this installation to 1,279 shp. The C model is powered by the -65B engine flat rated to 1,100 shp. Improved performance throughout a wider temperature limit is the legacy of the new engines, which have a 6,000-hour TBO. The engine has a new overspeed governor and new exhaust stacks. Beech engineers have limited reverse thrust to engine-saving low levels and have developed tables for partial-power takeoffs—both customer requests.

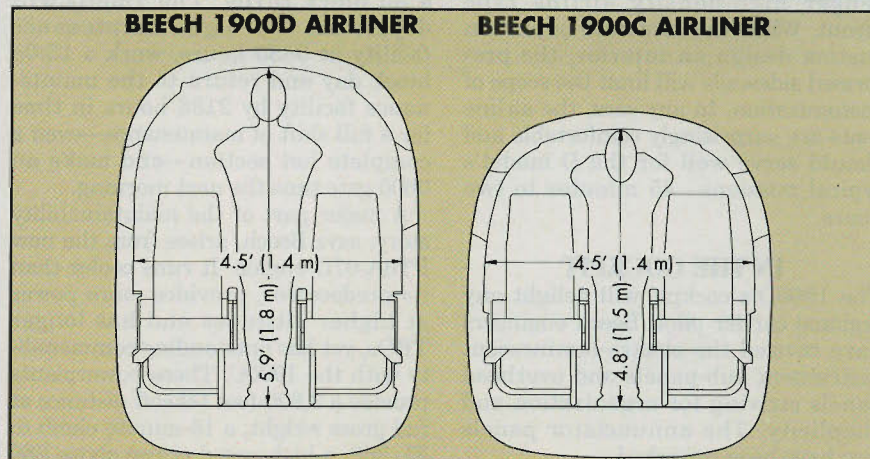
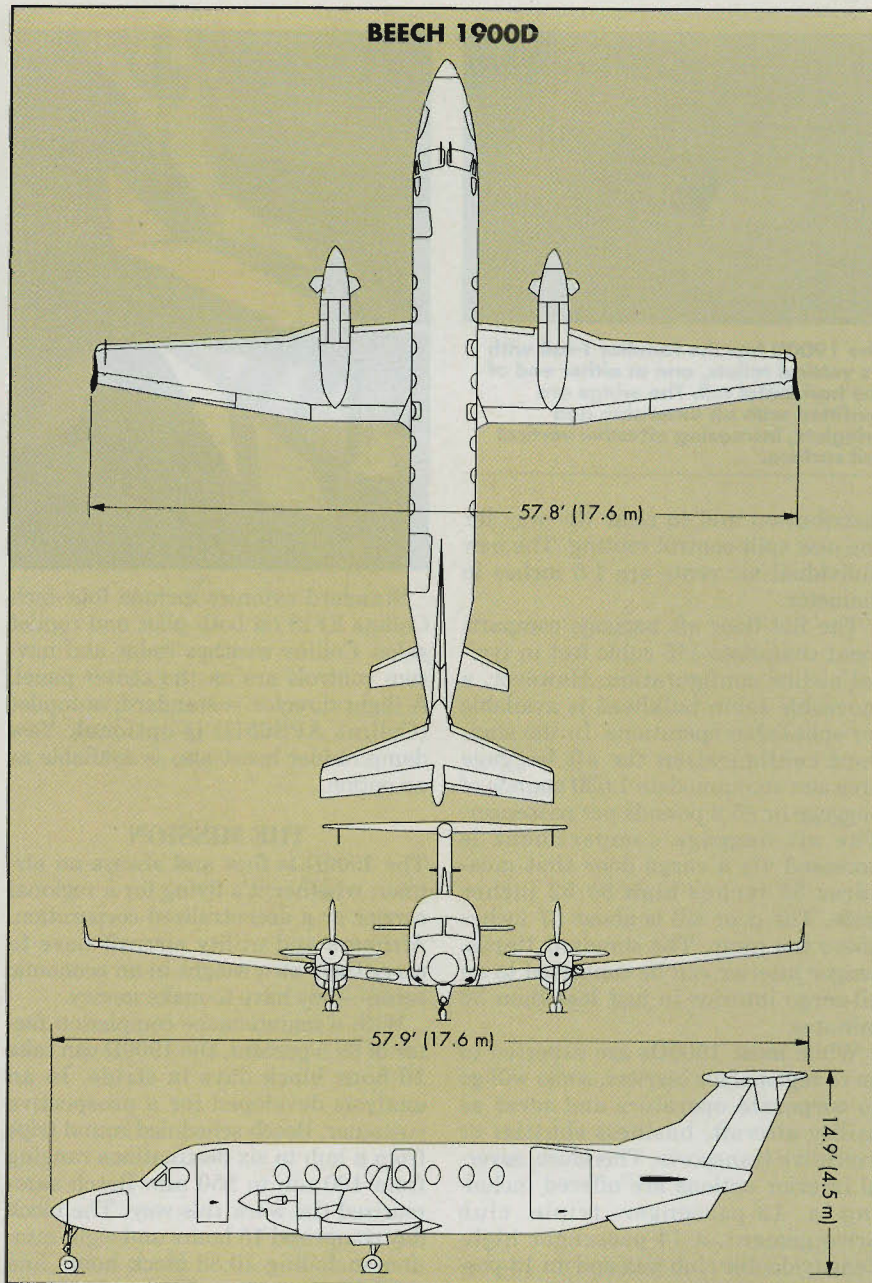
Propellers are new Hartzell composite-blade devices. They have higher activity, a wider chord and allow a comfortable, quiet 1,400 rpm cruise. The 1900D's prop deice is capable of significantly higher amperage than the C model's system.

Changes were made in the cowling, firewall and aft nacelle to meet the new commuter certification rules. On-wing hot sections (3,000 hours) are possible. If you look closely at a 1900D in flight, you'll notice that the wheels do not retract fully but rather stick out of their wells a few inches like the DC-3. And like the DC-3 it's entirely possible to land a 1900 with the wheels in the well and then apply brakes for a controlled wheels-up landing. This design is not only a significant safety element but could be a significant money saver when it comes to repairs after a gear-up incident.

INTERIOR IMPROVEMENTS

In addition to stand-up height and larger windows, Beech has made several other changes aimed at improving passenger comfort. For example, the modular cabin side panels have been redesigned to accommodate the higher individual cabin reading lights, aisle lights and oxygen masks. Armrests have been built into the side panels. Seats are regular airline style units with recline mechanisms, tray tables and under-seat storage for carry-on baggage.

Dual air conditioning systems—one freon system for ground operations and one air cycle machine for operation aloft—are standard. Cabin air ducting has been moved to improve air



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The 1900D has the familiar T-tail with its vertical taillets, one at either end of the horizontal tail. The wings are outfitted with an extension and winglets, increasing effective vertical tail surface.



Standard avionics include four-inch Collins EFIS on both pilot and copilot sides. Collins weather radar and nav-com controls are on the center panel. A flight director is standard; autopilot (Collins APS65H) is optional. Yaw damp/rudder boost also is available as an option.

THE MISSION

The 1900D is first and always an airliner, whether it's flying for a regional carrier or a decentralized corporation. Airliners and utility aircraft have to carry their own weight in an economic sense—they have to make money.

With a maintenance completion factor of 99.5 percent, the 1900D can take 15-hour block days in stride. In an analysis developed for a prospective customer, Beech scheduled round trips from a hub to six destinations ranging from 100 nm to 250 nm. Beech summarized the work this way: The block day comprised 15 hours and eight minutes including 10:33 block hours and 4:35 block turns. The 1900D will depart the overnight maintenance facility at 0630 hours, work a 15:08 block day and return to the maintenance facility by 2138 hours in time for a full shift of maintenance—even a complete hot section—and make an 0600 gate time the next morning.

A major part of the maintainability story, says Beech, arises from the new PT6A-67D engine. It runs cooler than its predecessor, provides more power at higher altitudes and has longer TBOs, yet has outstanding commonality with the 1900C. These powerplants provide a 3,800-foot takeoff distance at full gross weight; a 16-minute climb to FL 250, a high-speed cruise above 280



knots and a power margin at all conditions. Beech estimates that operators will budget one man-hour of maintenance per flight hour. Field replaceable major components include wing tips, flaps, horizontal stabilizer, control surfaces, windshield/windows, wing access doors, engines, propellers, instruments, radome, landing gear, antennas, vapor cycle air conditioner and air cycle machine.

FLYING THE 1900D

It has seemed to us over the years that the last element in the design of some regional aircraft has been flyability and pilot comfort. After all, most regionals are flown by relatively young pilots who are happy to get a money-paying seat anywhere, let alone in a 19-passenger turboprop.

If, indeed, that observation is valid, the Beech 1900D is an exception. The cockpit is roomy, comfortable and well ventilated. The seats are better than most we've tried in this class aircraft. The noise levels are a bit high, but most crews, we suspect, will snuggle down into their Dave Clarks and enjoy the view.

The airplane handles well on the ground and is quite maneuverable on a crowded ramp when both engines are running even with mechanical steering. That maneuverability disappears when one engine is shut down. If your operations call for engine-out taxi, you'll need the optional power-assist steering package.

Preflight and runup are typical King Air/PT6A with some simplifications. Ground idle is higher in this PT6A installation than most, so there isn't as much shuffling around the quadrant during second engine start and in bringing electrical system components

distribution and to clear the way for the new split-control routing. The new individual air vents are 1.5 inches in diameter.

The flat-floor aft baggage compartment comprises 175 cubic feet in typical airline configuration. However, a moveable cabin bulkhead is available for split-cabin operations. In the standard configuration the aft baggage area can accommodate 1,630 pounds of baggage or 85.8 pounds per passenger. The aft baggage compartment is accessed via a cargo door that measures 52 inches high by 52 inches wide. The door sill is about 57 inches above the ramp. The standard 19-passenger interior can be converted to an all-cargo interior in just less than 30 minutes.

While most 1900Ds are expected to go to regional air carriers, some will go to corporate operators and serve as utility aircraft, business shuttles or executive transports. Therefore, several interior options are offered including a 12-passenger triple club arrangement, a 14-passenger high-density/double club mix and an 18-passenger high-density airline type layout. While the corporate buyer can custom design an interior, the preformed sidewalls will limit the scope of customization. In any case, the airline seats are surprisingly comfortable and should serve well for the D model's typical missions—45 minutes to two hours.

IN THE COCKPIT

The 1900D's cockpit will delight any regional carrier pilot. Beech engineers have revised the electro-luminescent instrument sub-panels and overhead panels striving for organization and simplicity. The annunciator panels also have been reworked.

SPECIFICATIONS BEECH 1900D AIRLINER

Weights (lb/kg)

Max ramp	17,060/7,738
Max takeoff	16,950/7,688
Max landing	16,100/7,303
Max zero fuel	15,000/6,804
BOW	10,360/4,699
Max fuel	4,468/2,027
Useful	8,600/3,901
Max payload	4,640/2,105
Payload max fuel	4,132/1,874
Fuel max payload	3,960/1,796

Loadings

Wing loading	54.7 lb/sq ft
Power loading	6.6 lb/hp

Volumes

Crew station	103 cu. ft
Forward entrance	39 cu. ft
Forward cabin baggage	17 cu. ft (280 lb/127 kg)
Main cabin	584 cu. ft
Underseat stowage	32.2 cu. ft
Aft baggage area	175 cu. ft (1,510 lb/685 kg)
Baggage area/pax	11.8 cu. ft

Dimensions (see three-views)

Performance

Range*	
8,000 ft	450 nm
12,000 ft	490 nm
16,000 ft	540 nm
25,000 ft	680 nm
Max cruise speeds (15,000 lb)	
10,000 ft	281 KTAS
15,000 ft	290 KTAS
20,000 ft	287 KTAS
25,000 ft	280 KTAS
Stall speed	
35 deg. flaps	
@ 16,000 lb	87 KCAS
Field length**	
(17 deg. flaps, SL/ISA) (ft/m)	
16,000 lb	3,470/1,058
16,950 lb	3,740/1,140
Field length**	
(17 deg. flaps, 5,000 ft/ISA + 30°C)	
16,000 lb	4,990/1,521
16,950 lb	5,630/1,716
Climb	
(SL/ISA, 16,950 lb) (fpm/MPM)	
All-engine	2,625/800
Engine-out	675/206
Service ceiling	
(SL/ISA, 16,950 lb) (ft/m)	
All-engine	33,000***/ 10,058
Engine-out	17,500/5,334

*Range is calculated at high-speed cruise power at a typical operating weight of 10,360 pounds with 19 passengers (3,800 lb/1,724 kg) and IFR fuel reserves for a 100-nm alternate plus a 45-minute hold at 8,000 feet.

**Decision speed ranges from 101 to 107 KCAS for above field lengths.

***Maximum certified altitude is 25,000 ft.



Pilots transitioning from earlier models will find that their lot has improved. The airplane handles well during flare, touchdown and landing.

on line. Takeoff acceleration is brisk, as is climb. Visibility in all flight attitudes is excellent. The airplane gets noisy and bumpy as it approaches a stall, then breaks cleanly. There's plenty of control throughout the maneuver. Engine-out controllability is excellent. We flew low-speed steep turns in various configurations with an engine out and found the airplane to be entirely well behaved. The phugoid is positive damped and relatively long (we observed 30 seconds). Autopilots are optional on the 1900D. Hand flying, however, is not a chore. The airplane trims up well and is rock stable. Because the 1900D will cruise comfortably on one engine above 16,000 feet, operators do not have to prove drift down capability on most mountainous routes.

Our speed checks were accomplished in near ISA conditions. Long-range cruise power (1,400 rpm/2,014 pounds torque) at 8,500 feet generated 182 KIAS (214 KTAS) burning 383 pounds per hour per side. High-speed cruise at 8,500 feet generated 240 KIAS (280 KTAS) burning 585 pounds per side. At FL 230 we tried out at 280 KTAS burning 386 pounds per engine. All of our checks showed speeds three or more knots above book expectations and fuel flows a bit lower than the book predicted.

The controls are well harmonized and feel surprisingly light, particularly

when maneuvering for approach and landing. For an airplane that looks a bit ungainly, the 1900D is really a nice flying machine. Frankly, we were surprised with how well the airplane handles during flare, touchdown and rollout. Our subjective feel was that the 1900D may be the nicest landing "King Air" made. Later, several Beech pilots agreed with that observation.

The bottom line is that pilots transitioning from earlier 1900Cs will only find their lot has improved. Pilots new to the 1900-series will find this airplane is one of the nicest they've ever flown.

BUYING THE 1900D

Beech is working out production schedules for the 1900D right now. So far the order book looks healthy. Mesa Holdings has ordered 50 1900Ds and is accepting them at the rate of one per month. The Mesa airplanes will fly in several liveries including Mesa, United Express, USAir Express and AirMidwest. MarkAir Express of Anchorage, Alaska has ordered five 1900Ds and Commutair of Plattsburgh, New York has orders for 20. All of these operators currently use various versions of the 1900C. New customer orders will be handled by an expansion of the 1900D assembly line. The price of the Beech's 1900D Airliner is about \$3.95 million; price of the ExecuLiner is \$4.67 million.

B/CA