

PILOT FLIGHT CHECK: BEECHCRAFT'S DUCHESS

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Unique features and some good design make the

■ ■ Beech Aircraft Company eclipsed the aviation industry back in 1974 with the surprise introduction of a light airplane with a T-tail. That airplane was then the PD-289, soon after the Model 76, and today is being delivered as the Beech Duchess.

The T-tail was unique at its introduction, though Beech is no longer alone in building T-tailed craft.

Over 100 of the new light twins are scheduled to be flying—either in the hands of Beech Aero Centers or individual owners—by the end of September. Last February, *The PILOT* was the first magazine to be permitted an evaluation flight of this four-seat machine drawn by two 180-horsepower engines.

Overall, the Duchess shows signs of being a remarkably well-planned airplane. Like any plane, it has its bothersome touches. But the Duchess will leave a pilot with the impression that it's an easy-to-handle craft offering

many conveniences not frequently found in today's lightplanes.

The roots of this new airplane are in Beech's single-engine retractable Sierra, rather than the Bonanza or Baron. So the Duchess shows almost no similarity to the Beech high-performance singles and twins rooted in designs almost three decades old.

Among the unique features of this twin are its two cabin doors that open onto either wing, and a baggage door almost as large as the main doors. Portions of its skin evidence bonding construction techniques. It sports counter-rotating propellers that spin toward the fuselage. Powerplant and fuel gauges are likely the clearest and most easily read in any light airplane. And of course its T-configured horizontal stabilizer and elevator sit more than nine feet above the ground.

On preflight the height of the tail is a bit disconcerting. All you can do is

gaze upward and hope it is free of ice and in working order. During preflight, too, you face a gaggle of fuel drains—eight of them—tucked away under the wings and fuselage.

Each pilot climbs into the cabin through his own entrance, which is simply slammed shut in car-door fashion. The instrument panel he now faces is uncluttered, pleasantly arranged, and the fuel selectors uncommonly simple to set. Power control arrangement is standardized with the rest of the industry: left to right, throttles, prop controls, and mixtures. It's a set-up still alien to Beech's other twin-engine airplanes.

On starting the engines, the magneto switch for each operates the electric primer if depressed while in the "both" or "start" positions. The feature eliminates the need for three-handed pilots.

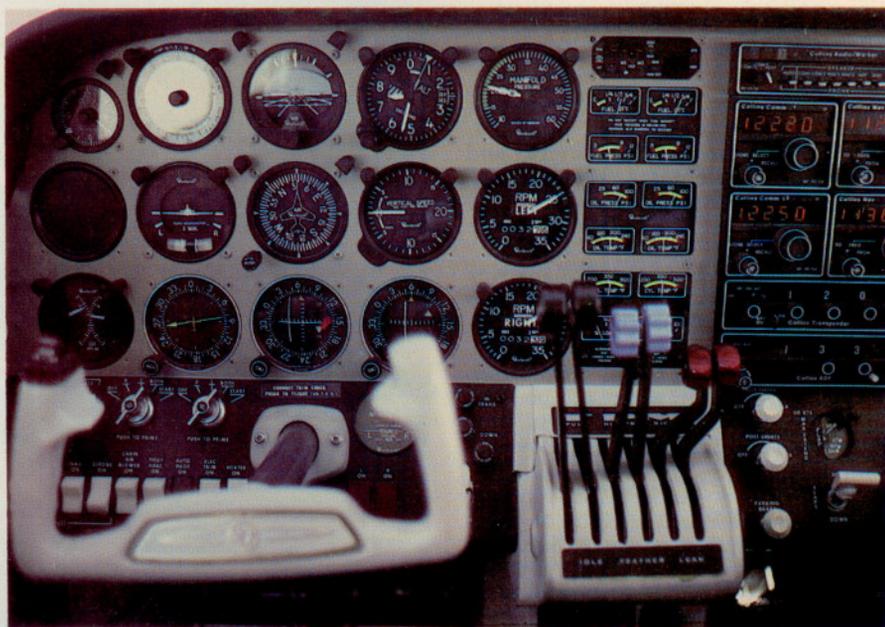
Upon calculating the weight and balance of the Duchess, you'll find a



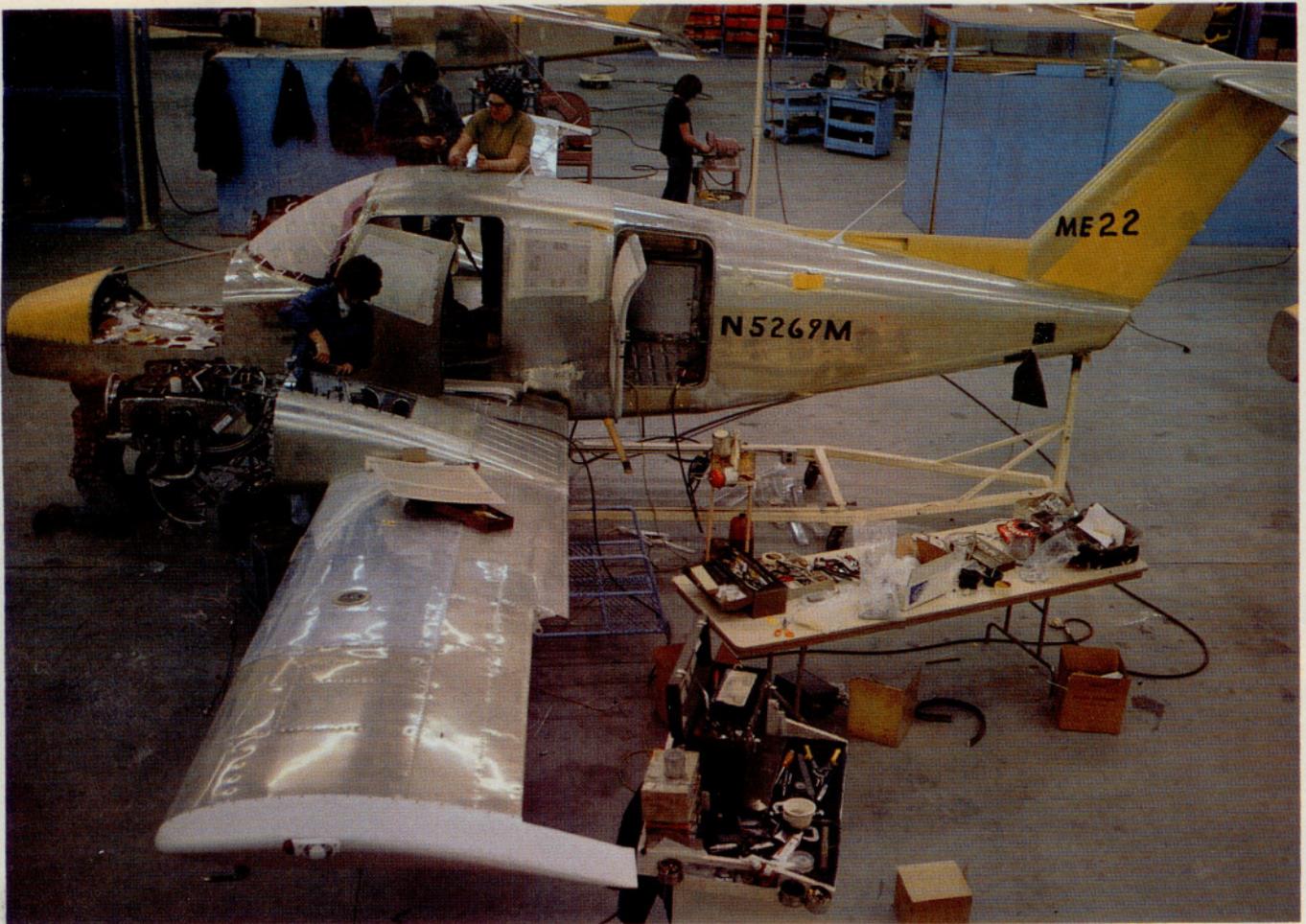
new light twin a solid spokesman for itself

light twin with a lot of loading latitude. N18976, the third Duchess built and the one which served as the flight check aircraft, carried a basic empty weight of 2,563 pounds (a weight that included oil and unusable fuel). With a full load of 100 gallons of avgas (600 pounds), the plane could still carry four 170-pound passengers plus 73 pounds of baggage before the airplane reached its maximum ramp weight of 3,916 pounds. Up to 200 pounds of baggage are allowed in a rear luggage area. There is no luggage locker in the nose.

The flight check craft, trimmed in "mesa gold" and "toreador red," carried a full set of Collins Micro Line avionics, plus a Narco DME 195. Avionics options totaled over \$18,000, but did not include RNAV or an autopilot or flight director of any kind. Additionally, the airplane had the "professional package" of options that cost



Panel layout: convenient all around. Engine gauges are unusually bright with rpm and mp dials just to the left. Note placement of primary VOR/LOC/GS indicator at bottom of instrument "T". Photos by the author.



Beech's Liberal, Kan., factory was recently expanded to handle one-a-day Duchess production.

A door for people on each side, plus another door for baggage, makes loading and unloading an easy task.

BEECHCRAFT DUCHESS continued

\$5,390 and added full instrumentation, lights, electric trim, tinted windows, prop unfeathering accumulators, and other convenience items. The Duchess' basic price is \$81,950; however, this demonstrator carried a sticker price of \$107,787.

For the flight check, the airplane was light and the air was cold. Only two pilots were aboard, Beech's Joyce Case, manager of Beech Aero Club Development, and I, for a total people-and-belongings weight of about 250 pounds. Thus, at takeoff, the Duchess was loaded 500 pounds under its allowable ramp weight.

After a delay at the 1,387-foot-msl Beech Field in Wichita, Kan., to allow scrapers to smooth a 2-inch coating of rough ice covering the south half of the runway, we rolled for takeoff. With the temperature there hovering about 12°F and our light loading, it was no surprise when the vertical speed indicator showed the craft climbing out





Nose gear pulls forward and mains move in when the T-tailed Duchess goes up.



under full power at 2,000 fpm.

At 4,500 feet, with power dropped to 25 inches manifold pressure and 2,500 rpm, the climb had stabilized at 1,450 fpm using the craft's best rate-of-climb speed of 85 knots. Besides being its best climb speed, 85 knots is also conveniently the speed for best single-engine climb rate and angle. At that climb speed the horizon is visible over the nose, characteristic of the excellent visibility afforded by the very large windshield and downward sloping nose.

Cruise checks, corroborated by the DME on a two-way run, were made at 10,500 feet in air that varied from 7°F to 13°F. At full throttle and red-line rpm (2,700) manifold pressure showed 20 inches and the airspeed dial read 142 knots. Corrected for temperature and altitude, we were trueing along at 164 knots (or 189 mph). At intermediate and low cruise settings of 2,500 and 2,300 rpm, true airspeed was calculated to be 160 and 158 knots respectively. Those speeds reflected a 2- to 5-knot edge on the book speeds,

which were published for an airplane at an "average weight" of 3,600 pounds, several hundred more than the Duchess' weight at the time of the speed checks.

(This use of "average weight" in the craft's speed and range specifications is a little unusual. Most commonly, figures for speed and range are based on an airplane at maximum gross weight; calculations at less than gross may alter the figures slightly.)

Beech lists the Duchess' maximum speed to be 171 knots or 197 mph. Beech officials say the plane met its target specifications. Light twins, it must be remembered, are not necessarily the fastest way to move four people through the air. Instead, they may add degrees of safety, convenience, and comfort to flight.

The new twin does offer a feel of roominess inside, plus a large baggage area behind the seats. Sound levels inside the cabin were quite high at the 2,700-rpm power settings, but diminished considerably when power was dropped back to 2,500 rpm. The rush

of air passing by the door seal at the pilot's side was audible, a condition being corrected, Beech officials said later.

Otherwise, however, the cabin seemed tight and comfortable. Cabin heating (a Janitrol gas-burning heater was installed in the nose) worked quickly and effectively, and included

heat vents for the rear seats. Fabrics and workmanship on the inside of the airplane were pleasing. And window area all around was immense, for excellent visibility.

Handling of the Duchess in flight was strictly routine. As with other light twins, yaw oscillation was quite apparent with a kick of rudder, but stability in both pitch and roll axes was excellent and, overall, control forces balanced nicely.

Stalls were totally unexciting: with gear and flaps down the craft stalled at 50 knots indicated. Clean, the stall came at 60. Considerably more buffeting preceded the clean stall, but either way the stall progressed with wings level while the craft began to settle without significant drop of the nose. A stall horn started chirping about 7 knots above the impending stall.

Single-engine work included abruptly pulling off power while below the published minimum single-engine control speed of 65 knots. To simulate a failure of the left engine after takeoff, the plane was "rotated" from 6,500 feet at 70 knots with gear down and full power. Elevator back pressure reduced the airspeed to 60 knots, the speed at which the left throttle was chopped back. The plane lurched a bit to the left, but showed no wing-tucking tendency. With nose down and right rudder, control was regained almost immediately with little more than 200 feet of altitude loss.

The same procedure was tried, this time pulling back the right engine. With counter-rotating props, the results were duplicated, except in reverse.

On one engine the Duchess, with its light loading, would still climb (the other engine feathered) at a rate of over 100 fpm at 11,000 feet. Its published single-engine rate of climb is 235 fpm, and its single-engine service ceiling is 6,170 feet.

Later we tried some takeoffs and landings. The landing gear carries an extension speed of 140 knots, which makes for easy slowdown of the craft. However, its maximum retraction speed is 112 knots. Retraction took 10 seconds, while extension was clocked at 9 seconds. It was apparent, too, that one main gear was lowering ahead of the other, for the airplane would yaw left, then right, as the extension cycle was underway.

Takeoffs are most remarkable in a T-tailed airplane. After getting rolling, the Duchess would simply fly itself off the ground as its airspeed needle crossed the 58 knots mark. Speed would quickly build up to exceed V_{mc}. During takeoff roll and climbout the pilot could leave his feet flat on the floor, because counter-rotating props totally negate the effects of torque, P-

factor, and prop-wash-induced roll tendencies.

Landings required full-up trim by the time we got to roundout, but were quite simply and smoothly accomplished. Seventy-five knots makes a good final approach speed, while 65 to 70 knots is recommended for short landings. Roll after touchdown with light crosswinds at Beech field was about 800 feet.

Flaps, which extend down to a 35-degree angle, are effective, and cause the nose to drop as they are applied. Extension and retraction of the wheels have almost no effect on pitch.

In flight, the airplane is stable. I trimmed up the Duchess for cruising flight in smooth air, then folded my arms and pulled my feet off the pedals. It maintained heading within a couple of degrees and altitude within 50 feet during more than six minutes of hands-off flight. Despite the stability, however, many pilots will want an autopilot (optionally available).

But there were other features aplenty. Each of the four seats has an inertia reel shoulder harness. Four air vents were on the cabin ceiling, and there were two more ball-type vents, at the side of the instrument panel. There are trim controls for all control surfaces.

An interesting placard was observed on the aircraft door: "Occupants shorter than 4 feet 7 inches, do not use shoulder straps. . . ."

Avionics are powered through a split buss, allowing for a failure of part of the electrical system, but leaving the pilot with a reasonable complement of avionics for continued flight to a safe landing. The electrical system of the Duchess is 14 volts (to be changed to 28 volts next February). The Lycoming engines on the craft are carburetor type, and carry a 2,000-hour time between overhaul. Fuel flow during our flying averaged around 18 gallons per hour; 71 gallons were consumed during a little less than four hours flying time.

Beech spent \$4.8 million developing the Duchess, according to Dale Erickson, the company's marketing manager for Aero Center aircraft. He reported that later this year Duchesses will be rolling from their Liberal, Kan., facility at a one-a-day rate. A slightly higher production rate is scheduled for next year. At that plant, 36 of the new twins were in various stages of construction during a February visit. He said the Duchess would "stay a four-seater," and referred to it as a "nice little Mercedes Benz."

Well, not quite. It's a little more expensive and it only has three wheels. But the Duchess flies, and quite nicely, too. □

BEECHCRAFT DUCHESS 76

Basic price \$81,950

Specifications

Engines	2 Lycoming O-360, 180 hp @ 2,700 rpm
Propellers	2 Hartzell constant- speed 76-in dia
Wing span	38 ft
Length	29 ft 1 in
Height	9 ft 6 in
Wing area	181 sq ft
Wing loading	21.5 lb/sq ft
Passengers and crew	4
Cabin length	7 ft 11 in
Cabin width	3 ft 8 in
Cabin height	4 ft
Empty weight	2,446 lb
Useful load	1,470 lb
Maximum ramp weight	3,916 lb
Power loading	10.8 lb/hp
Fuel capacity	100 gal usable
Oil capacity	8 qt/engine
Baggage capacity	200 lb (23.3 cu ft)

Performance

Take-off distance (ground roll)	1,017 ft
Takeoff over 50 ft	2,119 ft
Rate of climb	1,248 fpm
Single-engine rate of climb	235 fpm
Maximum level speed	171 kt
Recommended cruise speed (2,500 rpm)	158 kt
Economy cruise speed (2,300 rpm)	151 kt
Range at recom- mended cruise (with 45-min reserve)	711 nm
Range at economy cruise (with 45-min reserve)	780 nm
Service ceiling	19,650 ft
Single-engine service ceiling	6,170 ft
Stall speed—IAS (clean)	60 kt
Stall speed—IAS (gear and flaps down)	70 kt
Landing distance (ground roll)	1,000 ft
Landing over 50 ft	1,881 ft