BEECHJET 400A

NIOTB

Soods

Fast and with a Star Wars panel

BY RICHARD L. COLLINS

When Beech bought the Diamond business jet from Mitsubishi, the logical question was, "How long will it be before the airplane becomes 100-percent Beechcraft?" The answer to the question is, "Until now." Renamed the Beechjet but with many assemblies coming from Japan, production was gradually moved to Kansas. Recently completed airplanes are now 100-percent Beech-built, and the latest



version, the Beechjet 400A, reflects a complete transformation with important systems and in-

strument panel changes. It is being manufactured in a new plant, built especially for the Beechjet and its sibling, the U.S. Air Force T–1A Jayhawk trainer version of the aircraft, which will be used to train tanker and transport pilots.

It takes awhile for a design to mature. The Beechjet first flew as the Mitsubishi MU–300 on August 29, 1978, and was certified as the Diamond I a few years later. This airplane had 2,500 pounds of thrust per side. Everyone who flew the Diamond knew that it needed more powerful engines. The airplane felt lively enough, though the climb slackened greatly above Flight Level 300. The lack of power showed up when computing required runway

> Compared to the original Diamond I, the Beechjet 400A is a "new" airplane.

length or maximum weight for a highaltitude takeoff on a hot day. In the summertime, the airplane was often weight limited for departures.

Mitsubishi's next effort was the Diamond IA, still with 2,500-poundsthrust engines. Using some special procedures, such as shutting the environmental system off and maintaining the 2,500 pounds of thrust at higher engine temperatures, improved the takeoff performance. Then came the Diamond II with 2,900 pounds of

thrust per side, the airplane that was current when Beech bought the design.

The first effort at Beech was to call the airplane a Beechjet 400 and make the interior look like a King Air's.

Beech assembled and sold a number of Beechjet 400s. In an interim step, a Bendix/ King EFIS system was offered, along with a new autopilot. Beech had further plans, though, and the big change came with the Beechjet 400A,





which is about as "new" an airplane as you'll find when compared with the original. The instrument panel and avionics system are all new, with a three- or four-tube Collins system installed in most aircraft. The maximum ramp weight is up 450 pounds to 16,300. The zero fuel weight is up 530 pounds to 13,000. The maximum landing weight has been increased from 14,200 to 15,700



pounds. The 400A is approved to FL450, from 410 for the previous model.

Another new feature that comes with the 400A moniker is the opportunity to participate in the unique Beech-Power program that allows the customer to buy an airframe and lease the engines. Under BeechPower, the customer can acquire a Beechjet 400A with thrust reversers for \$4.1 million and lease the engines at an hourly usage rate of \$610. The program reduces the capital outlay by \$983,000 from the usual base retail price of \$5.08 million. With Beech-Power, the manufacturer provides full engine and thrust reverser maintenance, including hot sections, overhauls, routine maintenance, and annual inspection—everything, right down to the oil changes and filters. It's an interesting way to provide the operator with a guaranteed cost of engine operation.

With the new Collins autopilot, Beech was able to remove a separate surface for the yaw damper on the vertical tail, and the new yaw damper is approved up to the V_{MO} of 320 knots. The old one was speed limited. The cabin benefited from a rearrangement of the fuselage fuel tanks to put more of the tankage beneath the floor of the airplane. In effect, this stretched the cabin without stretching the fuselage, and the cabin can now accommodate a double club arrangement for eight passengers. The full-size lavatory is aft, and there's a relatively modest 25cubic-foot externally loaded baggage compartment. (External baggage is the exception rather than the rule in this class airplane.) Soundproofing has been improved to give the passengers a quieter ride.

There are a lot of neat things to look at during a walkaround inspection of a 400A. The wing leading edges are bright and shiny—no boots—and, along with the engine inlets, are heated with bleed air for anti-ice, with no loss of power due to this use of bleed air. The horizontal tail and elevator horn anti-ice is electric.

Spoilers atop the wing, pretty far back, serve both for roll control and as speed brakes. In normal operation, a full wheel deflection to the right would result in the right wing spoilers (two to





a wing) extending upward 68 to 72 degrees. The left ones would tuck in 14°. For a combination of speed

brake and roll control, the same fullright deflection would result in 73° to 78° up on the right spoilers and 14° up on the left spoilers.

Toward the tips of the wings at the trailing edge are surfaces that look like small ailerons. Actually, they are for roll trim and are actuated by the trim switch on the control wheel.

Eighty percent of the trailing edge of the wing is available for the doubleslotted Fowler flaps. A stub flap extends a bit less than the inboard half of each primary flap.

When giving the 400A a close look for fit and finish, the emergency exit, which was relocated for better cabin flexibility, can cause pause. It looks like it does not fit at the top and bottom. The door appears to be slightly inside the fuselage at its extremes. The same thing is true of the cabin door when it is closed on the ground. The reason is, the 400A cabin is an oval, not a circle, and when it pressurizes, the shape changes slightly. Then the door and emergency exit fit perfectly.

The oval cabin and flat cabin floor give the 400A a feeling of great spaciousness. Passengers have more shoulder- and headroom than with a circular cabin. The airplane flown for this report had a club-and-three-quarters cabin, with one aft-facing seat in the front club replaced by a closet/baggage area. This would likely be the most popular arrangement because it gives a place to hang coats and stow gear in the cabin. It would still allow eight passengers, as the toilet is a certified seat, complete with belt.

Turbine airplanes have come to have two personalities. One is the airplane itself. You still have to put your feet on

the pedals, one hand on the wheel and one on the power, and proceed with all the right moves. In addition to that, though, you have to learn to take advantage of all the information that is packed into the avionics system.

The three-tube system in the Beechjet includes a primary flight display for both pilots (it is a two-pilot airplane), plus a multifunction display on the pilot's side and two control display units



The wing leading edges are bright and shiny and are heated with bleed air for anti-ice, with no loss of power. (CDUs). The optional fourth tube would be another multifunction display on the copilot's side. Everything except the first tube is optional.

In demonstrating the airplane, Beech wisely begins with a session in the cockpit with power to the tubes on the panel. To just plop someone in the left seat and fly away with no explanation of the workings of the avionics

> would be counterproductive. Collins and FlightSafety have produced videos, which would be helpful to watch before flying because they show the system in use.

> The primary flight display (PFD) is really neat, though if you go flying with it and haven't watched the video, it is likely that you'll spend some moments wondering exactly what is going on. The PFD includes everything you need to know to fly, though



the presentations are not exactly like those on mechanical instruments.

The flight director and horizontal situation indicator presentations are more or less standard. Airspeed is a vertical presentation on the left side, and you can see about an 80-knot spread on the scale at a time. Mach is a digital readout at the top of the airspeed scale. Altitude is on the right, in a vertical display, with 500 feet at a time visible. With increasing values, the numbers on these displays move downward. The vertical speed is below the altitude

and has a digital as well as an analog readout. All the flight director and autopilot modes are annunciated on this tube, along with all selected navigational data. Distance to go, heading, and selected course are also presented digitally. The drift angle is shown on the HSI portion, and an electronic slip-skid indicator is at the top of the flight director. The altimeter setting is shown (it flashes going through 18,000 feet to remind



you to reset), and the altitude and decision height or minimum descent altitude alert are annunciated, as is the temperature.

If the PFD tube fails, the presentation can be moved to the multifunction display. If everything fails, a mechanical airspeed indicator, attitude indicator, and altimeter are provided.

The air data reference panel is used to set bug airspeeds, the altitude alert, and the altimeter and select various vertical speeds and profiles if desired. The altitude awareness panel is used for DH and MDA settings. The CDU keyboard is used for inputting flight plans, changing frequencies, and controlling the radar. The keyboard is numerical, similar to but not exactly like a telephone, so to input letters, as you have to do on a flight plan, you have to press two keys-first the one with the letter on it, then another to select between the letters on that key. (The difference between this and a telephone is that ABC is on the "1" key, where on a telephone, ABC is on the "2" key.) Someday, we are going to have full computer keyboards in airplanes.

Virtually everything you need or want to know about what is going on as the flight progresses is available on one of the tubes. If you want a map, you get a map. If you want to know the fuel status, it is in there. It is just a matter of learning which buttons to press.

With some basic understanding of the system and with the engines start-

ed, it is time to get going. The Beechjet taxies nicely, though if you honk on the effective brakes, the passengers might think there's a cowboy at the controls. For a maximumweight takeoff at 15° Celsius at sea level, V_1 is 105, V_R 115, and V_2 123. Under these conditions and with no wind, the balanced field length for takeoff would be 4,290 feet. The Beechjet is quite capable of using shorter runways and can use a 3,000-foot runway when carrying a total of just under 4,000 pounds of fuel and payload. The speeds are electronically set on the airspeed indicator, and the desired fan

> speed for takeoff thrust is determined.

The takeoff itself is simple enough. The pilot flying takes the thrust up to about 80 percent, and then the other pilot trims it in the high 90s, as calculated. At rotation speed, the nose is brought up smartly but smoothly into the Vbars on the flight director, and away you go. Some nosedown trimming is required as the airplane accelerates.

The only thing different



about the use of spoilers for roll control comes in trimming the airplane in roll. Because you don't want to fly around with one spoiler up a little bit, the roll trim drill is to center the control wheel and then trim as necessary to keep the wings level.

A Beechjet goes fastest in the high 20s and low 30s, but it is an airplane to be flown in the low 40s, where the efficiency is much better. The Beechiet will climb to FL430 in 32 minutes in standard temperature conditions. Two climb speeds, 220 and 250 knots, are given, with Mach 0.64 flown when it equates with either speed. At FL430, at mid-cruise weight, the Beechjet will push 440 knots on just over 1,000 pounds of fuel per hour. The fuel capacity is 4,911 pounds; it uses 845 pounds climbing to FL430, so you can go that 440 knots for quite a while. The airplane can depart with full fuel, plus 1,000 pounds (including the crew), and given average trip lengths, it would seldom need to depart at maximum weight.

Top cruise is at FL270 and is at the Mach limit of 0.785, which equates to 465 knots at standard temperature. The fuel flow is almost 1,800 pph.

The speed brakes are effective and do not cause much pitch change or rumble. As will most jets, the airplane descends quickly from those efficient cruise altitudes. It has to be slowed to no more than 250 knots at 10,000 feet on the descent and then down to 200, where approach flaps and the landing gear can be extended. Trim changes

The 400A seems small when viewed from the outside, but it is spacious and roomy when you get inside.

with configuration changes are minimal, and for the average landing, the V_{REF} speed would be between 100 and 110 knots. The landing is pleasant. It is mainly a matter of letting the slight nose-up pitching moment that comes

Beechjet 400A		
Base price: \$4,100,037, plus \$610/hr		
with BeechPower (see above)		
Price as tested: \$5,158,175		
Specifications		
Powerplants	Two Pratt & Whitney of Canada	
	T15D-5 turbofans, 2,900 lbst ea	
Length	48.4 ft	
Height	13.9 ft	
Wingspan	43.5 ft	
Wing area	241.4 sq ft	
Wing loading	66.69 lb/sq ft	
Power loading	2.78 lb/lbst	
Seats	11 max	
Cabin length	20.75 ft	
Cabin width	4.9 ft	
Cabin height	4.8 ft	
Empty weight, as	tested 10,345 lb	
Max ramp weigh	16,300 lb	
Max takeoff weig	nt 16,100 lb	
Useful load	5,955 lb	
Zero fuel weight	13,000 lb	
Max landing wei	ht 15,700 lb	
Fuel capacity	4,911 lb	
Performance		
Balanced field le	igth 4,290 ft	

with power reduction combine with ground effect, and maybe a slight bit of back pressure on the wheel, to roll those mains onto the runway. The reverse is very effective down to 60 knots, where the reversers are stowed.

The Beechjet 400A is an interesting airplane in that it gives the appearance of being relatively small when viewed from the outside but spacious and roomy when you get inside. The new avionics system is capable as well as being pretty to look at, and the flying qualities of the airplane are excellent. It is a neat and efficient package, finished with the typical Beech flair for quality.

465 kt
3.65 hr
45,000 ft
3,000 ft
109 kt
115 kt
123 kt
200 kt
264 kt
264-320 kt
320 kt
Mach 0.78
210 kt
200 kt
165 kt
111 kt

For more information, contact Beech Aircraft Corporation, Box 85, Wichita, Kansas 67201; telephone 316/676-7111.

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted.