Super King Air F90

Simple Sophistication

A frequent comment among the ranks of typical general aviation pilots, particularly when looking at turbine aircraft or considering the aids, training and checks professional crews enjoy, is that those who need the help most don't get it.

There's a great deal of truth to that. A single pilot flying a simple airplane IFR on high-density routes has a work load far higher than the airline captain flying far above him, the responsibilities of the latter notwithstanding. Routings are more complex. The weather is generally "harder" for a longer period during a flight. Communications are more frequent, as are changes to those complex routes.

There's another side to the lament, however. As a pilot or operator moves into more sophisticated and more capable equipment, it is to operate on stricter schedules, in more severe weather conditions, in a more hostile environment (high altitude), at higher speeds. And he usually gets paid for doing it.

Right between the two points of view is another factor: money. As essential as a mission may be in getting high-priced executives or charter customers or a blimp load of tour customers to a destination, there are many businessman p ots or charter operators slogging along in the *real* weathe , alone, in relatively simple aircraft that may have some complex systems as a result of not being state-of-the-art.

In a way, simplification is sophistication (like the guy in the understated $500 suit), and it all costs money.

For some pilots, a controllable pitch propeller, one engine and retractable gear is all the sophistication and systems they'll ever want or need. And for some combinations of pilot, currency and aircraft that's too much.

As one gets into multiple engines, greater altitude and range capability (turbosupercharging, for instance), pressurization, ice protection and weather detection systems, the need for knowledge, experience, planning, thinking, regular training and testing increases. One becomes a systems manager at least as much as a very competent pilot. In some turbine aircraft, the procedure for checking out the electrical system alone is detailed enough and long enough for a less sophisticated aircraft to be 50 miles down the airway. That's one reason why there are redundant systems, warning systems, sophisticated navigation gear, and autopilots and flight directors that require little more than the keyboarding of a few coordinates to fly the entire trip, from gear up to flare, without the touch of a hand. The pilot becomes an observer and a monitor for most of the trip.

We had an opportunity to spend some time with the newest model in the Beechcraft King Air series, the Super (for T-tail) F90. The aircraft, aside from being an appealing aircraft in the turboprop category, is a good example of how money buys relative simplicity, and how the current state of the art in systems design can greatly reduce pilot workload. It fills one with both admiration and envy.

To oversimplify, the F90 shares the same basic fuselage as the C90 and E90, the basic center section of the A100 and B100 and the T-tail design of the Super King Air. It has more powerful powerplants than all but the Super King Air.

Unless you're flying Gulfstreams or large transport aircraft, the F90 is a big airplane, looming large over its main gear. The impression is accentuated by the T-tail.

During our preflight walk-around, we reflected that, aside from the relative size and the distance to go to check certain elements, it is no more complicated—and some ways simpler—to get ready to go than quite a few light twins.

King Airs and their competitors are designed to carry

F90

Modern systems design can reduce pilot workload dramatically, even when everything goes wrong

passengers more than pilots, and the needs of the former are well taken care of. The cabin of N290KA is luxurious for four in facing pairs of large, movable and well-padded chairs. There is an additional seat/storage compartment in the rear and, all the way aft, the flushing biffy could be used as a sixth passenger seat (although the occupant would have to share the space with baggage and hanging jackets). All are fitted with shoulder harnesses. The inertia reel harnesses retract into the seat backs in the four main chairs. Other seating options can provide space for up to eight passengers.

If the sun gets too bright, the polarized cabin windows can be adjusted to block it out. There are galley and beverage facilities, temperature controls, a telephone, tables and lots of storage space to tend to passenger comfort. And there is a Halon fire extinguisher and medical oxygen for emergencies.

The noise level is low and the comfort high. So the boss is well taken care of behind the doors, which can close out the flight crew and the details and noise of flying.

It might seem inappropriate to call a turbine-powered, 10,950-pound airplane simple, particularly with all its systems. But when you consider all the tasks to be performed and the systems to be managed and monitored, and then consider how they are organized and automated in the F90, one has to be impressed with its *relative* simplicity.

The test of that attitude comes with initial operation. We had to maneuver the airplane on a tight, crowded ramp and proceed to the runway via narrow taxiways designed for light singles before having an opportunity to consider its manners. Despite the relative size and weight of 290KA (9,600 pounds), its maneuverability was very good.

The checklist is long, and the cockpit is full of things to check and set. The arrangement is so well thought out that one finds one's way without hours of studying and trying to remember.

All fuel system indicators and controls are to the left of the pilot on the sidewall. Fuel management is, well, simple. There is an automatic system to transfer fuel from the auxiliary to the main tanks. The fuel gauge system is a capacitance type, and the maximum error, no matter what temperature variations one encounters, is 3%. There are standby fuel pumps should the auxiliary pumps fail:

The electrical system control panel is on the lower subpanel to the left of the pilot's yoke. The system is certified to FAR Part 25, has three busses and an automatic load-shedding function in the event of failure. Should both generators fail, there is sufficient power available from the battery to sustain 50 minutes of IFR flight at night in icing conditions.

There is an annunciator panel, which contains 42 warning and advisory items covering everything from oil contamination to engine fire to an improperly closed cabin door.

The environmental system includes a programmable pressurization system, which provides a 10,000-foot cabin altitude at FL 260, two heating systems (one utilizing engine bleed air, the other a 27,000-BTU, electrical backup) and air conditioning. Cabin temperature is thermostatically controlled. Set the desired temperature and let automation handle the rest.

There is an automatic ignition system to relight the engines should one flame out because of icing or water ingestion on takeoff. There are electrical and mechanical


N290KA

F90

The array of instruments, dials, switches, levers, knobs and lights looks overwhelming, but thoughtful arrangement makes flying the F90 uncomplicated.

ice protection systems for the engines, as well.

Listing all the systems could take pages. The airplane is not simple, but systems design and careful attention to their operation and to the grouping of controls and gauges greatly reduce pilot work load, even when things go wrong.

Prestart, start and pretakeoff checks are straightforward despite all the systems to be checked. We don't mean to minimize the tasks involved in adhering to recommended procedures—there are 155 items and checks involved to get to takeoff. But, for instance, engine start is startlingly simple: battery on; ignition/start switch on; condition lever low idle; if temperatures and rpm are within limits, starter switch off; condition lever high idle; generator on.

With all checks completed, one turns the autofeather system on and goes. The autofeather system will handle propeller drag in the event of an engine failure, and the rudder boost will reduce directional control problems for the crew. Should an engine fail during takeoff, the pilot need only concentrate on obtaining/maintaining Vsse (one-engine-out safe operating speed of 102 KIAS at gross) and accelerating to best single-engine rate of climb (117 KIAS at gross) while getting the airplane cleaned up. Every other aspect of engine failure procedure is either handled for the crew or can be left to be completed after the basic task of maintaining control and flying to a safe altitude has been gotten out of the way.

Acceleration is fast and smooth, and the aircraft is through the critical speeds quickly. The initial recommended cruise climb of 140 knots produces a high deck angle—and a rate of climb of 2,380 fpm at gross and 3,108 fpm at 9,000 pounds. We found 180 knots—faster than most of us operate at cruise—provided much better visibility and a still-impressive rate of climb of more than 1,500 fpm.

Visibility is very good. The only addition we would like to see made is a pair of eyebrow windows for more visibility during maneuvering in high density terminal environment or at uncontrolled fields.

Despite the size, weight and variety of systems, the basic job of flying the F90 is surprisingly simple and pleasant. Control forces are well balanced and relatively light. Powerplant and speed management are uncomplicated.

Engine-out simulations produce no big "excursions." They are actually less demanding than in many smaller twins, thanks in part to the automated aids and in part to the basic good manners of the airplane. When we were discussing the flight profile with Chester Schickling, the company pilot who is now in charge of commuter aircraft sales for Beech, he said it flew " . . . just like a Baron." We though that was overstating the case for the airplane quite a bit, but it turned out to be quite accurate.

Slow flight, steep turns and approaches to stalls demonstrate the basic tractability and good manners of the airplane (we did no actual stalls out of deference to the passengers lounging in the cabin). The F90 stalls at 96 knots clean at gross weight and 80 with gear and full flaps extended, so it can hardly be called "hot."

Initial approach speed is 130 knots, and final is flown at 100. The latter speed can be used comfortably throughout a pattern to provide spacing with slower aircraft if needed.

At the other end of approach requirements, mixing it up with pure jets, approach flaps and gear can be extended at 184 KIAS to help hurry the rate of descent or to keep 727-like initial approach speeds.

Pitch changes with configuration changes are minimal, thanks in part to the T-tail. This helps reduce distractions when being hurried into an approach position or being brought in high and then being suddenly dumped. The less fuss in such situations—which are increasingly frequent—the better.

We flew several approaches in a variety of configurations and with varying degrees of assistance from the Sperry STARS autopilot/flight-director system. ATC presented a surprise of one kind or another during each approach, which added to the distraction, including missed approaches, but the basic flying job is easy enough so that there was no consternation at any time. Not even from the passengers.

The autopilot, by the way, has a "Soft Ride" mode for turbulent conditions. Selecting it commands the autopilot to reduce its response to deviations, which should permit it to be used under conditions in which many other autopilots would have to be disconnected. Which means in turn,

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that the pilot's work load is further reduced.

After touchdown, reverse pitch is available to help get the airplane stopped. Ground roll can be reduced by an average of one third with the use of reverse, or Beta. The capability is particularly appreciated on slick runways.

The most impressive characteristics of the F90 to us are the surprising ease for a transitioning pilot in finding his way around the cockpit and the little time it takes to feel comfortable flying the aircraft.

It's complex, for certain, and there is a great deal to learn about the aircraft, flight planning, systems checks and operations and emergency procedures. We don't think anyone should take it on without a full, approved course. Nevertheless, it is an airplane that—thanks to its basic manners, good systems and systems planning—a properly trained proficient pilot could operate without the need of a copilot. It's the nature of the business, however, that such aircraft are flown by two fully trained, professional crew members.

While few of us will get a crack at this category airplane, we can all look at it with envy. Not so much envy for its size and price and aura, however, as for the simplification, rationalization and reduction in the basic task of flying in today's IFR world.—EGT

F90

Beechcraft Super King Air F90

Basic price: $954,500

Price as tested: $1,156,471

Specifications

Engine	2-Pratt & Whitney Aircraft of Canada, Ltd. PT6A-135; 750 shp @ 38,100 rpm (1,900 propeller rpm) TBO 3,500 hr
Propellers	Hartzell four-blade constant speed, full-feathering & reversing
Wing span	45 ft 10.5 in
Length	39 ft 9.6 in
Height	15 ft 1.7 in
Wing area	279.7 sq ft
Wing loading	39.14 lb/sq ft
Power loading	7.3 lb/hp
Passengers and crew	10 max
Passenger cabin length	12 ft 9 in
Passenger cabin width	4 ft 6 in
Cabin height	4 ft 9 in
Maximum cabin pressure differential	5.1 psi
Empty weight	6,622 lb
Equipped empty weight (as tested)	7,030 lb
Zero fuel weight	9,600 lb
Useful load (basic aircraft)	4,408 lb
Useful load (as tested)	3,920 lb
Payload with full fuel (basic aircraft)	1,259 lb
Payload with full fuel (as tested)	771 lb
Maximum ramp weight	11,030 lb
Maximum takeoff weight	10,950 lb
Maximum landing weight	10,950 lb
Fuel capacity (standard)	470 gal usable
Oil capacity	14 qt per engine
Baggage capacity	403 lb (48 cu ft)

Performance

Takeoff distance (ground roll)	2,090 ft
Takeoff over 50 ft	2,856 ft
Accelerate/stop distance	5,346 ft
Rate of climb (gross weight)	2,380 fpm
Single-engine rate of climb (gross weight)	599 fpm
Maximum operating speed	250 KIAS
High cruise speed (9,500 lb, @ 12,000 ft)	267 kt (307 mph)
High cruise speed (10,500 lb, @ 26,000 ft)	245 kt (282 mph)
Cruise speed (max range power, 26,000 ft)	219 kt (252 mph)
Range at maximum cruise power, 26,000 ft (45-min reserve)	1,440 nm (1,657 sm)
Range at maximum range power, 26,000 ft (45-min reserve)	1,576 nm (1,814 sm)
Maximum operating altitude @ 10,950 lb	31,000 ft
Single-engine service ceiling @ 10,950 lb	14,419 ft
Stall speed (clean)	94 kt (108 mph)
Stall speed (gear and flaps down)	77 kt (89 mph)
Landing distance (ground roll), no reverse	1,895 ft
Landing over 50 ft	2,977 ft