Commander 1000

A pilot's airplane grows into a passengers' aircraft, too

BY EDWARD G. TRIPP

When the hangar chatter gets around to airplanes, the equivocal appellation "pilot's airplane" is as ubiquitous as the tall tales.

For a lot of pilots, that term is a euphemism for difficult; for others it connotes a straightforward, honest machine that gives a lot of pleasure in return for good technique.

The Commander line of twins—from the first Ted Smith model that flew for the first time in 1948 to the now-Israel Aircraft Industries' Westwinds that grew from the Smith-designed Jet Commander—have all been considered pilot's airplanes, in the positive sense.

And, mostly, they have all been performance leaders during their particular life cycle. For quite a while, they also were the epitome of business aircraft.

Commander was one of the first to offer a turboprop. Today, it offers nothing but. The 690/695 series have been good, solid performers. But as the competition has grown—there are now almost as many turboprops offered as there are single-engine, fixed-gear aircraft—it has been considered an old design by some. The fact that the cockpit is the quietest place in the airplane has not helped, either. After all, except for owner-flown aircraft, the man who okays the bills sits in back.

The 690B (see *AOPA Pilot,* May 1979, p. 66) was one step in trying both to increase performance and to

COLOR PHOTOGRAPHY BY ART DAVIS

make the people in back a bit happier.

In the fall of 1979, the company announced design objectives to improve both performance and comfort, together with two models that represent the first steps in achieving them.

The most obvious difference between the 690 series and the Models 840 and 980 is the truncated winglet at each tip. The wingspan is increased 30 inches, as well; the nacelles are improved aerodynamically; and gap seals help to reduce drag between the fixed and the control surfaces.

The aircraft features supercritical profile, Dowty Rotol propellers. The new design is claimed to provide better performance because of lower drag at high tip speeds (the propeller tips on the 840 and 980 rotate at approximately 0.9 Mach at 1,600 rpm). Because of the thicker leading edge of a supercritical profile, the blades flex less than conventional designs. This, it is claimed, lowers fatigue, increases service life and creates less vibration. In the cabin, both noise and vibration are reduced. The props result in a five-percent gain in efficiency at less weight.

The aerodynamic changes have achieved a 17.5-percent reduction in induced drag at altitude, plus a three-percent improvement in two-engine rate-of-climb speed and an 11-percent improvement in single-engine climb.

Comparing the 690B and the 840,

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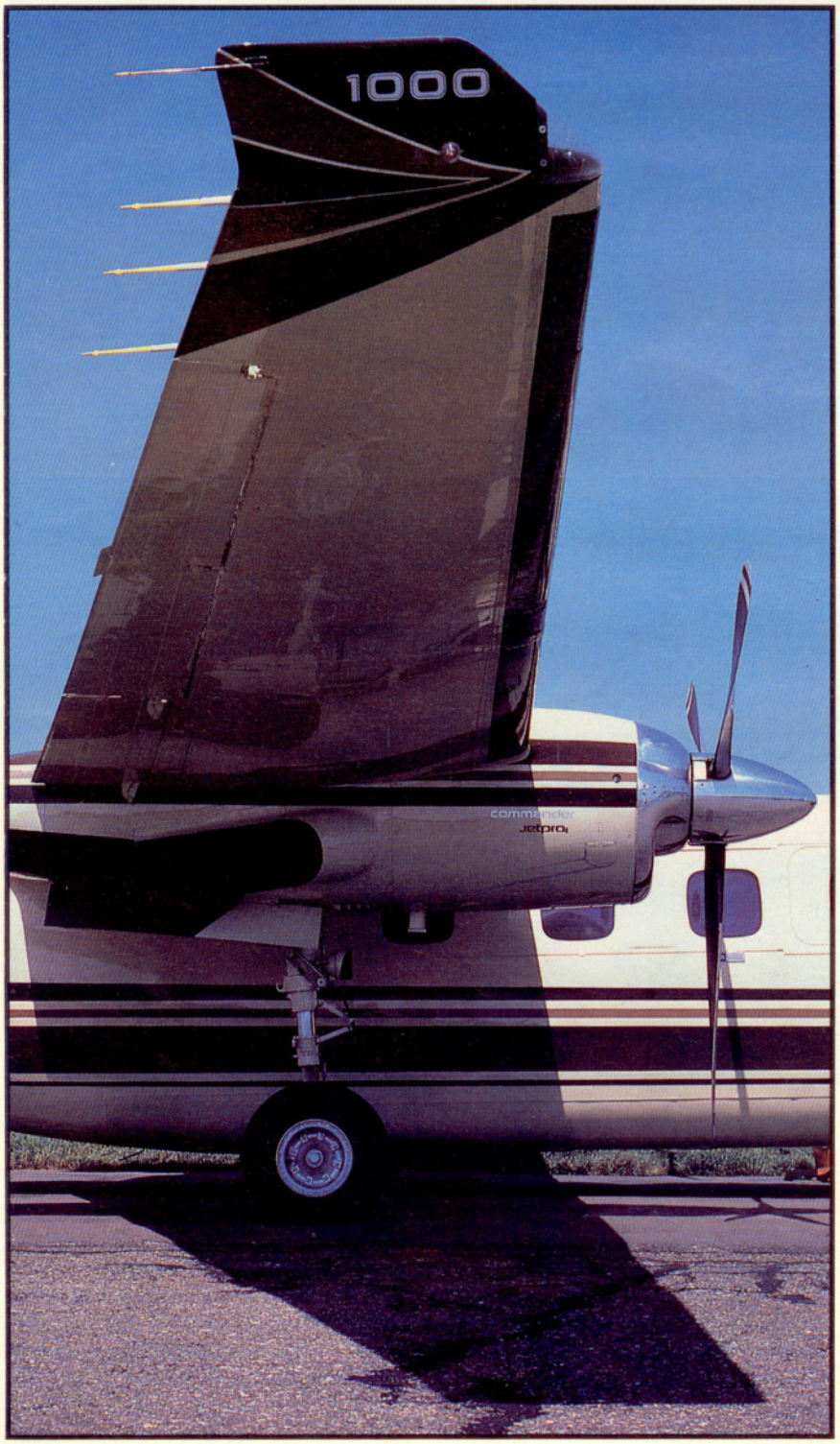
which share the same basic Garrett AiResearch TPE331-5 series engines rated at 717.5 shaft horsepower, in long-range cruise power settings at 31,000 feet, the 840 trues about five knots faster. This is the equivalent of an increase of about 80 hp, which also would increase fuel consumption.

The main difference that can be found between the 840 and the 980 is the powerplants. The 980 has TPE331-10s with 15.4 hp more.

The already simple fuel system was improved further and refueling time was reduced through a combination of tank interconnects and single fueling points in each wing. Fuel capacity was increased from 384 usable gallons on the 690B to 425 gallons on the 840 and 474 on the 980.



At the time the two aircraft were introduced, the company said that several new aircraft would be introduced in the following few years.

In 1980, the Model 1000 was announced; it was certificated in April 1981. Physically, it looks very much like a Commander turboprop. But the differences are interesting.

The large windows slung under the wing roots are gone. In their place are more, smaller windows: five on each side of the fuselage. In fact, it looks very much like the Model 1121 Jet Commander fuselage. The smaller windows, coupled with the increase in structure to permit pressurization of up to 6.8 psi (6.7 normal) helps to control the cabin-noise level even better than in the 840/980.

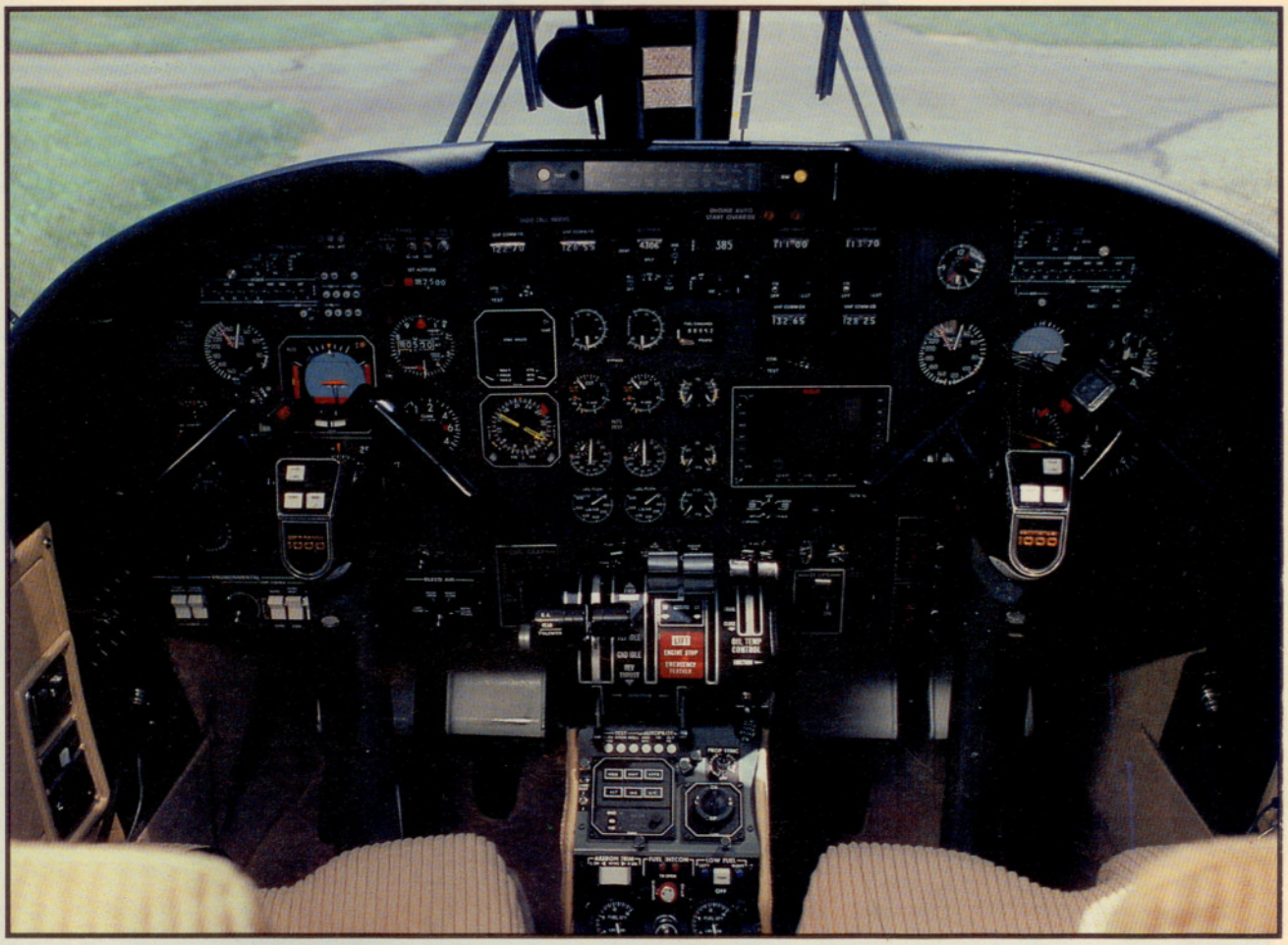
Empty and gross weights are 7,018 pounds and 11,200 pounds, compared to the 6,727 and 10,325 of the 840. The powerplants are a development of the TPE331-10 and produce 820 shp.

While the exterior dimensions are the same for the three models, the interior space of the 1000 is considerably larger. The passenger compartment is 233 cubic feet as opposed to the 840/980's 159. The primary way in which this has been accomplished is to extend the cabin to the rear by more than three feet. Where the aft pressure bulkhead is located in the 840 is best described as an archway in the 1000.

The arch is formed by the spar carry-through/center section. The separate compartment behind the center section, slightly more than three feet long, contains the lavatory (electric flushing is an option), a large refreshment console or small galley and a baggage space/hanging locker.

The new pressure vessel allows the cabin floor to be dropped a little more than three inches. This permits the chairs to be lower, which, together with the different window and cabin-overhead treatment, gives an illusion of greater space.

There also is a greater variety of interior arrangements that can be ordered; but, basically, the 1000 has three separate compartments that can be closed off: the cockpit, the main



cabin and what one passenger who sat back there for most of one flight dubbed "truly a throne room."

The impression when looking aft from the door is of a completely different airplane from all previous Turbo Commanders.

The cabins of the 690 series never seemed cramped or unpleasant to me, although I confess that I always have been interested far less in the passenger compartment than in the cockpit.

But, with the propeller hitting the flat-sided fuselage in the cabin area—just behind the door—and with the large aft windows, many people found the noise and vibration higher than in other turboprops, particularly those who spent a lot of time back there.

After spending one long flight moving throughout the cabin and throne room and having telephone conversations from the optional communications center (which can be fitted with dictation equipment), it is my admittedly subjective opinion that the 1000 cabin is very comfortable and that the noise level is competitively low.

We were fortunate with this new model. Most demonstration flights of new aircraft, particularly those made available to journalists, are controlled very carefully and are of very short duration. The more rare and/or expensive the airplane, the shorter the flight time. Given the small number of aircraft built and the cost to operate them, this is understandable, if not desirable.

Automated systems help the pilot operate the Commander at the altitudes for which it was designed.

It takes time to learn the systems of an aircraft. The more sophisticated the airplane, the longer it takes. In many, this really requires ground school and procedures trainer or simulator time before any meaningful evaluation can begin to be made. Then it takes hours of flying before all the numbers, procedures and quirks come down to a predictable routine; and then more flying in a variety of conditions and environments, with a few problems thrown in, to properly evaluate an airplane.

Wherever possible, we rent or lease aircraft in an attempt to acquire sufficient time to get beyond the glitter. This is tough—and expensive—enough with a sophisticated single or a light twin. It is just about prohibitive with larger aircraft.

I missed the chance to fly the 840 and 980 for a variety of reasons, so when the 1000 was certificated, I was anxious to get a look at it to see how the development of the basic design had progressed.

It was worth a trip to Oklahoma for just an hour or two in the new model. Then luck struck: For not only did I fly the first production aircraft, but also I got to fly the third one off the production line to Europe and then spent a few hours with it again when it returned and had had almost 200 hard hours of demonstration flights. So, I had the normal demonstration profile plus several long cruise legs in a variety of situations and conditions coupled with short missions and test flights. These were mixed into a variety of ATC and weather systems.

The Commander 1000 is certificated for flight up to 35,000 feet. While sev-

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eral turboprops can operate at this altitude, not too many do with any regularity. There are two sides to the 1000's high altitude capability. The airplane can take off from sea level at gross weight and climb directly to Flight Level 350 without struggling; and it operates very effectively at this altitude and very efficiently, too—fuel burn is reduced by 53 pph (7.9 gph) per engine compared with cruise at 28,000 feet, for instance. On the other hand, this is very hostile territory. The average time of useful consciousness is cut nearly in half from what it is at 25,000 feet (32 versus 70 seconds). That thin air means both that an aircraft is upset more easily and that control movements must be larger yet more precise.

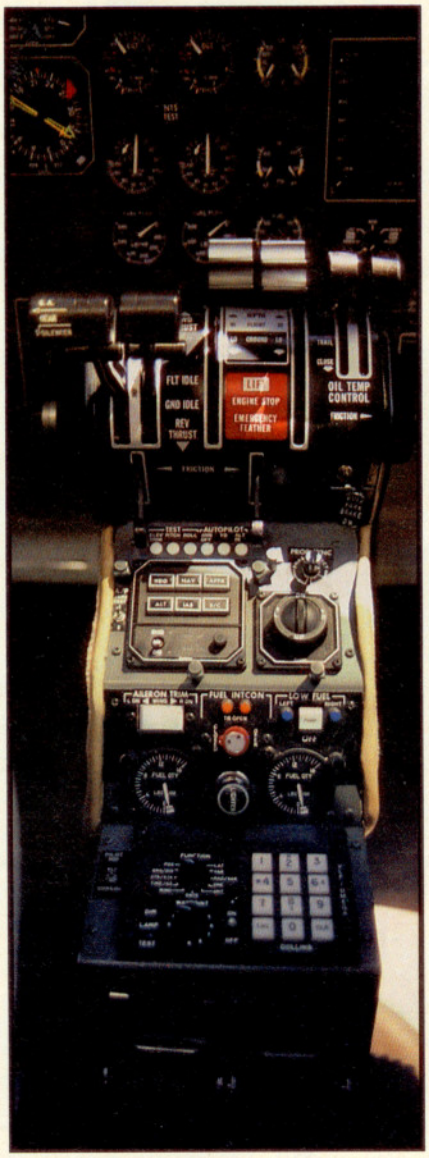
This can be boiled down to two approaches. Either the pilot—or the crew—must be very, very sharp and precise or the systems must be highly accurate and effective. If there is to be more than one person in the airplane, both approaches must be taken. Flying gets very serious up there.

The 1000 is designed and equipped for such operations, as it should be. The cockpit is fitted with quick-donning, pressure oxygen masks, for instance (with 32 seconds average to nirvana, there is not a second to waste).

There are quite a few automated systems and aids to help fly and manage the aircraft and powerplants. The Commanders are all well equipped in standard form. In fact, the equipment philosophy is very different from that for smaller aircraft. The biggest part of the optional equipment list is for cabin, not aircraft or avionics, accessories.

Both of the aircraft I flew (the second production aircraft was being tested for certification with the King KFC 250 autopilot/flight-control system) were fitted with the Collins AP 106 autopilot and FIS 84 flight-director system with altitude-preselect and airspeed-hold functions. They also had the Collins LRN-70 VLF Omega navigation system and a J.E.T. standby horizon and emergency power pack.

Though both were very well equipped for all-weather flying and very close to global capability (lacking only a second navigation system and HF radio), the equipment options, together with a lot of cabin extras, were



less than 10 percent of the list price.

The 1000 is what a pure jet was 15 years ago. It is practical and efficient to operate regularly at the higher altitudes. It gets there quickly, with no step climb and without fuss (after several gross weight takeoffs, we were still climbing at close to 1,000 fpm through FL 300); fuel burns are reduced greatly while performance is not.

The last few thousand feet are the hardest, of course. While torque is the primary limiting factor at low altitude, egt (actually, a computer-generated value combining several measurements) becomes the limiting value with increasing altitude. Normally, starting between 12,000 and 14,000 feet, the condition levers must be pulled back every few minutes to keep the temperatures at or below 650° C. Passing through 30,000 or 31,000 feet, the available power is reduced substantially. Time to climb to 30,000 feet at gross weight, for instance, is 19 minutes. It takes another 16 to get to FL 350. At 10,000 pounds takeoff weight, the time to climb to FL 350 is reduced to 25 minutes.

True airspeed is still quite good at this altitude: better than 270 knots on a standard day. For long flights, it pays to go right on up to the maximum operating altitude. The airplane handles the altitude well, noise level is low and the environmental systems can handle the human requirements up front in the sun and back in the shade to everyone's satisfaction.

Though the 1000 was certificated under grandfather rights to Civil Aeronautical Regulations Part 3 requirements, the fuselage and wings have been certificated to Federal Aviation Regulations Part 23 fatigue specifications. The structure, which has been put through 5,000 cycles during which 91 different parameters have been measured and analyzed, will be put through a total of 50,000 cycles before the tests end.

However, what would be glitches at lower altitudes suddenly can turn into emergencies in the high, thin air. If critical aids, such as the autopilot or the flight control system, should fail, the pilot work load increases far beyond being an annoyance. In turbulence, it reaches the state where the task load can be so high that another brain and body are needed to handle everything but the basic job of keeping the airplane on an even keel.

The Commander factory has run good schools for flight and maintenance crews for quite a few years. However, as of November, all training will be taken over by FlightSafety International. A new training facility will be built near the factory.

Even pilots with thousands of hours in Turbo Commanders will find quite a few things different in the 1000 and, therefore, the transition training well worth the time.

The most challenging part of flying really does not have anything to do with flying, and it is a characteristic with which pilots of the 690 are very familiar. Perhaps it is a legacy from Ted Smith, who obviously thought air-

PHOTOS BY BILL THOMPSON

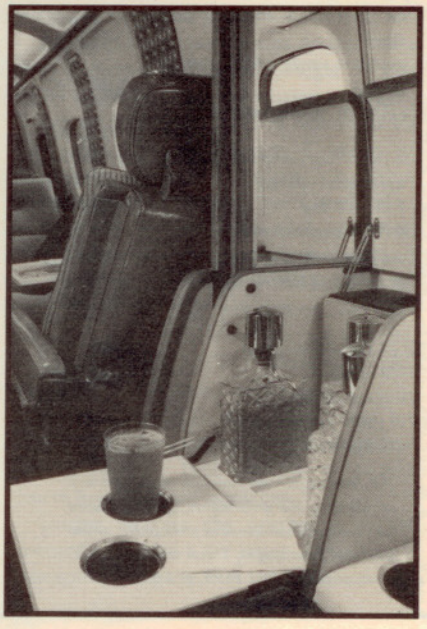
planes should fly, not lumber around on the ground: his eccentric approach to nosewheel steering. Pilots new to some of the Commanders (as do those new to the Piper Aerostar) find the technique a challenge.

On the Turbo Commanders, if the steering system is out of rig (it is hydraulically actuated by depressing the top of the rudder pedals), ground maneuvering is definitely a series of fits, starts and lurches. To put it bluntly, I flunked taxiing on the first aircraft, even though I was familiar with the technique and successfully had passed the course in the past. I felt redeemed the first time I taxied the third aircraft; it was much easier to taxi smoothly and without hitting the brakes.

Aside from systems operations, the 1000 flies like any other Turbo Commander with the exception of the landing. The 1000 is flown right onto the runway with very little flare.

For all its 11,200 pounds, the 1000 is very satisfying to fly. Visibility is excellent, as is control response. With gear operating speed at 182 knots and approach flaps at 178, with its high rate of climb and ability to make descents like those of a 727, the 1000 can operate compatibly in anyone's high density area. It can fit into smaller strips with ease, since you can fly it quite comfortably at an approach speed as low as 100 knots. It has good short- and unimproved-field performance.

The spacious cabin provides a comfortable and relatively quiet environment for those who pay the bills.



The 1000 is good for both short- and long-haul operations. Given the typical length of a corporate flight—well under 500 miles—turboprops as a class are more efficient than jets. Combine that with good, long-range, high-altitude performance and you have a lower cost aircraft that can compete very successfully with the jets.

The 1000 should make a substantial mark for itself as an almost-jet. It is even practical to consider as a transatlantic airplane. It has good range, a good layout for long hours in the air for both the crew and passengers. The additional few hours in crossing will be more than made up for if there are several stops to be made on the other side.

The 1000 is very versatile, in short. It is still a pilot's airplane, but it is very much the boss' airplane, too. □

specifications, "The Phoenix Design" continued overleaf

continued

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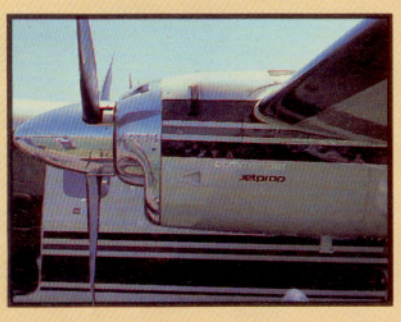
GULFSTREAM COMMANDER 1000
(Model 695A)

Base price $1,485,000 (King avionics)
$1,495,000 (Collins avionics)
Price as tested $1,613,515 (N96003S)
AOPA Pilot Operations/Equipment Category: All-weather

Specifications

Engines 2 Garrett AiResearch TPE331-10-501K, single-shaft, two-stage turbine, 820 shp @ 1,591 propeller rpm, 41,730 turbine rpm
Recommended TBO 3,000 hr

Propellers 2 Dowty Rotol, hydraulically actuated, constant speed, full feathering, reversing, three-blade, 106-in diameter
Recommended TBO 1,000 hr



Wingspan	52 ft 1.5 in
Length	42 ft 11.7 in
Height	14 ft 11.4 in
Wing area	279.4 sq ft
Wing loading	40.1 lb/sq ft
Power loading	6.8 lb/shp
Seats	8 to 11
Cabin length	17 ft 6 in
Cabin width	4 ft 2 in
Cabin height	4 ft 9 in
Standard empty weight	6,420 lb
Empty weight (as tested)	7,387 lb
Useful load	4,830 lb
Useful load (as tested)	3,863 lb
Payload w/full fuel	1,654 lb
Payload w/full fuel (as tested)	687 lb
Max ramp weight	11,250 lb
Max takeoff weight	11,200 lb
Max landing weight	10,550 lb
Zero fuel weight	9,000 lb
Fuel capacity, std	3,229 lb/482 gal (3,176/474 usable) (turbine fuel, 6.7 lb/gal)
Oil capacity ea engine	6 qt
Baggage capacity	cabin 100 lb/10 cu ft aft 600 lb/45 cu ft

Performance

Takeoff distance (ground roll)	1,450 ft
Takeoff over 50 ft	2,100 ft
Accelerate/stop distance, no reverse	3,939 ft
Accelerate/go distance to 50 ft height	3,700 ft
Rate of climb, sea level	2,804 fpm
Single-engine ROC, sea level	945 fpm
Max level speed, 22,000 ft, avg cruise weight	307 kt
Cruise speed, max recommended cruise power 15,000 ft	293 kt
Fuel consumption, ea engine	360 pph/53.7 gph
28,000 ft	288 kt
Fuel consumption, ea engine	245 pph/36.6 gph
35,000 ft	267 kt
Fuel consumption, ea engine	192 pph/28.7 gph
Cruise speed, max range power 15,000 ft	220 kt
Fuel consumption, ea engine	226 pph/33.7 gph
28,000 ft	234 kt
Fuel consumption, ea engine	181 pph/27 gph
35,000 ft	238 kt
Fuel consumption, ea engine	166 pph/24.8 gph
Range @ max recommended cruise power w/ 45-min res, std fuel	
15,000 ft	1,170 nm
28,000 ft	1,680 nm
35,000 ft	2,010 nm
Range @ max range power w/45-min res, std fuel	
15,000 ft	1,400 nm
28,000 ft	1,870 nm
35,000 ft	2,075 nm
Max operating altitude	35,000 ft
Single-engine service ceiling	21,000 ft
Landing distance	
over 50-ft obstacle	2,370 ft
(w/reverse)	2,186 ft
ground roll	1,600 ft
(w/reverse)	1,360 ft

Limiting and Recommended Airspeeds

Vmc (Minimum control w/critical engine inoperative)	93 KIAS
Vsse (Minimum intentional one-engine inoperative)	105 KIAS
Vx (Best angle of climb)	95 KIAS
Vy (Best rate of climb)	135 KIAS
Vxse (Best single-engine angle of climb)	102 KIAS
Vyse (Best single-engine rate of climb)	120 KIAS
Va (Design maneuvering)	139 KIAS @ 11,200 lb
Vfe (Max flap extended)	124 KIAS @ 9,000 lb
approach—20 deg	178 KIAS
full—40 deg	138 KIAS
Vle (Max gear extended)	198 KIAS
Vlo (Max gear operating)	198 KIAS
Vno (Normal operating)	250 KIAS to 24,332 ft
	197 KIAS to 35,000 ft
Mmo (Max operating)	0.60 Mach
Vr (Rotation)	93 KIAS
Vsi (Stall clean)	81 KIAS
Vso (Stall in landing configuration)	77 KIAS

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

Operations/Equipment Category for aircraft as tested: see June 1981 Pilot, *p. 103.*

"That's where I began my aviation career," he said, pointing to a tin service hangar on the edge of the perimeter road on the south side of Kansas City (Missouri) Downtown Airport. With quiet pride in the strides he has made from his beginnings as an apprentice mechanic, Allen E. Paulson, chairman, president and chief executive officer of Gulfstream American Corporation, mused over the pittance he received as hourly wage back then.

We just had finished touring the factory demonstrator Gulfstream III. It was the first Gulfstream to be completed by the factory (others have been done by independent completion centers). Paulson glowed as he stated that the exterior and interior designs had been executed by his son.

Gulfstream American, billed as the largest privately owned aircraft manufacturer in the world, now includes as part of its manufacturing facilities what was last known as the General Aviation Division of Rockwell International. For many years, what also has been called the Bethany Division was the apple of the eye of gentlemen whose vision was not clouded by the need to grub for a living: the Rockwells.

It all started on the West Coast in the late stages of World War II, when Ted Smith assembled a group of associates and formed Aero Design and Engineering Corporation. The first project was a light twin in what is now a familiar configuration: high wing with the main gear folding into the nacelles and a towering vertical stabilizer. It flew for the first time in 1948.

It took another four years and several organizational changes—and searches for financial backers—before an aircraft design was certificated. It was in another part of the country, too: Bethany, Oklahoma.

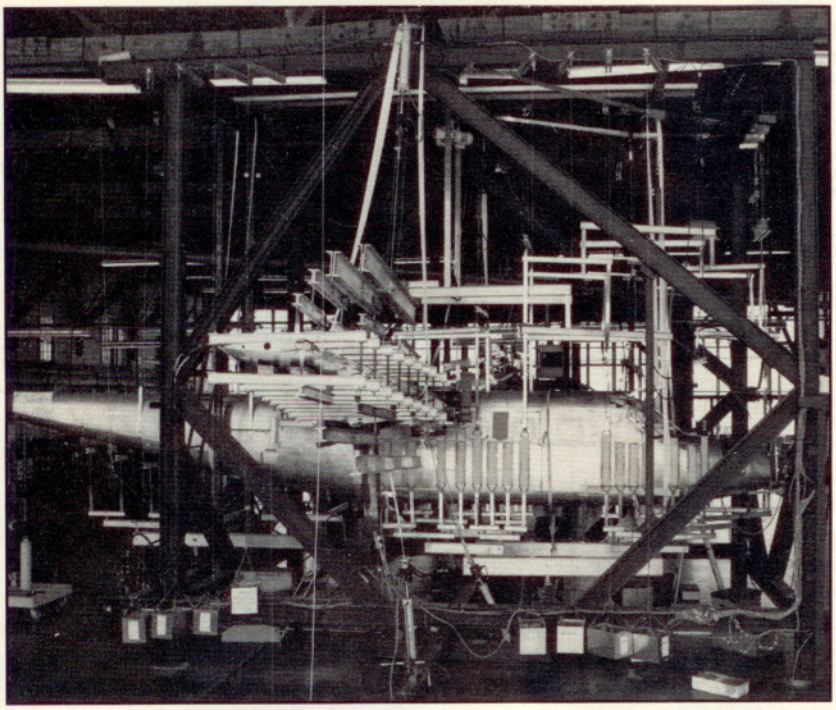
The Model 520 was the first Aero Commander. Eventually, the company became Aero Commander, too.

The 1950s was the limelight decade for Aero Commander. New designs, record flights and new concepts, such as the first pressurized business airplane, collected.

In 1958, Aero Commander became a subsidiary of Rockwell Manufacturing. More ideas poured out in the 1960s, and more new products. Col. Willard F. Rockwell was a visionary who in his seventies liked to remark that a good businessman had to plan for the future as though he were going to live forever. It was the responsible—and visionary—thing to do.

Rockwell was a corporation with heavy involvement in the automotive and truck industries. Even when the Colonel was

The Phoenix Design



For certification to FAR Part 23 standards, the Commander 1000's fuselage and wings will undergo 50,000 cycles of structural and fatigue tests in the "torture rack" at Bethany, Oklahoma.

around, many division managers and staffers at corporate headquarters in Pittsburgh grumbled and questioned why airplane foolishness should be allowed to clutter the balance sheet.

Willard F. Rockwell Jr. had faith in the general aviation business, too. When his father retired, he continued to support the efforts to build the most widespread and successful general aviation company.

The firm even designed new single-engine aircraft, after first buying the design for a budding family of singles similar to the Cessna Skyhawk—the Volaire of Aliquippa, Pennsylvania (called the Darter and the Lark by Rockwell), and the Meyers 200, a sleek retractable that also was complex to build.

Gulfstream American President Allen E. Paulson.

The decision to design and build a new family of light aircraft was ambitious in its basic objective and in the way the company chose to pursue it.

It was to be not only a new design, but a new factory—in Albany, Georgia. It was to be based on what the market wanted.

Armed with reams of data, what was by then the General Aviation Division of Rockwell settled in pecan plantation country, started building hard production tooling (the prototype would be the same as the thousandth production aircraft) and teaching unskilled workers to build complex hardware. The production lines included a few agricultural aircraft designs, as well as the 112/114 series (see *Pilot*, November, "Cabin-Class Singles," p. 80).

Rockwell stood by the commitment for many years. As a last resort, the entire line was moved to Bethany, where people knew how to build airplanes.

During all this, the aggressive parent merged with North American Aviation, an aerospace company that built, among other things, one of American's prime business jets: the Sabreliner. Rockwell had the Jet Commander, and, in what many have described as a total reversal by the Department of Justice, the entire merger hinged on the willingness of Rockwell to divest itself of one or the other of the jets.

The Jet Commander became a product of Israel Aircraft Industries. The Tel Aviv-based company has developed the product quite successfully while the Sabreliner line has sagged.

One would assume that a traditional aircraft company such as North American would be enthusiastic about a company such as Aero Commander. But there were quite a few top management people who, it appears, did not want to fool around with those little things.

Before the 112/114 line was suspended, there were many rumors that the entire Bethany Division was on the block and certainly under the evil eye.

Allen Paulson openly states that he was interested in what, for convenience sake, we will call Aero Commander before he bought (Grumman) Gulfstream. He was looking for a good facility for building the Hustler, a turboprop/turbojet composite, and its companion, the all-jet Peregrine.

For more than a year, there were rumors that it (Aero Commander) was on the block. If it was not sold, what is more, it just would be shut down.

When it was announced that the Commander line and facility would become part of Gulfstream American, there were sighs of relief mingled with expressions of concern: What would become of the Aero Commander line of aircraft?

After all, the designs were quite old. Every attempt at new ones were dismal failures (remember the 700 twin, a joint project of Japanese and U.S. ingenuity?).

Well, all seems well for the basic Ted Smith concept. With all the brave new ideas and modern design and thinking, it is his shape that continues.

Continuing also, through all the reorganizations, new concepts and reordered thinking is a loyal group of employees who have been building and selling Aero Commanders for a couple of decades.

What is now Gulfstream Commander is committed to introducing at least one new product each year through at least 1985.

Paulson wants to see the Peregrine built in Bethany together with, if not the Hustler, a civil version of the Peregrine. What about new Commanders? Yes, he says, bigger ones. □