SENECA III

Improving on one of the world's most popular light twins

BY MARK M. LACAGNINA

THE Piper Seneca has been the light twin of choice among private owners and commercial operators for more than a decade. The market dominance of the airplane at times has been remarkable. One year, more Senecas were delivered than the *combined* production figures for the Beech Duchess and B55 Baron, the Cessna 310 and Skymaster models, and Piper's Aztecs. That year was 1980, when the crest of general aviation aircraft sales had just begun to fall. Since then, it has continued to sell relatively well, despite deepening market doldrums.

Piper Aircraft Corporation has been loath to tamper with what has proved to be a successful formula for a light twin. Today's Seneca III is not very different from the original. The basic elements of the Seneca formula include the fuselage and wings of the Cherokee Six, small engines and simple systems. The formula results in a light twin that is relatively inexpensive to build and to operate, operationally flexible, comfortable and easy to fly.

When production began in 1972, the Seneca had four-cylinder Lycoming IO-360 engines, naturally aspirated and rated at 200 hp, each. The 4,200-pound airplane performed poorly on one engine. Single-engine rate of climb was 190 fpm, and the single-engine service ceiling was only 3,650 feet. Handling characteristics also left much to be desired. An aileron-rudder interconnect and a rather stiff stabilator downspring gave the controls a heavy feel, and many pilots encountered lateral instability at low airspeeds.

A switch to turbocharged, six-cylinder Continental engines for the Seneca II in 1975 raised the single-engine service ceiling to 13,400 feet. Single-engine rate of climb crept to 225 fpm. Control feel was improved somewhat by elimination of the aileron-rudder interconnect and incorporation of a weaker stabilator downspring. The airplane's peculiar tendency toward lateral oscillation was virtually eliminated by larger, Frise-type ailerons.

Maximum takeoff weight was increased to 4,570 pounds, and bladder tanks were added to the options list to increase usable fuel capacity from 558 pounds (93 gallons) to 738 pounds (123 gallons). Accompanying these changes was a maximum zero-fuel weight limit of 4,000 pounds. The limit was imposed to prevent excessive bending moments at fuselage/wing attach points, according to Piper. The Seneca II's zero-fuel weight limit is an annoyance to charter operators, since it can be exceeded easily by a pilot, three passengers and their baggage.

Several improvements were incorporated in the Seneca III, which went into production in 1981. Maximum takeoff weight was increased from 4,570 to 4,750 pounds, the zero-fuel weight limitation was raised from 4,000 to 4,470 pounds and a maximum ramp weight of 4,773 pounds was established. The new limits, accomplished by beefing up the nose gear system and the spar carry-through structure, greatly improved the airplane's loading flexibility. For example, an owner of a Seneca III typically equipped for IFR operations can fill all six seats with FAA-standard 170-pound passengers, cram the baggage compartments to their certified limits (100 pounds in the nose and 100 pounds behind the rear seats) and carry enough fuel for a two-hour flight, with reserves.

Other notable changes included reorganization of the instrument panel. Vacuum-formed plastic gave way to black metal, and engine gauges were relocated from the bottom of the panel to left-center. Switches were moved from the left side of the cockpit, where they were exposed to water leaking in from the storm window, to the bottom of the panel.

By changing from a pressure to a vacuum pneumatic system, mean time between failures of the Airborne pumps was nearly doubled, from about 400 hours to between 700 and 800 hours, according to Piper.

The Seneca III also has more power available for takeoff. Forty inches of manifold pressure and 2,800 rpm, producing 220 hp per engine, can be used for a maximum of five minutes. The limitation was imposed by noise regulations, rather than mechanical considerations. Seneca's maximum continuous power is 40 inches and 2,600 rpm, for 200 hp per side.

During the past four years, the formula for the Seneca III has been reworked only enough to accommodate new interior and exterior styling touches as well as new avionics equipment choices.

But two new elements have been added to the formula this year: inertia reel shoulder harnesses for all forward-facing seats and an electric flap-operating system. (Piper's 1985 Saratoga models also have electric flaps.)

continued

PHOTOGRAPHY BY ART DAVIS

Although it adds a degree of complexity to an airplane designed for simplicity, the new flap system solves at least one problem. Accompanying the increase in available takeoff power were large tabs on the trailing edges of the Seneca III's flaps. According to Piper, the tabs improved lateral stability during climb at maximum takeoff power. The extra surface area made the flaps more difficult to extend manually. Some pilots have complained of the need to use both hands on the flap lever to select the last notch.

On the new system, the combination selector/indicator is located on the right side of the control quandrant and has detents for three flap positions—zero, 25 and 40 degrees—as well as an amber light that illuminates when the flaps are in transit. (The drill is that if the light stays on for more than 10 seconds, the system's circuit breaker must be pulled to avoid burning out the electric motor.)

Since the flaps are extended or raised at a constant rate, the electric system eliminates much of the jerkiness that accompanies flap operation with the manual system. Also, elimination of the flap lever has freed up quite a bit of cabin floor space for charts.

However, the flap position indicator and the in-transit light are difficult to see from the pilot's position. Some neck-craning could be avoided if the

SENECA III

The last four production years have brought styling changes and new avionics. The basic design formula remains unchanged.

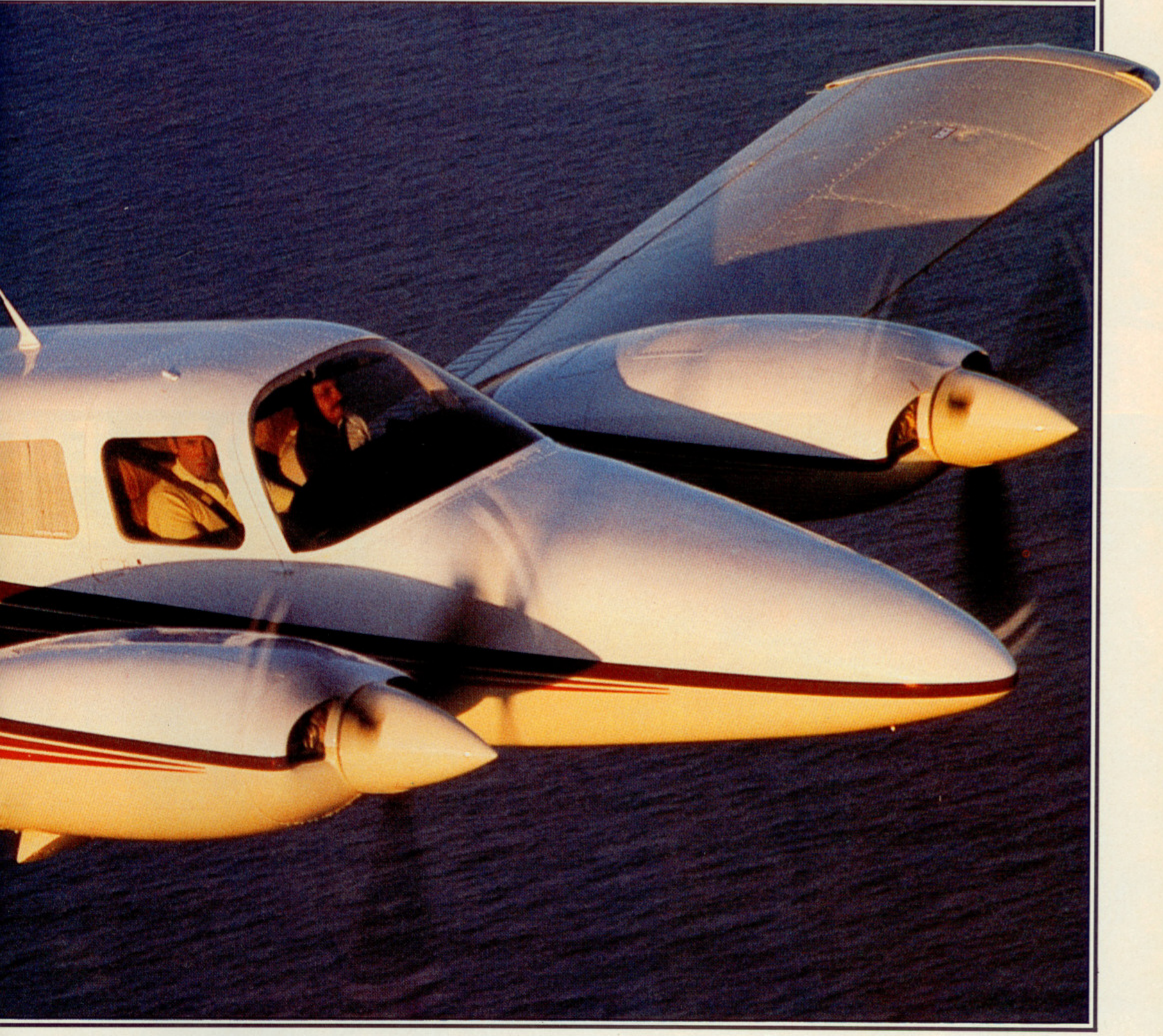
indicators were moved to the upper part of the pilot's panel. Also, the addition of a detent for 10 degrees of extension (the first notch in the manual system) would be useful for both takeoffs and approaches.

An excellent course is offered by Piper at Vero Beach, Florida. The course is taught by Robert (Bob) Scott, manager of training for the company, and staff instructors Steve Bergevin and Linda Smalkowski. Two days are spent in the classroom, exploring systems, performance and normal and emergency operating procedures. A comprehensive two-hour flight with one of the instructors is available at the pilot's request.

The course imparts a great deal of useful information, some of which cannot be found in a Seneca operating manual. Because of this, the course is valuable to Seneca pilots, inexperienced *and* experienced.

Bob Scott has developed a number of operating procedures that work very well in the airplane. Extending the flaps 10 degrees for takeoff allows rotation at a slower airspeed (70 to 75 knots, rather than the 79 knots recommended for a zero-flap takeoff) and precludes the airplane's tendency to sink a bit after lift-off.

The turbocharger on each engine has a fixed wastegate, adjusted to provide 40 inches of manifold pressure at full throttle at 12,000 feet. At sea level, the manifold pressure limit is reached at about half to three-quarters throttle travel. The pilot, therefore, must take care not to overboost the engines. There is a relief valve that is supposed to prevent manifold pressure from exceeding 42 inches, but the valves can, and do, stick closed. Scott recommends bringing the throttles forward to get 25 inches, initially, to allow the turbochargers to spool up and stabilize. Then, release the brakes and bring the throttles to 35 inches. The turbochargers will continue to spool, bringing manifold pressure up to between 38 and 39 inches. The pilot then can devote his full attention to the takeoff,



SENECA III

saving fine-tuning of the power for a less busy time, such as after the landing gear are retracted and initial climb attitude has been established.

The Seneca gets off the ground quickly, but not as quickly as the accompanying specifications table suggests. (*AOPA Pilot* uses manufacturers' specifications in its tables.) The takeoff distances (a ground roll of 920 feet and 1,210 feet to clear a 50-foot obstacle) and the accelerate/stop distance (2,400 feet) apply to maximum-performance takeoffs, involving 25 degrees of flaps and initial climb at 66 knots.

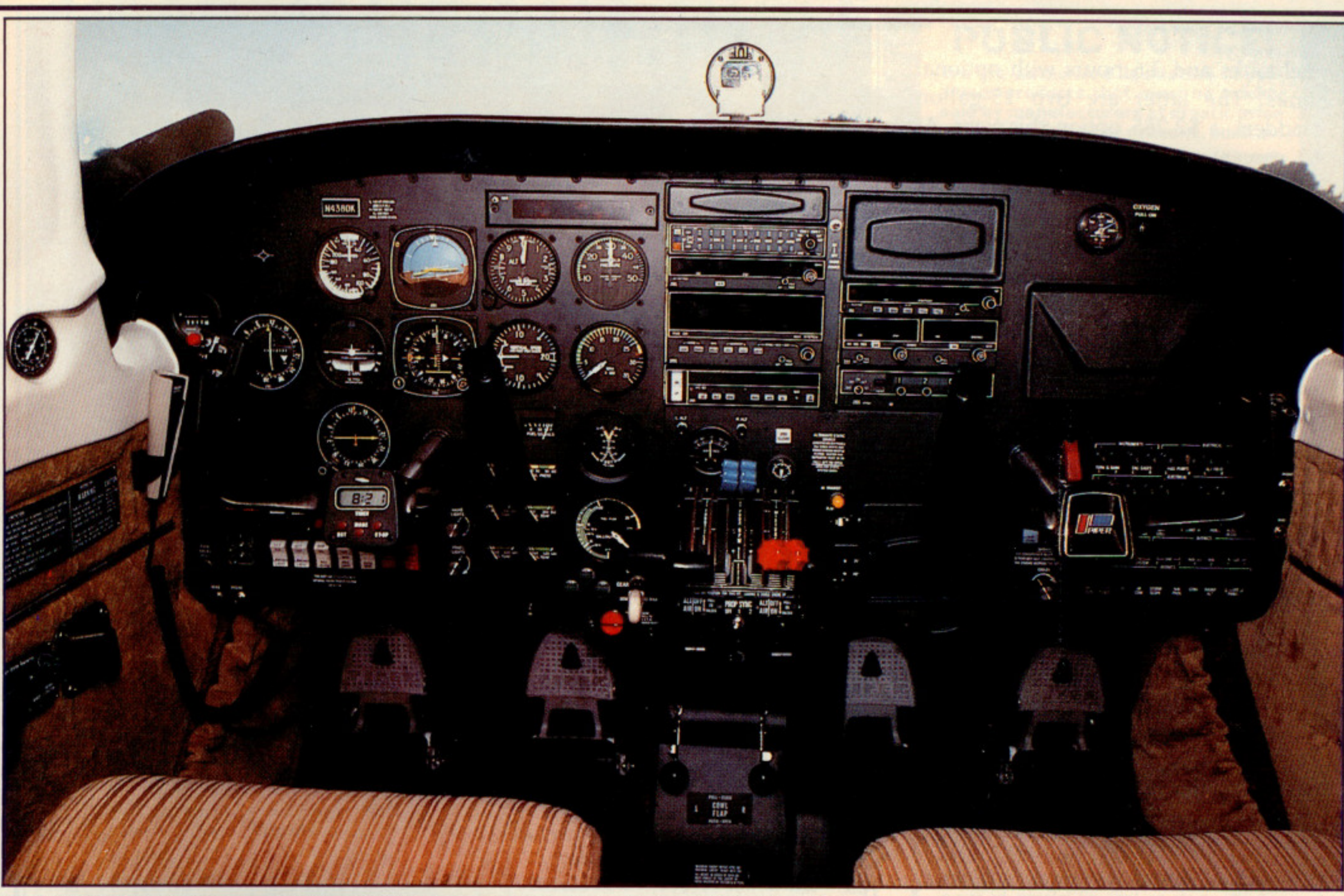
Under standard conditions and using the procedures recommended by Piper for a normal takeoff (no flaps and a rotation/abort speed of 79 knots), ground roll is about 1,500 feet, distance to clear a 50-foot obstacle is about 1,800 feet and about 3,800 feet of pavement are required to bring the airplane to a stop after it has accelerated to 79 knots.

According to Piper, single-engine rate of climb is 240 fpm under standard conditions, which include takeoff at gross weight from a sea-level airport at 15°C (59°F). The calculation also implies near-perfect pilot technique. However, during a single-engine go-around at Vero Beach Airport (elevation, 25 feet) on a 35°C (97°F) day, in a Seneca III substantially below maximum takeoff weight and flown by a somewhat rusty pilot (the author), rate of climb was about 175 fpm.

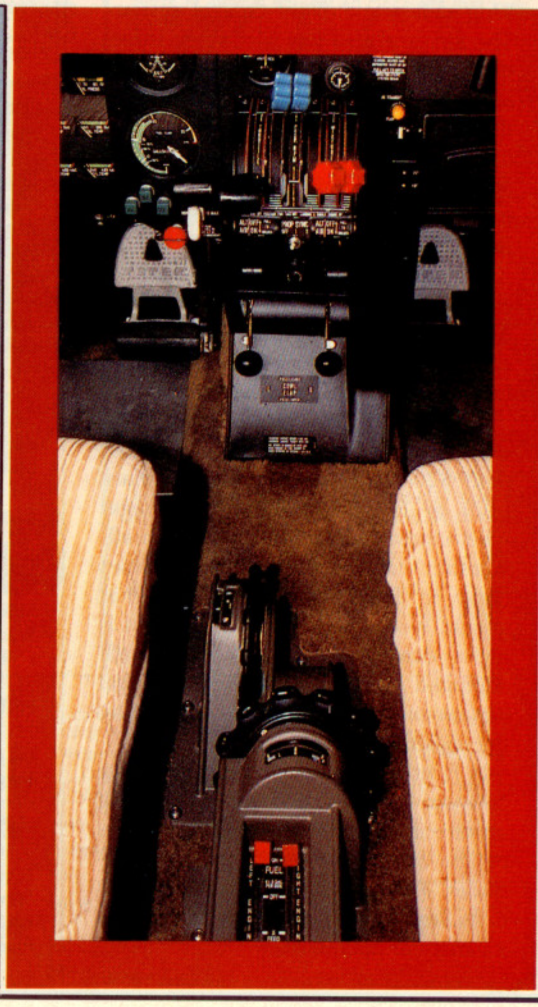
For cruise climb, the Seneca manual recommends 75 percent power (about 34 inches and 2,500 rpm), 102 knots and cowl flaps in trail. Scott recommends using more power (36 inches and 2,600 rpm), 120 to 125 knots and closing the cowl flaps. This results in a flatter deck angle, which provides better visibility for the pilot and enough air and fuel to cool the engines. Engine temperatures, of course, should be monitored closely and cowl flaps opened if necessary. I have used Scott's procedure for climb-outs from a number of airports—including Blythe, California, on a 39°C day—in brand-new, as well as much-used Seneca IIIs and have yet to find it necessary to open the cowl flaps during climb. The vigilance required for the procedure is rewarded by a slightly better rate of climb and a higher ground speed.

Leaning the fuel-air mixture for cruise requires time and patience. Any change in manifold pressure results in changes in fuel flow and exhaust gas temperature, measured at the turbocharger turbine inlet. The procedure for the Seneca III is a bit different from its predecessors. At 75 percent power, the mixture is leaned to 14.5 gallons per hour or 1,525°F, whichever comes first. Piper recommends 25°F rich of peak at lower power settings.

Most Seneca pilots operate their airplanes between 8,000 and 12,000 feet. At 10,000 feet and 75 percent power, true airspeed is 179 knots, and total fuel flow is 29 gph. Endurance, with reserves, is 2.7 hours with standard



The biggest change is the electric flap system. Gone is the floor-mounted manual flap handle.



fuel tanks and 3.6 hours with optional tanks. The latter are two 15-gallon bladders, a $2,285 option this year. At 65 percent power, the airplane cruises at about 175 knots while burning 24 gph. The endurance figures are 3.2 hours and 4.6 hours, respectively.

Descents in any turbocharged aircraft not equipped with speed brakes must be planned carefully to avoid shock-cooling the engines. Often, the only way to keep a Seneca's engines warm while complying with an air traffic control-mandated quick descent is to lower the gear and maintain 130 knots. (Speed brakes are available from Turboplus, Tacoma Narrows Airport, 1520 26th Avenue N.W., Gig Harbor, Washington 98335.)

The base price of a 1985 Seneca III is $194,000. Options for the airplane in the accompanying photographs, N4380K, include: auxiliary fuel tanks ($2,285); heavy duty brakes and tires ($270); wing tip recognition lights ($495); a 64-cubic-foot oxygen system ($2,990 and 40 pounds); air conditioning ($7,375 and 53 pounds); and a $37,425 avionics package, including King radios and flight control system. The airplane also has McCauley three-blade propellers, a $4,955 option that adds 44 pounds. According to Piper, the standard two-blade Hartzells are lighter and more efficient but are more expensive to maintain. The options brought the price for N4380K up to nearly $273,000.

The options list for the Seneca III is extensive. The airplane is certified for flight into icing conditions when properly equipped. Current price for the de-icing package is about $20,000.

A new Seneca, equipped for basic cross-country flying, costs a little more than $200,000. For the businessman-pilot or flight department manager who wants a light piston twin with all-weather capability, the price comes close to $370,000. (One item that should be added to the options list is higher-capacity alternators. In a well-equipped airplane, the power demand can far exceed what can be supplied by the 65-amp alternators.)

A light twin must straddle the fence between business and personal flying on one side and commercial operations on the other—it must be a jack-of-all-trades. The key to the Seneca's success is its flexibility. The formula is right for a variety of operations. □

SENECA III

Piper PA-34-220T Seneca III
Base price $194,900
Price as tested $272,962
***AOPA Pilot* Operations/ Equipment Categories*:**
Cross-country $204,000 to $225,000
IFR $285,000 to $320,000
All-weather $326,000 to $369,000

Specifications

Powerplants	Continental (L)TSIO-360-KB
	220 hp @ 2,800 rpm (5-min limit)
	200 hp @ 2,600 rpm (max cont)
Recommended TBO	1,800 hr
Propellers	Hartzell two-blade, 76 in dia constant-speed, full-feathering
Length	28 ft 7.4 in
Height	9 ft 10.5 in
Wingspan	38 ft 10.9 in
Wing area	208.7 sq ft
Wing loading	22.8 lb/sq ft
Power loading	10.8 lb/hp
Seats	6-7
Cabin length	10 ft 5 in
Cabin width	4 ft 1 in
Cabin height	3 ft 6 in
Std empty weight	2,852 lb
Empty weight, as tested	3,219 lb
Max ramp weight	4,773 lb
Std useful load	1,921 lb
Useful load, as tested	1,554 lb
Std payload w/full fuel	1,363 lb
Payload w/full fuel, as tested	816 lb
Max takeoff weight	4,750 lb
Max landing weight	4,513 lb
Zero fuel weight	4,470 lb
Fuel capacity, std	588 lb (558 lb usable)
	98 gal (93 gal usable)
Fuel capacity, w/opt tanks	768 lb (738 lb usable)
	128 gal (123 gal usable)
Oil capacity, ea engine	8 qt
Baggage capacity	
forward	100 lb, 15.3 cu ft
aft	100 lb, 17.3 cu ft

Performance

Takeoff distance, ground roll	920 ft
Takeoff distance over 50-ft obst	1,210 ft
Accelerate/stop distance	2,400 ft
Rate of climb, sea level	1,400 fpm
Single-engine ROC, sea level	240 fpm
Max level speed, sea level	196 kt
Cruise speed/Endurance w/45-min rsv, std fuel (fuel consumption, ea engine)	
@ 75% power, best economy	
17,000 ft	193 kt/2.6 hr
10,000 ft	179 kt/2.7 hr
	(174 pph/29 gph)
@ 65% power, best economy	
18,000 ft	191 kt/3.1 hr
10,000 ft	175 kt/3.2 hr
	(144 pph/24 gph)
@ 55% power, best economy	
22,000 ft	180 kt/3.6 hr
10,000 ft	159 kt/3.9 hr
	(114 pph/19 gph)
Max operating altitude	25,000 ft
Single-engine service ceiling	12,300 ft
Landing distance over 50-ft obst	2,160 ft
Landing distance, ground roll	1,400 ft

Limiting and Recommended Airspeeds

Vmc (Min control w/one engine inoperative)	66 KIAS
Vsse (Min intentional w/one-engine inoperative)	85 KIAS
Vx (Best angle of climb)	76 KIAS
Vy (Best rate of climb)	92 KIAS
Vxse (Best single-engine angle of climb)	78 KIAS
Vyse (Best single-engine rate of climb)	92 KIAS
Va (Design maneuvering)	140 KIAS
Vfe (Max flap extended)	115 KIAS
Vle (Max gear extended)	130 KIAS
Vlo (Max gear operating)	
Extend	130 KIAS
Retract	108 KIAS
Vno (Max structural cruising)	166 KIAS
Vne (Never exceed)	205 KIAS
Vs1 (Stall clean)	67 KIAS
Vso (Stall in landing configuration)	64 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 Categories are defined in June 1984 Pilot, p. 108. The prices reflect the costs for equipment recommended to operate in the listed categories.*