PIPER MOJAVE

Demonstrating the value of trickle-up and trickle-down

BY EDWARD G. TRIPP

PHOTOGRAPHY BY ART DAVIS

Four years ago, general aviation manufacturers were rushing to fill every real or imagined niche in their product lines, particularly if a competitor offered something they did not. Model proliferation quickly ceased as the severe decline in sales began.

Despite the fact that the industry was a mere trickle of sales away from being stopped flat last fall, Piper introduced three new models that were to be ready for market by this year. One, the Mojave, was designed to fill a gap in the Piper product line that had left a significant slice of the total market to Beech and Cessna: cabin-class, pressurized piston twins.

A great deal of homework and attention to lessons learned went into the hybrid design to try to ensure the Mo-

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jave would work properly and perform well at altitude. It is a mix of trickle-up and trickle-down, a bit of Navajo (and efforts to avoid the operational and maintenance problems of the original, pressurized P Navajo), a smidgen of Cheyenne plus a few features all its own.

The Mojave, or PA-31P-350, wings are based on the Chieftain design, with a bit of beefing and a two-foot extension on each side. The result is greater span loading and a higher aspect ratio to improve high-altitude performance. The empennage is basic Chieftain, also, with dual trim tab actuators on the elevator. The actuating rods are different diameters to avoid any harmonic vibration problems. The aft engine nacelles and lockers and the main gear are also from the Chieftain.

The fuselage is modified Cheyenne; the nose gear is straight Cheyenne. The fuel system, particularly the three interconnected bladders in the wing and nacelle are Cheyenne-derived. Total useable fuel capacity is 238 gallons (1,428 pounds).

Some lessons learned on the Cheyenne also have been applied to the Mojave. A fair amount of thought has been spent on accessibility and maintainability. The dual bus electrical system has been rationalized. For instance, all secondary fuses have been collected from various points throughout the airframe and located in the nose baggage bay. The enlarged bay (now easily accommodating that essential business tool, the golf bag) has an enhanced location and access to the avionics.

The nosecone swings out on a double hinge to make access to the battery and radar—an optional necessity—quick and easy. The flap system is similar to the Cheyenne's, too, with an in-motion monitoring system with self-test to prevent the asymmetric condition that has occurred in both Cheyennes and Navajos.

The aircraft's proof of concept is out on the wing. Piper and Lycoming worked together to develop a variant on the basic IO-540 that has powered all Navajo derivatives since the first one flew in 1964. Designated the TIO-540-V2A and rated at 350 hp, it was designed to operate at high altitude in all the attendant potential problems. The biggest of these in hard-working, turbosupercharged engines is heat. The Mojave engines, which are counter-rotating, feature intercoolers to reduce the temperature of the compressed, heated air fed to the combustion chambers from the turbo. Piper claims induction air temperature is reduced by as much as 170°F. The intercoolers, which are essentially radiators, enable the engines to carry more power at higher altitudes and increase efficiency, reduce fuel consumption and improve engine life (recommended TBO is 2,000 hours). The magnetos are pressurized.

The design offers lower cooling and less induced drag. The cylinder heads are designed to minimize cooling drag, while the nacelle is designed for the smallest profile and frontal area (although the extended nacelle baggage lockers probably trade some drag for the capacity provided).

Aerostar fans might see something familiar in the shape of the nose bowl, particularly the cooling air intakes.

Access to the cabin and cockpit of the Mojave is through a conventional airstair door that has automatic lights on the stairs and a pneumatic extender to minimize damage. Piper plans to offer a cargo door option next year. The passengers in a Mojave are well taken care of in typical Cheyenne/Navajo fashion. Four reclining passenger chairs in what is called a club-seating configuration are standard (an additional seat, or two different seat/potty arrangements, are available). Passenger visibility is good, and a big selection of interior options add to convenience, such as dividers, refreshment provisions,

folding tables and a stereo system.

Pressurization was a frequent problem for P Navajo owners. The Mojave was designed so that sufficient bleed air is available from the engines to eliminate spiking of cabin pressure with power changes and to provide normal pressurization at low power settings so that power reductions for descent, for instance, will not depressurize the cabin. Minimum power setting to maintain pressure is 2,200 rpm/25 inches. The AirResearch pressurization system includes a control and monitoring sub-panel on the pilot's side that includes variable rate (cabin rate of descent can be limited to 400 fpm with an aircraft rate of 2,000 fpm) and test functions.

The cockpit is laid out well, although some pilots object to the overhead panels that contain electrical and engine switches, lighting controls and deice switches. The controls are laid out in a logical sequence, but one should be careful not to confuse the fuel pump and alternator switches, which are next to each other. The things you need most in flight—the basic flight instruments, avionics and engine gauges—are well located. An annunciator panel runs across the top of the instrument panel just below the glareshield (which makes it difficult to see if you are tall). A master caution light and a warning horn are incorporated in the fault-monitoring system.

The aircraft that *Pilot* staff flew for this article, N9202Y, is Piper's principal demonstrator and is loaded with almost every available option. In the cockpit, this includes a four-inch flight director and HSI, a full deck of King Silver Crown avionics, including KNS 81 and 80 integrated navigation systems (two RNAVs), a KWX-56 color radar with stabilized antenna and a full copilot flight instrument panel with horizontal situation indicator.

Everything we saw, we liked. There is not a lot one can learn about an aircraft that is flown for just a few hours, but as events and the weather turned out, we used most of the systems in the Mojave in a few hours stretched over a day and a half.

After a briefing and check-out by Piper's manager of product promotion, Arnold H. Andresen, that included systems familiarization, cruise performance, slow flight and all the other basics, we flew a photo mission for the accompanying photographs that included further evaluation of the slow-flight handling, then a short cross country with all seats filled.

The next day turned very sour all along the East Coast with low ceilings and visibility, lines of thunderstorms and an ATC system that was close to saturation and required constant rerouting and holds. In the course of a three-leg cross country of a planned 650 nautical miles that was extended considerably by ATC, we had to deal with a variety of weather, including storm avoidance, icing and instrument approaches to minimums.

No, I will not regale you with that day's collection of "there I was" stories. The real point is that the aircraft handled well in all situations. Without pilot experience that included a hefty number of logbook entries for a variety

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of Navajos and Cheyennes, plus some schools, I would have left the aircraft on the ground that day. The similarity of cockpit layout and systems operations in the PA-31 family made us very comfortable in the cockpit during day and night IFR operation. The only unease was when the radar failed during the worst part of the weather, including icing, while ATC was giving us a string of constant instructions (we thanked them for vectoring us around the worst of the weather).

Piper includes pilot training at FlightSafety International in the price of the Mojave. It is well worth the time and effort for the competence, knowledge and confidence it provides.

The Mojave flies more like a Cheyenne than a Navajo, particularly in landing (lightly loaded, especially toward the forward CG limit, it is hard to keep the nosewheel off after you have used up all of the available nose-up trim).

At rotation there is a tendency to pitch up just at the point of lift-off. It works better with a bit of up elevator during the takeoff run.

Throttle management takes a lot of care and a tender touch. Small movements result in significant power changes.

Rate of climb in a cruise climb configuration (we settled on an average of 130 KIAS) runs better than 1,000 fpm up to the highest altitude we used, FL 200. This, combined with the good speeds at altitude, makes going high worth it for even relatively short trips (200 to 300 nm).

The Mojave is an easily managed aircraft in approaches, even though gear and approach flap speeds at 151 and 155 KIAS, respectively, are not as high as most of the competition. While reducing speed during the last stage of an approach, pitch sensitivity increases, particularly below 100 knots.

The Mojave was a pleasant aircraft to fly in all configurations and at all speeds, with pretty good control harmony. Aside from the lightening in pitch noted above, the only other operational caution we encountered during our flights was during icing conditions. Both cylinder head and oil temperatures will increase, as they do on many aircraft during such conditions. In our case, we had to open the cowl flaps in order to maintain temperatures within recommended limits.

It seems to land right in the middle of the competition (which is not such a

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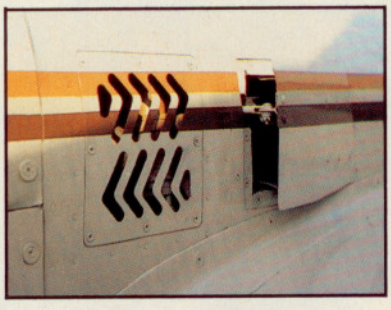
Piper PA-31P-350 Mojave

Base price $580,900
Price as tested $725,644
AOPA Pilot Operations/Equipment Category*:
IFR $580,900 to $610,000
All-weather $633,000 to $705,000

Specifications

Powerplants	2 Lycoming TIO-540-V2AD/LTIO-540-V2AD, 350 hp @ 2,600 rpm/42 in mp
Recommended TBO	2,000 hr
Propellers	2 Hartzell 3-blade, constant speed, full-feathering, 80 in dia
Length	34 ft 6 in
Height	13 ft
Wingspan	44 ft 8 in
Wing area	240 sq ft
Wing loading	30 lb/sq ft
Power loading	10.29 lb/hp
Seats	6 to 7
Cabin length	173.75 in
Cabin width	50 in
Cabin height	51.5 in
Empty weight	5,070 lb
Empty weight, as tested	5,396 lb
Max ramp weight	7,245 lb
Useful load	2,175 lb
Useful load, as tested	1,849 lb
Payload w/full fuel	747 lb
Payload w/full fuel, as tested	421 lb
Max takeoff weight	7,200 lb
Max landing weight	7,000 lb
Zero fuel weight	6,700 lb
Fuel capacity, std	1,458 (1,428 lb usable) 243 gal (238 gal usable)
Oil capacity, ea engine	13 qt
Baggage capacity	680 lb, 60 cu ft Cabin 200 lb, 22 cu ft Nose 300 lb, 20 cu ft Each nacelle 90 lb, 9 cu ft



Small scoops on each nacelle are for cooling pressurization bleed air.

Performance

Takeoff distance, ground roll	2,194 ft
Takeoff distance over 50-ft obst	3,035 ft
Accelerate/stop distance	4,140 ft
Rate of climb, sea level	1,220 fpm
Single-engine ROC, sea level	255 fpm
Max level speed, 25,000 ft	242 kt
Cruise speed/Range w/45-min rsv, std fuel, estimated, at mid-cruise weight (fuel consumption, ea engine)	
@ 75% power, best economy	
25,000 ft	234 kt/1,190 nm (252 pph/42 gph)
@ 65% power, best economy	
25,000 ft	220 kt/1,255 nm (204 pph/34 gph)
@ 55% power, best economy	
25,000 ft	201 kt/1,300 nm
Max operating altitude	25,000 ft
Single-engine service ceiling	11,500 ft
Landing distance over 50-ft obst	2,305 ft
Landing distance, ground roll	1,395 ft

Limiting and Recommended Airspeeds

Vmc (Min control w/one engine inoperative)	70 KIAS
Vsse (Min intentional one-engine inoperative)	101 KIAS
Vx (Best angle of climb)	91 KIAS
Vy (Best rate of climb)	101 KIAS
Vxse (Best single-engine angle of climb)	90 KIAS
Vyse (Best single-engine rate of climb)	100 KIAS
Va (Design maneuvering)	159 KIAS
Vfe (Max flap extended)	
Approach	155 KIAS
Full	128 KIAS
Vle (Max gear extended)	151 KIAS
Vlo (Max gear operating)	
Extend	151 KIAS
Retract	125 KIAS
Vno (Max structural cruising)	181 KIAS
Vne (Never exceed)	229 KIAS
Vr (Rotation)	88 KIAS
Vs1 (Stall clean)	81 KIAS
Vso (Stall in landing configuration)	73 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 1983 Pilot, p. 96. The prices reflect the costs for equipment recommended to operate in the listed categories.*

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bad place to be). The base price of $580,900 includes quite a bit of standard equipment: the buyer's choice of sufficient Collins or King avionics for IFR flight, including a King KHF 250 flight control system, corrosion proofing, polyurethane paint and a few other touches that are usually extra-cost items in this class of aircraft. There are several options that any purchaser should consider necessities, such as known-icing equipment ($18,985), propeller synchrophaser (for passenger comfort at $2,115), oxygen system ($4,800 to $5,810), radar ($20,595 to $41,335) and some additional avionics. N9202Y has a list price of $725,644. As mentioned earlier, it is loaded with everything except that time saver, a telephone (also an available option).

If first impressions can be a valid guide, based on the thoughtfulness with which the Mojave has been designed and our brief flying encounter, Piper seems to have reentered the pressurized piston twin market with a competitor. □

NAVAJO SPOTTER'S GUIDE

Navajo PA-31-300 (1967 to 1972)
Wingspan 40 ft 8 in
Length 32 ft 7.5 in
Height 13 ft
Tailplane span 18 ft 1.5 in
Powerplants Two 300-hp IO-540-K Avco Lycoming engines; engine change to IO-540-M in 1969.
Propellers Two-blade, 6 ft 8 in dia
Dutch door at rear of cabin on port side: top half swings upward; lower half hinges down (built-in steps).

Turbo Navajo (1967 to 1971)
Turbo Navajo differs from the Navajo only in having 310-hp TIO-540-A Avco Lycoming engines with turbochargers.

Turbo Navajo B PA-31-310 (1972 to 1974)
New engine nacelle compartments; new interior and exterior styling.

Turbo Navajo C PA-31-310 (1975 to 1977)
Propeller change Hartzell three-blade, 6 ft 8 in dia

Navajo PA-31-310 (1978 to 1982)
The Turbo Navajo C became the Navajo with an engine change in 1978. Production of PA-31 ended in 1982.
Powerplants Two 310-hp Avco Lycoming TIO-540-A2C turbocharged engines


Original Navajo

1970 Pressurized Navajo

Pressurized Navajo PA-31P (1970 to 1977)
Wingspan 40 ft 8 in
Length 34 ft 7.5 in
Height 13 ft 3 in
Tailplane span 19 ft 10 in
Powerplants Two 425-hp Avco Lycoming TIGO-540-E1A turbocharged engines
Propellers Hartzell three-blade, 7 ft 9 in dia
Swing-open nosecone.

Navajo Chieftain PA-31-350 (1973 to 1977)
Wingspan 40 ft 8 in
Length 34 ft 7.5 in
Height 13 ft
Tailplane span 18 ft 1.5 in
Powerplants Two 350-hp Avco Lycoming TIO-540-J2BD turbocharged counterrotating engines
Propellers Hartzell three-blade, 6 ft 8 in dia
Nacelle baggage compartments; one-piece passenger door with built-in airstair.

Navajo Chieftain PA-31-350 (1978 to present)
Powerplants Two 350-hp Avco Lycoming turbocharged counterrotating engines: one TIO-540-J2BD, one LTIO-540-J2BD

Turbo Navajo C/R PA-31-325 (1975 to present)
The Turbo Navajo C/R is identical to the Navajo C except for having counterrotating engines and nacelle baggage compartments, as on the Chieftain.
Powerplants Two 325-hp Avco Lycoming engines: one LTIO-540-F2BD, one TIO-540-F2BD

—Denise A. May


1982 Navajo


1983 Navajo Chieftain