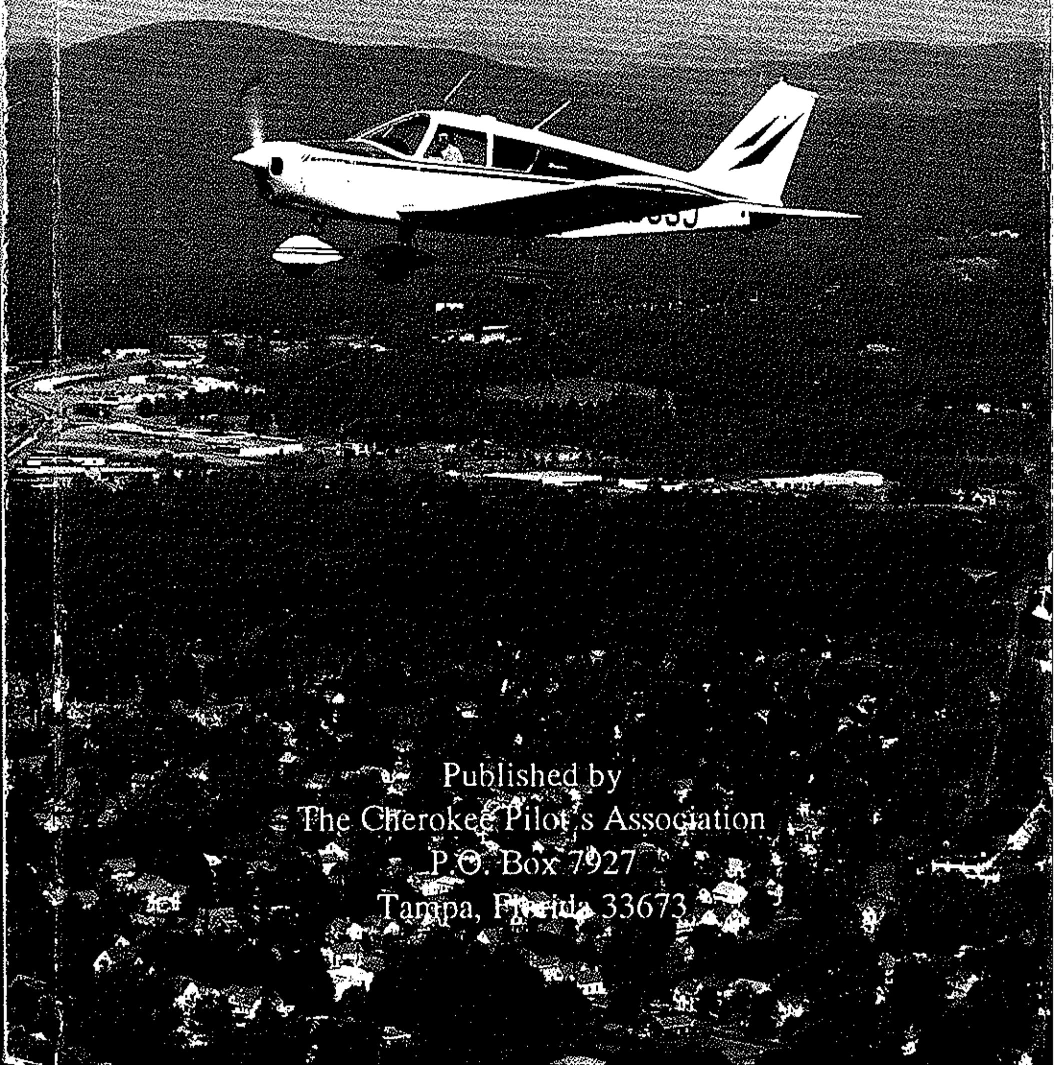
The Cherokee Tribe

By Terry Lee Rogers



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Acknowledgments

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To the folks at Piper Aircraft, especially to the Customer Service representatives, thanks for your help, as well.

To my sister, Tina Rogers, thanks for reading the manuscript and for making invaluable suggestions for revision.

And to Fred Weick a hearty thanks, not only for submitting material for use in this book, but for designing the best darn airplane in the world - the Cherokee.

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Chapter 1
A Brief Introduction

It all started with a casual remark by well-known aircraft designer Fred Weick. Weick, noted for his design of the Ercoupe airplane, was attending a meeting of the Flying Farmers of American and having dinner with William Piper and his son, William Jr.

Dinner conversation turned (of course) to airplanes, and Weick said he could design an all-metal airplane which could be built as cheaply as a fabric covered model.

At the time Cessna was making metal airplanes while nearly all of the Piper models were tube and fabric covered descendents of the original Cubs.

Later, Weick would receive a call from Pug Piper with a challenge to prove his point with engineering figures. Weick did so and began a career with Piper which would result in numerous variants on a sleek new design which would produce more than 40,000 airplanes.

What has become known as the Cherokee series of aircraft include trainers, retractable gear models, and seven passenger planes known for their hauling ability. It caused Piper to build a new Florida plant which eventually became the core of the entire company.

This book will cover some of the history which emerged from the original design, and will cover the attributes and peculiarities of the various models over the years.

I originally learned to fly in a Piper Tri-Pacer so it was a natural to transition to a Cherokee. My first Cherokee was a 1967 model. It had the overhead trim crank and a starter button and there was no mistaking that it was a Piper product. But that plane was the beginning of a love affair with the Cherokee tribe for me. I have flown nearly all of them and find that I am partial to none - so long as it's a Cherokee, I enjoy it as much as the one before.

One nice thing about the line is how easy it is to transition up. Moving up from a 140 through the Arrows right up to a Saratoga seems as natural as driving a smooth running car. Even when you move up to a bigger or more powerful model, there is something familiar about the controls, cockpit layout and handling. You know you're at home in a Cherokee.

Since 1980 I have served as Executive Director of the Cherokee Pilots' Association in Tampa, Florida, so naturally I am somewhat biased towards Pipers in general and Cherokees in particular. However, over the years many pilots have asked me to write a book which provides both the history and a model breakdown on the entire Cherokee series. What changes were made in which years and which planes had idiosyncrasies which should be kept in mind when purchasing a plane?

Another comment concerned owner and information manuals - some were pretty skimpy and pilots asked for additional information, especially information concerning emergency procedures.

It was these comments which served as the inspiration for this book.

With production of new single-engine models at a near standstill for many years, it is obvious that many individuals are looking for used aircraft to satisfy their desire to fly. This book will look at the various Cherokee models and try to show what to look for when considering them for purchase.

In addition, there is a need for specifications and figures showing the comparison in performance between various models. This book will also make this available to the reader.

Finally, this book will cover some of the common problems of ownership of Cherokees and try to provide some solutions to those problems, including names and addresses of manufacturers who can supply the help needed in keeping this fine line of aircraft flying.

The Cherokee series of aircraft broke new ground when it was first introduced in 1961, however, the line still offers more reliable transportation and more versatility at a reasonable cost then any competitor.

This book is dedicated to exploring just what it is that Piper has been doing all these years.

Chapter 2
The Cherokee - A Short History

In 1956 Piper aircraft was a distant number two in aircraft production behind Cessna, which was producing more of their all-metal single-engine airplanes than any other manufacturer in the world.

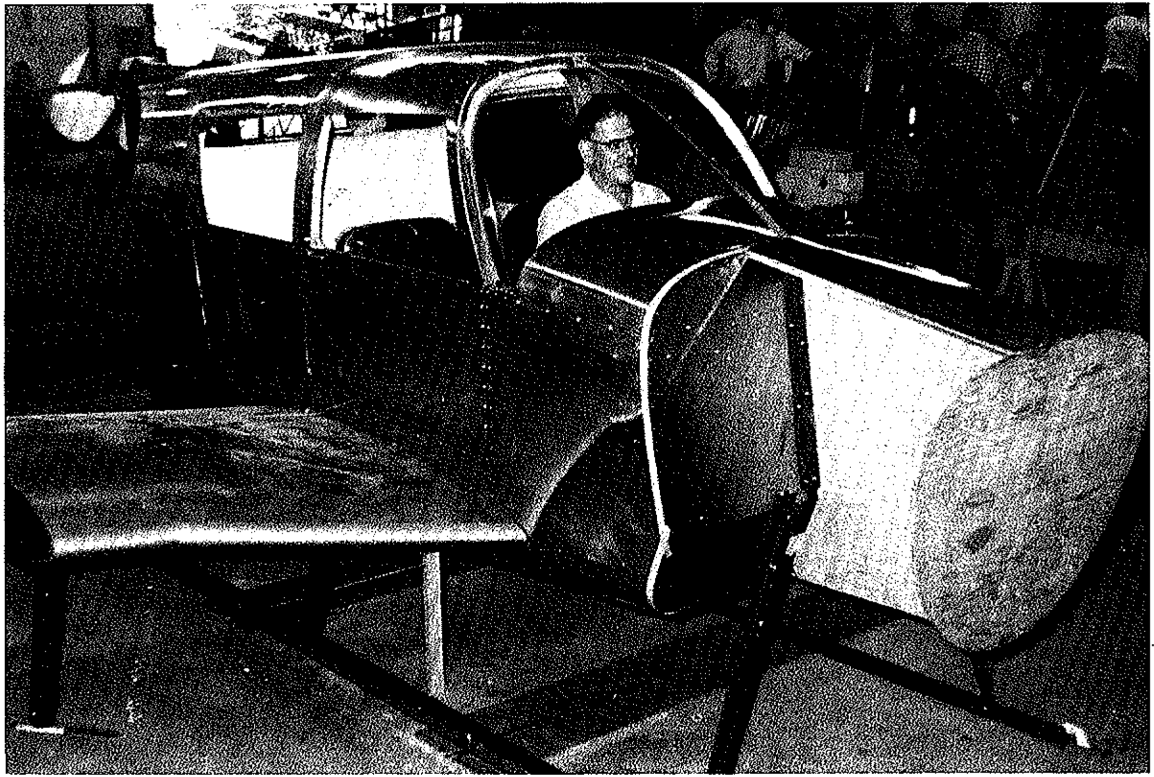
Piper singles consisted of the Cub, the Tri-Pacer and the Colt - somewhat antiquated tube and fabric designs which simply did not have the pizazz of the Cessna models then being offered. But in November of that year Fred E. Weick was asked by Pug Piper to help form a design center for Piper Aircraft and to help design new models.

Weick was no newcomer to aircraft design. Among his designs was the Ercoupe, a two-place all-metal low-wing aircraft which popularized tricycle landing gear in low-cost airplanes. The Ercoupe was considered revolutionary when it was introduced in 1946 and its sales had reached many thousands. Among its other novel design features was an elevator with limited travel which limited the stalling characteristics of the plane and made the Ercoupe all but spin proof.

Weick was asked to join the Piper family in developing a new facility in Vero Beach, Florida.

"I said I would join them as quickly as possible and tried to find 'Zero Beach' on the map. I could not find it, but I did find a 'Vero Beach' so I went to join them the next day," said Weick.

The site was eventually selected not only for a development facility, but for a new factory, to supplement the production facilities in Lock Haven, Pennsylvania. One of the first assignments given to Weick was to design a replacement for the venerable Tri-Pacer. The basic design features of the new model



Early Cherokee mock-up at plant in Vero Beach. Florida.

were laid out early in its development.

The designation of the new model was to be PA-28, or the 28th Piper aircraft model. It was to be a four-place airplane powered with a 150 Hp four- cylinder Lycoming engine. It was to be relatively small overall, with a low wing of about 30- foot span which would support a wide-tread (about ten feet) tricycle landing gear with 6.00 x 6 inch wheels and tires.

The wheelbase was to be as long as feasible and the nose wheel was also to have a full sized tire. With a tricycle gear the nose wheel is the critical one in soft field operation. In a soft field the nose wheel often carries more load than either of the main wheels.

With the wide-tread tricycle gear and with the low wing and the correspondingly low center of gravity, the airplane was designed to handle very well on the ground even in strong cross winds.

The construction of the airplane was to be of all metal but as simple as possible, with a straight wing, all ribs having the same shape, and the structure made up of as few large pieces as feasible. The control surfaces were to have beaded skins and be free from internal ribs or stiffeners.

The cabin of the Tri-Pacer was only 35 inches wide inside the steel tubes and Weick wanted the inside width of the new airplane to be 44 inches to give ample comfort. Piper, however, was preparing for production a new, more expensive, single-engine four-place model, the Comanche, and it had the 44-inch inside width. Management insisted that the new low-cost airplane not be directly competitive with the Comanche in comfort and insisted he limit the overall inside width to 42 inches.

And so many of the details of the airplane were worked out in the original specifications. John Thorpe was also hired to help with the engineering. Thorpe, who would help with the project through the aircraft's debut, was somewhat famous himself, having designed an interesting two-place model called the "Sky Scooter".

Design and development of that first Cherokee took four years with some interesting twists along the way. At one point, for example, the first aileron design had to be redone when it was found the ailerons worked backwards! On the redesign, care was taken to insure that it would be difficult, if not impossible, for the ailerons on production planes to be hooked up backwards in the field.

The new Cherokee, a 160-horsepower aircraft, was introduced to the world in 1961. However, many variants occurred.

First a slightly less powerful model was introduced, the 150--

then a more powerful one, the 180. The 150 was then down rated to create the 140 - a stripped two-seat model designed to be used as a trainer. The 140 was so successful, however, that the rear seats were soon restored and the plane became a family plane with "occasional" seats in the rear for children.

Other models followed - the 235, and the Arrow 180 and Arrow 200, the retractable models.

The Cherokee Six was a new, larger plane, provided seating for up to six passengers. A retractable model, the Lance, was soon added to that line.

In addition, various models underwent name changes over the years. The 140 was known at various times as the Cruiser or the Flite Liner. The 180 was sometimes called the Challenger or Archer, while the 235 was called the Charger or the Pathfinder.

In 1974, some models began sporting new semi-tapered wings and they received new designations - the 140 became the 151 or 161, also known as the Warrior; the 180 became the 181, also known as the Archer II, and the 235 became the 236, also known as the Dakota.

The bigger iron also eventually adopted the new wing design: the Cherokee Six became the Saratoga and the Lance became the Saratoga.

Is anyone confused by all this? Well let's review the development of the Cherokee line as it was described by the Designer, Fred Weick:

The Cherokee Was Designed For Simplicity

"Substantially, all of the sheet metal covering of the Cherokee required no special forming other than bending. The parts that required double-curvature forming, such as the nose cowl and the tips for the wing, stabilator fin and rudder, were formed of fiberglass and plastic molds."

The Cherokee used a novel wing design. Each wing used an I-Beam spar connected at the center with two plates. The FAA, however, was concerned about the strength of the design and ordered additional testing before production began.

"The first cycling test was arranged to give loads of one g - that is, level flight in smooth air" according to Weick.

"We continued the tests with the same loading, however, after 300,561 cycles without evidence of failure, the loading was increased to 1.25 g and the tests continued.

"In all, more than 400,000 cycles were finally applied. Detailed measurements of the bolts and the holes after the tests showed no measurable differences between the conditions after the tests and the conditions before the tests were started.

"The joints were than approved for production, but we were very careful to specify close tolerances on both the bolts and holes so they would always have a snug fit.

"The joints gave excellent trouble-free service and were so strong they could be used without modifications on later models of Cherokees which were much heavier than the original."

The original Cherokee was approved for production on October 31, 1960 - just in time for a dealer meeting introduction.

"At that time a Piper international sales meeting was being held at the West End in the Bahamas Islands and it was scheduled to continue for a couple of days more.

"The announcement became the hit of the meeting and generated a great deal of enthusiasm among the distributors and dealers. The new airplane would carry four people at an average cruising speed in the area of about 125 mph and would sell for just under $10,000.

"Production was slow at first but by the end of the summer we were up to about five planes a day. Work at the Development Center went along and by June 2 we had the approved type certificate for the Cherokee with a 150 Hp engine instead of just the 160.

"The 150 could be used with 80 octane fuel while the 160 Hp model required 90 octane.

"The Cherokees were well received by the public and the rate of production continued to increase. As time went on, a number of new models were added.

"By August, 1962, a 180 Hp model was approved and started into production. The major change was the use of a Lycoming four-cylinder 0-360 engine in place of the original 0-320 engine.

"This permitted a slightly higher gross weight and a higher useful load to be carried. It also improved the performance at high altitude fields and provided an excellent run of light plane flying.

"In the spring of 1963, both the 160 and 180 Hp models were approved as seaplanes with Edo floats. But Cherokees did not make very good seaplanes, largely because they had a single door on the right-hand side only. When beaching or docking, a seaplane pilot may want to get down on either the right hand float or the left hand float to facilitate the operation.

"Getting to the left hand float required an impractical aerobatic maneuver. Very few Cherokees were purchased with floats and after a while the models were dropped."

Cherokee 140 - the Trainer

"From the early 1930's until sometime after World War II, most of the civilian training was done on Taylor or Piper Cubs. This, of course, helped to influence the pilots trained to buy the more advanced Piper aircraft as they became available.

"As the use of the tricycle gear became almost universal, however, and as larger instrument panels were needed to support radios and other navigational equipment as well as gyroscopic instruments, the tail dragger cubs, with their narrow tandem fuselages, became obsolete. Also, side- by-side seating was found to be a better arrangement for training.

"Cessna led the way in the development of training airplanes through the 150 series, and now, in the early 1960's, Piper was in dire need of a training airplane. It was created by stripping a Cherokee 150 four-place airplane down to a two-place trainer.

"The rear seats were removed and the baggage area and close-out panel were moved up to that area.

"The same Lycoming 0-320 engine was used as in the 150, and although it was still rated at 150 Hp, a higher pitch propeller was used which held the Rpm and power down some and the airplane was called the PA-28-140. The approved type certificate was obtained in February, 1964 and the airplane was immediately put into production.

"It had gentle flying and stalling characteristics and served well as a trainer. With its low-wing arrangement providing both a low center of gravity and a low center of drag, as well as support for the wide tread landing gear, students were able to operate it safely under substantially higher wind conditions than with other trainers.

"Numerous reports came in that in many cases of high and gusty wind conditions, after the training had ceased in Cessna 150's the Cherokee 140 trainer had gone on without difficulty."

The 235 - The Load Carrier

"The next Cherokee model change was made by fitting the regular four- passenger model with a Lycoming 235 Hp six-cylinder 0-540 engine.

"To increase the fuel capacity with the larger engine, the wing tips were formed into fuel tanks and extended one foot on either side so that the span was increased from the original 30 feet to 32 feet. Each wing tip held 17 gallons which increased the total fuel capacity from the original 50 to 84 gallons.

"The 235 Hp model was available with the same type of fixed pitch aluminum alloy propeller as was used on all of the other Cherokee models up to that time. The maximum speed was 166 mph, however, which meant that the propeller pitch was too high for best take-off and climb performance.

"So the 235 was made available with either the fixed- pitch propeller or a constant-speed propeller. The model does well in short field operations, particularly fields at high elevations, in the high plains and mountain areas. The approved type certificate was received in July, 1963, and was immediately put into production.

"Maintenance improvements were made as soon as it appeared they were needed, and items involving comfort, performance and appearance were brought out in the yearly model changes.

"An example of the latter was changing from the old push-pull type of controls for the throttle, the mixture and propeller pitch control to a quadrant-type of control in which they are all grouped together in one cluster."

The Arrow Joins the Fold

"The next Cherokee model to come out was fitted with a retractable landing gear and it was called the Arrow.

"It was powered by the 180-Hp Lycoming engine.

"Except for the retractable gear and a change in the 180-Hp engine fuel system, the airplane was essentially the same as the fixed gear Cherokee 180. The latter had a Lycoming 0-360 engine with a carburetor which hung below the engine. In the retractable version the engine was changed to the Lycoming 10- 360, which had a fuel injection system and gave room under the engine for retraction of the nose gear within the cowling.

"Even with this extra room it was necessary for us to reduce the nose wheel size from the regular 6.00 x 6 to 5.00 x 6.

"By the late 1960's the Bonanza and the Cessna 210 four-place retractable gear airplanes had become heavier and more powerful and, therefore, more costly. It did not take long before the Cherokee Arrow outsold all of the others in that field.

"With its retractable gear the 180 Hp Cherokee Arrow is slightly faster than the 235 Hp Cherokee with fixed gear. The Arrow was therefore fitted with a constant-speed propeller as standard equipment.

"The Arrow gives more economical performance from a fuel standpoint, but the 235 is more of a workhorse in that it will carry heavier loads and operate better at high altitude fields.

"The most unusual feature in the Arrow is the control of the retractable landing gear. In the period before the Arrow came out, every year several hundred retractable geared light airplanes were landed with the gear in the up position.

"This was quite expensive, because it usually meant replacing or repairing an expensive constant speed propeller and repairing the bottom of the airplane and possibly the flaps.

"Some of those gear up landings were made even though the pilot had a great deal of warning by flashing red lights and squawking horns to tell him the gear was still up although the throttle was back and power off for landing.

"It happened that Pug Piper had two of those experiences himself, and he asked me if we could not devise a system that would take care of putting the gear down automatically, even if the pilot forgot to.

"Such an automatic back-up system for the pilot would have to sense both the airspeed and the engine power. With our Arrow, which had a landing speed, flaps down, in the low 60 mph range, this meant that if the pilot was coming in for a landing in a power off glide and the gear was still up, it should come down automatically when the airspeed got down to about 100 mph.

"On the other hand, in the take off run, with full power, the maximum angle of climb occurs at about 85 mph and the landing gear should be retracted and remain retracted throughout the climbing range, that is at airspeeds of 85 mph or above.

"Previously the Beech Bonanza had been fitted for a short time with a device which would accomplish this type of purpose by sensing both the airspeed and the engine manifold pressure, but its use had been discontinued.

"It occurred to me that the propeller slipstream velocity is increased by the application of power, and if I could find a spot within the slipstream area with which the airplane flying in full throttle climb at 85 mph would give a local airspeed reading of slightly over 100 mph, I could get the effective power with a single pitot-static airspeed sensor alone, and have a very simple arrangement.

"The Arrow was still in the design state, so I took a Cherokee 180 and flew a number of tests, exploring suitable locations for an airspeed sensor in the slipstream.

"I used a pitot-static sensor at that point similar to the one used for the indicated airspeed instrument for the Cherokee airplane, but larger so that a greater amount of air could be used to move a diaphragm which opened or closed a hydraulic valve. When this valve was open, the gear would fall down by the pull of gravity and lock in the down position for landing.

"The usual retraction and extension of the gear by the pilot is done by hydraulic actuators which are operated by an electric motor driving a gear pump which can be run in either direction.

"An electric switch on the instrument panel, the handle being in the form of a wheel and tire, is moved to an up position to retract the gear and down to extend the gear.

"The entire operation is carried on in the standard way with blinking light and squawking horn if the throttle is moved back to the landing position with the switch in the down position. Also, the usual squat switches are attached to each of the wheels and will prevent the gear from being retracted while the airplane is on the ground.

"Thus, in ordinary operation, the pilot operates the gear just as in the case of any other retractable. In case of malfunction, the gear can be put down by the pilot who pulls an emergency lever which opens the hydraulic valve mentioned previously which permits the gear to free fall and lock in place.

"However, if the pilot is making an ordinary landing and forgets to put the gear down the automatic feature will open that valve and the gear will come down and lock by itself.

"The original Arrow, the PA-28R-180, was approved in June 1967 and production started at that time. In addition, a 200 Hp version was approved and production started in January 1969."

The Warrior Wing

Piper wanted a wing design which would improve stall characteristics and increase wingspan.

"This could be done by tapering the other half of the wing, the portion beyond the flaps, so that the tip cord was smaller than the root cord, and the load at the tip would be reduced.

"This change was incorporated in the 150 Hp model in 1973 and it was designated the PA-28-151. The span was increased to about 35 feet and the plane had better climb and flatter flight characteristics. This change was well received and, by 1978, all Cherokee models still in production were fitted with the tapered outer wing panels. Later, new names were given the planes - Warrior and Archer II."

Big Birds - The PA-32 Models

"Early in the 1960's Pug Piper had the idea of expanding the Cherokee series to include a six-place multi-engine model. He thought we might fit it with three Lycoming 0-235 115 Hp engines. He thought that like the original tri- motor Ford and

At least one example of a Cherokee seaplane still exists. This one was spotted in Alaska.

Fokkers we could get by with a fixed landing gear and fixed pitch propellers and have a relatively low-cost multi-engine airplane that would carry six people."

Flight testing of the three-engine model proved unsatisfactory, however, and eventually a single-engine six place design was chosen.

"With the six-place seating arrangement, we wanted to have a narrow aisle so that people could get from the front to the rear seats. The cabin portion of the fuselage, therefore, had to be both wider and longer.

"To accomplish this and still use as much of the original Cherokee fuselage structure as possible, we sliced the cabin portion of the fuselage in half, through the center, and moved the halves out so that the width was increased by seven inches.

"The portion of the fuselage back of the cabin was kept essentially intact, but moved back 30 inches and a new tapered section fitted into the 30- inch gap.

"To balance the two additional rear passengers, the center engine was moved forward and an additional baggage compartment was placed between the firewall and cabin.

"The Cherokee 235 wing structure, with its fuel tanks at the tips, could be used just about as it was except strengthened slightly where needed. The tail surfaces could also be essentially those of the Cherokee 235.

"About that time I had the idea that this structure would make a good six- place single-engine airplane with a somewhat more powerful engine. It happened that the 235 Hp Lycoming 0-540 six-cylinder engine was rated very conservatively and was available with high compression ratio and higher RPM rated at 260 Hp.

"Fortunately it fit right into the same place in the power plant installation as the 235 model.

"The result was a single-engine airplane with excellent performance.

"We put an extra door at the back of the cabin on the left hand side so that the rear passengers could get in and out easily without going through the front door and through the aisle. With all but the front seats removed, a large cargo space was available and an extension was made to the opening for the rear door so that large pieces of cargo - even coffins - could be put in and out with ease. The airplane could then be used as a general purpose workhorse as well as a six-place passenger plane.

"An approved type certificate was obtained for the six-place single-engine model and the PA-32-260 was placed into production in 1965.

"Soon a 300 Hp version of the same engine was available from Lycoming and the PA-32-300 was started in production in 1966. The extra power was appreciated, particularly in mountain flying.

"There was good demand for the Cherokee Six, particularly for carrying the whole family, moving executives and hauling cargo. Its production has been continued until the present."

The Saratoga - Improved Performance

"Sometime in the 1970's the semi-tapered wing was incorporated, adding about three feet to the span and improving the climb characteristics. It is now called the Saratoga. It is also powered by a turbo-charged engine, which increases the cruising speed at optimum altitude from 150 to 165 knots.

"During the 1970's, what was originally the Cherokee Six was fitted with a retractable gear. It is now known as the Saratoga "SP", with SP standing for special performance. It is now available with either a turbo-charged engine or a naturally aspirated engine.

"With the turbo-charged engine the cruising speed at 75 percent power and optimum altitude is listed as 177 knots, or 204 mph, while the normally aspirated engine has values of 159 knots or 183 mph.

"And that is the story of the Cherokee. Many of the original Cherokee design parts are still in use in the present models and tower operators still refer to all of the single-engine models as Cherokees.

"As of December, 1983, 41,666 Cherokees had been produced. All of these planes include some parts at least, of the original Cherokee, which was produced back in 1961 as a low-cost all-metal low-wing airplane to replace the obsolete fabric-covered Tri-Pacer."

(Note: the preceding memoir was written by Fred E. Weick and first published as a series in the Cherokee Magazine (now the Piper Owners' Magazine) starting in March, 1985. Mr. Weick continues as a consultant to Piper Aircraft Corporation as of this writing.)

Chapter 3
The Cherokee...
A Family Album

Cherokees have come in different sizes and with different features over the years. All have some things in common. The designation is either PA-28 (Piper Aircraft, aircraft design number 28) or PA-32 for the larger models. All have the low-wing design with a single-entrance door. This single door is not considered one of the best features of the line. All have the under panel pull- handle parking brake, considered by many to be the best in the industry. And all have manual flaps, controlled by a large handle between the front seats. Most people prefer this arrangement to the electrical flaps offered by the competition.

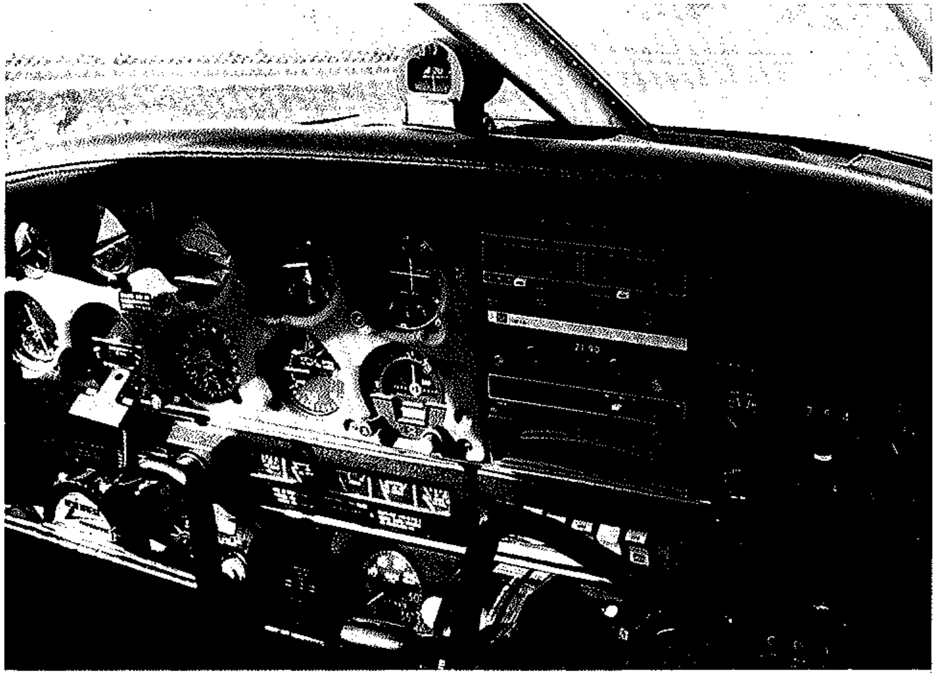
The cockpit design, from the smallest Cherokee 140 through the larger, six or seven passenger Saratoga, is familiar and comfortable to pilots schooled in Cherokees. Instrument and control placement is similar and flying technique does not change much as you go from smaller to larger models. Transitioning upward is generally easy.

For some people, however, the variety of Cherokee models is bewildering. Here is a listing, by model year, showing the models produced and the features for each year:

1962	Cherokee 150	150 Hp
	Cherokee 160	160 Hp

First Cherokee-83 produced in 1961 calendar year. Choice of 150 or 160 HP, 2150 or 2250 gross weight. Original Cherokee 160 base price is $9,995.

1963	Cherokee 150B	150 Hp
	Cherokee 160B	160 Hp
	Cherokee 180B	180 Hp



This panel, in a 1973 Cherokee 140, is typical of the breed.

Cherokee 180 introduced with gross weight of 2400 pounds. Speed fairings standard on 180, optional on others. 37-amp alternator replaces generator, soundproofing added. Cherokee 180 lists for $12,900.

1964	Cherokee 140	140 Hp
	Cherokee 150B	150 Hp
	Cherokee 160B	160 Hp
	Cherokee 180B	180 Hp
	Cherokee 235	235 Hp

Cherokee 140 and 235 introduced - 216 235 models produced during 1963 model year. New 235 sells for $15,900; 140 lists at $8,500.

1965	Cherokee 140	150 Hp
	Cherokee 150B	150 Hp
	Cherokee 160C	160 Hp
	Cherokee 180C	180 Hp
	Cherokee 235	235 Hp
	Cherokee Six (32-260)	260 Hp

Cherokee C introduced with fiberglass cowl and optional toe brakes. New panel is expanded, crossover exhaust used, wing root vents added, boarding step added, more leg space in rear seat. Cherokee 140 horsepower increased to 150. First of Cherokee Sixes introduced. Cherokee Six sells for $18,500.

1966	Cherokee 140	150 Hp
	Cherokee 150C	150 Hp
	Cherokee 160C	160 Hp
	Cherokee 180C	180 Hp
	Cherokee 235B	235 Hp
	Cherokee Six (32-260)	260 Hp
	Cherokee Six (32-300)	300 Hp

Rear seats optional on Cherokee 140, Cherokee Six 300 introduced at base price of $21,500.

1967	Cherokee 140	150 Hp
	Cherokee 150C	150 Hp
	Cherokee 160C	160 Hp
	Cherokee 180C	180 Hp
	Cherokee 235B	235 Hp

	Cherokee Six (32-260)	260 Hp
	Cherokee Six (32-300)	300 Hp
	Arrow 180 (28R-180)	180 Hp

Arrow introduced, new exhaust valves in 150, 160 and 180 models increase TBO to 2,000 hours. Cherokee Six gets new five foot wide cargo door option. Arrow base price is $16,900.

1968	Cherokee 140	150 Hp
	Cherokee 180D	180 Hp
	Cherokee 235B	235 Hp
	Cherokee Six (32-260)	260 Hp
	Cherokee Six (32-300)	300 Hp
	Arrow 180 (28R-180)	180 Hp

Cherokee 150 and 160 discontinued, Cherokee D now has trim wheel between seats, throttle quadrant, and third side window. 235 gets new instrument panel.

1969	Cherokee 140B	150 Hp
	Cherokee 180D	180 Hp
	Cherokee 235C	235 Hp
	Cherokee Six (32-260)	260 Hp
	Cherokee Six (32-300)	300 Hp
	Arrow 180 (28R-180)	180 Hp
	Arrow 200 (28R-200)	200 Hp

Cherokee 140B and 235C introduced, Arrow 200 introduced. Cherokee 140 Cruiser debuts with standard rear seats, wheel fairings, and optional avionics packages. The 140 gets new modern panel with standard instrument layout, circuit breakers instead of fuses, rocker switches instead of toggles, and a new throttle quadrant. Arrow 200 lists at $19,980.

1970	Cherokee 140C	150 Hp
	Cherokee 180E	180 Hp
	Cherokee 235D	235 Hp
	Cherokee Six (32-260)	260 Hp
	Cherokee Six (32-300)	300 Hp
	Arrow 180 (28R-180)	180 Hp
	Arrow 200 (28R-200)	200 Hp

Cherokee 180E, 140C, and 235D introduced. 180E has overhead vent system, control column lock, adjustable seats with headrests and increased rear seat leg room. The 140 has new

Dynafocal engine mount, overhead air vents and six way adjustable front seats.

1971	Cherokee 140D	150 Hp
	Cherokee 180F	180 Hp
	Cherokee 235E	235 Hp
	Cherokee Six (32-260)	260 Hp
	Cherokee Six (32-300)	300 Hp
	Arrow 180 (28R-180)	180 Hp
	Arrow 200 (28R-200)	200 Hp

Headrests and shoulder harnesses added to 140, two-seat Fliteliner now becomes trainer.

1972	Cherokee 140E	150 Hp
	Cherokee 180G	180 Hp
	Cherokee 235F	235 Hp
	Cherokee Six (32-260	260 Hp
	Cherokee Six (32-300	300 Hp
	Arrow II (28R-200)	200 Hp

Arrow 180 discontinued, 140 and 180 now offer air conditioning, seat back latches. Arrow II has five inch longer fuselage and wider door, new extended wing, and increased baggage capacity. Arrow II sells for $23,500.

1973	Cherokee 140E	150 Hp
	Challenger 180G	180 Hp
	Charger 235F	235 Hp
	Cherokee Six (32-260)	260 Hp
	Cherokee Six (32-300)	300 Hp
	Arrow II (28R-200)	200 Hp

Challenger is new name for 180, Charger name replaces 235. Both have eight- inch stretched cabins, wider doors, and stretched wings. Challenger gross weight is now 2,450 pounds. Toe Brakes now standard on 140. Challenger sells for $16,990; Charger lists at $24,390.

1974	Cherokee 140E	150 Hp
1975	Warrior 151	150 Hp
	Archer 180G	180 Hp
	Pathfinder 235F	235 Hp
	Cherokee Six (32-260)	260 Hp
	Cherokee Six (32-300)	300 Hp

	Arrow II (28R-200)	200 Hp

Warrior introduced with new tapered wing, 150 Hp, and 2,325 pound gross weight in 1974. Archer is new name for 180 series, Pathfinder the new name for 235. A fourth side window and utility door are added to the Cherokee Six. - No new changes in 1975 model year. New 1974 Warrior sells for $14,990.

1976	Cherokee 140E	150 Hp
	Warrior 151	150 Hp
	Archer II 181	180 Hp
	Pathfinder 235F	235 Hp
	Cherokee Six (32-260)	260 Hp
	Cherokee Six (32-300)	300 Hp
	Lance (32R-300)	300 Hp
	Arrow II (28R-200)	200 Hp

Archer II introduced. Tapered wing brings gross weight to 2,550 pounds. Lance available - has retractable landing gear. Archer II lists for $23,980, first Lance has base price of $49,990.

1977	Cherokee 140E	150 Hp
	Warrior 151	150 Hp
	Warrior II 161	160 Hp
	Archer II 181	180 Hp
	Pathfinder 235F	235 Hp
	Cherokee Six (32-260)	260 Hp
	Cherokee Six (32-300)	300 Hp
	Lance (32R-300)	300 Hp
	Arrow III (28R-201)	200 Hp
	Turbo Arrow III (28R-201T)	200 Hp

At midyear, Cherokee 140 discontinued - Warrior II with 160 horse engine replaces Warrior. Pathfinder discontinued. New Turbo Arrow III has turbocharged Continental 200 horse engine. Arrow III now has semi tapered "Warrior" wing. New Arrow III is $37,850; Turbo Arrow III is $41,800.

1978	Warrior II 161	160 Hp
	Archer II 181	180 Hp
	Cherokee Six (32-260)	260 Hp
	Cherokee Six (32-300)	300 Hp
	Lance (32R-300)	300 Hp
	Turbo Lance (32R-300T)	300 Hp
	Arrow III (28R-201)	200 Hp

	Turbo Arrow III (28R-201T)	200 Hp

Warrior II and Archer II get aerodynamic clean up, improved wheel fairings; Piper claims a 7 knot increase in speed. Pathfinder discontinued. Turbocharging becomes optional on Lance. T-tailed Lance introduced in mid model year.

1979	Warrior II 161	160 Hp
	Archer II 181	180 Hp
	Dakota 236	235 Hp
	Turbo Dakota 236T	235 Hp
	Cherokee Six (32-260)	260 Hp
	Cherokee Six (32-300)	300 Hp
	Lance (32R-300)	300 Hp
	Turbo Lance (32R-300T)	300 Hp
	Arrow IV (28R-201)	200 Hp
	Turbo Arrow IV (28R-201T)	200 Hp

Arrow IV, Dakota and Turbo Dakota introduced. Door closure strap added, push to talk switch is new option. Warrior gets new design spinner. All Arrow IVs now get T-tail design. Turbo Dakota is offered this year only. Dakota sells for $39,910 while turbo is $41,980.

1980	Warrior II 161	160 Hp
	Archer II 181	180 Hp
	Dakota 236	235 Hp
	Saratoga (32-301)	300 Hp
	Saratoga SP (32R-301)	300 Hp
	Turbo Saratoga (32R-301T)	300 Hp
	Turbo SaratogaSP (32R-301T)	300 Hp
	Arrow IV (28R-201)	200 Hp
	Turbo Arrow IV (28R-201T)	200 Hp

Saratoga, Saratoga SP (SP standing for Special Performance and meaning retractable gear) and Turbo Saratoga SP introduced. They replace the Cherokee Six and Lance series. New velour style interiors available on all series. Panel redesigned and fresh air vents improved. Quick change wheel fairings introduced. Saratoga sells for $66,700, turbo sells for $74,900. Saratoga SP lists for $80,200 while turbo version is $88,400.

1981	Warrior II 161	160 Hp
	Archer II 181	180 Hp
	Dakota 236	235 Hp

Saratoga (32-301)	300 Hp
Saratoga SP 32R-301)	300 Hp
Turbo Saratoga (32R-301T)	300 Hp
Turbo SaratogaSP (32R-301T)	300 Hp
Arrow IV (28R-201)	200 Hp
Turbo Arrow IV (28R-201T)	200 Hp

Weight & Balance plotter made standard, shoulder harness becomes fixed rather than detachable; carburetor-ice detector light and digital clock in control wheel become options.

Production since 1981 has been spotty. The ownership of Piper has changed several times and production has been nowhere where it was in the 1960's through 1980's. No major changes have been made in any of the models except for the Arrow, which has lost its T-tail and now sports conventional tail feathers.

Prices continue to escalate. The 1989 Warrior II had a base price of $62,900; the 1990 Arrow base price was $114,300 while the 1989 Saratoga SP listed for $171,990.

Chapter 4
The First Cherokees
The 150, 160 & 180

The first Cherokee rolled out of the Vero Beach factory in 1961 - 83 planes were produced that year. The original plane was a 160 horsepower model, although a 150 horse variation was soon offered.

The new plane was a sensation - it was sleeker and far more comfortable than the tube and fabric planes it replaced. The public grabbed them up as fast as they could be produced. They provided transportation for four, although the fuel load had to be monitored to keep weight and balance on the charts. The planes came with either a 2,150 or 2,200 pound gross weight limit and could carry 125 pounds of baggage (200 pounds with a beef-up kit.) Both featured Lycoming 0-320 engines.

Early models used some antiquated systems carried over from other Piper models--they had a starter button on the panel rather than a key switch, a hand control called a "Johnson Bar" under the panel for the brakes, and used an overhead crank for trim. These "features" would disappear in 1968.

Also found on the first planes was the so-called Hershey Bar wing. This wing was comparatively short and was nicknamed "Hershey Bar" because of its cross-section design.

Economy was a major consideration in the design and the new Cherokee used 400 fewer parts in production than the Tri-Pacer it replaced. It was an unqualified success.

In less than two years, however, the first variant was introduced - the Cherokee 180. This plane, with a Lycoming 0-360 engine, could carry more - gross weight was now 2,400 pounds. It was also faster - maximum speed was 148 mph compared to the 141 top speed of the 160.

Once again the new model sold like hotcakes. Production of these Cherokees is summed up in the following chart through 1972, when the last 180 was built:

Year	150/160	180	Serial Nos	
62-64	568	1,090	28-1	28-1760
65-66	98	1,975	28-1761	28-3835
1967	101	541	28-3836	28-4377
68-69	0	1,233	28-4378	28-5600
1970	0	259	28-5601	28-5859
1971	0	234	7105001	7105234
1972	0	318	7205001	7205318

Over the years numerous improvements were made in the planes. One of the biggest changes occurred in 1967 when the engines were fitted with 1/2 inch valve stems rather than the original 7/16 inch stems. The new valves helped reduce problems with valve sticking and increased TBO (time between overhaul) from 1,200 hours to 2,000 hours.

By now, nearly all of the original engines have had an overhaul of the engine and new 1/2 inch valves have replaced the valves, even on older models. However, every now and then a plane shows up with nearly 30 years on the original engines and the original valves. Obviously, these engines today are accidents just waiting to happen.

Another major change occurred in 1968 when the push-pull throttle and mixture controls were replaced with a lever-type throttle quadrant and a more modern instrument panel. Also new that year was an additional side window which improved both looks and increased visibility.

One of the major advantages of the Cherokee series is its simplicity - simple landing gear and a no-surprise layout result in low maintenance and annual inspection cost. In fact, a survey of owners in 1979 showed 180s with a lower average cost for annual inspections than for such lower- category airplanes as the Cessna Skyhawk and Gulfstream American Cheetah.

The 180 version of the airplane continued in production through 1975, although the name was changed to Challenger in 1973 and then to Archer for 1974 and 1975.

The Challenger and Archer were interim models between the original Cherokee 180 and the much improved Archer II of 1976. These interim models were upgraded in many ways although they did not receive the semi-tapered wing of the Warrior.

The Challenger and Archer models, however, did receive wing extensions which gave them a wing area of 170 square feet, the same as the Archer II, but with a wingspan of only 32 feet.

The cabin was stretched five-inches which gave rear seat passengers more leg room. Performance of these models was nearly identical to that of the former 180 models, although they did enjoy a 50 pound increase in gross weight to 2,450 pounds.

The Challenger and Archer have much to offer over other Cherokee 180s can present. A good one makes a fine buy on the used plane market.

Cherokees have had a number of ADs (see chapter 13), but most have been comparatively minor and have not been overly costly. For example, a 1967 AD required inspection of the fuel tanks for peeling sealant; a 1970 AD called for inspection of the muffler and exhaust system every 50 hours until an improved muffler was fitted; a 1973 AD required inspection of the piston pins; a 1975 AD required replacement of the oil pump shaft and impeller, and a 1978 AD applied to Bendix magnetos and required replacement of impulse couplings.

When considering one of these Cherokees, simply use common sense to avoid a real lemon. Have a mechanic check to be sure the plane is in good general condition, free of corrosion, and that all ADs are complied with.

Obviously, make sure the plane is equipped with 1/2 inch valves (any engine still flying on the original 1,200 TBO after 30 years is a hangar queen which should be avoided at all costs.)

Be alert to the fact that 180s built before 1970 have an engine redline between 2,150 and 2,350 RPM - continuous operation between these limits is prohibited due to the possibility of damaging vibration from the engine-propeller combination.

Another thing to be alert to is the possibility of leaks in the fuel tanks of pre-1967 models. These fuel tanks are a part of the wing and need to be removed for sealing. (See chapter 11.)

Over the years the Cherokee 150, 160 and 180 models have been good investments. After a large dip in value when the planes were new, the price curve leveled off and, recently, has been going up yearly. Many models are now worth more than they were when they were new and, with production at a near standstill, this trend is expected to continue.

So to sum up our discussion of these early Cherokees, they were the best sellers in their class because they did so much. They might not have the advantage in any particular category, but their compromise in the areas of gross weight, speed and simplicity were in the right combination to please more folks more of the time than any competitor. Simply put, they could do more of the things that people wanted a plane to do with more reliability and at a lower cost than any other aircraft on the market.

Some Things to Consider

Here are a few points to consider if you are eyeing one of these planes:

□ These aircraft are getting pretty old. Airframes have a long life expectancy, but no one knows how long. Watch out for corrosion and have your mechanic go over the aircraft carefully looking for any worn parts or systems.

□ Watch out for leaky fuel tanks. If you have them, they need to be removed from the plane and re-sealed. (See chapter on Help.)

□ Early models had Lycoming engines with 7/16 diameter valves. They should have been replaced with 1/2 inch valves by now, but occasionally one is found which has never been changed. They are limited to a 1,200 hour TBO (although the TBO becomes 2,000 hours after the valves are replaced.)

□ It is especially important that log books establish that no major damage has been suffered by the airplane. Planes with severe or extreme usage are subject to Piper service bulletin requiring expensive inspection of the wings.

□ Some problems which have appeared include corrosion at the rear spar (subject to a 1985 service bulletin urging owners to install access plates), cracking of control wheels, and balance weight problems (loose weights).

□ The Challenger and Archer are more sophisticated planes than others in the series, although they do not have all of the features found in the more recent Archer II. They make a good all-around aircraft if you can find one on the market.

Performance & Dimensions

Cherokee 150 & 150
1962-1967

Performance:

(Knots, nautical miles in parentheses)

	150	160
Top Speed (Sea Level)	139 (121)	141 (123)
Cruise:	130 (113)	132 (115)
Best Rate of Climb:	85 (74)	85 (74)
Stall Speed (with flaps):	54 (47)	55 (48)
Fuel Consumption (75% power):	9 gph	9 gph
Range (75%, sea level, std fuel):	490 (426)	500 (435)
Takeoff over 50' obstacle:	1,750 feet	1,700 ft
Ground run:	800 feet	775 ft
Landing over 50' obstacle:	1,890 feet	1,890 ft
Ground run:	535 feet	550 ft
Rate of climb (Sea Level):	660 feet	700 ft
Service Ceiling:	14,300 feet	15,000 ft

Specifications

Fuel capacity, Standard:	36 gallons	36 gallons
Reserve:	50 gallons	50 gallons
Engine:	Lycoming 0-360-E2A	(-B2B)
TBO:	2,000 hours	2,000 hours
Power:	150 hp	160 hp
Wing Span:		30 ft 0 in
Wing Area:		160 sq ft
Length:		23 ft 4 in
Height:		7 ft 4 in
Wing Loading:	13.4 lb/sq ft	13.8 lb/sq ft
Power Loading:	14.3 lb/hp	13.8 lb/hp
Gross Weight:	2,150 lbs	2,200 lbs
Empty Weight:	1,205 lbs	1,210 lbs
Useful Load:	945 lbs	990 lbs
Baggage Capacity:	125 lbs	125 lbs

Performance & Dimensions
Cherokee 180
1963-1972

Performance:
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	148 (129)
Cruise:	142 (123)
Best Rate of Climb:	85 (74)
Stall Speed (with flaps)	57 (49)
Fuel Consumption (75% power):	10 gph
Range (75% at 7,000 ft.)	705 (612)
Takeoff over 50' obstacle:	1,620 feet
Ground run:	775 feet
Landing over 50' obstacle:	1,150 feet
Ground run:	600 feet
Rate of climb (Sea Level):	720 feet
Service Ceiling:	15,700 feet

Specifications

Fuel capacity:	50 gallons
Engine:	Lycoming 0-360-A3A
TBO:	2,000 hours
Power:	180 hp 1
Wing Span:	30 ft 0 in
Wing Area:	160 sq ft
Length:	23 ft 4 in
Height:	7 ft 4 in
Wing Loading:	15 lb/sq ft
Power Loading:	13.3 lb/hp
Gross Weight:	2,400 lbs
Empty Weight:	1,225 lbs
Useful Load:	1,175 lbs
Baggage Capacity:	125 lbs

Performance & Dimensions

Challenger 1973
Archer 1974-1975

Performance:

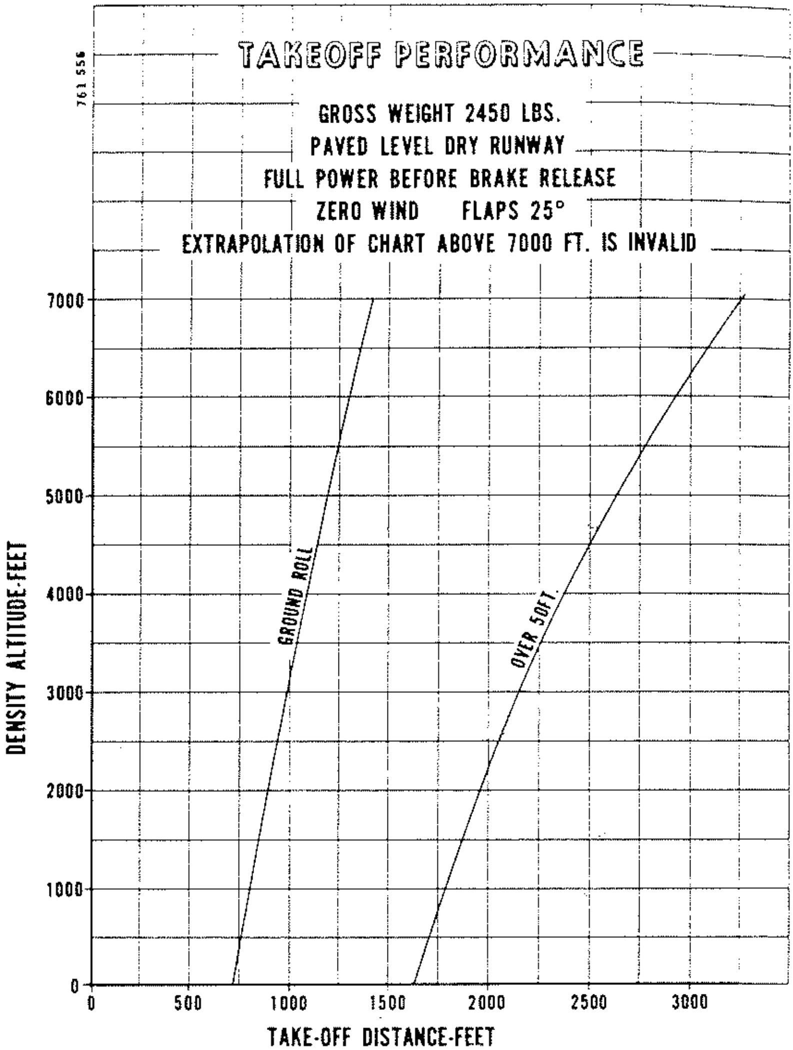
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	148 (129)
Cruise:	142 (123)
Best Rate of Climb:	85 (74)
Stall Speed (with flaps)	61 (53)
Fuel Consumption (75% power):	10.5 gph
Range (75% at 9,300 ft.)	715 (621)
Takeoff over 50' obstacle:	1,560 feet
Ground run:	720 feet
Landing over 50' obstacle:	1,200 feet
Ground run:	635 feet
Rate of climb (Sea Level):	725 feet
Service Ceiling:	14,200 feet

Specifications

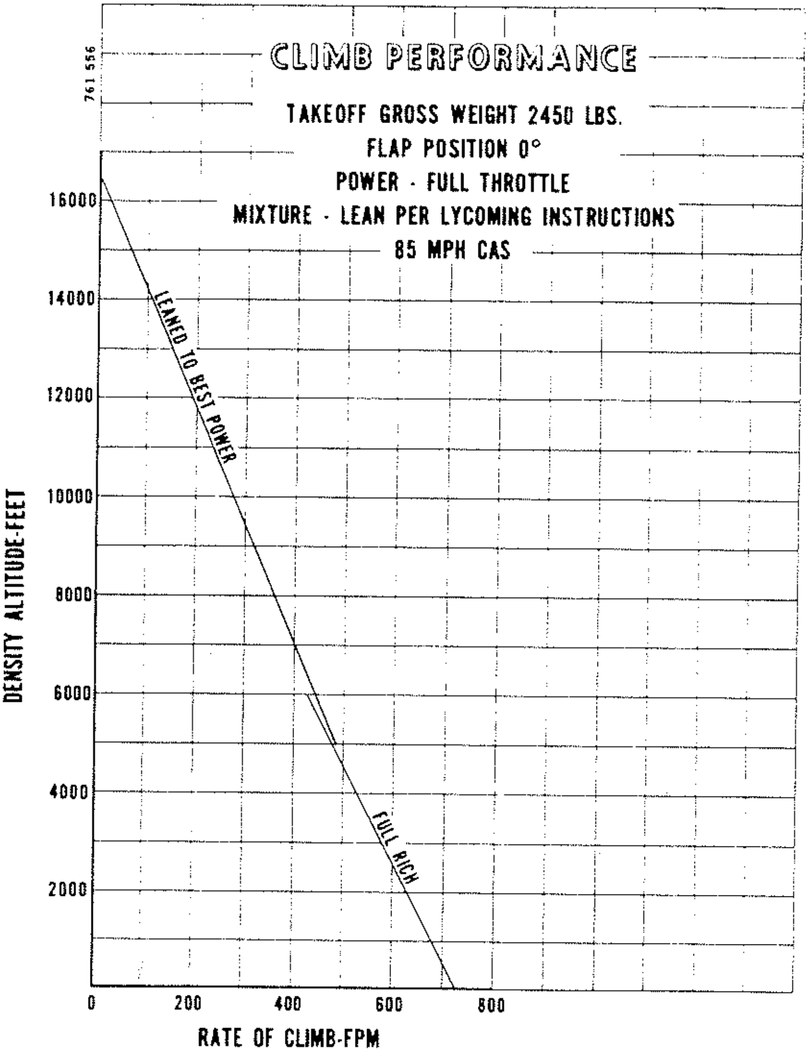
Fuel capacity:	50 gallons
Engine:	Lycoming 0-360-A4A
TBO:	2,000 hours
Power:	180 hp 1
Wing Span:	30 ft 0 in
Wing Area:	170 sq ft
Length:	24 ft 0 in
Height:	7 ft 9 in
Wing Loading:	14.4 lb/sq ft
Power Loading:	13.6 lb/hp
Gross Weight:	2,450 lbs
Empty Weight:	1,386 lbs
Useful Load:	1,064 lbs
Baggage Capacity:	200 lbs

PA-28-180
CHEROKEE



NOTE: SEE SECTION 7 FOR EFFECTS OF AIR CONDITIONING INSTALLATION ON PERFORMANCE.

PA-28-180 CHEROKEE



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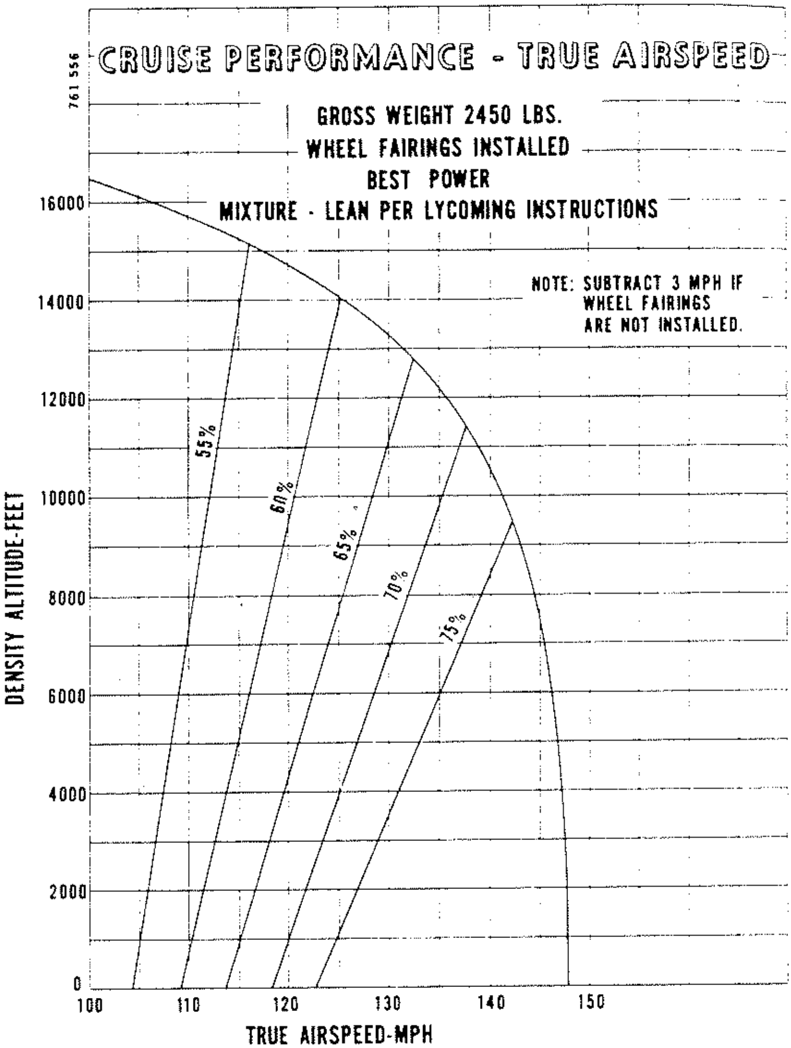

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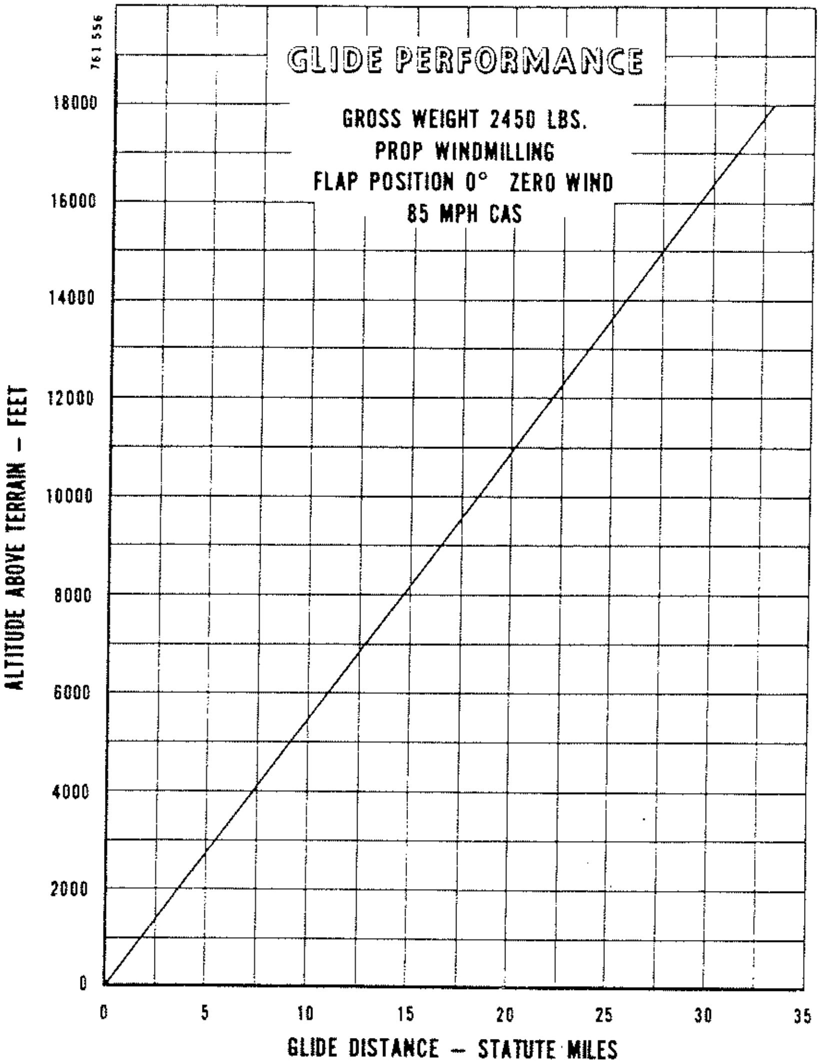


Cherokee 140 is extremely popular. This 1967 model is owned by Arthur F. Yarbrough, of Chugiak, Alaska.

Chapter 5
The Littlest Cherokee
The 140

The Cherokee 140 is the type of plane people get into fights over. Some argue it is a two-seat trainer. Others swear that it is a four-seat family plane. In fact, both are correct - up to a point.

Part of the problem may stem from the fact that Piper did not exactly know what to make of the plane. When first introduced in 1964 it was strictly a two- seat trainer, designed to replace the Colt and provide competition for the Cessna 150. To create the plane Piper stripped a Cherokee 150, including removing the rear seats, and then changed to a climb propeller and limited RPM to 2,450.

The restrictions were short-lived, however. In 1965 the horsepower was increased--back to 150--and in 1966 Piper offered rear seats as an option.

In 1969 the Cruiser model added luxury touches to the plane and, in fact, the rear seat became standard on that model. Sounds a lot like Piper was considering the plane a family plane, right?

So then, in 1971, the factory once again removed the rear seat and created the Flite Liner - a two-seat trainer.

Well, no matter. The plane is what you want it to be. And most of the 140s in the field have had rear seats installed somewhere during their lives. The only problem is that the plane is a bit marginal in performance and some pilots do not do the headwork required to stay out of trouble. Commonly, the scenario involves a pilot out-of- training for a long enough period to simply fly by "feel." He thinks it is a sign of a newcomer to actually do weight-and- balance computations.

But, if you fly a Cherokee 140 you had best get used to doing some computation. A 140, with all seats filled and with full fuel, is like a pet coral snake with a migraine headache. I wouldn't want to fool with it and neither would you.

The plane makes a great beginning airplane and one which many people never outgrow. Some do not like it for long trips, but long trips are simply a succession of short hops and many 140s are flown on cross-country hops regularly. They are readily available - more than 10,000 were produced by Piper. They are simple to maintain and any A&P mechanic can work on it.

Other advantages of purchasing a 140 include its docile handling qualities - it does not have sports car handling, but it will not bite the pilot either. And it has an excellent safety record.

The 1969 and later models are most highly prized, because they have the more modern instrument panel and throttle quadrant. Also, these planes have trim between the seats rather than the more quaint (but difficult to remember) overhead crank trim.

The fact is, any Cherokee 140 is popular today. Here is a chart which shows the total 140 production in its 14 year history:

Year	Total Produced	Serial Numbers	
1964	655	28-20001	28-20655
1965	731	28-20656	28-21386
1966	1,193	28-31387	28-22579
1967	1,533	28-22580	28-24112
1968	887	28-24113	28-24999
1969	1,401	28-25000	28-26400
1970	546	28-26401	28-26946
1971	641	7125001	7125641
1972	602	7225001	7225602
1973	674	7325001	7325674
1974	444	7425001	7425444
1975	340	7525001	7525340
1976	275	7625001	7625275
1977	290	7725001	7725290

Air conditioning, available since 1972, was a mixed blessing. It did provide more comfort in very hot locales, but its weight and drag exerted a high penalty in a plane which was already marginal in performance.

The fuel tanks hold 50 gallons with tabs marking the 36 gallon position. In fact, the original literature claimed 36 gallons of fuel with 50 listed as being a reserve amount. Even Piper was concerned about the possibility Pilots would fill the tanks and then try flying with full seats - an impossibility in the 140.

Speaking of fuel, the 140 operates well on auto fuel, making an economical plane even less expensive to operate (see chapter 13).

The 140 shares a cabin with the other PA-28 models, so it is more comfortable on cross-country trips than smaller planes, such as the 150. Rear seat comfort, however, leaves a lot to be desired for extended flying.

Like other planes available today, the 140 has been an excellent investment. Originally, the plane did not fare as well as other Cherokees because of its reputation as a trainer. Today, however, the prices are escalating and it is not unusual for an owner to fly a plane for several years and then sell it for more than he paid for it.

Some Things to Consider

☐ The 140 is a great little plane, but simply because it has four seats is no reason to expect it to fly with those seats filled and with full fuel. There is just not much performance available from that little engine so be sure to plan on doing weight-and-balance calculations whenever there is any doubt.

☐ Watch out for leaky fuel tanks. If you have them, they need to be removed from the plane and re-sealed. (See chapter on Help.)

☐ Early models had Lycoming engines with 7/16 diameter valves. They should have been replaced with 1/2 inch valves by now, but occasionally one is found which has never been changed. They are limited to a 1,200 hour TBO (although the TBO becomes 2,000 hours after the valves are replaced.)

☐ It is especially important that log books establish that no major damage has been suffered by the airplane. Planes with severe or extreme usage are subject to Piper service bulletin requiring expensive inspection of the wings.

☐ Early models (before 1969) had the older style panel with non-standard instrument placement. They are not as popular as the newer style planes.

☐ Some problems which have appeared include corrosion at the rear spar (subject to a 1985 service bulletin urging owners to install access plates), cracking of control wheels, and balance weight problems (loose weights).

Performance & Dimensions

Cherokee 140, Cruiser, Fliteliner
1964-1977

Performance:

(Knots, nautical miles in parentheses)

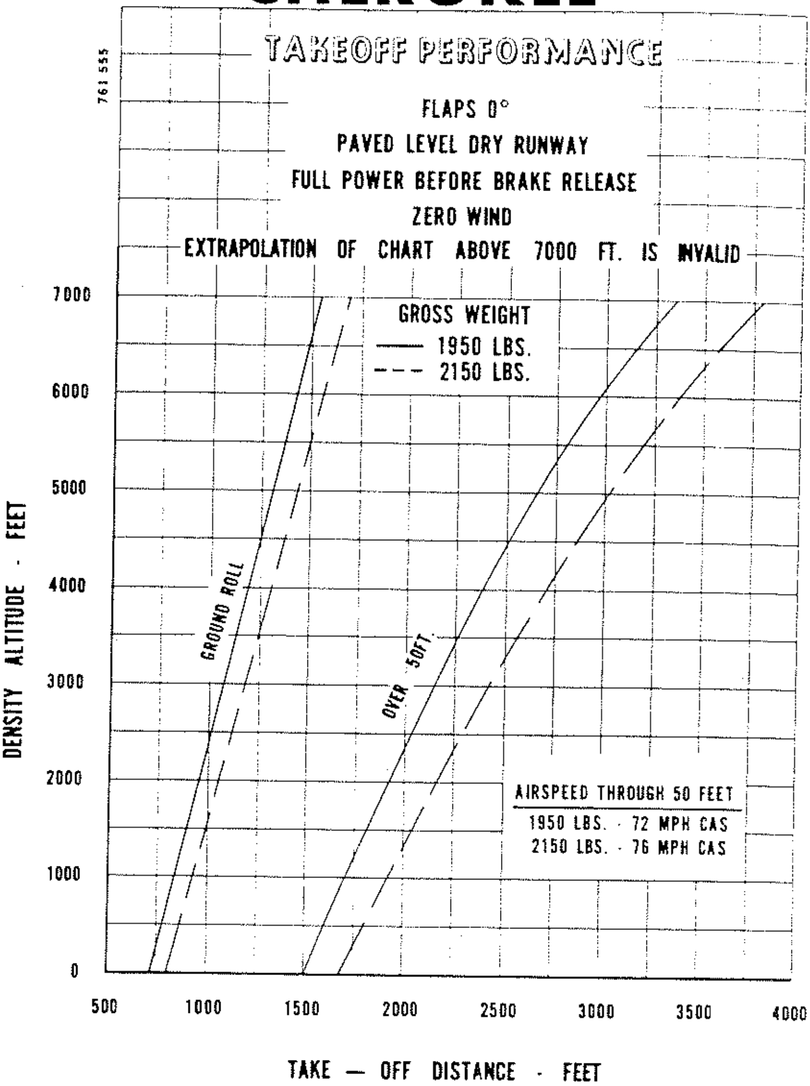
Top Speed (Sea Level)	142 (123)*
Cruise:	135 (117)*
Best Rate of Climb:	89 (77)
Stall Speed (with flaps)	55 (48)
Fuel Consumption (75% power):	8.4 gph
Range (75% at 7,000 ft.)	720 (626)
Takeoff over 50' obstacle:	1,700 feet
Ground run:	800 feet
Landing over 50' obstacle:	1,090 feet
Ground run:	535 feet
Rate of climb (Sea Level):	631 feet
Service Ceiling:	10,950 feet

Specifications

Fuel capacity (Standard):	36 gallons
(Full Tanks)	50 gallons
Engine:	Lycoming 0-320-E2A
TBO:	2,000 hours
Power:	150 hp
Wing Span:	30 ft 0 in
Wing Area:	160 sq ft
Length:	23 ft 4 in
Height:	7 ft 4 in
Wing Loading:	13.4 lb/sq ft
Power Loading:	14.3 lb/hp
Gross Weight:	2,150 lbs
(Early 140 Hp models)	1,950 lbs
Empty Weight:	1,274 lbs
Useful Load:	876 lbs
(Early 140 Hp models)	676 lbs
Baggage Capacity:	200 lbs

*Subtract 3 mph without wheel fairings.

PA-28-140 CHEROKEE



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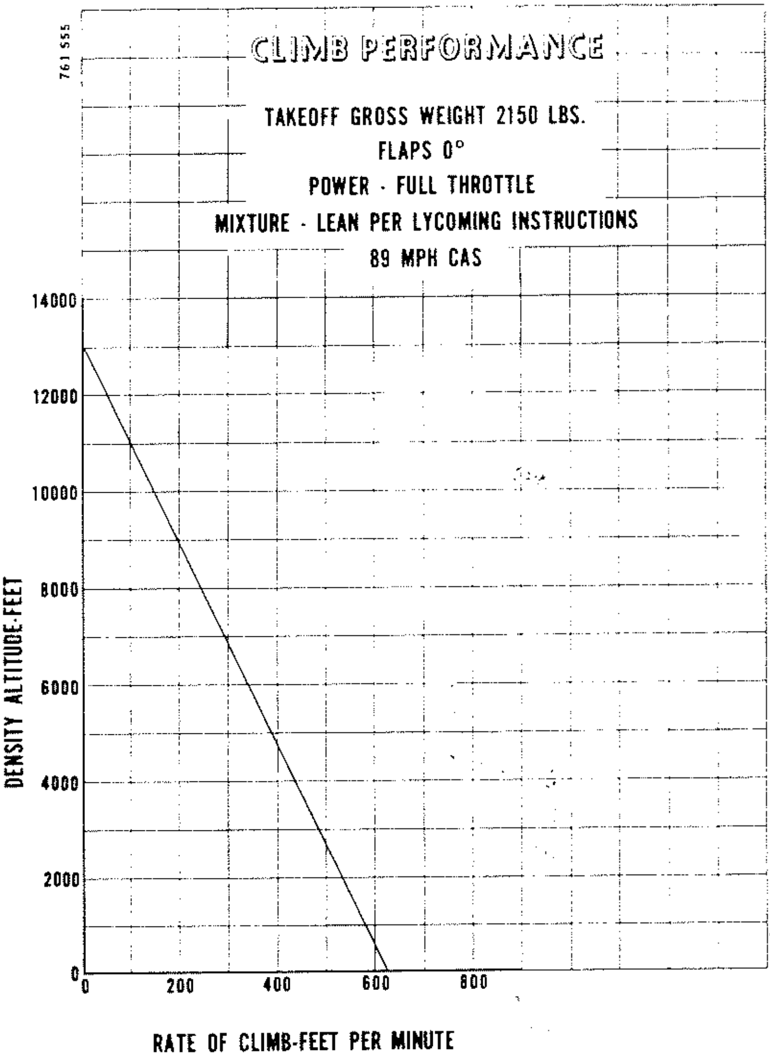

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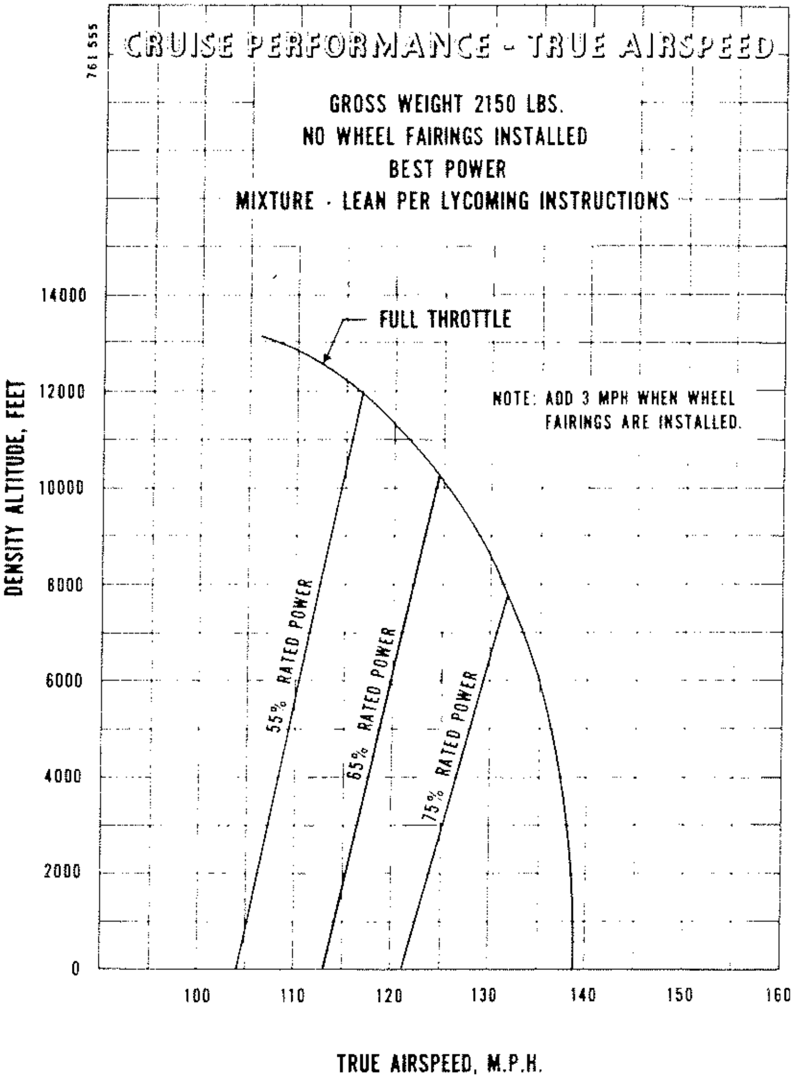

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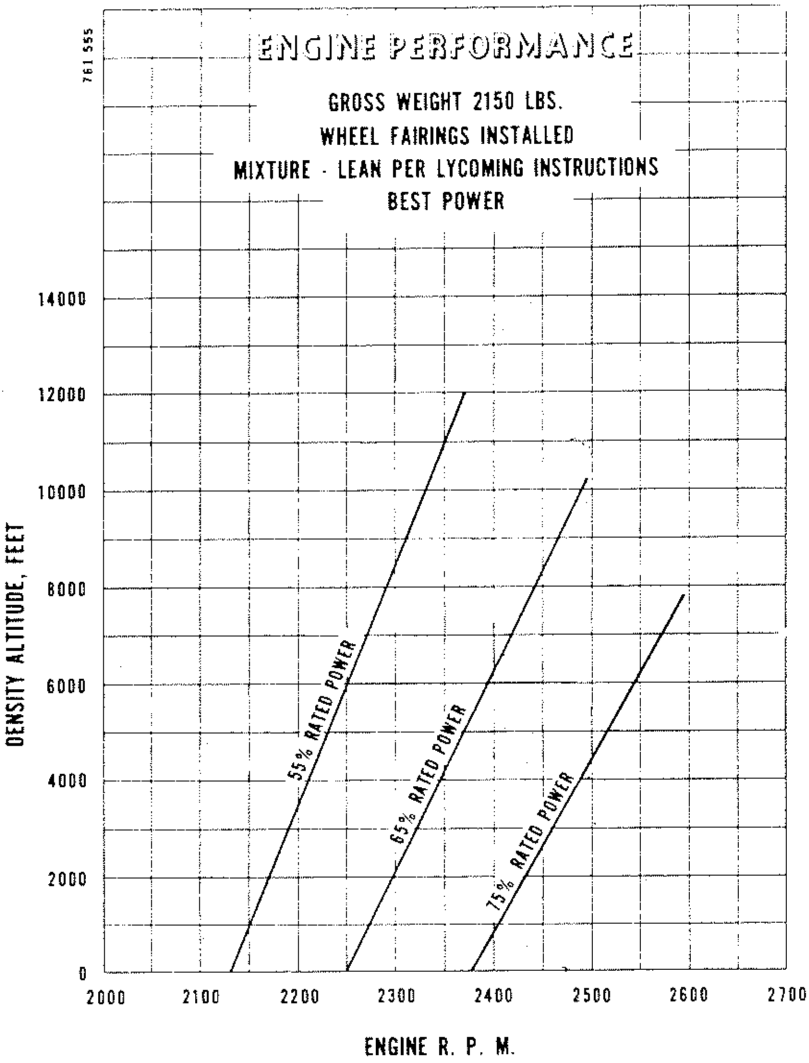
CHEROKEE



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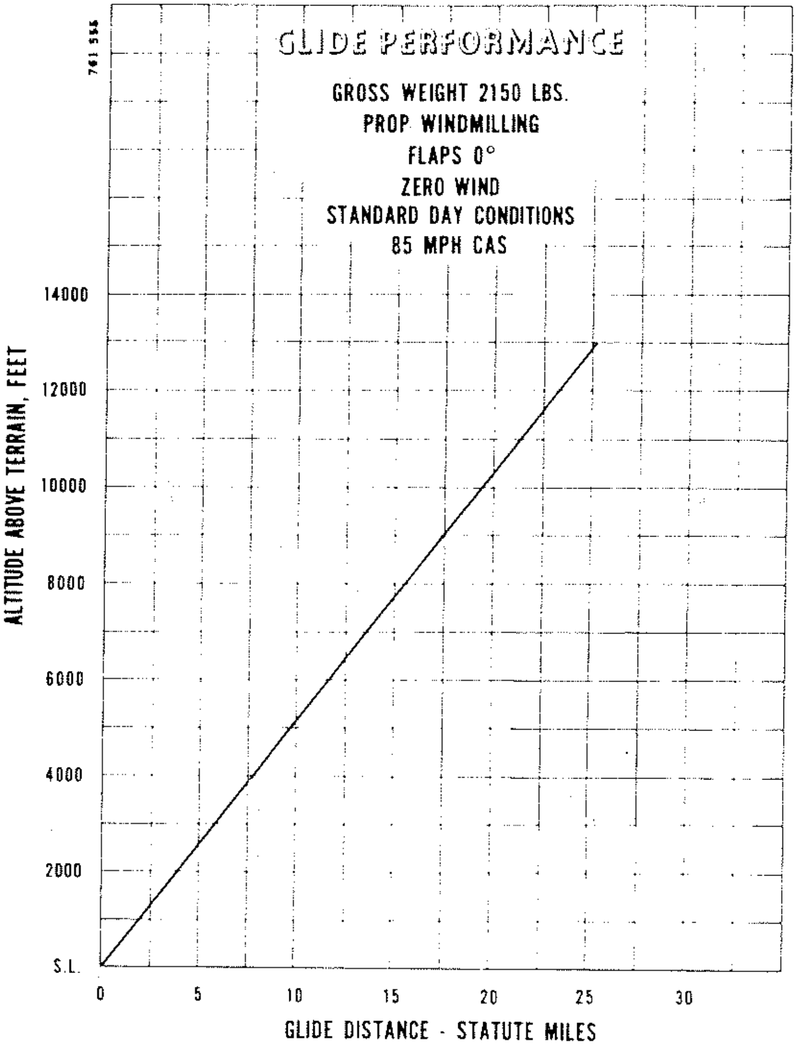


Cherokee Warrior shown coming in for a landing.

Chapter 6
A Sportier Wing
The Warrior

The Warrior was the first of the new, improved models which used a new semi-tapered laminar flow wing to provide a little better performance. The wing would prove so popular that within a few years it would be used on the entire Cherokee fleet.

The wings accomplished several things. They offered a nicer, lighter and crispier control feel than the previous "Hershey Bar" wings. Climb rate improved because of the higher aspect ratio of the new wings. And they looked a whole lot better.

No doubt they also increased the cost of the plane. The original constant- chord wing was chosen partly for its production economy. It could be cut from one piece of aluminum and, because of its short, stubby quality, could easily be packed in crates for overseas shipping. The new wing abandoned these "advantages."

The new wing was 35 feet long with an area of 170 square feet, compared to 30 feet and 170 square feet on the Cherokee 140.

A problem soon developed. A Warrior doing a barrel roll in Sweden in 1974 shed its wing. A check showed that the original Warrior wing would not withstand the 5.7 g load required by the FAA, so an emergency AD was issued limiting gross weight until a beef-up kit was added to the wing.

The design was changed and models after serial number 74-15538 received the new wing. No more problem.

The stall characteristics, good in previous Cherokees, became even better with the new wing. The outboard wing sections had a different taper than the wing root, which permitted them to retain control even when the inboard sections were stalled.

But all was not gravy. The new Warrior remained in production alongside the old Cherokee 140 for several years and the 140 could out-perform the Warrior in several areas. Top speed on the 140 was seven mph greater. Cruise speed was two mph better. Stall speed was three mph less. And takeoff distance over a 50-foot obstacle increased by 60 feet, with the takeoff roll increasing a whopping 265 feet.

In fairness to the Warrior, part of the difference has to do with the size of the machine - the Warrior had a gross weight of 2,325 pounds with a payload of 1,024 pounds compared to the 140's gross weight of 2,150 pounds and payload of only 876 pounds. Certainly the Warrior was closer to being a family machine than the 140 had been. And compared to its original objective - to provide a good alternative for buyers as compared to the Cessna 172 - the Warrior showed its mettle. The Warrior has a higher useful load than the 172, had a higher top speed, and has more interior room.

Unfortunately, for Piper, it did not sell as well as the 172, partly because of the larger Cessna dealer network which used Cessnas as trainers and then sold planes to their customers.

The Warrior, like other Cherokee clones, received its fair share of changes over the years. In 1977, at the same time the 140 was dropped from the line, the Warrior II was introduced, with a 160 horsepower engine (the same year Cessna upped the 172 engine to 160 horsepower, but adopted the ill-fated 0- 320-H version of the engine.)

Performance - takeoff distance, climb, and cruise speed - improved, and the engine could supposedly handle 100 LL fuel better than the 150 horse version. The new Piper engine did not suffer the cam and valve problems which Cessna suffered on its new engine.

In 1978 the plane was increased with new wheel pants which cleaned up the plane and resulted in a seven knot increase in cruise speed.

Although the Warrior did not sell as fast as its competitor, it was no slouch in the sales department, as reflected in the following chart:

Year	Model	Total Produced	Serial Numbers	
1974	151	703	74-15001	74-15703
1975	151	449	75-15001	75-15449
1976	151	435	76-15001	76-15435
1977	151	314	77-15001	77-15314
1977	161	323	77-16001	77-16323
1978	161	680	78-16001	78-16680

1979	161	598	79-16001	79-16598
1980	161	373	80-16001	80-16373
1981	161	322	81-16001	81-16322
1982	161	226	82-16001	82-16226
1983	161	109	83-16001	83-16109
1984	161	131	84-16001	84-16131
1985	161	99	85-16001	85-16099
1986	161	10	86-16001	86-16010

The Warrior wing carries 50 gallons of fuel and, with a fuel burn of 8 1/2 gallons per hour at 75 percent cruise, the plane has a generous endurance - more than the kidneys of many pilots and passengers!

Although the Warrior is improved compared to the 140, its payload still is not enough for full fuel and full seats. You can count on filling three seats with a little baggage with full fuel. Also, with gross weight, takeoff will not resemble that of a 747, especially in hot weather. Do the weight-and-balance and performance calculations before taking off or landing when you are at or near gross.

Another change in the Warrior over its predecessors involves ground handling - the nosewheel is connected to the rudder pedals by springs rather than directly. This makes the plane a joy to handle in ground operations.

The Warrior is a simple plane which has had no unusual maintenance problems in the field, other than the same gripes which affect just about every airplane. Maintenance and annual inspection costs are low - just about any mechanic knows the plane inside and out.

The planes originally came with aluminum battery cables which tend to cause poor starting, particularly in cold weather. Several companies make kits to replace these cables with copper ones at nominal cost.

Later model versions, like those of other Cherokee variants, tend to use more soundproofing and more luxurious interiors which make for more pleasant cabins, but at the cost of higher empty weights and lower payloads.

The Warrior is not as good a performer as the Archer, but its lower price makes it just right for a lot of people on the used-plane market.

A new variation was introduced in 1988 - the Cadet - which was basically a stripped down Warrior intended for flight training. This plane was only offered to flight- schools, however, and not many were made.

Some Things to Consider

☐ If you are interested in a very early Warrior, one with serial number earlier than 74-15538, make sure the log-books show that the beef-up kit was installed to the wings.

☐ As with other Cherokee models, it is important that log books establish that no major damage has been suffered by the airplane. Planes with severe or extreme usage are subject to Piper service bulletin requiring expensive inspection of the wings.

☐ The 160 horse versions of the plane offered much better performance, but all Warriors are somewhat marginal in performance at high gross weights - especially in high, hot and humid conditions.

Performance & Dimensions
Warrior
1974-1977

Performance:
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	135 (117)
Cruise:	133 (115)
Best Rate of Climb:	91 (79)
Stall Speed (with flaps)	58 (50)
Fuel Consumption (75% power):	8.5 gph
Range (75% at 7,000 ft.)	720 (626)
Takeoff over 50' obstacle:	1,760 feet
Ground run:	1,065 feet
Landing over 50' obstacle:	1,115 feet
Ground run:	595 feet
Rate of climb (Sea Level):	649 feet
Service Ceiling:	12,700 feet

Specifications

Fuel capacity:	50 gallons
Engine:	Lycoming 0-320-E3D
TBO:	2,000 hours
Power:	150 hp 1
Wing Span:	35 ft 0 in
Wing Area:	170 sq ft
Length:	23 ft 9 in
Height:	7 ft 4 in
Wing Loading:	13.7 lb/sq ft
Power Loading:	15.5 lb/hp
Gross Weight:	2,325 lbs
Empty Weight:	1,301 lbs
Useful Load:	1,024 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions

Warrior II
1977 Up

Performance:

(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	146 (127)
Cruise:	141 (123)
Best Rate of Climb:	91 (79)
Stall Speed (with flaps)	51 (44)
Fuel Consumption (75% power):	8.5 gph
Range (75% at 7,000 ft.)	679 (590)
Takeoff over 50' obstacle:	1,650 feet
Ground run:	1,050 feet
Landing over 50' obstacle:	1,160 feet
Ground run:	625 feet
Rate of climb (Sea Level):	644 feet
Service Ceiling:	11,000 feet

Specifications

Fuel capacity:	50 gallons
Engine:	Lycoming 0-320-D3G
TBO:	2,000 hours
Power:	160 hp 1
Wing Span:	35 ft 0 in
Wing Area:	170 sq ft
Length:	23 ft 9 in
Height:	7 ft 4 in
Wing Loading:	13.7 lb/sq ft
Power Loading:	15.3 lb/hp
Gross Weight:	2,325 lbs
Empty Weight:	1,391 lbs
Useful Load:	934 lbs
Baggage Capacity:	200 lbs

Chapter 7
The Upgraded 180
The Archer II

Like the smaller Cherokees, the 180 became more sophisticated, eventually becoming the Challenger and Archer, before finally getting the improved Warrior- type wing in 1977 with the introduction of the Archer II.

The Archer II, however, introduced in 1976, was the first of the 180 horse Cherokees to sport the semi-tapered wing. Gross weight went up another 100 pounds to 2,550 and cruise speed increased three miles per hour to 145, while stall speed dropped from 61 to 54 miles per hour.

The Archer II has been one of the most popular Cherokees since its introduction. It has consistently retained more of its value than any other Cherokee model. Perhaps that is because, like its predecessor, the 180, it does a better job doing the kind of flying people like to do than anything in its class. It generally will fly well with four on board and full fuel, although careful weight and balance analysis is called for, especially with any baggage on board. And its 0- 360 engine combined with a fixed-pitch propeller contribute to flying ease and economy in spades.

Routine maintenance and annual inspections are as easy as with any of the smaller Cherokees with a cost to match.

The Archer II is a plane which does not take a back seat to anyone in the luxury department. And there are a lot of them around for the used plane buyer to choose from. Here is the production chart (includes both Challenger and Archer models):

Year	Total Produced	Serial Numbers	
1976	476	76-90001	76-90476
1977	607	77-90001	77-90607
1978	551	78-90001	78-90551

1979	589	79-90001	79-90589
1980	372	80-90001	80-90372
1981	313	81-90001	81-90313
1982	178	82-90001	82-90178
1983	90	83-90001	83-90090
1984	114	84-90001	84-90114
1985	92	85-90001	85-90092
1986	21	86-90001	86-90021

The Archer II is a study in simplicity. With a fixed pitch prop, everything from starting the engine to setting power settings in cruise is a by- the-book experience.

Economy is an Archer watchword. With fuel burn at 10.5 gallons per hour (75 percent) and a simple airframe requiring little maintenance, the Archer can fly for little more money per hour than a much slower, less capable aircraft. Combined with its standard 50 gallon tanks, the aircraft has a three hour and fifty minute duration (with a 45 minute reserve).

The 0-360 Lycoming has been described as "bulletproof," and it certainly has shown its mettle in the field. Carefully flown, a 0-360 has a very good chance of making it to TBO.

The Archer II, like other products of recent years, packs a lot of luxury into the airframe. Unfortunately, the sound deadening packages and velour interiors tend to bring the basic weight up, cutting down the useful load. But there is no doubt the increased feeling of comfort and luxury is an additional reason that the Archer II outsold its rivals from Cessna since the day of its introduction.

Handling, as with other Cherokees, holds no surprises. The plane is completely controllable through the stall, which arrives with just a shudder and no violent break. The manual flap system, a favorite of Piper owners, does a good job of slowing the plane and allowing "greaser" landings.

To sum it up, the Archer II qualifies for the designation of "Chevrolet of the air." It is not as sporty as some planes and cannot haul as much as others, but it has the right combination to merit its selection as a family plane for more pilots than any other model.

Some Things to Consider

☐ As with other Cherokees, it is important that log books establish that no major damage has been suffered by the airplane. Planes with severe or extreme usage are subject to Piper service bulletin requiring expensive inspection of the wings.

Performance & Dimensions

Archer II
1976 Up

Performance:

(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	148 (129)
Cruise:	145 (126)
Best Rate of Climb:	85 (74)
Stall Speed (with flaps)	54 (47)
Fuel Consumption (75% power):	8.8 gph
Range (75% at 7,000 ft.)	690 (600)
Takeoff over 50' obstacle:	1,660 feet
Ground run:	870 feet
Landing over 50' obstacle:	1,390 feet
Ground run:	925 feet
Rate of climb (Sea Level):	735 feet
Service Ceiling:	13,650 feet

Specifications

Fuel capacity:	50 gallons
Engine:	Lycoming 0-360-A4M
TBO:	2,000 hours
Power:	180 hp 1
Wing Span:	35 ft 0 in
Wing Area:	170 sq ft
Length:	23 ft 9 in
Height:	7 ft 4 in
Wing Loading:	15.0 lb/sq ft
Power Loading:	14.2 lb/hp
Gross Weight:	2,550 lbs
Empty Weight:	1,413 lbs
Useful Load:	1,137 lbs
Baggage Capacity:	200 lbs

Cherokee 235 is a Workhorse. This Pathfinder is owned by Pathfinder Flying, Inc., of Oklahoma City, Oklahoma.

Chapter 8
The Heavy Haulers
The 235 & 236

The Cherokee 235 and 236 are the workhorses of the Cherokee fleet. They may not be fast, but they can haul just about anything you can stuff into them, and that has made for a pretty popular Indian. Although in 1973 they were given some interesting new names - Charger and later Pathfinder, and in 1976, with the new semi-tapered wing, the line became known as the Dakotas, each of the planes remained faithful to the original concept - heavy hauling, stiff-legged machines with operating economy thrown in for good measure.

The planes do not have retractable gear, so they are more reliable and cheaper to maintain than more complex machines. And in further conformity to the KISS principle (keep it simple, stupid), Piper offered the early models with a fixed-pitch propeller, although a constant-speed propeller was available as an option.

The Lycoming 0-540 engine, rated at 235 horsepower, is generally glitch- free, providing reliability and contributing to the model's reputation for economy. Although the plane is thirsty when compared to other PA-28 models (figure about 13 gph at 75 percent power), the plane can also do a lot more than its smaller brethren.

So let's take a look at how the model developed over the years.

The first 235, introduced in 1964, weighed in at 1,435 pounds and had a gross weight of 2,900 pounds. In other words, the useful load of 1,465 pounds was actually greater than the weight of the plane itself! Velour upholstery and other "improvements" on later models have greatly contributed to increased empty weight of the planes, but all of these planes are heavy haulers.

Early models, through 1967, carried 50 gallons of fuel in the wings, but could be ordered with optional tip tanks which provided an additional 34 gallons. In 1968 Piper made the 84 gallon configuration standard.

In 1973 Piper introduced the Charger which provided the same basic performance, but with a cabin which had been stretched five inches and an additional 100 pounds added to the gross. The 1974 version was called the Pathfinder and it provided a higher degree of luxury of appointments and new soundproofing, including a 1/4 inch windshield.

However, it was in 1979 that Piper really introduced something new in the Dakota. This was the first time the heavy Cherokees got the new semi-tapered "Warrior" wings. The engine was also rated to operate on 100 octane fuel, rather than the 80 octane previously used by the 235 models.

Owners praise the series for its ability to haul people and goods - all four seats can be filled, along with the fuel tanks and generally there is still a little left over for luggage. This cannot be said for many single- engine four-seat aircraft.

The planes have much better short field and climb performance than other Cherokees, thanks to the much higher horsepower. Handling, like other Cherokees, is crisp, but not sports-car like. It has benign stall qualities and tends to just hang in there at the point of stall.

Cockpit controls are convenient and, if you are used to smaller Cherokees, you will find the 235 or 236 to be very comfortable to fly.

And for anyone who wants to fly both heavy and high, Piper did offer the Turbo-Dakota, but that model was available in one year only - 1979. These planes came equipped with a lower-horsepower engine, the 200 horsepower Continental TSIO-360 which cut down the takeoff and climb performance, but gave this model a big edge in cruise speed at high altitudes. There is a slight decrease in useful load, but this may be more than made up for by the increased speed in the eyes of some owners.

However, you may be hard pressed to find one of these models. Only 90 of these planes were built before it was discontinued. And how did the rest of the line sell? Here is a chart showing production of 235 and 236 models since 1964:

Year	Model	Total Produced	Serial Numbers	
1964	235	585	28-10000	28-10584
1965	235	135	28-10585	28-10719
1966	235	121	28-10720	28-10840

1967	235	159	28-10841	28-10999
1968	235	227	28-11000	28-11226
1969	235	74	28-11227	28-11300
1970	235	78	28-11301	28-11378
1971	235	28	71-10001	71-10028
1972	235	23	72-10001	72-10023
1973	235	176	73-10001	73-10176
1974	235	109	74-10001	74-10109
1975	235	135	75-10001	75-10135
1976	235	181	76-10001	76-10181
1977	235	89	77-10001	77-10089
1979	236	335	79-11001	79-11335
1980	236	151	80-11001	80-11151
1981	236	96	81-11001	81-11096
1982	236	45	82-11001	82-11045
1983	236	25	83-11001	83-11025
1984	236	31	84-11001	84-11031
1985	236	20	85-11001	85-11020
1986	236	4	86-11001	86-11004

So the 235 and 236 models have been popular over the years. To understand the reasons for their popularity you only have to look at the plane itself. Here is a four-place plane which can generally carry four people - an oddity in the aircraft marketplace. It consumes some fuel, but not an excessive amount when you consider what it can haul.

It is reliable and does not cost an arm and a leg for routine maintenance. Its simple systems have not been subject to an inordinate number of ADs or service bulletins and the cost of maintenance is not much higher than other Cherokees.

Further, the plane is easy to fly and, if you can fly one of the smaller Cherokees, you will have no trouble at all in making a transition to one of these bigger birds.

The major drawback: these planes are not speed demons - plan on cruise speeds of from 153 to 166 mph. But they are plenty fast for many people who are more interested in payload than speed records.

Early models were designed to operate on 80 octane fuel - a problem when 80 octane fuel was phased out, but today these engines operate easily on auto fuel, while the other engines do not - a consideration for many people trying to decide on whether to get a model made before or after 1979. These planes have a loyal following and many of these owners would never even consider another plane.

Some Things to Consider

☐ Fuel management is a bit of a problem with two main and two tip tanks. Some fuel starvation accidents have resulted. Models prior to the Dakota had the fuel selector under the throttle quadrant - easier to see than the Dakota's left side panel placement.

☐ Turbo Dakota has had problems with high engine temperatures. Turbos, in general, tend to run hotter and have more engine problems than non-turbo models.

☐ Early models used 80 octane fuel. This was a problem when 100 LL came into widespread use, but today, the 80 octane engines can be utilized with auto fuel, while the later models cannot - a consideration when planning hourly cost.

☐ Dakota wheel fairings increase top speed, but also have a tendency to break and need repair.

☐ Charger and later models have the stretched (five inch) cabin and offer more room for rear seat passengers.

Performance & Dimensions
Cherokee 235
1964-1972

Performance:
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	166 (144)
Cruise:	156 (135)
Best Rate of Climb:	100 (87)
Stall Speed (with flaps)	60 (52)
Fuel Consumption (75% power):	13 gph
Range (75% at 7,000 ft.)	858 (745)
Takeoff over 50' obstacle:	1,040 feet
Ground run:	600 feet
Landing over 50' obstacle:	1,060 feet
Ground run:	550 feet
Rate of climb (Sea Level):	825 feet
Service Ceiling:	14,500 feet

Specifications

Fuel capacity:	50 gallons
(Optional)	84 gallons
Engine:	Lycoming 0-540-B4B5
TBO:	1,800 hours
Power:	235 hp 1
Wing Span:	32 ft 0 in
Wing Area:	160 sq ft
Length:	23 ft 8 in
Height:	7 ft 3 in
Wing Loading:	18.1 lb/sq ft
Power Loading:	12.3 lb/hp
Gross Weight:	2,900 lbs
Empty Weight:	1,435 lbs
Useful Load:	1,465 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions
Cherokee 235, Charger, Pathfinder
1973-1977

Performance:
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	166 (144)
Cruise:	153 (133)
Best Rate of Climb:	98 (85)
Stall Speed (with flaps)	61 (53)
Fuel Consumption (75% power):	13 gph
Range (75% at 7,000 ft.)	858 (745)
Takeoff over 50' obstacle:	1,260 feet
Ground run:	800 feet
Landing over 50' obstacle:	1,740 feet
Ground run:	1,040 feet
Rate of climb (Sea Level):	800 feet
Service Ceiling:	13,550 feet

Specifications

Fuel capacity:	82 gallons
Engine:	Lycoming 0-540-B4B5
TBO:	1,800 hours
Power:	235 hp 1
Wing Span:	32 ft 0 in
Wing Area:	170 sq ft
Length:	24 ft 1 in
Height:	7 ft 6 in
Wing Loading:	17.6 lb/sq ft
Power Loading:	12.8 lb/hp
Gross Weight:	3,000 lbs
Empty Weight:	1,592 lbs
Useful Load:	1,408 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions
Dakota
1979 Up

Performance:
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	170 (148)
Cruise:	166 (144)
Best Rate of Climb:	98 (85)
Stall Speed (with flaps)	64 (56)
Fuel Consumption (75% power):	13.6 gph
Range (75% at 7,000 ft.)	748 (650)
Takeoff over 50' obstacle:	1,216 feet
Ground run:	886 feet
Landing over 50' obstacle:	1,725 feet
Ground run:	825 feet
Rate of climb (Sea Level):	1,115 feet
Service Ceiling:	17,500 feet

Specifications

Fuel capacity:	72 gallons
Engine:	Lycoming 0-540-J3A5D
TBO:	2,000 hours
Power:	235 hp 1
Wing Span:	35 ft 0 in
Wing Area:	170 sq ft
Length:	24 ft 8 in
Height:	7 ft 4 in
Wing Loading:	17.7 lb/sq ft
Power Loading:	12.8 lb/hp
Gross Weight:	3,000 lbs
Empty Weight:	1,610 lbs
Useful Load:	1,390 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions
Turbo Dakota
1979 (Only Year Made)

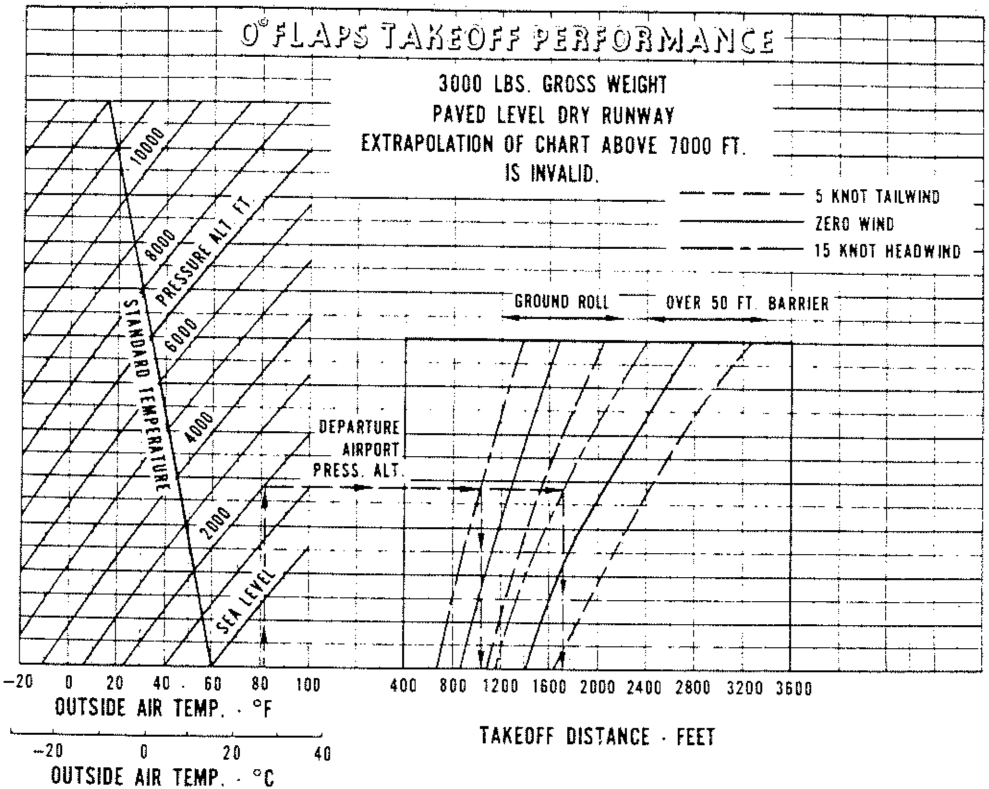
Performance:
(Knots, nautical miles in parentheses)

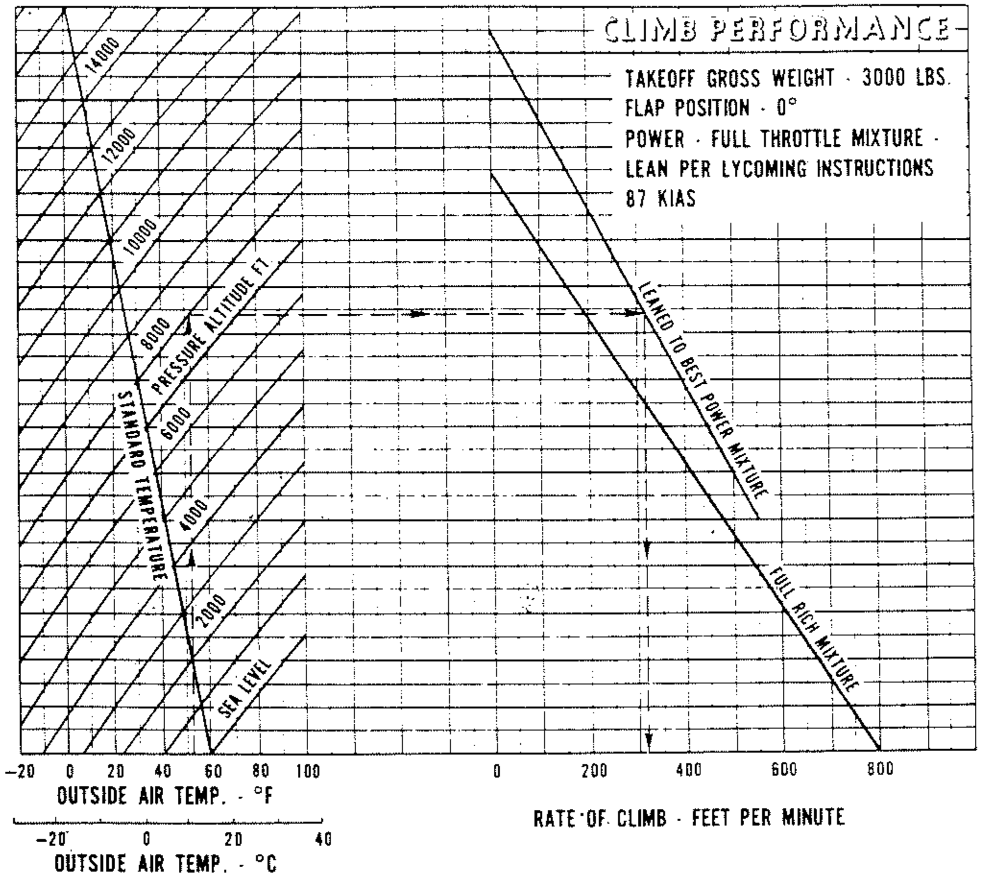
Cruise:	
75% @ 12,000 ft	166 (144)
65% @ 12,000 ft	157 (136)
65% @ 20,000 ft	174 (151)
Stall Speed (with flaps)	67 (58)
Best Climb:	98 (85)
Range (65% at 18,000 ft.)	1,036 (900)
Takeoff over 50' obstacle:	1,402 feet
Ground run:	963 feet
Landing over 50' obstacle:	1,697 feet
Ground run:	861 feet
Rate of climb (Sea Level):	902 feet
Service Ceiling:	20,000 feet

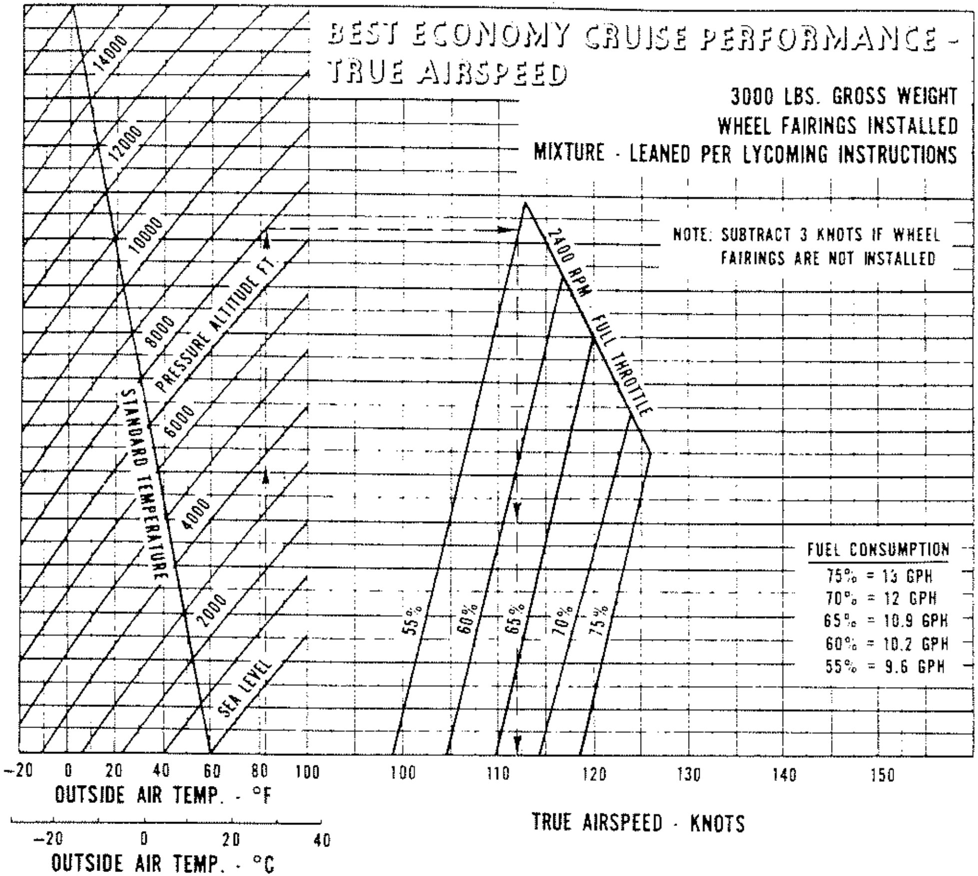
Specifications

Fuel capacity:	72 gallons
Engine:	Continental TSI0-360-FB
TBO:	1,400 hours
Power:	200 hp 1
Wing Span:	35 ft 0 in
Wing Area:	170 sq ft
Length:	24 ft 8 in
Height:	7 ft 4 in
Wing Loading:	17.0 lb/sq ft
Power Loading:	14.5 lb/hp
Gross Weight:	2,900 lbs
Empty Weight:	1,563 lbs
Useful Load:	1,337 lbs
Baggage Capacity:	200 lbs

Example:
Departure airport pressure altitude: 2000 ft.
Departure airport outside air temperature: 27
Surface wind: 15 knot headwind
Ground roll: 1020 ft.
Total takeoff distance: 1720 ft.




CLIMB PERFORMANCE
TAKEOFF GROSS WEIGHT - 3000 LBS.
FLAP POSITION - 0°
POWER - FULL THROTTLE MIXTURE -
LEAN PER LYCOMING INSTRUCTIONS
87 KIAS
14000
12000
10000
8000
6000
4000
2000
SEA LEVEL
PRESSURE ALTITUDE FT.
STANDARD TEMPERATURE
LEANED TO BEST POWER MIXTURE
FULL RICH MIXTURE
-20 0 20 40 60 80 100
OUTSIDE AIR TEMP. - °F
-20 0 20 40
OUTSIDE AIR TEMP. - °C
0 200 400 600 800
RATE OF CLIMB - FEET PER MINUTE



Example:
Cruise pressure altitude: 8000 ft.
Cruise outside air temperature: 27°C
Cruise power: 55%
Cruise true airspeed: 112 knots

PA-28-235

Power Setting Table - Lycoming O-540-B Engine - Constant Speed Propeller

Press. Alt 1000 Feet	Std Alt Temp °F	129 HP – 55% Rated RPM AND MAN. PRESS.				153 HP – 65% Rated RPM AND MAN. PRESS.				176 HP – 75% Rated RPM AND MAN. PRESS.				Press. Alt 1000 Feet
		2100	2200	2300	2400	2100	2200	2300	2400	2100	2200	2300	2400	
SL	59	20.6	20.1	19.6	19.2	23.2	22.6	22.0	21.5	25.7	25.0	24.4	23.7	SL
1	55	20.3	19.8	19.3	18.9	22.9	22.3	21.7	21.2	25.4	24.7	24.1	23.4	1
2	52	20.1	19.6	19.1	18.7	22.7	22.1	21.5	21.0	25.2	24.5	23.8	23.1	2
3	48	19.8	19.3	18.8	18.4	22.4	21.8	21.2	20.7	24.9	24.2	23.5	22.8	3
4	45	19.6	19.1	18.6	18.2	22.2	21.6	21.0	20.5	24.7	24.0	23.3	22.5	4
5	41	19.3	18.8	18.3	17.9	21.9	21.3	20.7	20.2	–	23.7	23.0	22.3	5
6	38	19.1	18.6	18.1	17.7	21.7	21.1	20.5	19.9	–	–	22.7	22.0	6
7	34	18.8	18.3	17.8	17.4	21.4	20.8	20.2	19.7	–	–	–	21.6	7
8	31	18.6	18.1	17.6	17.2	21.2	20.6	20.0	19.4					8
9	27	18.4	17.9	17.4	17.0	–	20.4	19.8	19.2					9
10	23	18.2	17.7	17.2	16.8	–	–	19.6	19.0					10
11	19	18.0	17.5	17.0	16.6									11
12	16	17.8	17.3	16.8	16.4									12
13	12	–	17.1	16.6	16.2									13
14	9	–	–	16.4	16.1									14
15	5	–	–	–	15.9									15

To maintain constant power, correct manifold pressure approximately 0.18" Hg for each 10°F variation in carburetor air temperature from standard altitude temperature. Add manifold pressure for air temperatures above standard; subtract for temperatures below standard.

Full throttle manifold pressure values may not be obtainable when atmospheric conditions are non-standard.

Chapter 9
Pick Up Your Legs
The Arrows

Someone at Piper got a brilliant idea: add retractable gear to the already popular Cherokee 180. In the process, he created a sensation for many years was the best selling plane in its class.

The Arrow was not the fastest in its class - it was slower than a Mooney. Nor could it haul the most. But it provided a good balance between speed and convenience and maintained a good reputation for reliability and economy to boot.

The 1967 introduction of the Arrow marked the first time that one of the big airplane manufacturers challenged Mooney in the field of light single- engine retractables. The Arrow would soon breed imitators from both Beech and Cessna.

The original plane also introduced the modern Piper instrument panel with the flight instruments grouped into a standard arrangement and with the power controls in a lever quadrant, rather than with the previous push-pull knobs.

The public could not have been happier.

One of the biggest novelties of the Arrow was the automatic gear extension system, an industry first.

But, like the remainder of the Cherokee tribe, the Arrow soon sported changes. The original Arrow had a 180 horsepower engine with a carburetor, while in 1969 an additional model was added - the Arrow 200 with a 200- horsepower fuel-injected engine.

The additional horses imposed a penalty of more than just some additional gas, however. The TBO (time between overhaul) recommended by Lycoming was just 1,200 hours on the 200 horse model compared to 2,000 hours for the 180 horse model. Most buyers, however, were willing to trade the longevity of the engine for the additional speed and power of the 200 horse

Arrow is very popular Cherokee model. This 1969 version is owned by Michael W. Hurst, of Hampstead, NH.

model. As time went on, the TBO of the 200 horse model was increased, first to 1,400 hours in 1972 with the Arrow II, then to 1,600 hours in 1973, and finally to 1,800 hours in 1976.

The early models had only 50 gallon tanks which limited their range. However, Arrows since 1977 came with the 72-gallon tanks are more versatile.

One major change came with the Arrow II of 1972. This plane had the stretched cabin which provided five inches more leg room to rear seat passengers and made the plane a lot easier to live with.

Another major change was the adoption of the semi- tapered wings in 1977 - the advent of the Arrow III.

From a styling standpoint, the 1979 Arrow IV added the T-Tail. This modification was more successful on the Arrow than it was on the Lance. At least the Arrow did not receive new undesirable handling qualities because of the change.

One problem involving Arrows concerns quick-drain oil valves on the engine. It is possible to install the wrong quick drain and find that the landing gear, upon retraction, causes all the oil to drain from your engine. This is covered in Piper Service Letters 501 and 534-A.

The automatic gear extension system is still one of the major innovations on the Arrow series and owners seem to like it a lot. It is simple, yet effective in preventing gear-up landings in most situations. Basically, a probe detects the airspeed of the aircraft and will automatically lower the gear whenever airspeed falls below about 105 mph with power off or 85 mph with full power. Obviously, it should be impossible to land with the gear up with this system.

Unfortunately, pilots have shown that it can be done. The system can be over-ridden. This is desirable when practicing stalls and other maneuvers. But when a pilot locks the system out and then forgets he did so, he may also forget to lower the gear and proceed to make his most embarrassing landing. It has happened enough so that most insurance companies no longer offer a discount to Arrow owners based on the unlikelihood of a gear up landing.

Also, Piper issued a service bulletin recommending disconnecting the system. That bulletin was subsequently revised, but Piper does not recommend use of the system unless the pilot is thoroughly familiar with the contents of the aircraft flight manual. The reason for Piper's attitude involves potential problems during forced landings. If the engine should quit and a pilot attempts to make an emergency landing, he may not be able to make his intended landing spot if the gear unexpectedly extends during the glide. It would be necessary to insure that the gear was locked up in such a circumstance.

Early Arrows had a lever between the seat to lock out the system, but the lever needed to be held down to do so. This was not very practical when practicing stalls. So the lever was redesigned so it could be clicked into position and would hold itself.

The Arrow, like other Piper products, was out of production shortly, but was brought back by Piper in 1989. Both the Arrow and Turbo Arrow were available and came, once again, with the conventionally located stabilator as on earlier models. The performance, however, was nearly identical to the Arrow IV. Also, as of this writing, no planes were being made in Vero Beach (the list price of the 1990 Arrow was $114,300).

What years were big sellers for the Arrow? Take a look at the production chart below.

Year	Model	Total Produced	Serial Numbers	
1967	180	351	28R30001	28R30351
1968	180	736	28R30352	28R31087
1969	180	163	28R31088	28R31250
1969	200	600	28R25001	28R35600
1970	180	20	28R31251	28R31270
1970	200	220	28R35601	28R35820
1971	180	13	71-30001	71-30013
1971	200	230	71-35001	71-35230
1972	200	320	72-35001	72-35320
1973	200	466	73-35001	73-35466
1974	200	320	74-35001	74-35320
1975	200	383	75-35001	75-35383
1976	200	545	76-35001	76-35545
1977	201	178	77-37001	77-37178
1978	201	317	78-37001	78-37317
1979	201	267	79-18001	79-18267
1980	201	47	80-18001	80-18047
1981	201	73	81-18001	81-18073
1982	201	26	82-18001	82-18026

But Turbo Models were also produced, and those are summarized in the following table.

Year	Model	Total Produced	Serial Numbers	
1977	201T	427	77-03001	77-03427

1978	201T	373	78-03001	78-03373
1979	201T	310	79-31001	79-31310
1980	201T	178	80-31001	80-31178
1981	201T	208	81-31001	81-31208
1982	201T	69	82-31001	82-31069
1983	201T	49	83-31001	83-31049
1984	201T	32	84-31001	84-31032
1985	201T	15	85-31001	85-31015
1986	201T	1		86-31001

During its history, the Arrow sold just under 7,000 copies. It was available in different sizes and engine configurations. Yet it remained a favorite with the flying public. Like the other Cherokee variants, it offered a step above basic flying, yet it retained its docile Cherokee flying qualities and allowed a comfortable move up for pilots trained in smaller Cherokees. Its good compromise as to speed versus payload, coupled with excellent operating economy have made it a winner in the eyes of pilots.

Some Things to Consider

☐ Retractable gear are more complicated than fixed gear and tend to require more maintenance. Service difficulties have appeared with the Arrow gear, particularly downlocks and particularly involving the nosegear.

☐ Some owners love the automatic gear system, others hate it. But everyone should be aware of the problem of unexpected gear extension in situations involving an emergency landing.

☐ The constant-speed propeller (Hartzell) is subject to an AD which requires that it be overhauled every 2,000 hours or five years, whichever comes first. One company has come up with a three-blade McCauley propeller conversion to eliminate the problem (see chapter on Help).

☐ As with other Cherokees, it is important that log books establish that no major damage has been suffered by the airplane. Planes with severe or extreme usage are subject to Piper service bulletin requiring expensive inspection of the wings.

Performance & Dimensions

Arrow 180
1967-1971

Performance:

(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	170 (148)
Cruise:	162 (141)
Stall Speed (with flaps)	61 (53)
Best Rate of Climb Speed:	100 (87)
Fuel Consumption (75% power):	9.5 gph
Range (75% at 7,000 ft.)	857 (745)
Takeoff over 50' obstacle:	1,240 feet
Ground run:	820 feet
Landing over 50' obstacle:	1,340 feet
Ground run:	776 feet
Rate of climb (Sea Level):	875 feet
Service Ceiling:	15,000 feet

Specifications

Fuel capacity:	50 gallons
Engine:	Lycoming 0-360-B1E
TBO:	2,000 hours
Power:	180 hp 1
Wing Span:	30 ft 0 in
Wing Area:	160 sq ft
Length:	24 ft 2 in
Height:	8 ft 0 in
Wing Loading:	15.6 lb/sq ft
Power Loading:	13.9 lb/hp
Gross Weight:	2,500 lbs
Empty Weight:	1,380 lbs
Useful Load:	1,120 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions

Arrow 200
1969-1971

Performance:

(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	176 (153)
Cruise:	166 (144)
Best Rate of Climb:	95*(83)
Stall Speed (with flaps)	64 (56)
Fuel Consumption (75% power):	10.2 gph
Range (75% at 7,000 ft.)	810 (704)
Takeoff over 50' obstacle:	1,600 feet
Ground run:	770 feet
Landing over 50' obstacle:	1,380 feet
Ground run:	780 feet
Rate of climb (Sea Level):	910 feet
Service Ceiling:	16,000 feet

Specifications

Fuel capacity:	50 gallons
Engine:	Lycoming I0-360-B1E
TBO:	1,800 hours
Power:	200 hp 1
Wing Span:	30 ft 0 in
Wing Area:	160 sq ft
Length:	24 ft 2 in
Height:	8 ft 0 in
Wing Loading:	16.3 lb/sq ft
Power Loading:	13.0 lb/hp
Gross Weight:	2,600 lbs
Empty Weight:	1,459 lbs
Useful Load:	1,141 lbs
Baggage Capacity:	200 lbs

*100 mph with gear retracted.

Performance & Dimensions
Arrow II
1972-1976

Performance:
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	175 (152)
Cruise:	165 (143)
Best Rate of Climb:	95* (83)
Stall Speed (with flaps)	64 (56)
Fuel Consumption (75% power):	10.2 gph
Range (75% at 7,000 ft.)	900 (782)
Takeoff over 50' obstacle:	1,600 feet
Ground run:	780 feet
Landing over 50' obstacle:	1,380 feet
Ground run:	780 feet
Rate of climb (Sea Level):	900 feet
Service Ceiling:	15,000 feet

Specifications

Fuel capacity:	50 gallons
Engine:	Lycoming I0-360-C1C
TBO:	1,800 hours
Power:	200 hp 1
Wing Span:	32 ft 2 in
Wing Area:	170 sq ft
Length:	24 ft 7 in
Height:	8 ft 0 in
Wing Loading:	15.6 lb/sq ft
Power Loading:	13.3 lb/hp
Gross Weight:	2,650 lbs
Empty Weight:	1,515 lbs
Useful Load:	1,135 lbs
Baggage Capacity:	200 lbs

*100 mph with gear retracted.

Performance & Dimensions

Arrow III
1977-1978

Performance:

(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	171 (149)
Cruise:	164 (143)
Best Rate of Climb:	104 (90)
Stall Speed (with flaps)	61 (53)
Fuel Consumption (75% power):	10.2 gph
Range (75% at 7,000 ft.)	785 (682)
Takeoff over 50' obstacle:	1,600 feet
Ground run:	1,025 feet
Landing over 50' obstacle:	1,525 feet
Ground run:	615 feet
Rate of climb (Sea Level):	831 feet
Service Ceiling:	16,200 feet

Specifications

Fuel capacity:	72 gallons
Engine:	Lycoming I0-360-C1C6
TBO:	1,800 hours
Power:	200 hp 1
Wing Span:	35 ft 5 in
Wing Area:	170 sq ft
Length:	27 ft 0 in
Height:	8 ft 4 in
Wing Loading:	16.2 lb/sq ft
Power Loading:	13.8 lb/hp
Gross Weight:	2,750 lbs
Empty Weight:	1,637 lbs
Useful Load:	1,113 lbs
Baggage Capacity:	200 lbs

*100 mph, gear retracted.

Performance & Dimensions
Turbo Arrow III, 1977-1978
Turbo Arrow IV, 1979 Up

Performance:
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	204 (177)
Cruise:	198 (172)
Best Rate of Climb:	110 (96)
Stall Speed (with flaps)	65 (56)
Fuel Consumption (75%):	12 gph
Cruise Range (65% at 18,000)	840 (730)
Takeoff over 50' obstacle:	1,620 feet
Ground run:	1,110 feet
Landing over 50' obstacle:	1,555 feet
Ground run:	645 feet
Rate of climb (Sea Level):	940 feet
Service Ceiling:	20,000 feet

Specifications

Fuel capacity:	72 gallons
Engine:	Continental TSIO-360-F -FB
TBO:	1,400 hours
Power:	200 hp 1
Wing Span:	35 ft 5 in
Wing Area:	170 sq ft
Length:	27 ft 4 in
Height:	8 ft 4 in
Wing Loading:	17.0 lb/sq ft
Power Loading:	13.8 lb/hp
Gross Weight:	2,900 lbs
Empty Weight:	1,692 lbs
Useful Load:	1,208 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions

Arrow IV
1979 Up

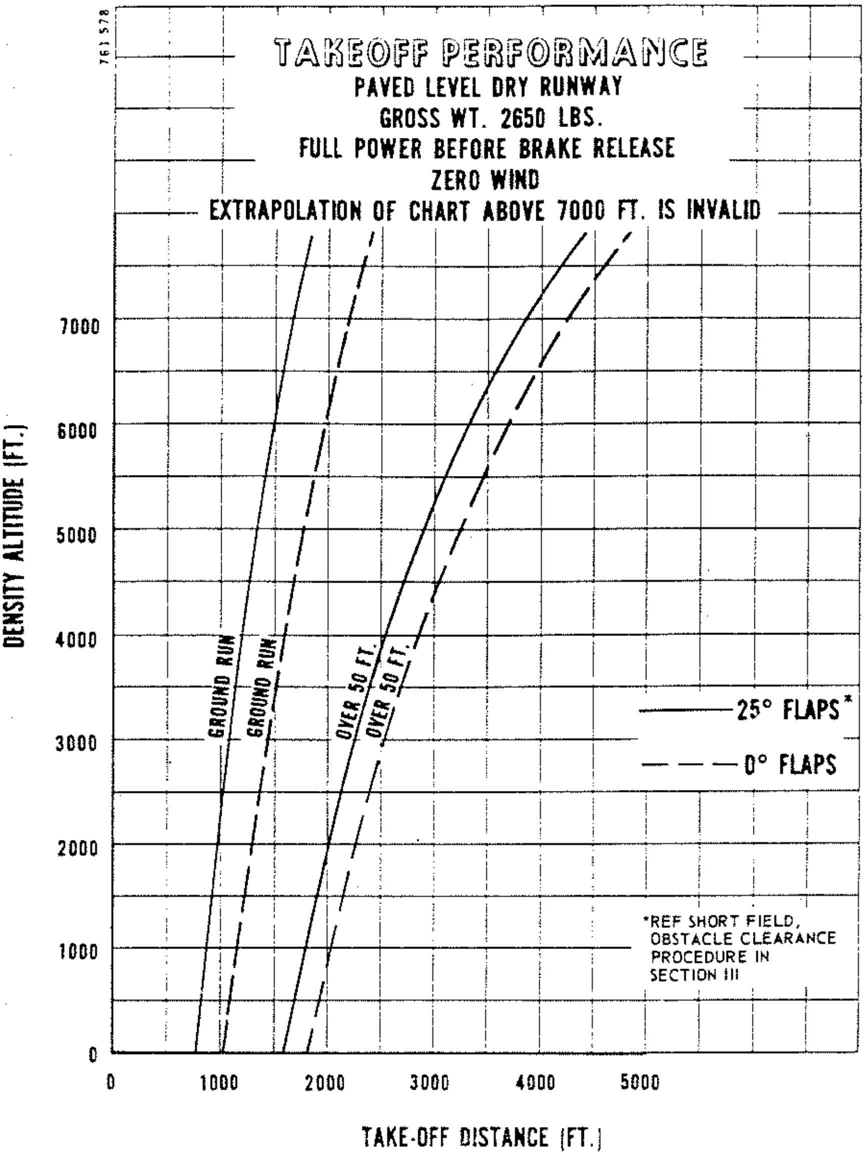
Performance:

(Knots, nautical miles in parentheses)

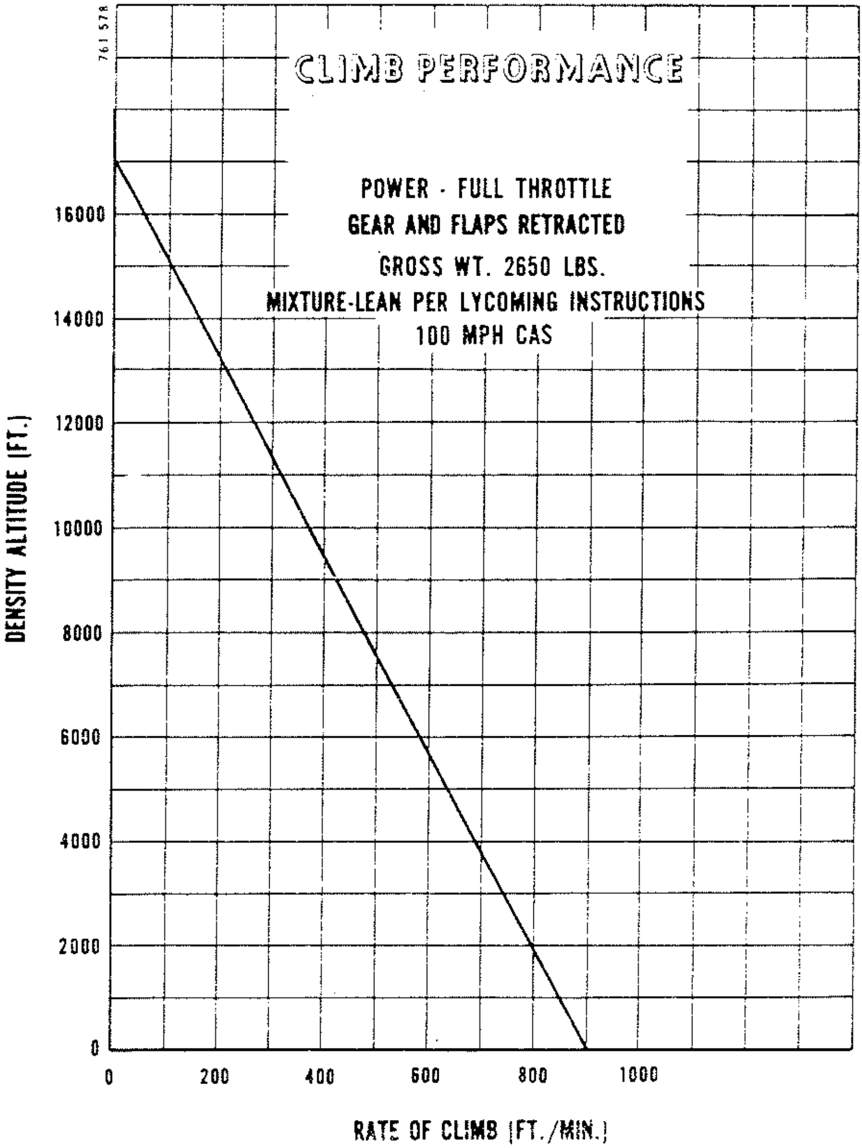
Top Speed (Sea Level)	171 (149)
Cruise:	164 (143)
Best Rate of Climb:	104 (90)
Stall Speed (with flaps)	61 (53)
Fuel Consumption (75% power):	10.2 gph
Range (75% at 7,000 ft.)	986 (857)
Takeoff over 50' obstacle:	1,600 feet
Ground run:	1,025 feet
Landing over 50' obstacle:	1,525 feet
Ground run:	615 feet
Rate of climb (Sea Level):	831 feet
Service Ceiling:	16,200 feet

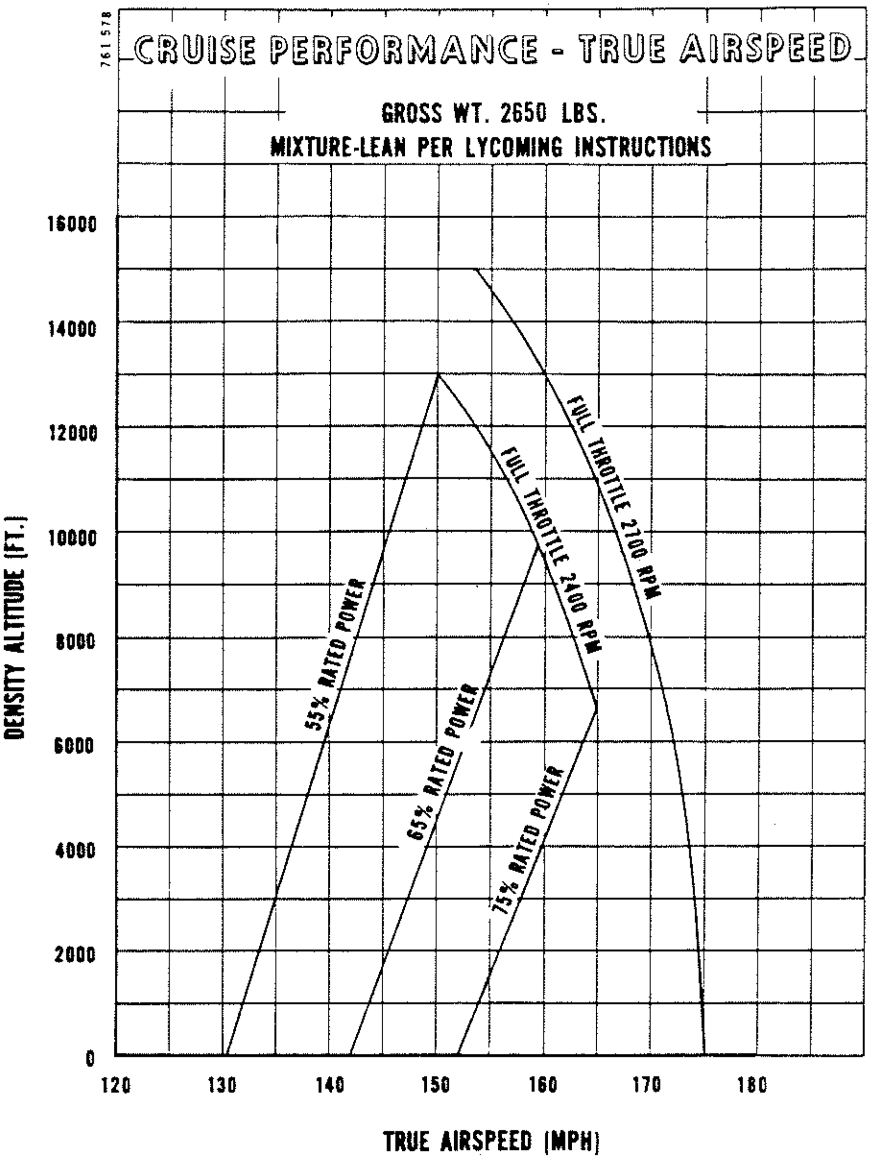
Specifications

Fuel capacity:	72 gallons
Engine:	Lycoming IO-360-C1C6
TBO:	1,800 hours
Power:	200 hp 1
Wing Span:	35 ft 5 in
Wing Area:	170 sq ft
Length:	27 ft 0 in
Height:	8 ft 4 in
Wing Loading:	16.2 lb/sq ft
Power Loading:	13.8 lb/hp
Gross Weight:	2,750 lbs
Empty Weight:	1,637 lbs
Useful Load:	1,113 lbs
Baggage Capacity:	200 lbs


761 578
TAKEOFF PERFORMANCE
PAVED LEVEL DRY RUNWAY
GROSS WT. 2650 LBS.
FULL POWER BEFORE BRAKE RELEASE
ZERO WIND
EXTRAPOLATION OF CHART ABOVE 7000 FT. IS INVALID
DENSITY ALTITUDE (FT.)
7000
6000
5000
4000
3000
2000
1000
0
GROUND RUN
GROUND RUN
OVER 50 FT.
OVER 50 FT.
25° FLAPS*
0° FLAPS
*REF SHORT FIELD, OBSTACLE CLEARANCE PROCEDURE IN SECTION III
0
1000
2000
3000
4000
5000
TAKE-OFF DISTANCE (FT.)

ARROW II


761 578
CLIMB PERFORMANCE
POWER - FULL THROTTLE
GEAR AND FLAPS RETRACTED
GROSS WT. 2650 LBS.
MIXTURE-LEAN PER LYCOMING INSTRUCTIONS
100 MPH CAS
DENSITY ALTITUDE (FT.)
16000
14000
12000
10000
8000
6000
4000
2000
0
0
200
400
600
800
1000
RATE OF CLIMB (FT./MIN.)



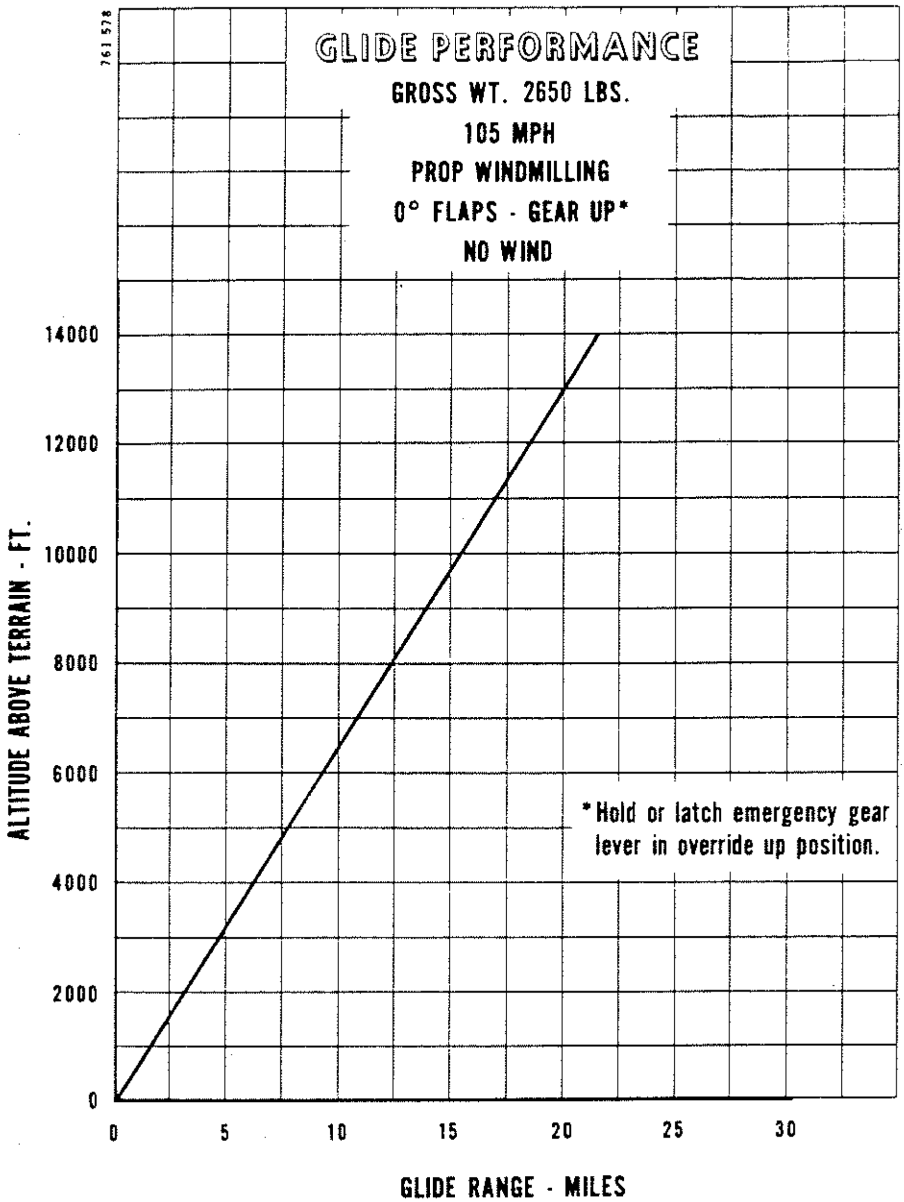
761 578
CRUISE PERFORMANCE - TRUE AIRSPEED
GROSS WT. 2650 LBS.
MIXTURE-LEAN PER LYCOMING INSTRUCTIONS
DENSITY ALTITUDE (FT.)
16000
14000
12000
10000
8000
6000
4000
2000
0
FULL THROTTLE 2700 RPM
FULL THROTTLE 2400 RPM
55% RATED POWER
65% RATED POWER
75% RATED POWER
120
130
140
150
160
170
180
TRUE AIRSPEED (MPH)

ARROW II

Power Setting Table - Lycoming Model IO-360-C Series, 200 HP Engine

Press. Alt Feet	Std. Alt Temp °F	110 HP – 55% Rated RPM AND MAN. PRESS. 2100	2400	130 HP – 65% Rated RPM AND MAN. PRESS. 2100	2400	150 HP – 75% Rated RPM AND MAN. PRESS. 2400	Press. Alt Feet
SL	59	22.9	20.4	25.9	22.9	25.5	SL
1,000	55	22.7	20.2	25.6	22.7	25.2	1,000
2,000	52	22.4	20.0	25.4	22.5	25.0	2,000
3,000	48	22.2	19.8	25.1	22.2	24.7	3,000
4,000	45	21.9	19.5	24.8	22.0	24.4	4,000
5,000	41	21.7	19.3	FT	21.7	FT	5,000
6,000	38	21.4	19.1	--	21.5	--	6,000
7,000	34	21.2	18.9	--	21.3	--	7,000
8,000	31	21.0	18.7	--	21.0		8,000
9,000	27	FT	18.5	--	FT		9,000
10,000	23	--	18.3				10,000
11,000	19	--	18.1				11,000
12,000	16	--	17.8				12,000
13,000	12	--	17.6				13,000
14,000	9	--	FT				14,000

To maintain constant power, correct manifold pressure approximately 0.16" Hg for each 10°F variation in inlet air temperature from standard altitude temperature. Add manifold pressure for air temperatures above standard; subtract for temperatures below standard.


761 578
GLIDE PERFORMANCE
GROSS WT. 2650 LBS.
105 MPH
PROP WINDMILLING
0° FLAPS - GEAR UP*
NO WIND
14000
12000
10000
8000
6000
4000
2000
0
ALTITUDE ABOVE TERRAIN - FT.
*Hold or latch emergency gear lever in override up position.
0
5
10
15
20
25
30
GLIDE RANGE - MILES

Cherokee Six is a Hauler. This example is owned by Robert E. Shreck. of Fairborn. Ohio.

Chapter 10 The Big Iron - Straight Leg Versions The Six & Saratoga

Welcome to the land of the Cherokee big iron - the six to seven passenger PA-32 models. These planes come in two versions - the fixed gear models, as exemplified by the original Cherokee Six and the more recent Saratoga, and the retractable planes, as exemplified by the Lance and the Saratoga SP. This chapter will consider the fixed gear models, while Chapter 11 will discuss the finer points of the retractable-gear planes.

The planes hit the market in 1965 with the first Cherokee Six, a 260 horsepower model capable of hauling six passengers. The new plane, although based loosely on previous Cherokee models, sported an entirely new body - seven inches wider and four feet longer than previous Cherokees. Despite the differences, Piper bragged that about 70 percent of the tooling could be used on either the PA-28 and PA-32 models.

The increased length consisted of two inserts in the regular Cherokee design - a 1 1/2 foot section forward of the firewall which provided space for 100 pounds of baggage, and a 2 1/2 foot section added to the rear of the cabin. An additional door behind the wing on the left of the fuselage provided access to the rear seats. A 10 inch aisle between the two front pairs of seats allowed a passenger to enter through the rear and move to the front if he desired.

The plane handled much like other Cherokees only with a heavier feel. The handling, however, was nowhere as heavy as one might suspect considering the plane's 3,400 pound gross weight.

The Cherokee Six soon became popular among not only larger families, but among businesses. It became a mainstay among funeral directors, for example. Not many single-engine planes would hold a coffin!

Piper ads in the late 70's played up the roominess of the plane by showing a piano being loaded aboard. The model serves well as an air ambulance, too. Its cargo hauling capacity is legendary.

Although changes were made in the original plane, the PA-32s had fewer changes over the years than the rest of the Cherokee line. The first major change did come in 1966 when a 300-horse version was made an option. The extra horses did improve performance, although the gross weight remained the same.

Like other Cherokees, the original models were equipped with Lycoming engines with 7/16 inch valve stems. The engine was changed to 1/2 inch valve stems in 1968 and presumably all models have been retrofited with newer valves by now.

In 1967 a five-foot wide cargo door became available.

In 1970 the Six got the newer instrument panel with standard placement of instruments and the lever style power quadrant. In 1974 the plane got an extra side window, improving the styling, and in 1975 the rear fin was stretched six inches.

Finally, in 1980 the plane got the same Warrior style semi-tapered wing which had previously been appended to each of the other Cherokee models. The Saratoga was born.

The Saratoga was a bit fancier than previous Sixes and sported an increase in gross weight to 3,600 pounds. (Useful load, however, increased only by 50 pounds - the remainder was absorbed by the luxury upholstery and sound deadening packages on the newer model.)

Like other Cherokees, the PA-32 models were hits from the start. The Saratoga model, no doubt, would have been a great seller too if it had not suffered a production decline in line with the remainder of the general aviation industry after 1980. Here is how sales fared during the years of the Six and Saratoga:

Year	Model	Total Produced	Serial Numbers	
1965	260	317	32-1	32-317
1966	260	534	32-319	32-852
1966	300	135	32-4001	32-40135
1967	260	157	32-855	32-1011
1967	300	293	32-40137	32-40429
1968	260	98	32-1012	32-1110

1968	300	136	32-40430	32-40565
1969	260	140	32-1111	32-1250
1969	300	285	32-40566	32-40850
1970	260	47	32-1251	32-1297
1970	300	168	32-40851	32-41018
1971	260	23	71-00001	71-00023
1971	300	78	71-40001	71-40078
1972	260	45	72-00001	72-00045
1972	300	137	72-40001	72-40137
1973	260	65	73-00001	73-00065
1973	300	191	73-40001	73-40191
1974	260	51	74-00001	74-00051
1974	300	170	74-40001	74-40170
1975	260	43	75-00001	75-00043
1975	300	188	75-40001	75-40188
1976	260	24	76-00001	76-00024
1976	300	130	76-40001	76-40130
1977	260	23	77-00001	77-00023
1977	300	113	77-40001	77-40113
1978	260	8	78-00001	78-00008
1978	300	202	78-40001	78-40202
1979	300	290	79-40001	79-40290
1980	301	106	80-06001	80-06106
1981	301	99	81-06001	81-06099
1982	301	40	82-06001	82-06040
1983	301	31	83-06001	83-06031
1984	301	19	84-06001	84-06019
1985	301	21	85-06001	85-06021
1986	301	3	86-06001	86-06003

With the advent of the Saratoga line, the model was produced for several years in very limited numbers with a turbocharged Lycoming engine. The production for these Turbo Saratogas is summarized below:

Year	Model	Total Produced	Serial Numbers	
1980	301T	52	80-24001	80-24052
1981	301T	34	81-24001	81-24034
1982	301T	10	82-24001	82-24010
1983	301T	13	83-24001	83-24013
1984	301T	2	84-24001	84-24002

Why do people buy them? These planes are powerful brutes. They are not speed demons, but they can haul one heck of a load, whether it be people or packages. They all have useful loads in excess of 1,500 pounds and that is a lot for a single-engine plane to haul around.

There is one limit to its carrying ability, however. The Six is one of the few single-engine planes to have a zero- fuel weight limit. The weight of plane, passengers and baggage is limited to 3,112 pounds, even if fuel is reduced. Thus, the cabin payload is limited to about 1,300 pounds no matter how much fuel you off-load. This restriction, however, does not limit the big birds utility much.

On the ground the planes tend to handle like the big planes they are. Nose wheel steering is very heavy and taxiing in close quarters can be a problem - differential braking may be needed to help with steering.

In the air, however, they fly like...a Cherokee. Climb rate is good, but visibility is limited over that long nose while it is pointed skyward during climb out. In cruise handling forces are just slightly greater than in smaller Cherokees. Stalls are a piece of cake. It wants to hang on and not break clearly. The Saratoga's wings make stall recovery even better than the Six.

Fuel burn averages about 16 gph for the 300 and 14-15 gph for the 260 horse models. But that should prove plenty considering the 84 gallon tanks of the Six and 104 gallon tanks of the Saratoga.

Anyone considering a Six needs to consider the merits of the 260 versus the 300 horse version. Actually, there is very little difference in performance between the two models. The biggest differences are in the take-off distance and climb rates. Cruise speeds show a difference of only about five to eight miles per hour. About 80 percent of the Sixes do have the 300 horse engine, however. That engine is a fuel-injected version of the Lycoming 0-540 engine, while the 260 horse version comes with a carburetor.

The 260 generally has a little better reputation for reliability than the 300 - it is basically the same engine as the 300 only stressed less. But the 300 has a pretty good reputation, too, and both have 2,000 hour TBO ratings. Overhaul cost, too, is a factor favoring the 260 version of this plane.

The Saratogas were only available with the 300 horse engine - there is no choice here. And the planes are more luxurious than their predecessors. But of course, The Saratoga carries a big price premium on the used plane market compared to a similarly equipped Six.

So to sum up the story of the straight-leg versions of the PA-32 series, the key words are big and brawny. The PA-32 models can carry a lot which makes them ideal for large families or for business applications where a big payload may mean big money. They are a lot more thirsty than their smaller cousins, but then they can do so much more. They are not, however, for someone who plans on doing a lot of solo flying without much payload. Then it becomes a big waste of money.

And if you need to fly your piano around with you - this is your plane!

Some Things to Consider

☐ Most Sixes have cargo doors, but some early models may not. If there is no cargo door, the utility of the plane is drastically curtailed.

☐ Likewise, some early 260 models had a fixed pitch propeller. It did simplify flying and eased maintenance a bit, but it also seriously compromised climb and cruise speed.

☐ A few early planes were delivered with only 50 gallon tanks. This seriously limited the plane's endurance and range.

☐ Piper offered an optional Seventh seat, which was handy for large families. But it fit back in the baggage compartment and was too tight to be practical for use by an adult.

☐ As on other Cherokees, it is important that log books establish that no major damage has been suffered by the airplane. Planes with severe or extreme usage are subject to Piper service bulletin requiring expensive inspection of the wings.

☐ Club Seating was made available in 1977. It offers a nice cozy cabin which many people prefer. It is not an easy job to retrofit this seating arrangement to a plane which did not originally come so equipped.

☐ Early models suffered the same problem with leaking fuel tanks that other Cherokees did. Plan on removing and re- sealing those tanks.

☐ The 260 horse engine is even more reliable than the 300, but its carburetor is much more likely to suffer from induction icing than the 300 horsepower engine's fuel injection system. This could be a big safety point.

□ Air conditioning was an option and gets mixed revues. It is nice in very hot parts of the country, especially for extended operation on the ground. However, it is heavy and uses power which cuts the performance of the airplane. Some owners have had troubles with the system, too, particularly keeping it in fan belts.

□ Cowling fasteners have given problems - a departing engine cowling could come through the windshield doing catastrophic damage. Make sure you check to ensure the cowling is securely fastened.

Performance & Dimensions

Cherokee Six (260)
1965-1978

Performance:

(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	168 (146)
Cruise:	160 (139)
Best Rate of Climb:	100 (87)
Stall Speed (with flaps)	63 (55)
Fuel Consumption (75% power):	14 gph
Range (75% at 7,000 ft.)	950 (826)
Takeoff over 50' obstacle:	1,360 feet
Ground run:	810 feet
Landing over 50' obstacle:	1,000 feet
Ground run:	630 feet
Rate of climb (Sea Level):	850 feet
Service Ceiling:	14,500 feet

Specifications

Fuel capacity:	50 gallons
Optional Fuel	84 gallons
Engine:	Lycoming 0-540-E4B5
TBO:	2,000 hours
Power:	260 hp 1
Wing Span:	32 ft 9 in
Wing Area:	174.5 sq ft
Length:	27 ft 9 in
Height:	7 ft 11 in
Wing Loading:	19.5 lb/sq ft
Power Loading:	13.1 lb/hp
Gross Weight:	3,400 lbs
Empty Weight:	1,699 lbs
Useful Load:	1,701 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions

Cherokee Six (300)

1966-1979

Performance:

(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	174 (151)
Cruise:	168 (146)
Best Rate of Climb:	1,050 fpm
Stall Speed (with flaps)	63 (55)
Fuel Consumption (75% power):	16 gph
Range (75% at 8,000 ft.)	856 (744)
Takeoff over 50' obstacle:	1,500 feet
Ground run:	1,050 feet
Landing over 50' obstacle:	1,000 feet
Ground run:	630 feet
Rate of climb (Sea Level):	1,050 feet
Service Ceiling:	16,250 feet

Specifications

Fuel capacity:	50 gallons
Optional Fuel	84 gallons
Engine:	Lycoming 0-540-K1A5
TBO:	2,000 hours
Power:	300 hp 1
Wing Span:	32 ft 9 in
Wing Area:	174.5 sq ft.
Length:	27 ft 9 in
Height:	7 ft 10 in
Wing Loading:	19.5 lb/sq ft
Power Loading:	11.3 lb/hp
Gross Weight:	3,400 lbs
Empty Weight:	1,789 lbs
Useful Load:	1,611 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions

Saratoga
1980 Up

Performance:

(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	175 (152)
Cruise:	172 (149)
Best Rate of Climb:	104 (91)
Stall Speed (with flaps)	67 (58)
Fuel Consumption (75% power):	16 gph
Range (75% at 6,500 ft.)	947 (823)
Takeoff over 50' obstacle:	1,759 feet
Ground run:	1,183 feet
Landing over 50' obstacle:	1,612 feet
Ground run:	732 feet
Rate of climb (Sea Level):	990 feet
Service Ceiling:	14,100 feet

Specifications

Fuel capacity:	102 gallons
Engine:	Lycoming I0-540-K1G5
TBO:	2,000 hours
Power:	300 hp 1
Wing Spa'n:	36 ft 2 in
Wing Area:	178.3 sq ft
Length:	27 ft 8 in
Height:	8 ft 2 in
Wing Loading:	20.2 lb/sq ft
Power Loading:	12.0 lb/hp
Gross Weight:	3,600 lbs
Empty Weight:	2,071 lbs
Useful Load:	1,529 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions

Turbo Saratoga
1980 - 1984

Performance:

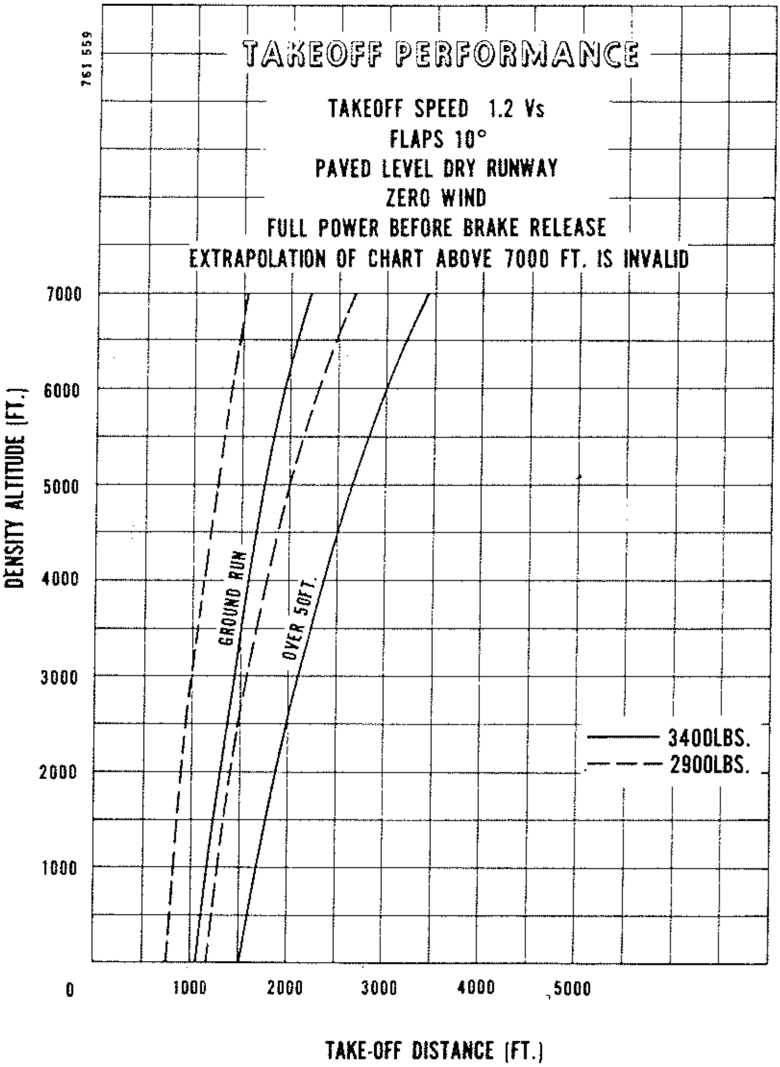
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	205 (178)
Cruise:	165 (158)
Best Rate of Climb:	105 (91)
Stall Speed (with flaps)	67 (58)
Fuel Consumption (75%):	16.5 gph
Range (75% at 20,000 ft.)	898 (780)
Takeoff over 50' obstacle:	1,590 feet
Ground run:	1,110 feet
Landing over 50' obstacle:	1,725 feet
Ground run:	732 feet
Rate of climb (Sea Level):	1,075 feet
Service Ceiling:	20,000 feet

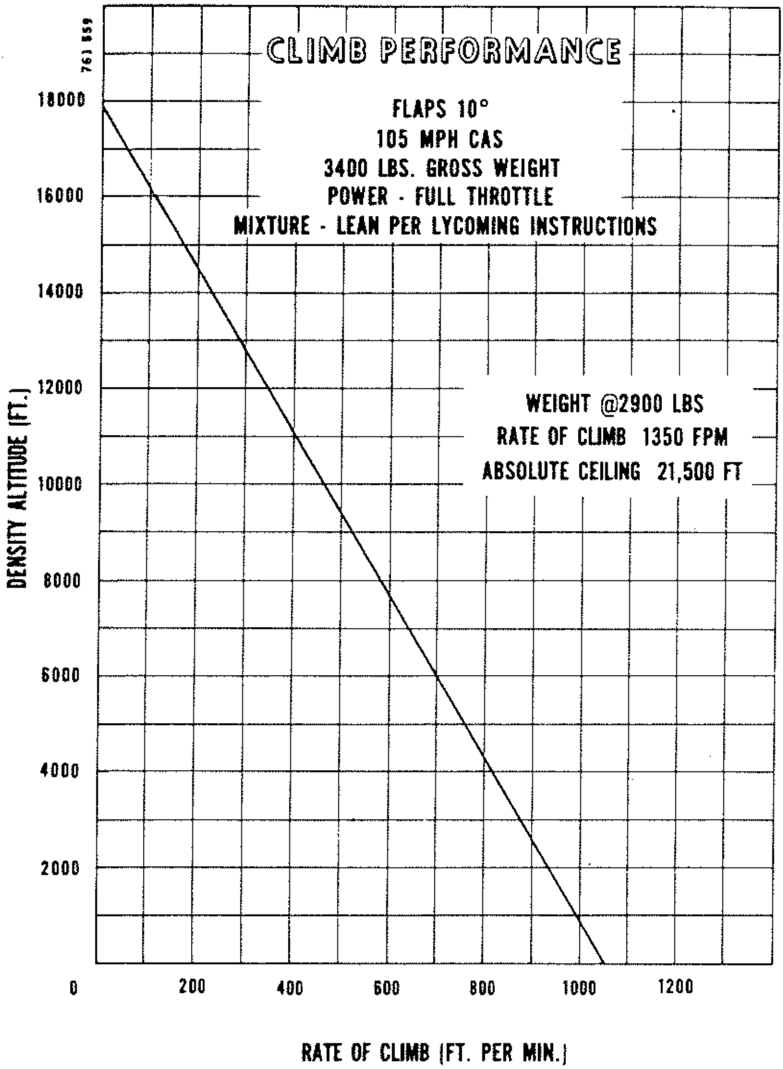
Specifications

Fuel capacity:	102 gallons
Engine:	Lycoming TI0-540-S1AD
TBO:	1,800 hours
Power:	300 hp 1
Wing Span:	36 ft 2 in
Wing Area:	178.3 sq ft
Length:	28 ft 2 in
Height:	8 ft 2 in
Wing Loading:	20.2 lb/sq ft
Power Loading:	12.0 lb/hp
Gross Weight:	3,600 lbs
Empty Weight:	2,003 lbs
Useful Load:	1,597 lbs
Baggage Capacity:	200 lbs

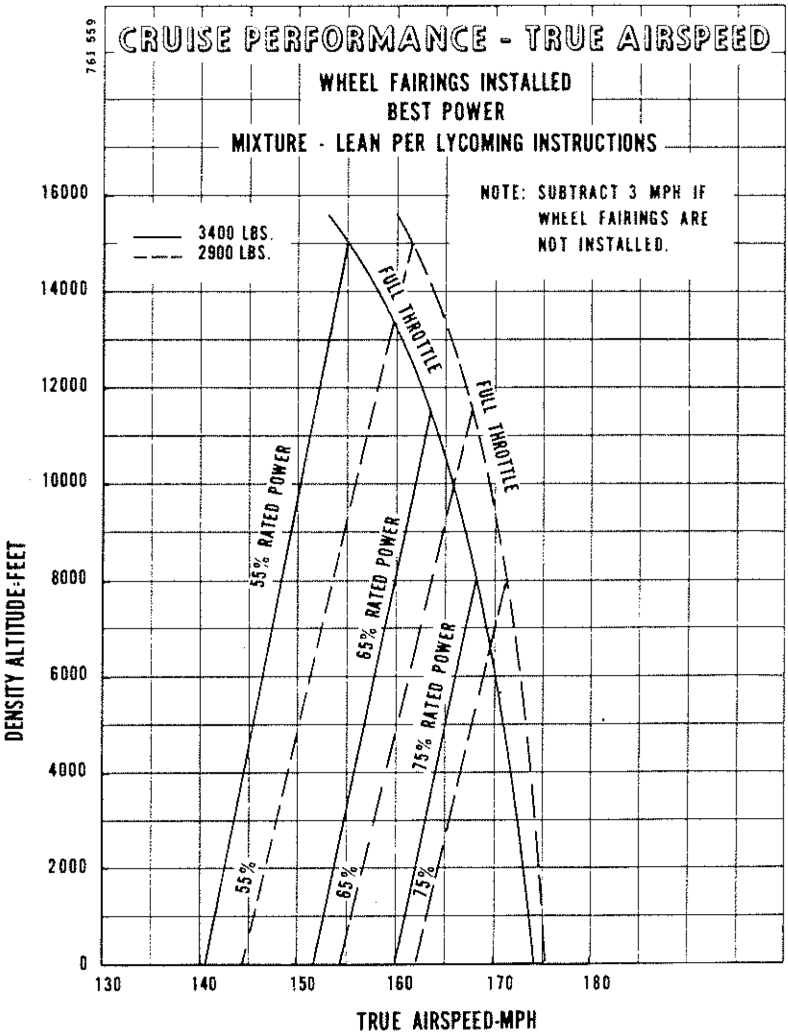
PA-32-300
CHEROKEE SIX



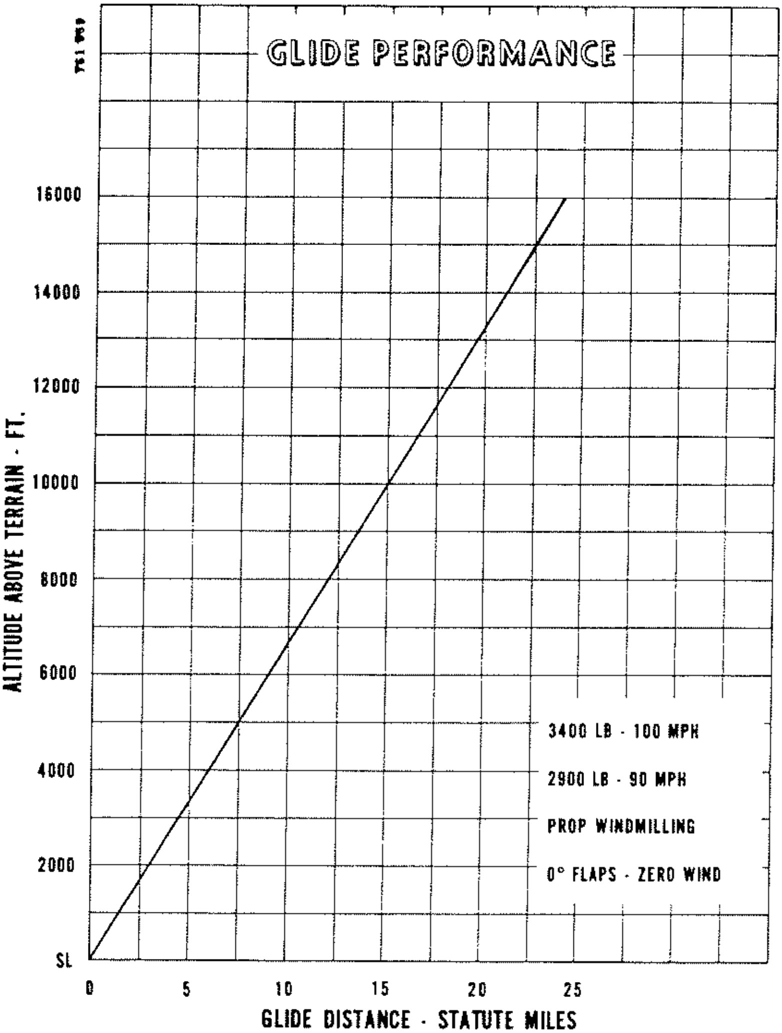
PA-32-300
CHEROKEE SIX



PA-32-300
CHEROKEE SIX



PA-32-300
CHEROKEE SIX



T-Tail Lance got a bad reputation, but devoted fans say it is a bum rap.

Chapter 11
The Big Iron - Retractable Versions
The Lance and Saratoga SP

The Lance and Saratoga SP are the retractable version of the big iron models. They are, to the PA-28 line, what the Arrow is to the PA-28 models. And like the Arrow, the Lance and Saratoga SP feature the same automatic gear extension system - used on that line.

The Lances were introduced in 1976. They were basically Cherokee Six models with retractable gear attached. The 300 horse fuel-injected Lycoming 0- 540 was the only powerplant available.

The same Hershey Bar wing used on other Cherokees was used on all Lances. The Lance II, introduced in 1978, was difference becaused it used T-type tail feathers - that is, the stabilator was mounted at the top of the rudder rather than the bottom. The T-tailed Lance, however, got a poor reputation because of adverse handling characteristics--a subject we shall return to shortly.

The final big change came in 1980 when the Saratoga SP was introduced. This was basically a Lance with the new "Warrior style" wings which spruced up the model's performance. The tail feathers also returned to their normal location on this model. All of these planes were heavy haulers, like the Cherokee Six, but with eight to ten miles per hour additional cruise caused by the disappearing landing gear.

These planes were not the fastest in their class, but, once again, they provided a mix of utility, speed, and economy which pleased many buyers. Here is how the planes sold over the years:

Year	Model	Total Produced	Serial Numbers	
1976	300R	525	76-80001	76-80825
1977	300R	548	77-80001	77-80548
1978	300R	68	78-80001	78-80068
1978	300RT	285	78-85001	78-85285
1979	300RT	105	79-85001	79-85105

Turbo versions of the T-tailed Lance were available in both 1978 and 1979. They sold surprisingly well:

Year	Model	Total Produced	Serial Numbers	
1978	300RT-T	289	78-87001	78-87289
1979	300RT-T	126	79-87001	79-87126

The Saratoga SP came about at an unfortunate time in the history of general aviation - the bottom fell out of the market for everyone.

Production is summarized below:

Year	Model	Total Produced	Serial Numbers	
1980	301	139	80-13001	80-13139
1981	301	122	81-13001	81-13122
1982	301	60	82-13001	82-13060
1983	301	29	83-13001	83-13029
1984	301	24	84-13001	84-13024
1985	301	16	85-13001	85-13016
1986	301	2	86-13001	86-13002

And some turbocharged Saratoga SPs were also produced:

Year	Model	Total Produced	Serial Numbers	
1980	301	121	80-29001	80-29121
1981	301	114	81-29001	81-29114
1982	301	68	82-29001	82-29068
1983	301	40	83-29001	83-29040
1984	301	27	84-29001	84-29027
1985	301	20	85-29001	85-29020
1986	301	2	86-29001	86-29002

The Lance II caused a lot of pilot grumbling and created a reputation for the plane which causes it to be out of favor with potential used plane buyers even today. The problem centers on the T-tail. Selected by Piper more for cosmetic rather than practical reasons, the tail is just too high, out of the slipstream of the propeller. It has very little authority at low speeds, leading to some unusual handling characteristics.

During a takeoff run, for example, the tail does not do much of anything at first. Then, should a pilot be attempting to make a major pitch change with the elevator, the plane will suddenly respond and tend to over-rotate. Similar problems develop during landing when, at low speeds, the elevator simply runs out of control.

Many T-tail Lance owners, however, praise their planes and, although admitting the shortcomings, say that the planes are just as easy to fly as a regular-tail plane once you get used to them and plan accordingly. Some pilots, who have no anxiety about the handling, find good buys in T-tail Lances in the used plane marketplace. A T-tail usually brings several thousand dollars less than a comparable straight tailed plane.

Otherwise, handling is similar to that of the Cherokee Six - heavier than smaller Cherokees, but not as heavy as you might suspect, considering the size and gross weight of the airplane.

As on the Six, the Lance and Saratoga SP tend to have heavy nosewheel forces and may need a shot of differential braking to help with taxiing or maneuvering in close quarters.

Like their fixed-leg brethren, the Lances and Saratoga SP models have greatly expanded cabins which can hold a surprisingly large volume. The post 1977 models could be had with club seating which many consider a desirable option. This arrangement is easier acquired by purchasing a plane with the option already in place than by trying to retro-fit it to a plane after purchase.

The retractables, like other Cherokees, are relatively economical to operate and to fix. For example, its closest competitor is the Beechcraft Bonanza. But while the Bonanza has a recommended TBO of from 1,400 to 1,500 hours, the Lance or Saratoga SP have TBO recommendations of from 1,800 to 2,000 hours.

Maintenance problems are somewhat routine. The planes are not too much more difficult to work on than, say, an Arrow. Several ADs have caused consternation among owners, but the AD list has not been unusually long for this plane.

Some pilots report difficulty in keeping the engine temperatures much below the red line in climb out during hot weather. It seems to be a trait of the beast.

Once again, the Lances are not jet planes. The retractable gear adds only eight to ten miles per hour to cruise over the cruise speed of a Cherokee Six. Cruise speed is determined, in part, by the drag of the airplane, and although the retractable gear cuts down some, the cross section of that spacious cabin exerts its own penalty. The more roomy the plane, the lower the limit on speed.

Both the Lance and Saratoga SP were available in turbo models. These planes can climb above the weather and make good time using faster tail winds at altitude. But turbochargers, in general, cause more maintenance headaches than normally aspirated induction systems.

Some Things to Consider

☐ The T-Tail Lance is both a boon and a bane. Its handling qualities are, incontrovertibly, quirky, yet its reputation is somewhat overstated. Because of this there are some good buys on this model if the handling is something you think you can get used to.

☐ Retractable gear can only do so much to a plane with a large frontal area - in this case it adds just eight to ten miles per hour to cruise. Retractable gear are more complicated than fixed gear and tend to require more maintenance. As with the Arrow, service difficulties have appeared with the Lance and Saratoga SP gear. Downlocks, trunnions and other gear mechanism have given owners problems.

☐ Some owners love the automatic gear system, others hate it. But everyone should be aware of the problem of unexpected gear extension in situations involving an emergency landing.

☐ Cowling fasteners have given problems - a departing engine cowling could come through the windshield doing catastrophic damage. Make sure you check to ensure the cowling is securely fastened.

Performance & Dimensions
Lance
1976-1978

Performance:
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	180 (156)
Cruise:	176 (153)
Best Rate of Climb:	106 (92)
Stall Speed (with flaps)	60 (52)
Fuel Consumption (75% power):	16 gph
Range (75% @ 5,000 ft)	898 (780)
Takeoff over 50' obstacle:	1,660 feet
Ground run:	960 feet
Landing over 50' obstacle:	1,708 feet
Ground run:	880 feet
Rate of climb (Sea Level):	1,000 feet
Service Ceiling:	14,600 feet

Specifications

Fuel capacity:	98 gallons
Engine:	Lycoming I0-540-K1G5D
TBO:	2,000 hours
Power:	300 hp 1
Wing Span:	32 ft 9 in
Wing Area:	174.5 sq ft
Length:	27 ft 9 in
Height:	9 ft 0 in
Wing Loading:	20.6 lb/sq ft
Power Loading:	12.0 lb/hp
Gross Weight:	3,600 lbs
Empty Weight:	1,980 lbs
Useful Load:	1,620 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions
Lance II (T-Tail)
1978-1979

Performance:
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	181 (157)
Cruise:	178 (155)
Best Rate of Climb:	106 (92)
Stall Speed (with flaps)	60 (52)
Fuel Consumption (75% power):	16 gph
Range (75% at 5,000 ft.)	898 (780)
Takeoff over 50' obstacle:	1,690 feet
Ground run:	960 feet
Landing over 50' obstacle:	1,710 feet
Ground run:	880 feet
Rate of climb (Sea Level):	1,000 feet
Service Ceiling:	14,600 feet

Specifications

Fuel capacity:	98 gallons
Engine:	Lycoming I0-540-K1G5D
TBO:	2,000 hours
Power:	300 hp 1
Wing Span:	32 ft 9 in
Wing Area:	174.5 sq ft
Length:	28 ft 4 in
Height:	9 ft 6 in
Wing Loading:	20.6 lb/sq ft
Power Loading:	12.0 lb/hp
Gross Weight:	3,600 lbs
Empty Weight:	2,003 lbs
Useful Load:	1,597 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions
Turbo Lance II (T-Tail)
1978-1979

Performance:
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	191 (166)
Cruise:	186 (162)
Best Rate of Climb:	106 (92)
Stall Speed (with flaps)	60 (52)
Range (75% @ 10,000)	921 (800)
Takeoff over 50' obstacle:	1,660 feet
Ground run:	960 feet
Landing over 50' obstacle:	1,710 feet
Ground run:	880 feet
Rate of climb (Sea Level):	1,000 feet
Service Ceiling:	20,000 feet

Specifications

Fuel capacity:	98 gallons
Engine:	Lycoming TI0-540-S1AD
TBO:	1,800 hours
Power:	300 hp
Wing Span:	32 ft 9 in
Wing Area:	174.5 sq ft
Length:	28 ft 11 in
Height:	9 ft 6 in
Wing Loading:	20.6 lb/sq ft
Power Loading:	12.0 lb/hp
Gross Weight:	3,600 lbs
Empty Weight:	2,071 lbs
Useful Load:	1,529 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions
Saratoga SP
1980 Up

Performance:
(Knots, nautical miles in parentheses)

Top Speed (Sea Level)	188 (163)
Cruise:	182 (158)
Best Rate of Climb:	105 (91)
Stall Speed (with flaps)	66 (57)
Fuel Consumption (75% power):	16 gph
Range (75% at 5,000 ft.)	995 (865)
Takeoff over 50' obstacle:	1,573 feet
Ground run:	1,013 feet
Landing over 50' obstacle:	1,612 feet
Ground run:	732 feet
Rate of climb (Sea Level):	1,010 feet
Service Ceiling:	16,700 feet

Specifications

Fuel capacity:	102 gallons
Engine:	Lycoming I0-540-K1G5D
TBO:	2,000 hours
Power:	300 hp 1
Wing Span:	36 ft 2 in
Wing Area:	178.3 sq ft
Length:	27 ft 8 in
Height:	8 ft 2 in
Wing Loading:	20.2 lb/sq ft
Power Loading:	12.0 lb/hp
Gross Weight:	3,600 lbs
Empty Weight:	1,999 lbs
Useful Load:	1,601 lbs
Baggage Capacity:	200 lbs

Performance & Dimensions
Turbo Saratoga SP
1980 Up

Performance:
(Knots, nautical miles in parentheses)

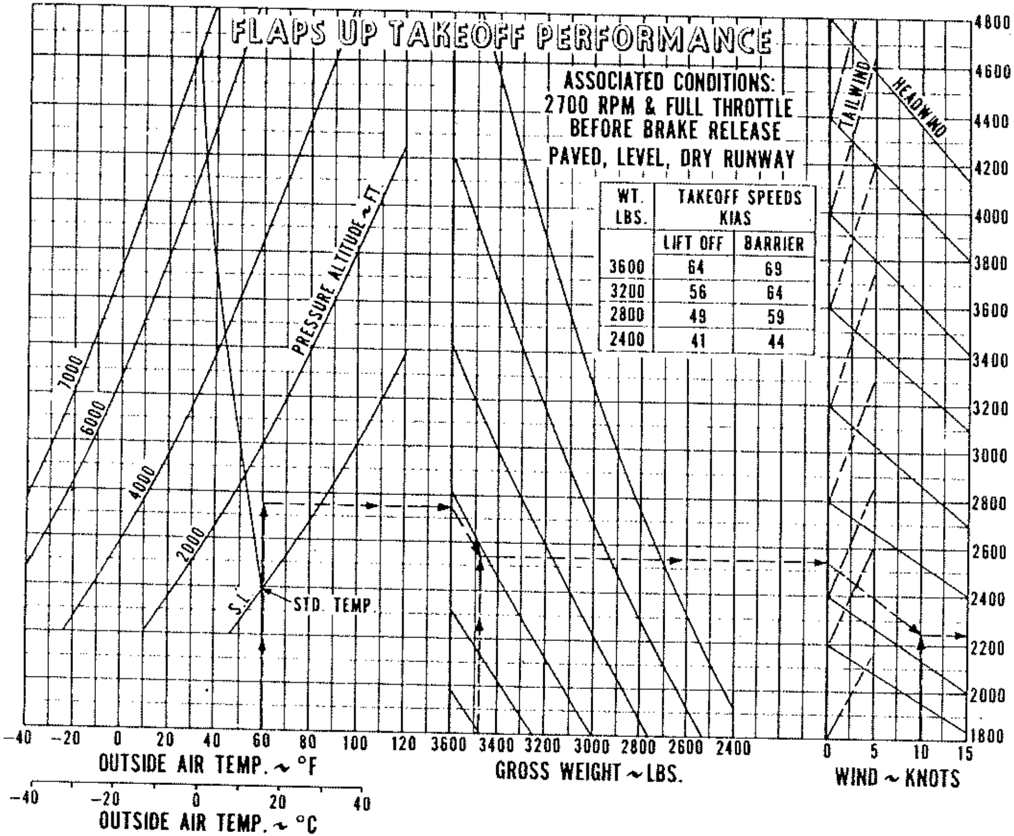
Top Speed (Sea Level)	224 (195)
Cruise:	203 (176)
Best Rate of Climb:	105 (91)
Stall Speed (with flaps)	65 (56)
Fuel Consumption (75 %)	16.5 gph
Range (75% at 6,500 ft.)	971 (844)
Takeoff over 50' obstacle:	1,420 feet
Ground run:	960 feet
Landing over 50' obstacle:	1,725 feet
Ground run:	732 feet
Rate of climb (Sea Level):	1,120 feet
Service Ceiling:	20,000 feet

Specifications

Fuel capacity:	102 gallons
Engine:	Lycoming TI0-540-S1AD
TBO:	1,800 hours
Power:	300 hp 1
Wing Span:	36 ft 2 in
Wing Area:	178.3 sq ft
Length:	28 ft 2 in
Height:	8 ft 2 in
Wing Loading:	20.2 lb/sq ft
Power Loading:	12.0 lb/hp
Gross Weight:	3,600 lbs
Empty Weight:	2,078 lbs
Useful Load:	1,522 lbs
Baggage Capacity:	200 lbs

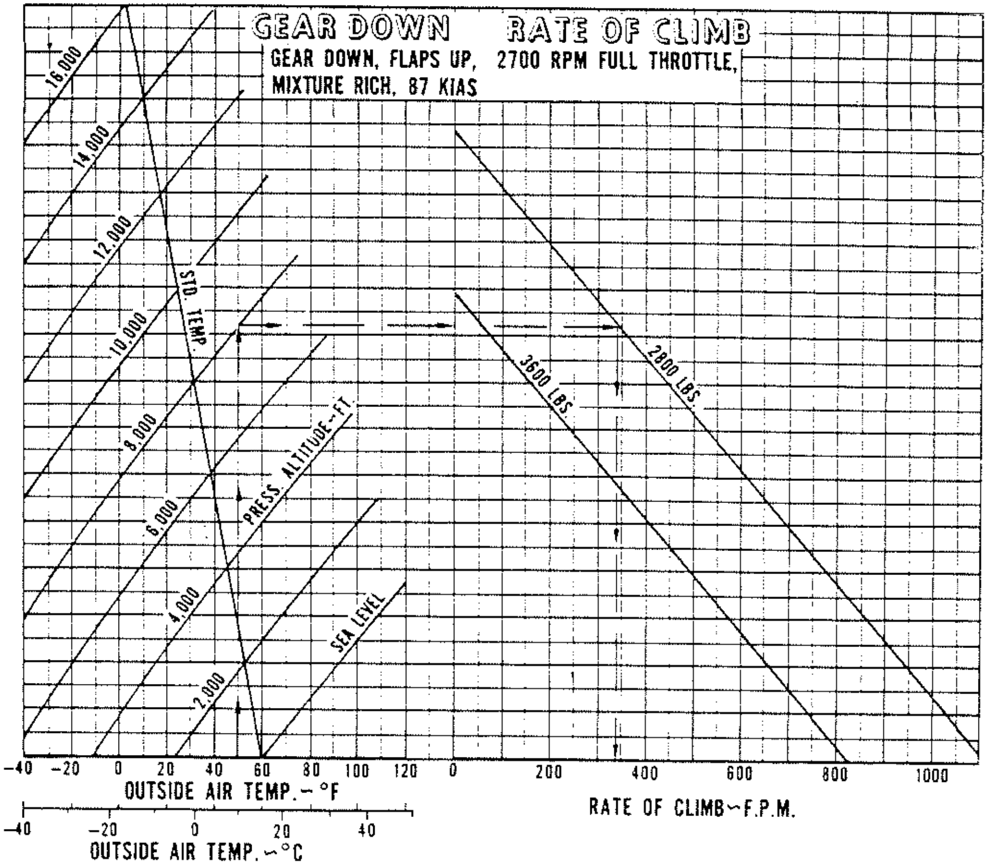
PA-32R-300

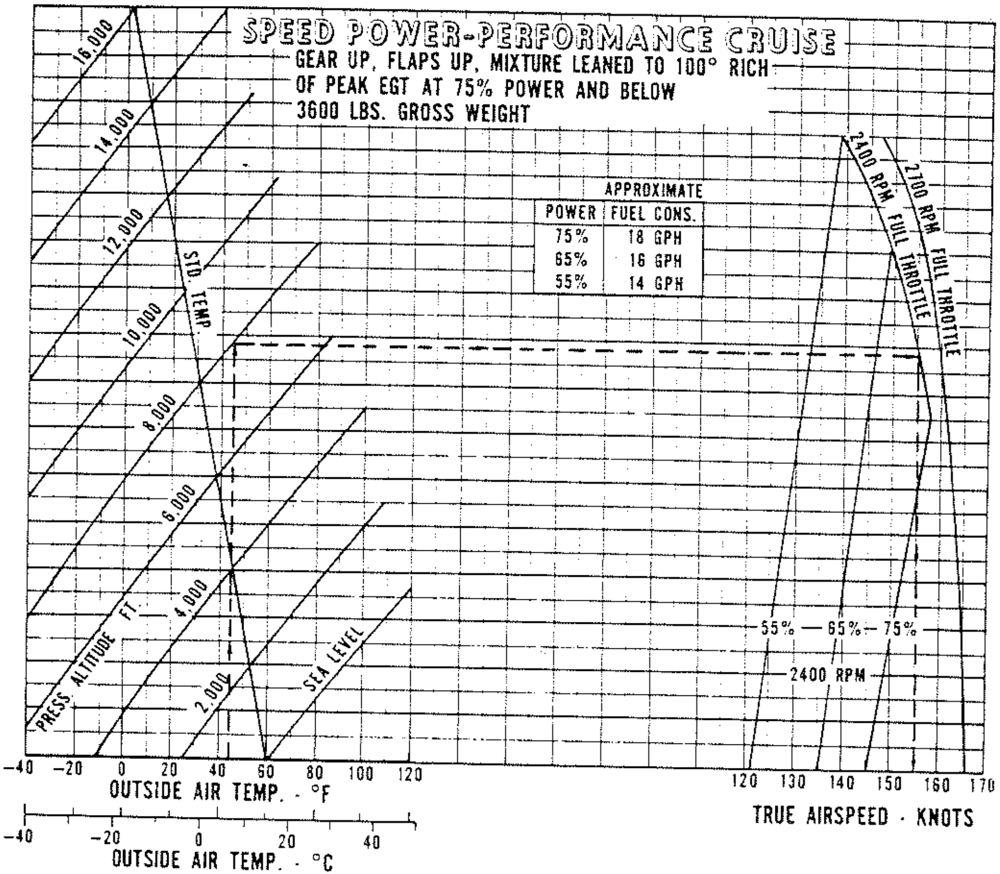
Example:
Outside air temperature: 60°F
Airport pressure altitude: 1200 ft.
Gross weight: 3480 lbs.
Wind component: 10 knots headwind
Takeoff distance over 50 ft. barrier: 2240 ft.



WT. LBS.	TAKEOFF SPEEDS KIAS	
	LIFT OFF	BARRIER
3600	64	69
3200	56	64
2800	49	59
2400	41	44

Example:
Climb pressure altitude: 8000 ft.
Outside air temperature: 50°F
Gross weight: 2800 lbs.
Rate of climb: 340 F.P.M.





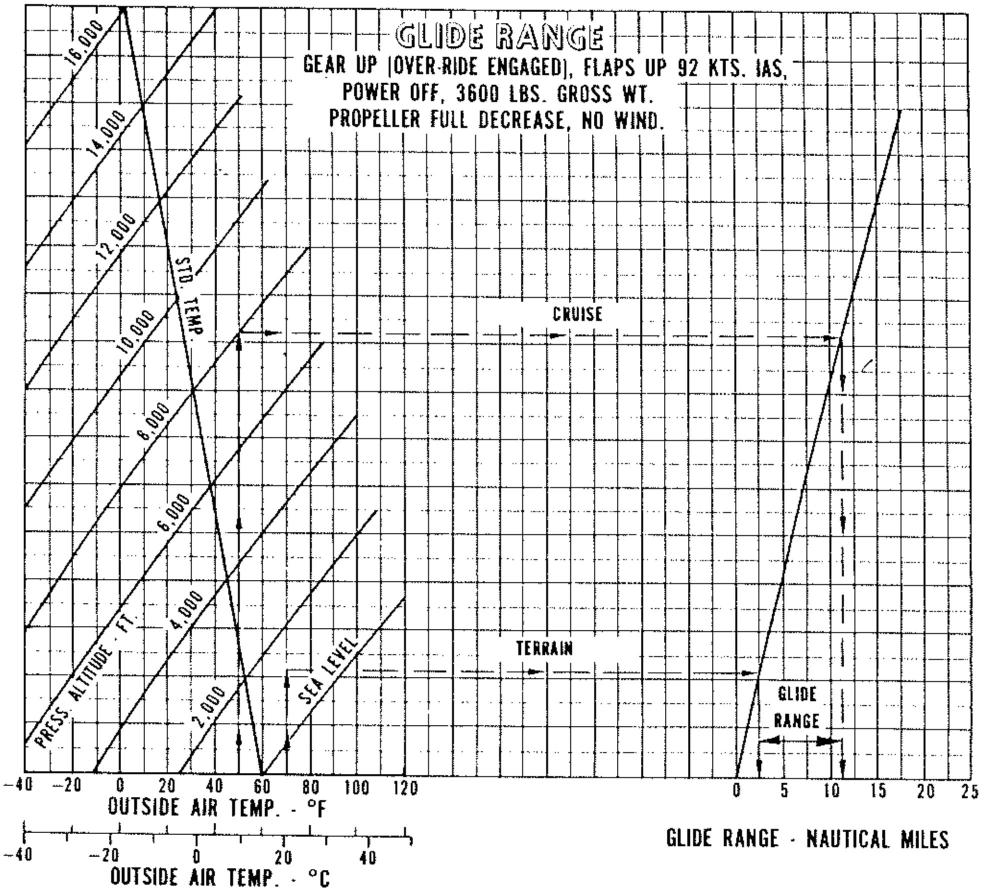
Example:
Cruise pressure altitude: 8000 ft.
Cruise OAT: 42°F
Power: Full throttle, 2400 RPM
True airspeed: 155 knots

POWER SETTING TABLE – LYCOMING MODEL IO-540-K, -L, -M SERIES, 300 HP ENGINE

Press. Alt Feet	Std Alt Temp °F	135 HP – 45% RATED RPM AND MAN. PRESS.				165 HP – 55% Rated RPM AND MAN. PRESS.				195 HP – 65% Rated RPM AND MAN. PRESS.				225 HP – 75% Rated RPM AND MAN. PRESS.		
		2100	2200	2300	2400	2100	2200	2300	2400	2100	2200	2300	2400	2200	2300	2400
SL	59	19.0	18.5	18.0	17.6	22.5	21.8	21.2	20.7	25.6	24.7	23.8	23.2	27.6	26.6	25.8
1,000	55	18.8	18.3	17.8	17.4	22.3	21.6	21.0	20.5	25.3	24.4	23.5	22.9	27.3	26.3	25.5
2,000	52	18.6	18.1	17.6	17.2	22.1	21.4	20.7	20.2	25.1	24.2	23.3	22.7	27.1	26.1	25.2
3,000	48	18.4	17.9	17.4	17.0	21.9	21.2	20.5	20.0	24.8	23.9	23.0	22.5	26.8	25.8	24.9
4,000	45	18.25	17.75	17.2	16.8	21.7	21.0	20.3	19.8	24.6	23.7	22.8	22.2	26.5	25.6	24.6
5,000	41	18.1	17.6	17.0	16.6	21.5	20.8	20.1	19.6	24.3	23.5	22.5	22.0	–	25.3	24.4
6,000	38	17.9	17.4	16.8	16.4	21.3	20.6	19.8	19.3	24.0	23.2	22.3	21.7	–	25.0	24.1
7,000	34	17.7	17.2	16.6	16.25	21.0	20.4	19.6	19.1	23.7	22.9	22.0	21.5	–	–	23.8
8,000	31	17.5	17.0	16.5	16.1	20.8	20.2	19.4	18.9	–	22.5	21.8	21.2			
9,000	27	17.3	16.8	16.3	15.9	20.6	20.0	19.2	18.6	–	–	21.5	21.0			
10,000	23	17.1	16.6	16.1	15.75	20.4	19.8	19.0	18.4	–	–	21.2	20.7			
11,000	19	16.9	16.4	15.9	15.6	20.2	19.6	18.7	18.2	–	–	–	20.4			
12,000	16	16.75	16.25	15.75	15.4	20.0	19.4	18.5	18.0							
13,000	12	16.6	16.0	15.6	15.2	–	19.2	18.3	17.7							
14,000	9	16.4	15.8	15.4	15.0	–	–	18.0	17.3							
15,000	5	16.2	15.7	15.2	14.8	–	–	–	16.9							

To maintain constant power, correct manifold pressure approximately 0.18" Hg for each 10°F variation in induction air temperature from standard altitude temperature. Add manifold pressure for air temperature above standard; subtract for temperature below standard.

PA-32R-300



Example:
Cruise pressure altitude: 8000 ft.
Cruise OAT: 50°F
Terrain pressure altitude: 1200 ft.
Terrain temperature: 70°F
Glide Range: (11 nautical miles minus 2.5 nautical miles) = 8.5 nautical miles

Chapter 12
Trouble In Paradise
Failing Wings & AD Things

Every now and then an aircraft series develops a problem which seems pretty astronomical at the time. Perhaps the entire fleet is grounded or an AD requires considerable modification or inspection at a high cost. Such was the case in early 1987 when Cherokee owners were shocked by a scenario which threatened the very existence of their planes.

It all started when a Cherokee 180, used in pipeline patrol crashed after a wing departed in flight. The FAA responded nearly immediately by issuing AD 87-8-8 which required the inspection of wing spars. The inspections would be done by removing the wings from the aircraft. The entire fleet of PA-28 and PA- 32 models (except for the 236, with a heavier spar) was affected.

The inspection was required on all aircraft with more than 5,000 hours on the airframe and it was costly - estimates ranged from about $1,500 to $4,000 to make the inspection, and there were not many shops around which were used to removing and installing Cherokee wings. Not only was the AD costly, but a shop could cause more damage by improper procedure in demating the wing. Worse yet, The AD required the process to be repeated every 5,000 hours.

But just as it was starting to look like a calamity for the Cherokee line, the FAA reconsidered its position (after several hundred inspections revealed no additional problems.)

Piper, however, working with the FAA, issued a service bulletin to cover the subject and provide for inspection of suspect airplanes. The seven-page service bulletin, Number 886, would break the line down into four classes of airplane and require inspection based upon the class.

Normal airplanes would be those which did not fall into any other category. They would require wing spar inspection after 62,900 hours. (This is between 150 and 600 years of normal Cherokee usage.)

"Severe" Category airplanes are those which were engaged in low-level flying, such as pipeline patrol, fish or game spotting, power line patrol, or aerial advertising. These planes are ones which spent a significant period of time flying below 1,000 feet AGL.

"Extreme" Category airplanes are those which suffered damage as the result of operations from extreme rough runways, flight in extreme damaging turbulence, or other accidents or incidents which required major repair or replacement of wings, landing gear or the engine mount.

"Unknown" is the final Category, and applies to all aircraft where the history is not known. Such planes are presumed to have had some severe or extreme usage.

The service bulletin calls for inspection every 6,000 hours in the case of severe, extreme or unknown categories for most Cherokee models. Some models, such as the Arrows, the 236 and the PA-32 models, falling into these categories, are required to receive inspections each 3,000 hours.

And although the service bulletin is not mandatory for owners unless the plane is used in a commercial operation, it is important to be able to document the past usage of Cherokees as long as this service bulletin remains in effect.

The AD System

The FAA periodically publishes directives, known as Airworthiness Directives (ADs), which require aircraft owners to perform certain maintenance or modification to their aircraft.

Part of the cost of an annual inspection is doing the research to determine that all of the ADs applying to a particular plane have been complied with and the manner of compliance. This is why it often costs a lot of additional money for the first annual inspection on a plane, when it is done by a mechanic unfamiliar with it.

All ADs are issued a number and only some numbers apply to any particular aircraft. The first numbers indicate the year, the second numbers show the period (bi-weekly) in the year when the AD was issued, and the final number shows the numerical designation of the AD during that two-week time period. Got this all down?

And one other thing - ADs apply not only to airplanes and engines, but to accessories and equipment, such as radios, autopilots and fuel pumps.

So how do you know what ADs apply to your plane? You research it, either by going down to the FAA office and weeding through the paperwork. Or, more realistically, by ordering a list which applies to your plane.

Several companies specialize in creating custom lists of ADs for your plane. One is AeroTech Publications, Inc., P O Box 528, Old Bridge, NJ 08857 (800) 235-6444 or (908) 462- 5330.

This company publishes a computerized AD listing for your plane, based upon serial number, or will provide an ADLog, which is a system of record keeping which permits you to demonstrate easily the compliance with all ADs on your plane.

To give you some idea of which ADs apply to which planes, we are providing the following listing. However, although most of the important ADs are shown, some which may affect your plane, may have been omitted. A complete check, based upon serial number, is required to comply with the FARs.

AD Listing

Model PA-28-140, 150, 160, 180 & 235

62-19-3: Replace propeller bolts (through S/N 28-365).

62-26-6: Inspect exhaust system every 50 hours or modify system (through S/N 28-707).

63-23-2: Inspect exhaust valves and guides, Lycoming 0-320 engines, every 500 hours of operation. (Applies only to engines with original 7/16 valves, not with 1/2 inch diameter valves. With 1/2 inch stem valves the AD no longer applies, and the TBO increases to 2,000 hours.)

64-6-6: Inspect control wheel for cracks (through S/N 28-868). 64-16-5: Modify AC fuel pump on Lycoming engines.

66-5-4: Modify various Marvel-Schebler carburetors. 65-6-6: Modify sending unit of fuel gauge.

66-20-4: Inspect AC oil filter for gasket failure.

66-20-5: Inspect and modify propeller spinner (S/N 28-1761 through 28- 3533).

67-12-6: Inspect control surface structures for corrosion.

67-20-4: Replace nosewheel torque links.

67-26-2: Modify fuel lines and selector valves.

67-26-3: Inspect the fuel system and reseal.

69-9-3: Mark tachometer with red band from 2150 through 2350 rpm.

69-15-1: Inspect or replace control wheel pin.
69-22-2: Inspect control wheel for cracks.
70-15-18: Modify autopilot.
70-16-5: Replace muffler or inspect each 50 hours.
70-18-5: Replace landing gear attach bolts.
70-22-2: Modify the fuel selector valve (235 only).
70-26-4: Inspect stabilator balance weight tube with for cracks.
71-14-6: Inspect magneto filter terminals.
71-21-8: Replace fuel selector cover (all except 235).
72-6-5: Inspect for looseness of Marvel-Schebler carburetor arm.
72-8-6: Inspect main gear torque links.
72-14-7: Inspect the stabilator attachment fittings.
72-17-5: Modify electric trim control system.
72-24-2: Attach throttle placard (140, 150, 160).
73-7-4: Replace coils or magnets on Bendix magnetos.
73-23-1: Inspect piston pins on overhauled engines.
74-9-4: Relocate rear-seat safety belt attachments.
74-13-4: Modify throttle control cable (140).
74-18-6: Replace fuel quantity placards on 1973-74 235s.
74-19-1: Inspect wing spars on 235 models.
74-24-13: Modify some altimeters.
74-26-7: Install or replace the "Spins Prohibited" placard on 1973 through 1975 180s.
74-26-9: Inspect some Bendix magnetos.
75-2-3: Inspect nose wheel fork for bends in legs.
75-8-3: Inspect fuel drain valves (all except 235).
75-8-9: Replace oil pump shaft and impeller-Lycoming engines.
76-18-4: Inspect fuel selector valve (235).
76-25-6: Replace oil cooler hose (140 only through S/N 71- 25471).
77-1-1: Placard fuel quantity gauges and check for calibration.
77-12-1: Replace fuel system parts or inspect every 50 hours (235).
77-12-6: Replace some Hartzell propeller blades.
77-23-3: Check or replace engine and propeller control rod or cable ends.
78-23-1: Replace fuel drain cover door or inspect every 100 hours (235).
79-13-8: Replace some Airborne dry air pumps.
79-18-5: Replace ELT battery.
79-22-2: Modify the fuel tank vents.

79-26-5: Inspect or replace fuel and oil hoses.
80-6-5: Test Slick magneto impulse couplers.
80-24-3: Inspect or replace ammeter.
81-16-5: Inspect Slick magneto coils.
81-18-4: Replace oil pump impeller and shaft-Lycoming engines.
82-13-1: Perform Bendix magneto service bulletin.
82-20-1: Inspect Bendix magneto impulse couplers.
84-26-2: Replace paper air filter element every 500 hours.
86-17-1: Replace ammeter.

Models PA-28-151, 161

74-14-4: Install weight placard (all through S/N 74-15538)
74-24-12: Modify aileron centering system (1974-75 models).
74-24-13: Modify some altimeters.
75-8-3: Inspect fuel drain valves.
75-8-9: Replace oil pump shaft and impeller-Lycoming engines.
75-16-4: Modify carburetor air box (1974-75 models).
77-1-1: Check system and placard fuel quantity gauges.
77-1-3: Modify carburetor air box (1974-77).
77-23-3: Check or replace engine and propeller control rod/cable ends.
79-2-5: Inspect or repair gascolator assembly.
79-7-2: Replace some batteries.
79-13-3: Inspect fuel line unions.
79-13-8: Replace some Airborne dry air pumps.
79-18-5: Replace the ELT battery.
79-22-2: Modify fuel tank vents.
79-26-5: Inspect or replace fuel and oil hoses.

Models PA-28-181

77-1-1: Check system and placard fuel quantity gauges.
77-23-3: Check or replace engine and propeller control rod/cable ends.
79-7-2: Replace some batteries.
79-13-3: Inspect fuel line connections.
79-13-8: Replace some Airborne dry air pumps.
79-18-5: Replace ELT battery.
79-22-2: Modify fuel tank vents.
79-26-5: Inspect or replace fuel and oil hoses.
80-6-5: Test Slick magneto impulse couplers.

80-14-2: Repair or replace throttle linkage.
80-14-3: Modify PTT switch on control wheel.
80-24-3: Inspect or replace ammeter.
81-16-5: Inspect Slick magneto coils.
81-18-4: Replace oil pump impeller and shaft-Lycoming engines.
84-26-2: Replace paper air filter element every 500 hours.
86-17-1: Replace ammeter.

Models; PA-28-236

77-12-6: Replace some Hartzell propeller blades.
79-7-2: Replace some batteries.
79-13-3: Inspect fuel line connections.
79-13-8: Replace some Airborne dry air pumps.
79-18-5: Replace ELT battery.
79-18-6: Comply with Bendix service bulletin.
79-22-2: Modify the fuel tank vents.
79-26-5: Inspect or replace fuel and oil hoses.
80-14-3: Modify PTT switch on control wheel.
80-24-3: Inspect or replace ammeter.
81-16-5: Inspect slick magneto coils.
81-18-4: Replace oil pump impeller and shaft-Lycoming engines.
82-11-5: Comply with Bendix service bulletin.
82-20-1: Inspect Bendix magneto impulse couplers.
82-27-3: Inspect or replace turbine housing every 200 hours (turbo models).
84-26-2: Replace paper air filter element every 500 hours.
86-17-1: Replace ammeter.

Models PA-28R-180, 200, 201T

68-12-4: Replace parts in the gear retraction system.
69-12-1: Replace air induction hose or inspect every 10 hours.
69-15-1: Inspect or replace control wheel pin.
70-9-2: Inspect propeller spinner for cracks every 25 hours until modification kit is installed.
70-15-18: Modify autopilot system.
70-26-4: Inspect stabilator balance weight tube for cracks.
71-5-2: Inspect crankshaft bearings, Lycoming IO-360 engines.
71-21-8: Replace fuel selector cover.
72-14-7: Inspect the stabilator attachment fittings.

72-17-5: Modify electric trim control system.
73-10-2: Replace Bendix fuel injectors.
73-23-1: Inspect piston pins on overhauled engines.
74-9-4: Relocate rear-seat safety belt attachments.
74-24-13: Modify some altimeters.
74-26-7: Check placard to insure that spins are prohibited.
74-26-9: Inspect Bendix magnetos.
75-8-3: Inspect fuel drain valves.
75-8-9: Replace oil pump shaft and impeller-Lycoming engines.
75-9-15: Install new fuel flow divider gasket.
75-24-2: Inspect rear legs on quick-disconnect seats.
76-15-8: Install nose gear modification kit.
76-16-2: Replace certain Airborne vacuum pumps.
77-1-1: Check system and placard fuel quantity gauges and check for calibration.
77-12-6: Replace some Hartzell propeller blades.
77-23-3: Check or replace engine and propeller control rod/cable ends.
78-9-7: Inspect and replace impulse coupling on various Bendix magnetos.
78-23-10: Replace fuel injector parts.
79-4-5: Comply with Lycoming service bulletin 433A.
79-7-2: Replace some batteries.
79-13-3: Check for fuel leaks at tanks and in cabin.
79-13-8: Replace some Airborne dry air pumps.
79-18-5: Replace ELT battery.
79-21-8: Modify lock nut on fuel injectors.
79-22-2: Remove fuel tanks and modify vent system.
79-26-5: Inspect or replace fuel and oil hoses.
80-19-1: Repair muffler.
80-24-3: Inspect or replace ammeter.
80-25-7: Inspect oil cooler for leaks.
81-11-2: Replace oil drain (up to 1976).
81-12-4: Inspect rudder torque tube attachment and hardware. Modify if required.
81-13-10: Inspect tach and oil pump drive gear; replace if necessary.
81-18-4: Replace oil pump impeller and shaft-Lycoming engines.
81-23-2: Inspect oil filter adaptor; replace if necessary.
82-6-11: Modify nose gear (some models).
82-13-1: Inspect Bendix magneto bushings.
82-20-1: Inspect Bendix magneto impulse couplers.
82-27-3: Inspect or replace turbine housing every 200 hours

(turbo models).

84-26-2: Replace paper air filter element every 500 hours.

86-17-1: Replace ammeter.

Model PA-32-260, 300

66-20-4: Inspect AC oil filter for gasket failure.

67-3-7: Replace the fuel selector valve (S/N 32-151 through 32-535).

67-12-6: Inspect control surface structures for corrosion.

67-20-4: Replace nosewheel torque links.

67-26-2: Modify fuel lines and selector valves.

67-26-3: Inspect the fuel system and reseal.

67-30-6: Replace air induction system or inspect every 100 hours.

69-9-3: Mark tachometer with red band from 2150 through 2350 rpm to prevent propeller vibration.

69-15-1: Inspect or replace control wheel pin.

69-22-2: Inspect control wheel for cracks.

70-15-18: Modify autopilot system.

70-18-5: Replace landing gear attach bolts.

70-22-2: Modify fuel selector valve.

71-9-5: Modify seat belts.

72-8-6: Inspect main gear torque links.

72-14-7: Inspect the stabilator attachment fittings every 100 hours.

72-17-5: Modify electric trim control system.

73-23-1: Inspect piston pins.

74-9-2: Comply with Piper SB 103 - location of the stall warning light.

74-18-13: Nosewheel modification.

74-19-1: Inspect wing spars.

74-24-13: Replace some altimeters.

75-8-9: Replace oil pump shaft and impeller-Lycoming engines.

75-9-15: Install new fuel flow divider gasket.

75-10-3: Modify baggage door (1975 models).

75-24-2: Inspect or replace rear seat legs and attachments.

76-18-4: Inspect fuel selector valve.

77-1-1: Check system and placard fuel quantity gauges.

77-12-1: Replace fuel system parts or inspect every 50 hours.

77-12-6: Replace some Hartzell propeller blades.

77-23-3: Check or replace engine and propeller control rod/cable ends.

78-23-1: Replace fuel drain cover door or inspect every 100 hours.

78-23-10: Replace Bendix fuel injector seals.

79-13-8: Replace some Airborne dry air pumps.

79-18-5: Replace ELT battery.

79-21-8: Modify lock nut on fuel injectors.

79-26-5: Inspect or replace fuel and oil hoses.

80-14-1: Modify fuel vent system to prevent leaks.

80-14-2: Repair or replace throttle linkage to prevent separation.

80-14-3: Modify PTT switch on control wheel.

80-17-14: Comply with Bendix service bulletins.

80-19-1: Repair muffler.

80-24-3: Inspect or replace ammeter.

81-18-4: Replace oil pump impeller and shaft-Lycoming engines.

82-11-5: Comply with Bendix service bulletin.

82-13-1: Inspect Bendix magneto bushings.

82-20-1: Inspect Bendix magneto impulse couplers.

82-27-3: Inspect or replace turbine housing every 200 hours (turbo models.)

83-22-4: Replace fuel diaphragm on Bendix fuel injectors.

84-26-2: Replace the paper air filter element every 500 hours.

86-17-1: Replace ammeter.

Model PA-32R-300 Lance

76-11-9: Re-route the fuel lines in wheel well.

76-15-8: Replace nose gear with modification kit.

76-16-08: Replace engine oil coolers.

76-18-4: Inspect or replace fuel selector valve.

77-12-6: Replace some Hartzell propeller blades.

77-23-3: Check or replace engine and propeller control rod/cable ends.

78-16-8: Replace oil cooler.

78-22-7: Replace control column stop sleeve.

78-23-1: Replace fuel drain cover door or inspect every 100 hours.

78-23-10: Replace Bendix fuel injector seals.

79-13-4: Install new fuel flow indicator tubes (S/N 78-87001 through 79- 87124).

79-13-8: Replace some Airborne dry air pumps.

79-18-6: Comply with Bendix service bulletins.

79-26-4: Modify rudder to prevent skin cracks.
79-26-5: Inspect or replace fuel and oil hoses.
80-14-1: Replace leaking fuel tank vents.
80-14-2: Modify PTT switch on control wheel.
80-17-10: Install new wastegate (turbo models).
80-17-14: Comply with Bendix service bulletins.
80-20-5: Inspect turbo exhaust coupling with dye penetrant.
80-24-3: Inspect or replace the ammeter.
80-24-7: Modify gear down locks.
81-18-4: Replace oil pump impeller and shaft-Lycoming engines.
81-19-4: Inspect or replace all hoses.
81-24-7: Modify nosewheel.
82-11-5: Comply with Bendix service bulletin.
82-20-1: Inspect Bendix magneto impulse couplers.
83-22-4: Replace the fuel diaphragm on Bendix fuel injectors.
84-26-2: Replace the paper air filter element every 500 hours.
86-17-1: Replace ammeter.

Models PA-32-301 Saratoga and Saratoga SP

80-14-3: Modify PTT switch on control wheel.
80-17-10: Install new wastegate (turbo models).
80-17-14: Comply with Bendix service bulletins.
80-24-3: Inspect or replace the ammeter.
81-18-4: Replace oil-pump impeller and shaft-Lycoming engines.
82-11-5: Comply with Bendix service bulletin. 82-13-1: Inspect Bendix magneto bushings.
82-20-1: Inspect Bendix magneto impulse couplers.
83-22-4: Replace the fuel diaphragm on Bendix fuel injectors.
84-26-2: Replace the paper air filter element every 500 hours.
86-17-01: Replace ammeter.

Oma D. Day, of Springfield, Virginia, taxis out to the active in his Warrior.

Chapter 13
Help, I Need Somebody
Goods and Services for Cherokees

There are a lot of manufacturers and companies out there providing goods and services for airplanes. Just about any magazine will show advertisers for avionics, tools, equipment and services, such as painting and refurbishing aircraft. But these are general services which will fit one model airplane as well as another.

There are a few things available especially for Cherokee aircraft which every owner should be available. They include modification companies, companies which provide add-on accessories, and companies which specialize in repairing parts which are exclusively Cherokee in nature.

Here is a listing which might come in very handy for Cherokee owners.

Airframe Performance Kits

These kits, which have been available for several years, tend to increase airspeed by cleaning up drag. They consist of mainly aileron and flap gap seals which eliminate the channel between the wing and control surface, wheel pants fairings, and other "goodies" designed to eliminate drag in such places as flap hinges.

The kits seem to do a good job, although getting anyone who can give an accurate tested result seems nearly impossible.

At this writing, there are three companies specializing in this type of clean-up:

General Aviation Corp.
Rock County Airport
Janesville, WI 53545
(608) 756-1234

Knots-2-U, Inc.
P O Box 589
Harbor Springs, MI 49740

Mod Works
8250 Skylane Way
Punta Gorda, FL 33982
(813) 637-6770

Associations

The Cherokee Pilots' Association is composed of Cherokee owners throughout the United States, Canada, and in other countries.

The association publishes a monthly magazine, the Piper Owners' Magazine, which contains member written information concerning operating tips and how to articles about the safe, cost-efficient operation of Cherokees. Included is information concerning:

- ☐ Maintenance
- ☐ Modification reports
- ☐ FAA Airworthiness Directives
- ☐ Airworthiness Alerts
- ☐ Service Bulletins

Also available is a group insurance program for aircraft, a family- oriented annual convention, and regional fly ins throughout the year.

It is the only organization devoted to maintaining specifically Cherokee models.

Membership at the beginning of 1991 was $28 a year.

For more information contact:

Cherokee Pilots' Association
P O Box 7927
Tampa, FL 33673
(813) 935-7492

The Aircraft Owners' and Pilots' Association (AOPA) is the grandaddy of aircraft owner groups and it supports all general aviation activities. It issues a top-rated magazine, the AOPA Pilot, and offers membership services such as title searches and aircraft purchasing guidance. It is invaluable for any owner of an airplane.

Membership at the beginning of 1991 was $39 a year.

For more information contact:

AOPA
421 Frederick Way
Frederick, MD 21701
(301) 695-2000

Auto Fuel STC

One way many aircraft owners are saving money is by switching to auto fuel. Auto fuel is less expensive than aviation fuel and works better in some engines which were designed to work on 80 octane fuel but are forced to utilize 100 LL fuel today.

STCs are available at moderate cost (about 50 center per horsepower) for the Cherokee 140 and Cherokee 235. They are available, too for Cherokee 180 models with serial numbers 28-1761 and up. (Earlier models require extensive modification of the airplane cowling and muffler system.) This STC is more expensive than for the 140 and 235, but it should more than pay for itself quickly.

Petersen Aviation
Route 1, Box 18
Minden, NE 68959
(308-237-9338)

Experimental Aircraft Assoc.
EAA Aviation Center
Oskosh, WI 54903-3086
(414-426-4800)

Battery Cable Kits

Kits are designed to eliminate resistance caused by original Piper aluminum wiring. In addition, Bogert offers a battery box designed to eliminate certain problems with the original Piper battery box design.

American Aviation
P O Box 850023

Yukon, OK 73085
(405) 354-7136

Bogert Aviation
Route 1, Box 1676
Prosser, WA 99350
(800)627-8088 or (509) 786-4300

Engine Upgrade

The Cherokee 140 is an underpowered plane for many applications. Many owners like their planes, but not the power, and one company offers a 180 horsepower engine with a constant-speed prop conversion which makes the plane a real performer. It is far from cheap, but it can really make the Cherokee 140 a sleeper.

Avcon Conversions
P O Box 654
Udall, KS 67146
(316) 782-3317

Fiberglass Parts

Certain fiberglass parts, such as cowlings, may need replacement. Other parts, originally made of ABS plastic, such as dorsal fin caps, may last a lot longer when they are replaced by fiberglass parts. There is one company which specializes in making quality fiberglass parts for Cherokees.

Globe Fiberglass, Inc.
3240 Drane Field Road
Lakeland, FL 33811
(800) 899-2707 or (813) 644-2178

Fuel Tank Repair

Certain fuel tanks, notably those produced before 1967, had problems with leaks. If this happens to your plane there is only one good way to solve it - remove the tank and seal it. One company specializes in this service and provides special cartons for shipping your tanks (and instructions for removing and shipping them):

Skycraft Corp.

85 N. Main Street
Yardley, PA 19067
(215) 493-1875

Instrument Rebuilding

Some instruments, such as fuel gauges and oil pressure gauges, are not readily available. But you can get your instrument rebuilt.

Air Parts of Lock Haven
Hangar 3, Piper Memorial Airport
Lock Haven, PA 17745
(800) 443-3117

Interiors

You can do a good job of refurbishing much of your plane yourself. The interior, especially, makes a big difference in your plane, and you can do the work yourself with custom made interior pieces, including seat covers, side panels, headlining and carpeting for your plane.

Airtex Products
259 Lower Morrisville Rd.
Dept CN
Fallsington, PA 19054
(215) 295-4115

Landing Light, Wing Mount

For additional light at night, additional wing mounted landing lights are a good idea.

Skycraft Corp.
85 N. Main Street
Yardley, PA 19067
(215) 493-1875

Propeller Conversion

One company offers McCauley conversions for some Cherokee models. A three- blade model for the Arrow reportedly cuts down noise inside the plane and eliminates recurrent inspections which plague the standard Hartzell props.

A two-blade model for the 180-181 is said to be more durable than the standard blade.

U. S. Propeller Service
P O Box 415
East Haddam, CT 06423
(800) 233-2586

There is also a company which can install a constant- speed propeller on some Cherokee 180 models. For more information contact:

Hutchinson Aircraft Service,
Hutchinson County Airport
Borger, TX 79007
(806) 274-6781.

Standby Electrical System

When your alternator or generator quits, you have only a little while before you will be without electrical power. A portable backup unit may come in really handy.

SV Avionics
16290 Redmond Way
Redmond, WA 98052
(800) 669-1003 or (206) 881-1001

STOL Kit

For those operating out of short fields, or who feel they may need to fly into them, a STOL kit, which adds stall strips to the wings, may be just what you need.

Horton, Inc.
Wellington Municipal Airport
Wellington, KS 67152
(800) 835-2051

Wing Tips (Hoerner Design)

Some old wing tips look bad. A more modern design is available to replace the original Piper tips.

Met-Co-Aire, Co.

P O Box 2216
Fullerton, CA 92633
(714) 870-4610

Valve Cover Gaskets

Special reusable valve cover gaskets are available for Cherokees.

Real Gasket Co.
P O Box 1366
Laurel, MS 39441-1366
(800) 635-7325 or (601) 649-0702

Windshield (Single Piece)

A single-piece windshield eliminates the center post and the two single windshields. The conversion looks real good and owners comment on its extra quiet. However, it does not completely eliminate center obstructions - a bar is installed inside the aircraft, similar to the internal bracing on a Bellanca.

Globe Aero, LTD
P O Box 5775
Lakeland, FL 33803
(813) 644-2451

Chapter 14
Saving Your Tail
Emergency Procedures

As editor of the *Piper Owners' Magazine*, I hear a lot of comments from owners of Cherokees. One common complaint is that various owners manuals do not provide enough information on acceptable emergency procedures.

So here, gathered from several Piper owner's manuals and handbooks, are various emergency procedures which may be adapted to your particular plane.

Emergency Procedures

This section contains procedures that are recommended if an emergency condition should occur during ground operation, takeoff, or in flight.

These procedures are suggested as the best course of action for coping with the particular condition described, but are not a substitute for sound judgement and common sense. Since emergencies rarely happen in modern aircraft, their occurrence is usually unexpected, and the best corrective action may not always be obvious.

Pilots should familiarize themselves with the procedures given in this section and be prepared to take appropriate action should an emergency arise.

Most basic emergency procedures, such as power off landings, are a normal part of pilot training. Although these emergencies are discussed here, this information is not intended to replace such training, but only to provide a source of reference and review and to provide information on procedures which are not for all aircraft. It is suggested that the pilot review standard emergency procedures periodically to remain proficient in them.

Engine Power Loss During Takeoff

The proper action to be taken if loss of power occurs during takeoff will depend on circumstances.

1. If sufficient runway remains for a normal landing, land straight ahead.

2. If insufficient runway remains, maintain a safe airspeed and make only a shallow turn if necessary to avoid obstructions. Use of flaps depends on circumstances. Normally, flaps should be fully extended for touchdown.

3. If you have gained sufficient altitude to attempt a restart, proceed as follows:

a. MAINTAIN SAFE AIRSPEED

B. FUEL SELECTOR - SWITCH TO ANOTHER TANK CONTAINING FUEL

c. ELECTRIC FUEL PUMP - CHECK ON

d. MIXTURE - CHECK RICH

e. CARBURETOR HEAT (OR ALT. AIR) - ON

NOTE:

If engine failure was caused by fuel exhaustion, power will not be regained after tanks are switched until empty fuel lines are filled, which mat require up to 10 seconds.

If power is not regained, proceed with the POWER OFF LANDING procedure.

Engine Power Loss In Flight

Complete engine power loss is usually caused by fuel flow interruption, and power will be restored shortly after fuel flow is restored. If power loss occurs at low altitude, the first step is to prepare for an emergency landing (See POWER OFF LANDING). Maintain an appropriate airspeed* , and if altitude permits, proceed as follows:

1. Fuel Selector - Switch to another tank containing fuel.
2. Electric Fuel Pump - On.
3. Mixture - Rich.
4. Carburetor Heat - On.
5. Engine Gauges - Check for an indication of the cause of power loss.
6. Primer - Check Locked.
7. If no fuel pressure is indicated, check tank selector

position to be sure it is on a tank containing fuel.

When power is restored:

8. Carburetor Heat - Off.
9. Electric Fuel Pump - Off.

If the above steps do not restore power, prepare for an emergency landing.

If time permits:

1. Ignition Switch - "L" then "R" then back to "BOTH".
2. Throttle and Mixture - Different settings. (This may restore power if the problem is too rich or too lean a mixture, or if there is partial fuel system restriction.)
3. Try other fuel tanks. (Water in the fuel could take some time to be used up, and allowing the engine to windmill may restore power. If power loss is due to water, fuel pressure indications will be normal.)

NOTE

If engine failure was caused by fuel exhaustion, power will not be regained after tanks are switched until empty fuel lines are filled, which may require up to 10 seconds.

If power is not restored, proceed with POWER OFF LANDING procedure.

* (Power off gliding speed, recommended by Piper varies with model, but should be approximately the best rate of climb speed. The speeds recommended are: 140, 150, 160, 180, and Archer - 80 mph; 235 - 94 mph; Dakota - 98 mph; 151, 161 - 85 mph; Arrow - 110 mph; Cherokee Six, Lance - 100 mph; Saratoga - 92 mph.

Power Off Landing

If loss of power occurs at altitude, trim the aircraft for best gliding angle and look for a suitable field.

If measures taken to restore power are not effective, and if time permits, check your charts for airports in the immediate vicinity; it may be possible to land at one if you have sufficient altitude. If possible, notify the FAA by radio of your difficulty and intentions. If another pilot or passenger is aboard, let them help.

When you have located a suitable field, establish a spiral pattern around this field. Try to be at 1000 feet above the filed at the downwind position to make a normal approach. Excess altitude may be lost widening your pattern, using flaps or slipping, or a combination of these.

Touchdown should normally be made at the lowest possible airspeed, with full flaps.

When committed to landing:

1. Ignition - Off.
2. Master Switch - Off.
3. Fuel Selector - Off.
4. Mixture - Idle Cut-OFf.
5. Seat Belt (and harness if available) - Tight.

For Arrow, Lance and Saratoga SP models only:

Whether to attempt a landing with gear up or down depends on many factors. If the field chosen is obviously smooth and firm, and long enough to bring the plane to a stop, the gear should be down. If there are stumps or rocks or other large obstacles in the field, the gear in the down position will better protect the occupants of the aircraft. If, however, the field is suspected to be excessively soft or short, or when landing in water of any depth, a wheels-up landing will normally be safer and will do less damage to the airplane.

Do not forget that at airspeeds below approximately (118 mph, PA-32R; 105 mph, PA-28R) the gear will free fall, and will take six to eight seconds to be down and locked. If a gear up landing is desired, it will be necessary to latch the override lever in the "OVERRIDE ENGAGED" position before the airspeed drops to prevent the landing gear from inadvertently free falling.

Touchdown should normally be made at the lowest possible airspeed.

(a) Gear Down Landing - When committed to a gear down emergency landing, close the throttle control and shut "OFF" the master and ignition switches. Flaps may be used as desired. Turn the fuel selector valve to "OFF" and move the mixture to idle cut-off. The seat belts and shoulder harness (if installed) should be tightened. Touchdown should be normally made at the lowest possible airspeed.

Always remember that the automatic gear system will extend the gear. Be prepared to latch the emergency gear lever in the "OVERRIDE ENGAGED" position before this happens to prevent the landing gear from inadvertently free falling, unless gear extension is desired.

NOTE: If the master switch is "OFF", the gear cannot be retracted.

(b) Gear Up Landing - If a gear up landing is necessary, latch the emergency gear lever in the "OVERRIDE ENGAGED" position to prevent the gear from inadvertently extending.

Touchdowns should normally be made at the lowest possible airspeed with full flaps.

When committed to landing, turn "OFF" the ignition and master switch. The fuel selector should be "OFF" and the mixture at idle cutoff.

Tighten the seatbelts and shoulder harness (if installed).

Spins

Intentional spins are prohibited in all Cherokee models except for the 140, and that plane only when operated under certain restrictions which place it in the utility category airplane. For approved maneuvers as a utility category airplane, refer to the Flight Manual. If a spin is inadvertently entered, immediately use the following recovery procedures:

1. THROTTLE - IDLE
2. RUDDER - FULL OPPOSITE TO DIRECTION OF ROTATION
3. CONTROL WHEEL - FULL FORWARD
4. RUDDER - NEUTRAL (WHEN ROTATION STOPS)
5. CONTROL WHEEL - AS REQUIRED TO SMOOTHLY REGAIN LEVEL FLIGHT ATTITUDE

Open Door

The cabin door on the Cherokee is double latched, so the chances of its springing open in flight at both the top and bottom are remote. However, should you forget the upper latch, or not fully engage the lower latch, the door may spring partially open. This will usually happen at takeoff or soon afterward. A partially open door will not affect normal flight characteristics, and a normal landing can be made with the door open.

If both upper and lower latches are open, the door will trail slightly open, and airspeed will be reduced slightly.

To close the door in flight, proceed as follows:

1. Slow aircraft to 100 MPH IAS.
2. Cabin Vents - Close
3. Storm Window - Open
4. If upper latch is open - latch. If lower latch is open - open top latch, push door further open, and then close rapidly. Latch top latch.

A slip in the direction of the open door will assist in latching procedure.

Fire

The presence of fire in noted through smoke, smell, and heat in the cabin. It is essential that the source of the fire be promptly identified through instrument readings, character of the smoke, or other indications, since the action to be taken differs somewhat in each case.

SOURCE OF FIRE - CHECK
1. Electrical Fire (Smoke in Cabin):
   a. Master Switch - Off.
   b. Vents -Open.
   c. Cabin Heat - Off.
   d. Land as soon as possible.
2. Engine Fire (In Flight):
   a. Fuel Selector - Off.
   b. Throttle - Closed.
   c. Mixture - Idle Cut-Off.
   d. Heater - Off (In all cases of fire).
   e. Defroster _Off (In all cases of fire).
   f. In terrain permits, land immediately.

NOTE

The possibility of an engine fire is flight is extremely remote. The procedure given above is general and pilot judgement should be the deciding factor for action in such an emergency.

3. Engine Fire (During Start):

Engine fires during start are usually the result of over priming. The following procedures is designed to draw the excess fuel back into the induction system.
   a. If engine has not started:
      1. Mixture - Idle Cut-Off
      2. Throttle - Open
      3. Turn engine with starter (This is an attempt to pull the fire into the engine.)
   b. If engine has already started and is running, continue operating to try pulling the fire into the engine.
   c. In either case stated in a and b, if the fire continues longer than a few seconds, the fire should be extinguished by the best available external means.
      1. Fuel Selector - Off.
      2. Mixture - Idle Cut- Off.

Loss of Oil Pressure

Loss of oil pressure may be either partial or complete. A partial loss of oil pressure usually indicated a malfunction in the oil pressure regulating system, and a landing should be made as soon as possible to investigate the cause and prevent engine damage.

A complete loss of oil pressure indication may signify oil exhaustion or may be the result of a faulty gauge. In either case, proceed toward the nearest airport, and be prepared for a forced landing. If the problem is not a pressure gauge malfunction, the engine may stop suddenly. Maintain altitude until such time as a dead stick landing can be accomplished. Don't change power settings unnecessarily, as this may hasten complete power loss.

Depending on the circumstances, it may be advisable to make an off airport landing while power is still available, particularly if other indications of actual oil pressure loss, such as sudden increased in temperatures, or if smoke, are apparent, and an airport is not close.

If engine stoppage occurs, proceed to POWER OFF LANDING.

Loss of Fuel Pressure

1. Electric Boost Pump - On.
2. Fuel Selector - Check on full tank.

If problem is not an empty fuel tank, land as soon as practical and have engine driven fuel pump checked.

High Oil Temperature

An abnormally high oil temperature indication may be caused by a low oil level, an obstruction in the oil cooler, damaged or improper baffle seals, a defective gauge, or other causes. Land as soon as practical at an appropriate airport and the cause investigated.

A steady, rapid rise in oil temperature is a sign of trouble. Land at the nearest airport and let a mechanic investigate the problem. watch the oil pressure gauge for an accompanying loss of pressure.

Alternator Failure

Loss of alternator output is detected through a zero reading on the ammeter. Before executing the following procedure, ensure that the reading is zero and not merely low by actuating an electrically powered device, such as the landing light. If no increase in the ammeter reading is noted, alternator failure can be assumed.

1. Reduce Electrical Load.
2. Alternator Circuit Breakers - Check
3. "Alt" Switch - Off (for 1 second), then on.

If the ammeter continues to indicate no output, or alternator will not stay reset, turn off "Alt" switch maintain minimum electrical load and land as soon as practical. All electrical load is being supplied by the battery.

Engine Roughness

Engine roughness is usually due to carburetor (or induction system) icing which is indicated by a drop in RPM, and may be accompanied by a slight loss of airspeed or altitude. If too much ice is allowed to accumulate, restoration of full power may not be possible; therefore, prompt action is required.

Turn carburetor heat on (or alt. air on fuel-injected models). RPM will decrease slightly and roughness will increase. Wait for decrease in engine roughness or an increase in RPM, indicating ice removal. If no change in approximately one minute, return the carburetor heat to COLD. If the engine is still rough try steps below:

1. Mixture - Adjust for maximum smoothness. Engine will run rough if too rich or too lean.
2. Electric Fuel Pump - On.
3. Fuel gauges - Check tanks to see if fuel contamination is the problem.
4. Engine gauges - Check for abnormal readings. If any gauge readings are abnormal, proceed accordingly.
5. Magneto Switch - "L" then "R", then back to "BOTH".

If operation is satisfactory on either magneto, proceed on that magneto at reduced power, with mixture full rich, to a landing at the first available airport.

If roughness persists, prepare for a precautionary landing at pilot's discretion.

NOTE

Partial carburetor heat may be worse than no heat at all, since it may partially melt ice, which will re-freeze in the intake system. When using carburetor heat, therefore, always use full heat, and when ice is removed return the control to the full position.

Propeller Overspeed
(Constant Speed Propeller only)

Propeller overspeed is caused by a malfunction in the propeller governor or low oil pressure which allows the propeller blades to rotate to the full low pitch.

If propeller overspeed should occur, retard the throttle and check the oil pressure. The propeller control should be to full "DECREASE rpm" and then set if any control is available. Airspeed should be reduced and throttle used to maintain 2,700 rpm.

Chapter 15
Let the Buyer Beware
Shopping for a Good Cherokee

Most pilots shop for a "used" aircraft. Let's face it - few planes are being made today and fewer people can afford them. And although there are some pitfalls to used plane shopping, a careful buyer can get a good deal and a fine performing airplane. Unfortunately, the subject cannot be thoroughly covered in just one chapter. But there are some things every plane purchaser should be aware of and I will try to cover as many of them here as possible.

Anyone considering the purchase of a plane for the first time should consider his needs carefully. Why does he want to own rather than rent? Renting is usually cheaper for pilots who do not fly more than 50 hours or so each year.

Have you checked your logbooks to see how many hours you are really flying? Many pilots are surprised to find they fly far fewer hours than they thought.

For the occasional pilot who wants to eschew renting, flying clubs or partnerships may be a better choice.

But let's assume you have considered and decided to go ahead and buy your plane. What next?

You must decide on the type of plane you need. A retractable may seem more macho to you, but if your average trip is less than 400 miles you will probably not notice the speed difference, and you will have acquired some expensive new systems to maintain.

If you fly long distances regularly or spend much time flying in mountains you may need to consider a turbocharged plane which can get the altitude you need. Of course, then you are not only considering higher maintenance for the plane but you had better plan on learning something about oxygen systems, too.

Do not buy a larger or more sophisticated aircraft than you actually need. The costs go up rapidly.

You will have to maintain your aircraft and the maintenance will need to be performed by a licensed A&P mechanic. You will have to have an annual inspection performed each year and the cost of the annual will vary depending upon what discrepancies the mechanic uncovers during the inspection.

You will have to pay for routine maintenance during the year, as when a generator belt breaks or a new battery is required. You will also have to plan ahead for the day when the engine (and perhaps the propeller) needs a major overhaul. And you will have to ensure that all ADs (Airworthiness Directives) issued by the FAA are complied with.

None of this is cheap and the more complicated your plane, the more it is going to cost to maintain it.

And by all means, do make a realistic assessment of the total costs of flying your plane. Generally, the costs can be broken down into the hourly and the fixed costs.

Fixed costs are items such as insurance, tie down, annual inspection fee, financing costs, and taxes which you pay simply because you are a plane owner. These are costs which you pay whether you fly your plane 500 hours or just one hour.

The hourly costs, however, vary with the amount you fly your plane. Here you need to consider the cost of fuel and oil, and the allocation of maintenance and engine major overhaul reserves.

The last point needs some amplification. Although you can never know for sure what the hourly maintenance costs will be for your plane, you need to make some reasonable estimate and then put something aside regularly to help pay for the estimated cost. Or, in the alternative, fly the aircraft without reserve, knowing that you may need to mortgage the homestead to pay for maintenance or overhaul when it becomes necessary.

For example, if you have a good-flying plane with 1,100 hours on an engine nominally rated at 2,000 hours for TBO, you need to find the cost of overhauling the engine, then divide it by 900 and that should be your reserve. Not that the 2,000 hours is guaranteed to be the point when you need an engine overhaul - your plane may need one at 1,500 hours or it could go on as long as 2,500 hours, but the TBO is a good reference point to get you started in your planning.

Notice that the fixed costs are pretty well set, no matter how much you fly. This is the reason it is not feasible to own an aircraft unless you use it regularly. If your fixed costs come to $2,000 and you fly 250 hours a year, your hourly breakdown of the fixed costs comes to $8 an hour. But if you fly that same plane just 40 hours, your hourly breakdown on fixed costs comes to $50 an hour, and that does not include any fuel or maintenance.

There are some things you can do to bring down operating costs and some planes are more likely candidates to save you money than others. A Cherokee 140, for example, can be operated with an auto-fuel STC which can save you money. But remember that you will have to fuel the plane. Make sure you know how you are going to do it and do it safely.

Some mechanics will allow you to save money by helping on the annual inspection. It is known as an owner-assisted annual and it gives you the chance to learn something about your plane. But if you are all thumbs and cost the mechanic time rather than save it for him, you are not going to save any money here.

Decide What A Plane is Worth

Let's assume you have worked out all the costs, you have been realistic, and you realize that the costs could go considerably higher with a little bad luck or an unexpected AD or so. You have a potential model picked out and you are set to start looking. What next?

Get an idea what the plane is worth. You can get an idea by scanning the pages of Trade-A-Plane, the aviation yellow sheet that lists more planes for sale than any publication in the country.

Remember, the prices in Trade-A-Plane are "asking prices" - you can assume that most of them will sell for somewhat less than the asking price.

(You can subscribe to Trade-a-Plane for six months by sending $15 to Trade- A-Plane, P O Box 929, Crossville, TN 38557.)

Another good source of price information is the Aircraft Value Guide which is published four times a year by ESSCO, 1615 S. Arlington St., #420, Akron, OH 44306. The subscription price, at the time of this writing, is $42 a year or $12 for one issue. It lists the wholesale and retail price for each year, as well as the anticipated engine overhaul cost.

But remember, aircraft prices, both asking and actual sale, vary widely depending on condition of the plane and the avionics and other equipment included.

The cost of a good paint job on a plane is about $5,000. So obviously, a plane with a good paint job should command a premium price over one which is in need of new paint. Avionics, too, is expensive. A complete avionics package may be worth more than the airframe it is mounted in, especially on older model planes with new radios.

The value of a used airplane will depend, too, upon the condition of the engine and the number of hours since it was last overhauled (SMOH).

However, beware here of engines which are being sold with new overhauls. Many owners with a sick engine will take their planes and have a "limits only" overhaul performed on the engine. By law, all the mechanic has to do is ensure that all parts being replaced in the engine meet minimum manufacturer limits.

The problem with such an overhaul is that although it may meet minimum limits when the mechanic finishes with it, it may be out of those limits a few flying hours later.

The seller, however, will try to advertise such a plane by pointing out it only has 5 hours SMOH. Beware of such a plane. It may be in for another major overhaul within the year.

Selecting A Plane

Before you select a plane, you are going to want to look it over carefully, inside and out. So the first step should be the personal inspection.

Talk to the owner. Why is the owner selling it? Does he seem honest and straightforward when you ask him questions about the plane? Ask him directly if there is anything wrong with the plane that you should be made aware of.

Take your time. It is your money and you have a right to satisfy yourself that you are not simply buying a bucket full of trouble. Here is a checklist which should give you an idea what to look for:

Cabin: Check doors and windows. Do they operate properly and latch correctly? Do locks work? Is glass clear or crazed or cracked? Do seats adjust properly? Do they lock correctly on their tracks? How about overall upholstery condition? Check carpeting for wetness - a sign of water leaks. Be sure to check both carpeting and headliner. Do heater and vent ducts work properly? Is interior plastic broken, cracked or missing? Check the panel. Does it have the instruments and avionics you want and need? Does everything work properly? Any missing knobs or switches? Any instrument faces cracked? Does the panel look neat or has someone simply stuck radios and instruments in any available spot? Look under panel to determine whether installations were done neatly and professionally.

Engine: Open the cowling and check the engine. Is it clean? Free of rust? Any trace of oil leaks? Are hoses in good condition? Any evidence of chafing? Are there metal particles in the oil screen? (Check to ensure that magneto is off - treat magneto as on) Turn propeller through - does there appear to be compression on all cylinders? Check battery for corrosion (box may be at rear of plane or under rear seat -depends upon model.) Check cowling for damage.

Propeller: Does it appear in good condition? Any nicks or cracks? Is the spinner in good condition? Check propeller for looseness. Any leaks from hub (constant speed)?

Wings & Tail: Any obvious damage. Any dents or wrinkles in skin? Are all inspection plates in place? Any sprung rivets? Any fuel stains around tanks? Do control surfaces work properly and freely? Any signs of rust or corrosion? Check sumps for presence of water or debris. Check all lights and strobes. Check the pitot and static vents. Lower flaps - do they appear in good condition and working properly?

Fuselage: Any skin wrinkles or obvious damage? Are radio antennas secure?. Is there any evidence of leaks? How about the paint job? (Paint jobs can cost $5,000 or so - no Earl Scheib $99 specials here.)

Landing Gear: Check condition of the tires - look for any unusual wear patterns indicating gear out of alignment. Are brake lines secure? Are struts properly inflated and free of corrosion? Check condition of wheel fairings or gear doors (retractables.)

Finally, make sure that the required paperwork is with the airplane. The FAA requires that there be a current airworthiness certificate, an aircraft registration certificate, an FCC radio license, an approved flight manual (or operating limitations list on older aircraft), and weight and balance information.

Check also to see if the owner has his bill of sale from his purchase of the aircraft and a service manual for the plane.

Now you need to review the aircraft log books. Start at the most recent entry and work backwards. The logs should go all the way back to when the aircraft was manufactured. Missing logs could be the result of accident or theft, but they could also mean the owner has something to hide.

Make sure you compare serial numbers against the airframe, engine, avionics, and other components listed. Look for any entries showing damage to the plane. Make sure that there is no long lapse of time or missing sections of the logs. Try to determine whether major ADs have been complied with.

The inspection of the logs is extremely important. Not only will you check them yourself, but your mechanic will also go through them thoroughly during his pre-buy inspection. The logbooks tell more about how a plane has been cared for and whether it is airworthy than any other factor.

In short, you want to do a walk-around inspection as complete as you would if you were about to fly a strange plane on a long over-water flight.

If all appears in order and you like what you have seen up to this point, it is time for a flight test.

The Flight Test

The flight test does two things - it shows whether there is a problem with the plane and it will also show whether the plane feels right to you. Some people just do not get along well with a particular airplane. If you are not comfortable with a particular model, that model is probably not for you.

During the flight test you will check out all systems. How does the engine start? Does the battery turn the engine over quickly? Do all instruments come into the green quickly - particularly the oil pressure gauge?

How does it handle on the ground? Any problem with brakes or steering?

After airborne make sure you check all instruments. Do they read correctly? Do performance figures seem to match those of the owner's handbook? How does the plane handle?

Are there wind noises around doors and windows? Try out the heater (even in August). Any unusual smells from the system?

Are all controls free and operating without binding? Trim the aircraft up for several different speeds. Does it work correctly? Slow the aircraft. Raise and lower both gear and flaps. Any problems? How about the rigging? Doe the plane fly splendidly with hands off or do you have to constantly correct it? Check the rudder trim (down on the pedestal)? Does it work? Try a stall. Does the stall warning system work?

Check all avionics. You may have to fly a distance to find the appropriate navigation aids, but you need to know whether all radios are operating (including such items as DME or the localizer portion of your radios).

Now return to the airport and do a few take offs and landings. Do you know the proper procedure for these. How about a short field takeoff? Does the plane get off the ground okay? Any shimmy in the nosewheel on takeoff or landing?

Taxi the aircraft back to the ramp. Now, try one more start. Some engines which start perfectly when cold are almost impossible to start hot. Now is the time to find out.

With the test flight completed, if you still are interested in the plane it is time for a little professional help.

The Mechanic's Inspection

The mechanic's inspection should be performed by your mechanic - not by the mechanic of the seller or broker. You should be the one to pay his bill. Although this will cost you a little cash it is money well spent. The mechanic you select will be the one looking out for your interests and the one who can tell you best what problems may develop in your plane.

A mechanic's inspection cannot be accomplished quickly. He will need to go over the logbooks thoroughly and this will take time - and he gets paid by the hour. He needs to make sure not only that the logbooks are complete, but that all ADs are complied with and that they were complied with correctly.

He will also check to see that there are 337 forms for any major modifications which have been made on the plane. This is required by the FAA and could cause some grievous consequences down the road if the paperwork is missing.

He will check the condition of the engine by running a compression check and perhaps by doing a borescope check of the inside of the combustion chambers.

He will completely inspect the fuselage and control systems. This means removing all access panels and some interior components.

In cases where the owner has just had an annual inspection done or where he advertises "annual at time of sale," you may not skip the mechanic's inspection. Just like overhauls, annual inspections vary in quality depending on who is doing them. You must have an inspection of your own if you are to know the real condition of the plane.

If the plane passes muster here it is time to get serious about purchasing the plane.

The first thing you want done is a title search. There are numerous firms in Oklahoma City which do this work. Two with good reputations are AOPA Title Search Service, 405-682- 2511 and Insured Aircraft Title Service, Inc., 800-654- 3282.

The title search will tell you two things - whether the plane is actually owned by the person who is selling it to you, and whether there are any unpaid liens on the plane.

Sometimes a seller, in good faith, is unaware that a previous lien on an aircraft has not been satisfied, or, in some cases, a previous lender "forgot" to file the appropriate satisfaction. This is why you need a title search to determine whether you are purchasing an aircraft free and clear. If you are financing your aircraft the lending institution will require that you get a title search.

Buying the Plane

Now, you need to make the actual transfer. The seller gets the money, of course, and the buyer has some paperwork to complete.

First of all make sure you get the proper paperwork from the seller. You will need a bill of sale (FAA Form 8050-2), the airworthiness certificate, all engine, airframe or equipment logbooks, equipment list and weight and balance data, and the flight manual (or operating limitations).

You will then need to fill out several forms:

FAA Form 8050-1 - Aircraft Registration Application - which will be filed along with the bill of sale. You will keep the pink copy in the aircraft until a new registration is issued by the FAA.

FAA Form 8050-41 - Release of Lien - to be completed by the seller if there is a lien on the plane.

FCC Form 404 - Application for Radio Station License - must be completed if you have radios, one form required no matter how many radios you have. A section remains with you and acts as a temporary license until the permanent one arrives.

The forms are simple enough - you should be able to fill them out yourself. But if you need help, AOPA offers members a closing service, for a fee, which will take care of any paperwork for you.

But once the paperwork has been submitted, the buyer is now the owner of the aircraft under the law.

Congratulations, you rascal. You now own your own airplane.

Chapter 16
Establishing a Meaningful Relationship
Living With Your Cherokee

Now that you are a Cherokee owner there are some things you need to consider. Cherokees make fine planes - many owners have had theirs for a decade or more. In fact, many owners consider their planes a part of the family and maintain a family relationship. But just as with any other relationship, it needs a bit of work.

Let's look at some things which will affect your plane while you own it.

Leaks

Cherokees are leakers. Let's face it, most Cherokees end up with wet carpets and water in unwanted areas during wet weather. So, what can you do?

There are two basic approaches to leaks. One involves caulk guns and sealants and a garden hose. The idea is to go out and find the source of leaks with an assistant plying the garden hose over all nooks and crannies of the plane. They are then plugged with sealant.

The problem is that the sources of leaks are many - windows, doors, wing root seal, tail cone, and door latch mechanism - just to mention a few common areas.

The problem is complicated by the fact that the water tends to accumulate in areas far distant from the actual source of the leak. What happens is that water leaks in a particular area - a rear window, for example, and then runs along a channel and

Cherokees are very versatile. Here, professional musician Peter Rejto commutes with his cello.

finally accumulates on the other side of the plane.

In addition to having an assistant with a water hose, it may be necessary to remove upholstery and carpeting to trace the location of the leak.

For those desiring to spend some time with a caulk gun, be aware that some of the new silicone RTV sealants work best, particularly on windows and windshields.

A second approach involves protecting the plane from rain and the elements in the first place. In short, it involves hangaring the plane. This is certainly a good method as it also protects the paint and keeps inside temperatures below the boiling point. It also, of course, involves higher monthly costs.

A variation of this method involves a cabin cover. This method will help and may stop all leaks, although it will not help if your leak is at a place such as the wing root or the tail cone, of course.

Hard Starting

Cherokees are noted for hard starting. Not necessarily for problems concerned with the ignition or fuel systems, but simply for the problem where the starter does not want to turn the engine over and the pilot has to "bump" it to get it to start.

Your Cherokee may start fine today, but it may develop the dreaded slow starter syndrome at any time in the future.

The reason is not hard to discover. Piper, generally, puts the battery somewhere in the back of the plane - under the rear seat or behind the baggage compartment. In addition, to save weight and money, Piper used aluminum cables. These lengthy aluminum cables have a tendency to corrode and to impede starting.

The cure is equally obvious. Remove those cables and replace them with copper cables. Several companies manufacture STC'd kits which are direct replacements for the aluminum kits. They are worthwhile investments. (See chapter 13).

Some owners have used homemade devices, such as welding cable, to replace the starter cables. I advise against it. First, it is not approved for the aircraft and sharp IAs have been known to spot it and ground an airplane during an annual inspection for using unapproved cables. Second, some cables, such as welding cable, are not designed for the vibration in an aircraft and tend to develop some corrosion and mechanical problems of their own. The replacement kits are economical enough that no one should be without one.

Engine Overhaul

There comes a time in the life of every airplane when an engine overhaul is necessary. This is certainly not unique to Cherokee models - it applies to every aircraft flying. Yet it is the cause of more confusion and more apprehension among owners than practically any other area.

First off, today's aircraft engine is generally pretty rugged and reliable. Properly cared for, an engine is good for thousands of hours of flying without problems. But, they do not last forever.

Engine manufacturers issue a recommended TBO (time between overhauls) on each of their engines. This time is the manufacturer's guess on how many hours an engine should go before needing an overhaul. Unfortunately, no one ever told the engine what this number was and engines continue to wear out early or to go far beyond TBO without trouble. It is far from an infallible guide.

In the first place, it is based on certain assumptions. The first assumption is that the plane is flown regularly, without any long periods of down time. Lycoming suggests that at least 15 hours a month is required to have an engine reach TBO.

Second, proper maintenance, with regular oil and filter changes is anticipated. Finally, the engine manufacturer assumes that the engine will be operated without unusual stresses, such as in training or in very dusty conditions.

Even if a plane is properly maintained and flown regularly, however, some planes simply will not make it to TBO. It could be that the prior overhaul was not done properly, or it could be simply bad luck.

This is why many used planes with 2,000 hour TBO recommendations are advertised as having 1,500 hours total time, with 300 hours since major overhaul.

Other planes, however, fly right on past TBO and never know the difference.

It is quite legal to fly beyond TBO, but it is not very smart unless you keep a good eye on the plane, monitor all indications, and have periodic checks, including oil analysis done at each oil change interval.

How can you determine whether an engine is ready for overhaul?

Here is a quick checklist to help you make the decision:

1) What has been the particular engine history?

2) What kind of reputation does your particular engine model have?

3) How has the engine been operated? Any long down-time periods?

4) How has your engine been maintained over its life?

5) What does the oil and filter say? Have oil changes been regularly done?

6) Oil consumption. Has there been an unusual increase Recently?

7) Fuel consumption - has it been running lean at cruise power?

8) What has been the trend in the oil analysis program?

9) What has been the trend in compression checks?

10) How do the spark plugs look?

Consult the manufacturer's literature for more information about recommended overhaul periods and for tips on how to extend engine life.

If you do need an overhaul, what should you do? Ads proclaim all sorts of remedies - major overhaul, factory rebuilt, factory new, zero time....What exactly do all these terms mean?

A pilot with a run-out engine has several ways to go, but we had better get the terminology straight. Basically, there are three options: factory new engine, rebuilt engine, and overhauled engine.

A factory new engine is exactly that. It is an engine, ordered from the factory, which is brand new. It is also quite expensive. This is why the majority of planes do not get them at overhaul time.

Rebuilt engines are engines which have been disassembled and then rebuilt to like-new standards. In fact, the FAA specifies that a rebuilt engine shall be "disassembled, cleaned, inspected, repaired as necessary, reassembled, and tested to the same tolerances and limits as a new item...."

Rebuilt engines may come either from the factory or from a custom repair shop. Generally, the factory rebuilt is more expensive - the cost of a new engine, less the cost of the core charge - but it does have advantages. Only a factory can grant "zero time" to an engine. That is, only the factory can issue completely new log books to an engine.

An engine advertised as "zero time" will not be such unless it was rebuilt by the factory. Factory rebuilt engines are distinguished by their manufacturer with an "R" in the serial number.

And finally there is the overhaul - the most commonly used method of refurbishing a run-out engine. Unfortunately, all overhauls are not created equal. A good overhaul should be able to operate to full TBO, but you have only the reputation of the overhaul shop to rely on.

Engine manufacturers specify certain service limits for all major parts of their engines - these are limits beyond which the part is no longer serviceable.

Unfortunately, it is quite legal to overhaul an engine to just "service" limits. Such an engine may have been disassembled, in fact, and then reassembled with no parts having been replaced. So long as all parts complied with service limits, such an overhaul would be quite legal.

Also, unfortunately, it would not last very long.

Although some owners shop simply for "cheap" overhauls, they may not get them in the end. Once an engine is opened up, some items may be found which considerably alter the amount of the original estimate. What do you think your bargaining position will be after the engine has been disassembled?

To sum up the overhaul situation, overhauls may not be bad buys. In fact you can get a good one without paying top price. But you must know the shop you are dealing with and you must deal only with someone who will stand behind his product in case of a problem.

Oil Analysis

One service which is highly recommended to help you keep your engine running trouble-free to and beyond TBO is oil analysis.

Oil analysis is done at each oil change. A small sample of oil is collected and sent to a laboratory which then will send you a written analysis of the oil.

The purpose is to detect minute metal particles in the oil and tell in what percentage they are found. Here are a few things which may be found and the places they are likely coming from:

Aluminum	Pistons, Bearings
Chromium	Rings, Cylinders
Copper	Bearings
Iron	Rings, Crank, Cam
Lead	Gasoline
Magnesium	Rings
Nickel	Rings, Bearings
Silicon	Dirt
Silver	Bearings
Tin	Bearings

The results of one oil analysis are not very useful. You need to do one at each oil change and then note any trends. Also, because the testing methods vary from lab to lab, you should stick with one and compare their results from one oil change to another.

Oil should be collected in mid-stream (not the bottom or top of the oil) and should be hot when collected.

Oil labs will send you a sampling kit and instructions. There are many available, but two are:

Spectro, Inc.
P O Box 16526
Fort Worth, TX 76133

Spectrum Laboratories, Inc.
524 Pelham Avenue
Piscataway, NJ 08854
(201) 752-1400.

Preventive Maintenance

One costly aspect of aircraft ownership is preventive maintenance. But the FAA says you can do your own preventive maintenance - by doing so you will save money and you will also learn a great deal about your plane.

If you are going to do work on your own plane you really need a service and parts manual. You can get them from Piper or from ESSCO (see Chapter 13).

You will also need a good set of tools (avoid cheapo tools which may damage the part you are working on). A little experience helps. If you are not adept at mechanical things, get your mechanic to teach you the proper way to do a task before attempting it yourself.

Anytime you work on a plane, use good work habits. Keep parts clean. Put things back the way you found them. Make sure that you complete a task before taking that coffee break. When you return you may think you torqued and then safetied those bolts you were working on, but you may not have. Always finish the current task before taking a break.

You can do preventive maintenance on your own plane - the FAA says so. But that does not mean you can do any maintenance you want to. What you can do is specifically spelled out in Part 43 of Appendix A of the FARs. Here is what you can do:

1) Removal, installation and repair of landing gear tires.

2) Service landing gear shock struts by adding oil, air or both.

3) Servicing landing gear wheel bearings, such as cleaning

and greasing.

4) Replacing defective safety wiring or cotter keys.

5) Lubrication not requiring disassembly other than removal of non- structural items such as cover plates, cowlings and fairings.

6) Replenishing hydraulic fluid in the hydraulic reservoir.

7) Refinishing decorative coating of fuselage, wings, tail group surfaces (excluding balanced control surfaces), fairings, cowling, landing gear, cabin or cockpit interior when removal or disassembly of any primary structure or operating system is not required.

8) Applying preservative or protective material to components where no disassembly of any primary structure or operating system is involved and where such coating is not prohibited or is not contrary to good practices.

9) Repairing upholstery and decorative furnishings of the cabin or cockpit interior when the repairing does not require disassembly of any primary structure or operating system or interfere with an operating system or affect primary structure of the aircraft.

10) Making small, simple repairs to fairings, non- structural cover plates, cowlings and small patches and reinforcements not changing the contour so as to interfere with proper airflow.

11) Replacing side windows where that work does not interfere with the structure of any operating system such as controls, electrical equipment, etc.

12) Replacing safety belts.

13) Replacing seats or seat parts with replacement parts approved for the aircraft, not involving disassembly of any primary structure or operating system.

14) Troubleshooting and repairing broken circuits in landing light circuits.

15) Replacing bulbs, reflectors and lenses of position and landing lights.

16) Replacing wheels or skis where no weight-and-balance computation is involved.

17) Replacing any cowling not requiring removal of the propeller or disconnection of flight controls.

18) Replacing or cleaning spark plugs and setting of spark plug gap clearance.

19) Replacing any hose connection except hydraulic connections.

20) Replacing fabricated fuel lines.

21) Cleaning fuel and oil strainers.

22) Replacing batteries and checking fluid level and specific

gravity.

And lest you be alarmed by the omission, a specific amendment permits pilots to replace the spin-on oil filter on your Cherokee.

If, in this book, I have seemed to dwell on problems rather than the advantages of ownership, the reason is that these areas are the ones which seem to keep popping up in questions from Cherokee owners. Certainly aircraft ownership is not just a bunch of problems - most of the time it is a very worthwhile experience.

The feeling of freedom you get as you drive to the airport knowing that you can soon get to far-away places faster and with a much better view than earth-bound mortals makes all the work and expense worthwhile.

So, for now, don't worry about the headaches. Enjoy your Cherokee and, happy flying!

The Cherokee Tribe

By Terry Lee Rogers

The resource book for all owners of Piper Cherokees or for anyone considering purchasing one.

A complete guide to everything you would want to know about a Cherokee including:

- ☐ Where to find them.
- ☐ Model year idiosyncrasies.
- ☐ AD listing.
- ☐ Production figures, by year.
- ☐ Serial Number listing.
- ☐ Performance charts & graphs.
- ☐ Supplier and modification directory.

Terry Lee Rogers is the editor of the *Piper Owner Magazine* and has been executive director of the Cherokee Pilots' Association since 1980. He edited the loose-leaf guide, *Cherokee Hints & Tips.*

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