CESSNA P210N

IT'S LONELY AT THE TOP

If you can handle it, the P210N can handle almost anything.

BY EDWARD G. TRIPP

Aside from the funny little windows and the fatter windshield posts, the Cessna P210N looks much like the normally aspirated and turbocharged 210s. Even the recommended procedures in the operating manual are practically the same, with an additional line added here and there to cover the pressurization system.

The P210N operates much the same as other 210s, too—so long as everything, including the pilot, is working properly, that is. A 4,000-pound single is a heavy airplane in all respects; it shows up in ground handling and in all phases of flight. The P210 is just a bit more so than the other variants; it requires more planning and preparation, more checking and better decisions (November *Pilot,* p. 32).

The planning, preparation and decisions begin before the airplane is purchased, really, and continue through every preflight, flight and post flight. The best operating altitudes for the airplane become hostile territory if something goes wrong. The best way to minimize things going wrong or their worst effects is to consider and plan and equip for such contingencies.

The owner/operator of such an airplane generally is stepping up to an entirely new set of flying considerations, rather than stepping back from a more sophisticated, pressurized twin. (The operational profile of the P210 and the relative operating economics, however, *could* be a lure to more big aircraft operators as fuel and maintenance costs rise. We aren't even considering the single versus twin arguments here. Many of them are really economic decisions rather than operational or safety ones—and the cost of buying and flying will resolve an increasing number of them in favor of singles.)

A large number of P210 purchasers are relatively low-time pilots who have neither the fundamental knowledge of high-altitude flight and weather nor experience with in-flight situations and equipment decisions to prepare them for what they might encounter. Many of them are trusting to luck. In my personal opinion, Cessna has more reason to operate a systems and operations school for P210 owners than for its larger aircraft.

Equipment failures or weather problems and poor decisions have more potential for disaster at the normal operating altitudes of this aircraft than they do for lower-flying ones.

In fact, a prospective purchaser could approach equipment decisions for the P210 in much the same way that someone buying a turboprop or a turbojet does: the green airplane to which one adds avionics and other systems. Sure, the completion business on a big jet is more detailed, since everything including exterior paint and interior design is left to the buyer. But the decisions on the basic flying and navigating gear in the P210 are at least as important to dependable, safe operation.

The two key objectives to equipping a P210 are pilot work load and dependability (including redundancy). It is a fairly work-intensive airplane, particularly during departure and arrival. In cruise, however, the work load is much reduced, aside from systems monitoring, fuel management and weather-related decisions. It is a largely electric airplane and is highly dependent on its single vacuum system for gyro instrument and deicing.

Maintenance, too, presents a rather different set of considerations to the potential operator. This is not the kind of airplane that should wait until something breaks before it goes in for maintenance. It should be set up on a progressive maintenance cycle with a qualified shop and a well-trained mechanic to try to catch things before they fail. It might be preferable to establish a safe life for certain compo-

PHOTOGRAPHY BY ART DAVIS

nents, such as the vacuum pump and the alternator. While there is no established mean time between failures (MTBF) for such components, they are so essential and have such a deplorable service history, that they should be placed on an estimated service-life basis.

Other articles in this issue deal with the weather, and the physiological and the operating considerations of flight above the altitude at which supplemental oxygen is required. An article on pressurization by Barry Schiff that appeared in the March 1979 *Pilot* (p. 46, reprinted in *The Proficient Pilot*) is a good introduction to both mechanical and operational considerations.

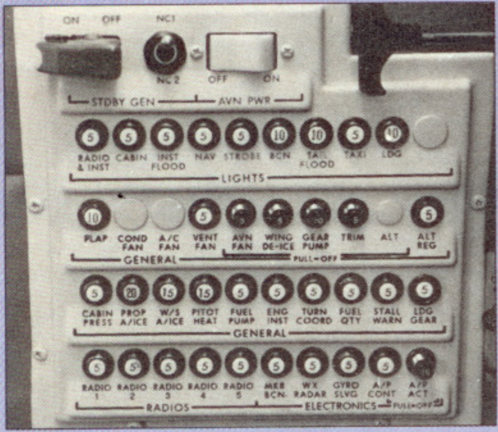
None of this is intended to make high altitude flying intimidating nor to make the P210 sound like a touchy, lumbering beast. But the operational environment and the aircraft itself demand that the pilot be well-trained and informed, careful and methodical. And the pilot's work load is higher.

Even preflight requires more care. The engine is tightly cowled, and there is not enough space to run a hand into the air intake and over the top of the engine. But birds can—and have—made some elaborate nests in that small space. Fortunately, the top halves of the cowl can be removed in a few minutes to make inspection easy. It is good procedure to remove the cowling and look closely every few days, since there is a lot of plumbing, wiring and tubing to check for security and wear throughout the engine compartment.

The fuel system needs careful examination before each flight. It is very easy for line crews to underfill, since the fuel swirls into the tank and needs a slow pumping rate for the last 10 or 15 gallons. Though the tanks may appear full to the attendant, the fuel settles and a great deal more can be added. The pilot also should check to ensure that the caps are secure and the vents free to prevent siphoning. And he should not rely on the fuel gauges.

There are five fuel system drain points: one for each wing tank, one for each reservoir tank at the bottom of the fuselage and the fuel strainer drain on the left side of the engine. The strainer is mounted in the nosewheel well and should be checked regularly for security (clearances in the nosewheel bay are close). As mentioned in the November article, a small ladder is indispensable for such high-winged aircraft.

A bit of rear-seat space is lost to avionics equipment, so save the seat for the small and the nimble.



Keeping up with the systems and the ADs is challenging. The fuel selector received the latest AD.

The P210 is definitely a checklist airplane. There are too many essential bits to be checked or performed to trust to memory. For instance, the avionics cooling fan is a no-go item; the radio stack will be out of commission in a few minutes if the fan fails.

Consider the pressurization items to be verified during preflight and departure: cabin door and emergency exit closed and locked; door handle safety lock open; cabin pressure altitude set (at least 1,000 feet above field elevation); pressurization controls set (dump valve and pressure switch on or off, depending upon conditions); outside air selector on or off; if air conditioning is installed, system off and air selector valve closed.

If ambient temperatures are warm and you have decided to leave the pressurization system disengaged until cooler air is reached (the turbocharged air that provides pressure is warm—despite the heat exchanger, 15° to 20° warmer than the ambient air temperature), you must close the dump valve and engage the pressure switch 1,000 feet below the selected altitude.

You also must remember to lock the door handle safety before pressurizing, just in case you forgot it while cleaning the airplane up after takeoff.

While resetting the altitude pressure in flight is possible, it is not easy. Even resetting the cabin altitude selector as slowly as possible creates significant pressure changes or "bumps."

Then the entire process must be done in reverse during descent and approach, particularly if the destination is higher than the cabin altitude.

These are just a few examples of the considerations that a pilot must anticipate to achieve a smooth, trouble-free flight. Then, too, there are a lot of other things going on, particularly in IFR flight. Distractions are many; the checklist must be followed precisely.

For a pilot new to the 200 series Cessnas, just flying the airplane is sufficiently demanding. As was already mentioned, it is a heavy airplane, and a lot of that weight sits over the nosewheel. Taxiing is a bit lumbering,

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DIRECTIVES, DIRECTIVES

Depending upon how you count, at press time the P210 was about to be hit with either its fifth or sixth airworthiness directive concerning its fuel system.

The arguable one, issued before the actual introduction of the pressurized version of the 210, affected the fuel selector. However, one theory concerning the fuel-vapor-caused engine stoppage or surging problem centers on the fuel selector valve as a point at which air can be introduced to the fuel system.

I checked the selectors on several P210s because of suspicion that the one on the first aircraft we were operating might be part of the vapor problems we had encountered. There was a great variety of positive detent or, conversely, mushiness, among the airplanes. Cessna maintains that the fuel selectors for all its single-engine line have been reengineered for 1981 to provide more positive operations.

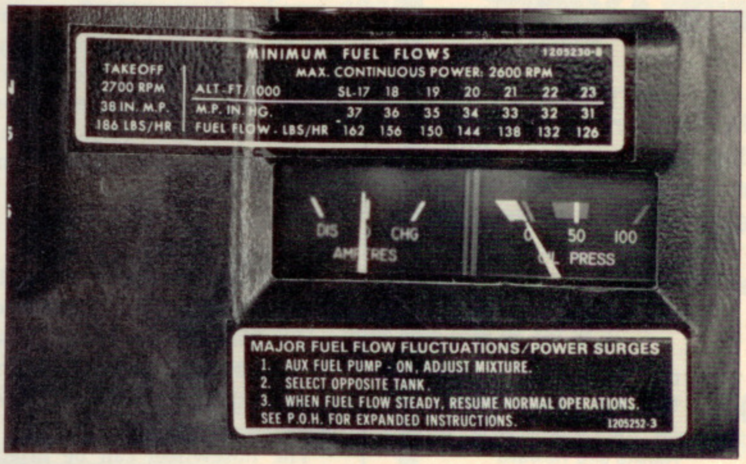
Problems with Cessna 200 series fuel systems were frequent enough to lead the National Transportation Safety Board to recommend that the Federal Aviation Administration require that the manufacturer redesign the fuel system for the series and that it incorporate vapor return lines between the reservoir and the main tanks. The NTSB also claimed that there were many installation errors on the production line, including too-small radii bends in fuel lines (which can precipitate vapor lock), improper size fuel lines, lines routed too close to the engine and exhaust in the engine compartment.

One AD covered fuel-quantity gauges and transmitters—although, as with most aircraft, the gauging system in the P210 provides only an approximation of quantity. Another was the first to deal with the vapor problems. The FAA thought the problem was resolved by the next AD, which required modification and insulation of fuel lines in the gear bays and the engine compartment.

Two maintenance operations have pointed out that the factory-reimbursed labor allowance for the line modifications in the gear wells is much too little, if the work is to be performed properly. Clearances are tight, particularly in the nose-gear bay. A gear retraction test should be performed to ensure that no lines are hit while the gear is in transit. One shop said that, even after performing the work on five aircraft, it still took two and a half man-days to do the work for which Cessna allowed a couple of hours. It would pay any operator to check these areas regularly for signs of interference. The fuel strainer came adrift on one of the aircraft we flew because of a failed seal (although the actual cause was not determined).

In late August of last year, an emergency AD and a Cessna service bulletin were issued, as a consequence of detonation problems that resulted in two accidents plus damage to engines in 19 Model P210s. The problem was suspected to be improperly set, unmetered fuel pressure. Because the front engine seal blew in a couple of cases, an accompanying change required the addition of oil seal retention plates.

Normal leaning to fuel flow references or peak egt is not permitted above 60-



percent power, and restrictions were placed on minimum fuel flows and leaning procedures above 60 percent. In addition, changes to the engine timing were required; and, in a subsequent action, all aircraft were grounded until a compression check was made to assure that detonation damage had not occurred.

Reportedly, the latest AD will include the requirement that the sonic Venturi for the aircraft pressurization system be replaced by a smaller one to reduce induction system pressures (and, possibly, temperature) and that minimum takeoff (full power) fuel pressures be increased.

While the root cause of the problem is investigated, P210 owners continue to endure downtime and increased maintenance and operating costs. The higher fuel flows resulting from the new procedures for power settings above 60 percent mean they must accept lower average block speeds or reduced endurance and higher per-hour fuel costs.

Other powerplant difficulties reported by P210 operators have more to do with quality control or installation than design; but some of them have been quite serious, leading to engine stoppage or failure. There have been quite a few problems reported with the exhaust system and several instances of turbocharger failure.

While nearly all other pressurized aircraft have been hit with an AD affecting the outflow and safety valves, including repetitive inspections, the P210 has been untouched. However, one of the aircraft we flew seemed to have an outflow valve sticking. Whether it was a faulty valve or an improper pressure-release setting has yet to be determined.

Operators must accept the pressurization system as an additional maintenance item. As with gyros, pressure valves will become "dirty" and are sensitive to such things as tobacco smoke residue.

An AD was issued last October on 210 series aircraft fitted with the King KFC 200 to ensure that the roll servo cable was installed properly. There was one instance where aileron control was lost, fortunately on the ground, because a bolt loosened, letting both the roll cable and the primary aileron cable slip from the bellcrank.

Yet another AD was received at press time that affects P210s: Stewart Warner oil coolers with fewer than 10 hours must be removed and replaced; those with more than 10 hours must be inspected before every flight for leaks. The problem is a potential for catastrophic failure. Approximately 8,700 aircraft are affected, including other Cessna singles and possibly aircraft from other manufacturers.

Most of the other difficulties with the P210 have been installation, quality-control and accessory problems related to the pressure-door locking mechanism, electrical wiring, fuel indicators, gear-actuating hydraulic system and avionics.

Recently, several service difficulty reports on a variety of aircraft have recommended that the equivalent of a 100-hour inspection be performed before one accepts delivery of a *new* aircraft. These reports dealt with such things as chafing, misrouted or improperly rigged control cables.

Performing a thorough preacceptance examination with a skilled mechanic may be a wise form of insurance. Sophisticated airplanes might be approached with the old sporting philosophy that the best defense is a good offense. □

which compounds the visibility problem for the new operator.

Except during cruise, the pilot—or the autopilot—has to fly the airplane. It does not fly itself off the ground, even with the recommended 10-degree flap setting. Just as it is a check-list airplane, it is a by-the-numbers airplane.

It is important to check power setting and fuel flow early in takeoff, particularly on the first flight of the day. The throttle must be treated with respect, since sudden movement or full input can overboost the engine. The fuel flow must be adjusted to 186 pounds per hour, which sometimes will not be established automatically. During hot operations, the electric fuel pump might be required in order to stabilize pressure—even though use of the electric pump is not recommended for normal operation.

Standard procedure calls for use of 10 degrees of flap for takeoff. It gets the weight off the nosewheel faster than a no-flap takeoff and keeps the initial climb attitude lower. This procedure also reduces the ground run and distance over the standard 50-foot obstacle by 10 percent.

The nosewheel can be lifted at 65 knots and the aircraft will lift off at about 75. Best-angle-of-climb speed is 80 knots, which produces a view-blocking deck angle. Normal procedure is to accelerate to initial climb speed of 85, while tapping the brakes and retracting the gear. At 85 the flaps can be retracted. The aircraft will feel as though it is sagging off, but the aircraft should be pitched up to maintain 85 to 90 knots while the flaps come up. Best rate speed is 100 knots, although 110 to 115 provides better visibility.

Maximum power, 310 hp at 2,700 rpm/38 inches MP, is limited to five minutes. Maximum continuous power, 285 hp at 2,600/37 inches, can be maintained to the critical altitude of 17,000 feet.

This is useful, particularly in hot weather operations during instrument departures, to try to provide a rate of climb that is acceptable to ATC. Quite frequently, the recommended cruise climb setting, 2,500 rpm/33 inches MP, will not produce a sufficient climb rate, even at 100 knots, to satisfy ATC. The result is a lot of vectors or even 360-degree turns. Every heading change and every pitch change require a retrimming of the aircraft. The slightest out-of-trim condition degrades climb performance considerably, and the pilot must pay a lot of attention to flying the airplane smoothly during departures. Unfortunately, using the autopilot at these low airspeeds compounds the problem, since it responds sloppily and induces wide yawing moments that further degrade performance.

Pilots new to the 210 will become acquainted quickly with the rudder trim. Depending upon airspeed, a minor pitch change can move the ball one-half to full deflection. This can reduce the rate of climb by as much as 300 feet per minute. Changes in airspeed also require retrimming. During climb, the first few minutes of acceleration to cruise speed and descent, constant adjustments are required.

Power settings require constant attention, too, particularly at altitude, since any variation in airspeed or altitude will affect manifold pressure. Above critical altitude, any change in fuel flow will change the manifold pressure, too.

Control pressures are fairly high in the 210, particularly the elevator. Aileron response is good. The rudder/aileron interconnect makes coordinated, rudderless turns possible at cruise speeds, but is annoying at low speed and during crosswind landings.

Stalls are straightforward. The pitch attitude required for a full-power departure stall is so high that it seems almost impossible to do so inadvertently. They should be practiced, however, since they are possible, particularly during an IFR departure; and recovery needs to be quick, especially at low altitude.

The P210 is a very solid feeling airplane and handles turbulence well. The impression of solidity at cruise, however, can be misleading—possibly to the point where the airframe could be overstressed. Maneuvering speed at maximum takeoff weight (4,000 pounds) is 130 knots; at 3,350 pounds it is 119; at 2,700 it is 106, which is about the weight a well-equipped P210 could be after a long flight.

The indicated airspeed at normal cruise altitudes is between 140 and 145 knots, so reduction to maneuvering speed at high weights is a matter of a slight power reduction or dropping the gear.

Gear operating speed is 165 knots, almost the same as maximum structural cruising speed (Vno). Maximum speed with the gear extended is 200 knots, which is the never exceed speed, or red line (Vne). The high operating speed can be very useful under certain flight conditions, including heavy turbulence or an ATC-requested maximum rate descent. (With gear extended in smooth air, maintaining 165 knots will result in a rate of descent in excess of 3,000 feet per minute, with more than sufficient power to keep temperatures in the green.)

Pilots must stay ahead of the airplane in all modes of flight. Descents must be planned ahead. For instance, ATC often will issue instructions for minimum crossing altitudes at some fix near a terminal area. This is not a difficult procedure, but it is a new one for pilots unaccustomed to operations above oxygen altitudes. Power must be managed very carefully, and the pilot must keep in mind that power has to be maintained at or above 2,500 rpm/17 inches or 2,200 rpm/20 inches to maintain pressurization. Loss of pressurization is both uncomfortable and frightening, although it isn't dangerous unless someone in the cabin has a physiological problem.

The pilot has to monitor fuel burns carefully. Maximum differential between right and left wing fuel tanks for the autopilot is 50 pounds. Lateral fuel imbalance can present difficulties when hand flying the aircraft, too, particularly at approach speeds.

The P210 is a high-altitude airplane for reasons other than the advantages of turbocharging and pressurization. Visibility, particularly in climb attitude, is not good. Even in level flight, visibility to the sides requires a lot of head ducking and wing lifting. It also requires a lot of attention inside the airplane for operation and monitoring of the systems. Setting up for cruise flight takes several minutes as the airplane accelerates, cruise power is set, temperatures stabilize, the airplane is cleaned up and the mixture is leaned.

It pays to get above 10,000 feet and away from most other traffic as quickly as is practical.

The airplane is more efficient at higher altitudes, too. On flights over 300 nautical miles, it is worth the 25 to 30 minutes required to get to or above 17,000 feet. Up there the P210 is a very comfortable airplane, with plenty of room to stretch and scatter papers. Traffic is less of a problem, too.

It is not a time to daydream, however, since evaluations and decisions have to be made constantly. Temperatures have to be monitored closely, particularly in high ambient temperatures or in icing conditions.

The normal operating altitudes are hostile territory. The old business about flying high above the weather is balderdash. Particularly during the summer, there are a lot of moist, cold clouds between 15,000 and 23,000 feet; the chances of encountering icing conditions are good. Then, too, there is always the weather below to be dealt with. Good flight planning and weather briefings are a must, and the pilot has to have alternatives and alternates well sorted out at all times.

During icing encounters, it is necessary to watch temperatures quite closely. The area around the oil-cooler air intake seems to become partially blocked by ice, disturbing, if not blocking, the flow of air. It often is necessary to carry partial cowl flaps under these conditions to maintain proper temperatures.

Most of our flights in our two test P210s were more than 400 miles long. We encountered a great deal of weather and high winds on many of the flights, frequently having to deal with over-75-knot headwind components. To experiment with wind versus true airspeed differentials, we varied cruising altitude by as much as 17,000 feet. With each attempt it was better to maintain higher cruise altitudes in

DECISIONS, DECISIONS

Equipment and accessory selection and systems specification often is one of the most difficult aspects of buying larger aircraft, particularly for an individual or a company doing it for the first time. Equipment decisions for purchasers of new light aircraft, however, usually are few in number. Most manufacturers offer packages of options, with some variation in make and type of autopilot systems and avionics.

With the added capability of many single-engine aircraft today and the more sophisticated, demanding use made of them, a great deal more consideration should be given to the selection and the installation of what no longer can be called options.

It is actually an exercise in strategic planning: what is needed, how can pilot workload be reduced, what kind of backup can be built in to cope with failures and emergencies. It starts, of course, with the nature of the use of the aircraft, including the kind of weather and operational flexibility the user needs. Once the elements are selected, the pilot should look at the equipment and start playing "what if" (what if the vacuum system fails? what if the electrical system fails?).

The more regular and serious the use, the more essential the exercise becomes. The more hostile the environment, the more crucial it is.

The P210N is at the pinnacle of the decision tree for singles. The number of decisions that can be made about factory-installed equipment are fewer with Cessna products than with any other light aircraft manufacturer, particularly with respect to autopilots and avionics.

A prospective purchaser could buy a bare-bones P210 and equip it in the field. This might be preferable to some pilots; others may prefer the relative economy and simplicity of accepting the limitation to ARC avionics and related equipment.

In 1980, the base price of the Pressurized Centurion was $121,000; it has been increased to $139,000 for 1981, with similar increases in factory options.

Whichever way you choose to outfit your airplane, there are certain items of equipment that should be considered mandatory for the operational capabilities and characteristics for pressurized aircraft (single or twin).

Here are some on my list: (all prices are 1980 list) the known-icing package (27.2 pounds and $12,500); 95-amp, 28-volt alternator and heavy-duty battery (included with the known-icing package); radar (Bendix monochrome RDR 160, $9,275 and 21.9 pounds); slaved gyro and horizontal situation indicator (a minimum of $3,320 and 4.3 pounds); stand-by generator ($875 and 7.6 pounds); antiprecipitation kit ($135 and 0.4 pounds) and antiprecipitation antennas; strobe lights ($525 and 3.3 pounds); a full, six-cylinder engine analyzer, (*not offered* as a factory option); and a counter-drum pointer, encoding altimeter ($2,095 and 3 pounds).

The possibilities of misreading altitude increase above 10,000 feet and below 1,000 feet. The counter-drum pointer altimeter makes errors far less likely than with any other type. In fact, I would add one to any aircraft I regularly flew IFR.

The Air Line Pilots Association has studied the role of altimeter error in quite a few accidents. ALPA has petitioned the National Transportation Safety Board to reconsider its findings in several accident investigations with respect to design-induced altimeter-reading errors and further has asked that the board recommend that all air carrier aircraft be converted to digital altimeters. If errors occur among highly trained, well-disciplined air carrier crews, it stands to reason that even more can occur in single-pilot operations.

terms of ground speed than to descend in hopes of netting out better with lower headwinds. This will not always be the case, of course; but if winds aloft forecasts between 6,000 and 18,000 don't vary by more than 20 or 25 knots, stick to high altitudes.

Our cruise power setting was approximately 65 percent during all of the flights, because of the higher fuel burns and relatively minor increases in cruise speed at higher settings. True airspeeds averaged better than 183 knots, while average fuel burn was 17 gallons per hour, with loads usually 400 pounds below gross.

Descents often offer the chance to make up the time spent in climb, particularly if the air is smooth. Speeds of up to 180 knots are quite comfortable, so long as the pilot is prepared to reduce speed immediately if turbulence is encountered on the way down.

The P210 is a comfortable and manageable instrument airplane. Approach speeds can be kept high to fit in with the traffic mix at high-density airports and can be slowed to final approach speed inside the middle marker without fuss. Both of the aircraft we flew were equipped with the Honeywell-based ARC 400B autopilot, which is not happy at low airspeed. Anything much below 120 knots down the ap-

Another desirable option, while expensive, is a self-contained, self-powered stand-by gyro horizon. The only company currently manufacturing the unit that we could identify is Jet Electronics and Technology of Grand Rapids, Michigan, a subsidiary of Gates Learjet. A two-inch unit retails for about $7,000.

There are quite a few options that add to operating ease, such as a yoke-mounted transponder ident switch, a boom mike (really a necessity for single-pilot IFR), better panel and interior lighting systems (the best available really should be standard in such airplanes) and a tail floodlight. I thought that last item was pretty silly, until the first night I used it for identification in a high density area. Then it seemed worth the high ($550) price.

One piece of optional equipment that many pilots assume is standard with pressurized and even turbocharged airplanes is oxygen. Cessna offers a Scott canister emergency system with six outlets for $895. Once activated, it supplies oxygen until it is depleted; it cannot be shut off. It is simple and light (5.6 pounds) and is adequate for high altitude emergencies.

Operators who regularly operate in high terrain, however, may want a longer-duration system, to permit them to stay at altitude in the event of pressurization loss.

The optional inertial-reel shoulder harness is far preferable to the fixed harness.

Other options are for comfort. Cessna now offers black, gray or imitation-wood panels. One of the two aircraft we operated had a black panel, which everyone agreed made it easier to read the instruments. Then there are cup holders, three-way adjustable seats, writing desks, armrests and fabric and carpet selections.

One comfort option that some might want but we do not (it all depends on where you operate) is air conditioning. The system takes up 70.3 pounds of useful load and costs $4,995 in 1980. It also is a bit complicated and, as with many automotive air conditioning systems, is not very effective when most needed: in very hot weather. And it increases the pilot's workload, adding several steps to the check-list procedure during ground and flight operations.

The belt-driven compressor is mounted on the right front of the engine. The system adds quite a bit of plumbing to the engine compartment, through the cabin and back to the evaporator, which is mounted at the aft end of the baggage bay and ends with a large, ungainly air outlet in the tailcone.

The first batch of P210s to be fitted with the system had operational problems, including higher oil and cylinder-head temperatures. There is a modest reduction in climb and cruise performance, too.

There is one piece of factory equipment I definitely can advise against: the ARC 300 series autopilot, which is standard in the "II" series options package. While some pilots have had good experiences with it, it really does not seem adequate for the P210 (and I have found it marginal even on Skyhawks and Skylanes). The 400B is an available option ($6,750 exchange with the II package or $9,625, if ordered installed in a bare airplane).

Even the 400B is not as compatible with the airframe as we would like, particularly at low airspeeds. It also was very abrupt in lateral movement in turbulence, rapidly snatching one aileron and then the other in both of the aircraft we operated. This may be an installation, rigging or adjustment problem, although we were not able to determine that at press time.

There is no one piece of equipment that is right for everyone: personal preference, the varieties and possible combinations of equipment, its location in the airplane and its effect on weight and balance must be analyzed carefully before the final decision is made. It is not an easy process, but the effort can do a lot to make your flying experiences good ones. □