Austin's Condensed Centurion Reference

When getting into each new airplane, always be sure that your checklist matches your POH as well as your airworthiness and registration certificates – in terms of both the model and the special equipment (if any). (A checklist for a turbocharged, known-ice-approved N model, for example, should *not* be found in a normally aspirated, non-ice-approved L model.) Obviously you should always follow the specific procedures for your particular model.

Some of our airplanes have Pilot's Operating Handbooks and others have Approved Flight Manuals. If it's a POH, make sure the model and year matches the airplane's airworthiness certificate and registration certificate. If it's an AFM, make sure that the correct N number and airframe serial number are written on the first page.

For the purpose of all written tests (including those given as part of an initial or recurrent Part 135 checkride) we will only actually memorize one set of V-speeds, maximum structural capacities and power configurations: those for the normally aspirated L model. (Generally, these numbers got bigger as the design matured.) When flying the line, adjust your procedures as called for by the checklist and/or POH for your airplane. The L model is merely our "base model" for pilot training; most of the techniques and procedures for flying an L model can safely be employed when flying an M or N model as long as the pilot is aware of the differences in this handout. The opposite is *not* true, however, as using M or N V-speeds (for example) in an L model could result in damage.

FLEET LIST

There is great diversity and variety in our fleet, and unfortunately very little standardization. To illustrate that point, I compiled this catalogue in August of 2002. It is continuously subject to change for numerous reasons. It is shown here to only give you an idea of the abundance of differences that you will encounter.

62 210s

30 L models (1972-1976)
16 M models (1977-1978)
16 N models (1979-1984)

50 with the 520*
12 with the 550**

58 normally aspirated
4 turbocharged

27 known-ice approved
8 with boots
19 with the TKS system
35 *not* known-ice approved

34 with the single 60-amp alternator
8 with the single large (95-amp or 100-amp) alternator
3 with a 95/60 system
8 with a 60/20 system
9 with a 60/60 system

59 with ADF
3 without ADF

17 with DME
45 without DME

* We use IO-520-L, IO-520-L51, IO-520-L47, TSIO-520-R and TSIO-520-H4 engines in our non-upgraded 210s. Of these, the IO-520-L51 is by far the most common. ** We use IO-550-P1, IO-550-P2, IO-550-P3 and IO-550-L engines in our upgraded 210s.

WHY THE 210?

Centurions are very popular among Part 135 operators for stage lengths of 30 minutes to 2 hours because within that framework the 210 is an extremely profitable airplane. In fact, no other single-engine piston-prop can carry a greater payload a farther distance at a faster speed or a lower cost than the Cessna 210 Centurion! Dollar for dollar, pound for pound, knot for knot it is the best in the business. Direct operating costs may be as low as $40/hour and total hourly operating costs, including direct, variable, fixed, reserves and capital expenses, may be well under $200/hour.

PASSENGER STEP

Some 210s were originally designed with a boarding step on the passenger side which cycled with the gear – i.e., it extended when the wheels did. Because these are usually more in the way than useful for cargo operations, they have been disconnected and wired shut in our fleet. So if you notice a strange piece of hardware recessed in a slot directly below the right-side door, that's what it is. Don't worry about it; it is non-functional and has no impact on flight or ground operations.

INSPECTING THE NOSE GEAR WELL

In some 210s, the nosewheel doors will be closed on the ground. If you wish to open the nosewheel doors on the ground for the purpose of preflight inspection of the hydraulics, linkages, fuel lines and wiring in that area, you may open them by *cautiously* using the procedure specified in the POH as follows:

1. Pull the hydraulic power pack circuit breaker.
2. Make sure that the master switch is off.
3. Extend the manual gear extension lever and then pump it just two or three times.

To close the gear doors, first ensure that the area is clear. (When the doors close, they snap shut with enough force to cut off someone's finger.) When you have visually verified that the area is clear:

1. Push in the HPP CB.
2. Turn the master switch on momentarily.

The doors will slam closed and then the HPP will shut off automatically when the pressure switch senses that hydraulic pressure has been fully restored to the nominal level.

OIL

We use two kinds of oil in the Flight Express fleet. Most of the time we use Aeroshell 100 Ashless Dispersant (50 weight oil). In the north we also use multi-grade oil. During the engine's 50-hour break-in period, however, we use straight mineral oil. You will know that an airplane is in its 50-hour break-in period because there will be a homemade placard – usually consisting of masking tape and magic marker – which so states. This can be confirmed by looking at the TBO in the Cockpit Inspection & Overhaul Report (the first page of the Aircraft Maintenance Discrepancy Log).

We typically keep a case of oil in cargo compartment D at all times to save the company some money and the pilot some effort. If you find that the case is almost empty, check with other local pilots to find out where you keep the oil and replace the empty case with a full one. (The weight of this case must be included, along with all other equipment and supplies in the airplane, on your Load Manifest.)

Each and every 210 has its own unique natural oil level. For some engines it's 8 quarts, for some 9 and a quarter, for some 8 and a half . . . but once an engine's oil supply reaches that point the level tends to remain more or less constant for a while. There is no need, in other words, to fill up the sump all the way to 10 quarts every time. That extra oil will just get ejected through the crankcase breather line and make a sticky, dirty mess on the underside of the fuselage. Anything at or above 8 quarts is perfectly acceptable and can be left alone.

You may sometimes hear about the "invisible eleventh quart." The screw-on oil filter, along with the oil lines associated with the cooling and lubrication system, have a capacity of about 1 quart. That means that when you fill up the engine after it has been completely drained dry you can actually put in 11 quarts. Don't get confused, though: the oil sump itself holds 10 quarts and the dipstick indicates up to a maximum of 10 quarts.

In most of our 210s, there are two cowl hatches: one for checking the oil and one for adding oil. (Check at the side, add at the top.) On a few of them, however, be advised that there is only one cowl hatch (located at the top.) If so, check and add the oil at the same place.

ELECTRIC AUXILIARY FUEL BOOST PUMP

The peak fuel flow (full power / sea level) in a normally aspirated 210 is around 144 pounds per hour. There is no way gravity alone can supply a flow rate this high. If the engine-driven mechanical fuel pump fails while the engine is operating at a high power setting, the engine will almost immediately stop producing power. Use of the electric auxiliary fuel boost pump will then be necessary.

The electric auxiliary fuel boost pump is NOT to be used in flight except in an emergency. Unlike some other high-performance airplanes, and even some other Cessnas, it is ***not*** supposed to be operated during takeoff, on approach, during maneuvers or while switching tanks (unless you have actually run a tank dry and the engine has begun to lose power or has already lost power completely). If you run the electric auxiliary fuel boost pump while the regular engine-driven fuel pump is working normally, this will cause the engine to receive about twice as much fuel as it needs, flood it and cause it to lose power or even stop running entirely.

The electric auxiliary fuel boost pump consists of a split rocker switch located on the lower left side of the instrument panel next to the master switch. The left side is red and the right side is yellow. The left / red side is HIGH; the right / yellow side is LOW. The HIGH side will be required to keep the engine running at high power settings such as takeoff and initial climb. The LOW side should be adequate to keep the engine running at cruise power settings, depending upon conditions.

For safety, in most of the earlier 210s the HIGH side is spring-loaded to the OFF position. (That feature was eliminated in some later models.) This means that if you bump against it, it will automatically turn itself off when pressure against it is released. The LOW, side, however, will tend to remain on. This is so that you do not have to continuously hold pressure against the switch while flying following a fuel pump failure.

The electric auxiliary fuel boost pump *is* normally used to prime the engine before starting, however, and the procedure for this is listed in the Flight Express Initial and Recurrent Flight Training Handbook. I will quickly summarize it now. Turn on the master switch, bring the mixture, prop and throttle fully forward, turn on both sides of the split switch, observe a rise and peak on the fuel flow meter and then turn both sides of the split switch off. Remember that the left (red) side of the split switch is spring-loaded to the off position. The right side is not. If you merely release the switch – rather than actually clicking it positively to the off position – then the low side will continue to run even though the high side is off. The fuel will be injected continuously into the intake ports of the cylinder heads. It will trickle down the exhaust stack and form two puddles of raw avgas to the left and right of the nosewheel. A backfire during the attempted engine start (which is likely with an overprimed engine) may then ignite these puddles and start an engine fire. Improper priming is a common cause of engine fires on the ground.

If you do find yourself with an engine fire during start, there are three things which you must do right away to bring it under control.

1. Keep cranking. ***Don't*** release the starter switch while the fire is still burning.
2. Pull the mixture to idle cutoff.
3. Turn the fuel selector valve off.

This should quickly extinguish the fire. You may then get out and inspect for damage. If you see evidence of damage, such as charring, blistering or melting of any part of the airplane, get a mechanic to inspect the aircraft before you fly it. If overpriming only caused a momentary "flash fire," however, then the brief combustion of fuel and fuel vapor may not have caused any damage and you may proceed normally.

OIL DIPSTICK

The oil dipstick is held securely in its tube by a hairspring which you can see at the base of the handle. To release this spring, twist the handle while pulling gently until the spring pops. ***Do not*** tug hard on the dipstick handle; this can actually jerk the dipstick tube completely out of the engine case. (Overzealous pilots and pilot candidates have done this.) This is time-consuming to fix. On the subject of the oil dipstick, take a moment to check the black rubber O-ring at the base of the handle. If that O-ring is missing or badly deteriorated, the handle will not form a good seal and oil will be expelled under pressure, blown past the handle. Oil can also be lost in this manner when the dipstick is not pushed in all the way so that the hairspring clicks back into its closed position.

MIXTURE MANAGEMENT IN TAXI OPERATIONS

Flight Express, Inc. does not recommend leaning during taxi because it is generally unnecessary and poses a potential risk. Unlike many other common Cessna engines, the IO-520 engine has not generally shown much of a tendency to foul its plugs while taxiing with the mixture knob set to the full-rich position. If you *do* experience an unacceptable mag drop during the runup, however, you may try to clear the plugs by bringing the power up to about 2,000 RPM and then *gently*, *smoothly* and *slowly* leaning the mixture to get the engine hot. *Do not do this abruptly!* If a second mag check is still unacceptable, then return to the ramp and call Dispatch as well as Maintenance. If a particular airplane does seem to show a tendency to foul its plugs during ground operations then you may elect to lean during taxi. CAUTION: In the often high-pressure, fast-paced, tightly scheduled commercial cargo-carrying environment of single-pilot Part 135 IFR operations, many pilots have forgotten that they leaned the mixture during taxi and then attempted takeoff with the mixture knob not advanced. In such a scenario, the power will increase up to a point but then the engine may begin to hesitate or may even quit operating altogether. This could lead to an accident.

THE OVERVOLTAGE SENSOR

Regardless of the electrical system configuration, it will be protected by an **overvoltage sensor**. If the OS detects a power surge, it will automatically trip the alternator off-line through a switch called an overvoltage relay. If this happens, the voltage warning light will illuminate and the ammeter will indicate a discharge. (Note that these indications will be *exactly the same* as the indications you would get if the alternator had actually failed.) The OS may be reset simply by turning both sides of the master switch off and back on again.

BACKUP VACUUM SYSTEMS

We have two backup systems for the vacuum pump in the Flight Express fleet – the standby vacuum system (SVS) and the dual pump system.

Some of our airplanes have the SVS. Others have the dual pump system. And a few have no backup system. Backup systems for the vacuum pump are *not* required by the FARs.

The **dual pump system** uses two parallel dry vacuum pumps. This simple and redundant system has one chief advantage and one chief disadvantage. The chief advantage is that *it requires no pilot recognition and no pilot action*. This is important because many partial-panel accidents seem to occur when the pilot never realized that he was partial-panel. The chief disadvantage is that when one pump fails the other suddenly doubles its workload and since it may be just as old (or possibly even older) than the pump that just failed, it may fail soon too.

You will know that you are in an airplane equipped with a dual-pump system because it will have a suction gauge with two glass windows. When both red nipples are visible it means that both pumps are off. When the engine is started both nipples should disappear. If one of them re-appears, it means that one of the pumps has failed. If they both re-appear, it means that both pumps have failed.

The **standby vacuum system**, on the other hand, uses the engine itself as a vacuum pump. It consists of a valve which, when open, allows air to be sucked out of the vacuum gyro instrument cases and into the intake manifold.

When an airplane is on the ground with its engine not running, its MP is the same as outside barometric pressure. When the engine starts and idles, its MP is much lower than outside barometric pressure, meaning that there is a lot of suction available. When power is increased, MP also increases, rising closer to outside barometric pressure. When this happens there is less suction available.

The SVS, while mechanically simple, has two chief disadvantages. First, *it requires pilot recognition and pilot action*. The pilot must recognize that he has had a vacuum pump failure (which means that he has to have a good, aggressive instrument scan and cross-check which includes his suction gauge and low-vac warning light) and then pull the SVS knob to activate the system. The knob is often (but not always) located on the lower left side of the instrument panel. You will know that you are in an SVS-equipped airplane because it will have a pressure/power table placard and it will also have a low-vacuum warning light.

Second, the SVS does not work as well at high power settings or high altitudes. It works much better at low power settings and low altitudes.

A required placard posted in each SVS-equipped airplane specifies **what *maximum* power setting can be used at any given *pressure* altitude at maximum continuous RPM (2,700) in order to achieve the required *minimum* suction of 3.5" Hg.** Use this placard to help you decide whether to use the SVS. Using the SVS may require such a large power reduction that a descent will result. (Each of these placards was created after an actual test flight in that particular airplane.)

For example, suppose you are cruising at 8,000 feet over the Appalachian mountains on a smooth VFR morning. The MEA is 7,000 feet. Your vacuum pump fails. The placard (shown below) shows that in order to achieve 3.5" Hg of suction the power would have to be reduced to 12" MP. Would you do it? No, of course not. In this case, maintaining your altitude is more important than having your vacuum gyros work. So in that situation, you would cover the affected instruments and proceed normally without them.

To use another example, suppose you are flying the same airplane at 8,000 feet over Miami on a turbulent IFR night. The MEA is 2,000 feet. Your vacuum pump fails. Again, the placard shows that in order to achieve 3.5" Hg of suction the power would have to be reduced to 12" MP. Would you do it? *Yes*, because in this situation you can afford to lose altitude but you need your vacuum gyros to maintain control of the airplane in dark, bumpy, cloudy conditions.

THE ELECTRIC HYDRAULIC POWER PACK

The L model of the Cessna 210 was the first to use an electro-hydraulic system to extend and retract the gear. This fairly complex system has had its share of operational problems. The M and N model also use this system.

Normally, you will only hear the hydraulic power pack operating when the landing gear is actually in transit. A pressure switch automatically turns on the HPP's electric motor when the hydraulic pressure drops below a certain level and then the pressure switch automatically turns off the HPP when the hydraulic pressure is fully restored. If the HPP comes on when the gear is not cycling, *something is wrong*. If the HPP comes on once for a second or two during a two-hour flight, that is probably nothing to worry about. But if it comes on for two or three seconds at a time on a regular or intermittent basis, then there is definitely a problem of some kind. It may be the result of one of two likely causes: first, the pressure switch might be failing. Or second, there might be a hydraulic fluid leak. This second possibility is, of course, far more serious. In either case, you should immediately disable the HPP by pulling the HPP CB. For safety, it makes sense to assume that the more potentially adverse condition exists. If there is a hydraulic fluid leak, then there is a very real risk of not being able to lower the landing gear. Remember: **NO FLUID, NO GEAR!**

If all the hydraulic fluid leaks out of the system, there is no way to lower the landing gear – manually, electrically or otherwise.

If this kind of on-again, off-again operation of the HPP occurs in flight, pull the HPP CB and then extend the gear manually right away (before any more fluid can escape – just in case there really is a leak).

ONCE THE GEAR IS DOWN AND LOCKED YOU ARE SAFE – THERE IS NO WAY THE GEAR CAN UNLOCK AND RETRACT WITHOUT THE USE OF THE HYDRAULIC POWER PACK.

You may also choose to lower the gear manually after you have had an alternator failure . . . not because there is anything wrong with the HPP, but because you want to conserve battery power. (The HPP uses a very large amount of current.)

If you do decide to extend the gear manually for the purpose of saving battery power, there are three steps that you must follow IN THE CORRECT SEQUENCE in order to successfully accomplish this:

1. Pull the HPP CB.
2. Select the gear handle to the DOWN position.
3. Extend and pump the manual gear extension lever.

If you selected the gear handle to the DOWN position first, the gear will extend electro-hydraulically and the battery will be instantly drained – you had one chance and you blew it.

If you extended and pumped the manual gear extension lever first, your arm would get tired but aside from that nothing would happen, since the valve is not open and the fluid cannot actually go anywhere.

A mechanically induced gear failure leading to a gear-up landing is not necessarily a disaster. Numerous pilots have landed 210s gear-up with no injuries and no negative impacts on their careers. One such pilot was flying run 530 (based out of Atlanta) when he had an actuator rod fracture during the gear retraction sequence while taking off from Fort Lauderdale. Hearing the loud "bang," he tried recycling the gear and discovered that it would not come down. Wisely, he diverted to our Principal Operations Base at Orlando Executive Airport. He used the company frequency to talk to several mechanics, including the Director of Maintenance himself, who talked him through a series of troubleshooting procedures. Eventually, everyone agreed that a gear-up landing would be inevitable. The emergency equipment was scrambled. The tower cleared him to land on runway 13 so that the airport would not have to be closed. The entire Orlando-based Flight Express staff – about 30 people, including mechanics, pilots, dispatchers, accountants, administrators and couriers – gathered on the ramp to watch the landing. They cheered and applauded when he exited the airplane. An FAA inspector was present. He shook the pilot's hand and said "good job." (That was the extent of the post-accident interview.) We had the plane off the runway in under ten minutes and it was flying again in about two weeks. Four news helicopters – one for each local network affiliate – were hovering off the approach end of the runway to capture his landing on video. The pilot took that video with him to his airline interview and was hired on the spot.

PREFLIGHT BRAKE INSPECTION

Always check to make sure the brake pads are at least the thickness of a nickel before proceeding with a flight. Metal-to-metal friction can quickly destroy an entire brake assembly and lead to a loss of control. If the brakes are being applied firmly and one brake suddenly fails completely it can throw the airplane into a violent turn. The absence of one brake also makes it difficult to come to a stop without turning.

TACH vs. HOBBS

Tach or Hobbs time is recorded on your Aircraft Record for one reason only: tracking maintenance issues. It is not to be confused with your flight time, which is derived using the block-to-block system. ("Flight time," according to Part 1, Definitions and Abbreviations, means that time beginning when the airplane first moves under its own power for the purpose of flight and ending when the airplane comes to a complete stop at its final destination. This is *not* to be confused with takeoff-to-landing time, startup-to-shutdown time, tach time or Hobbs time, all of which are different.)

Many of our 210s have been reconfigured to use the Hobbs meter as the primary way to keep track of when various maintenance items come due. Originally, the tachometer was used for this purpose. In an airplane that has been converted in this way, there will be a placard over the tachometer which refers the pilot to the Hobbs meter.

In a traditional setup, the Hobbs meter measures real time from engine startup to engine shutdown. The tachometer, however, runs faster when the engine runs faster and runs more slowly when the engine runs more slowly, showing real time only when the engine is operating at cruise power (usually about 75%).

In the converted 210s, however, the Hobbs meter is attached to an airspeed switch which causes it to start running only when the airspeed reaches about 50 knots. The resulting time is a closer approximation of engine time than "traditional" Hobbs time.

Always look at the tachometer first. If the engine time numbers are visible, write them down – that is your starting time. If, however, the tachometer has a placard covering the engine time numbers, *then and only then* look at the Hobbs meter and use those numbers as your starting time. Only use Hobbs if tach is placarded. And of course be sure to remember to use the same source for your ending time.

THE RIGHT-SIDE (CO-PILOT) PEDALS

The pedals on the right side are slaved to the pedals on the left side. There are no direct connections between the right-side pedals and the brakes, rudder or nosewheel. Moreover, the only brake master cylinders are located behind the left-side pedals. This is to facilitate the stowing of the right-side pedals so that cargo or other items may be placed under the right side of the instrument panel without interfering with pedal travel.

To stow or unstow the pedals, pull out the black knob at the lower right of the instrument panel. This knob is located among the cabin air and cabin heat control knobs and will be labeled "co-pilot pedals / pull to stow."

FUEL VENTS

Each wing tank is independently vented. The vent tubes run to the trailing edge of each wingtip. It is perfectly normal to see fuel dripping from these tubes, which emerge from between the outboard edge of the aileron and the fiberglass end cap, especially after being topped off on a hot day. This does not indicate that there is anything is wrong with the airplane. It is also common to see fuel spilling from the wingtips in this manner during level taxi turns. Finally, on a calm day you may actually be able to see fuel vapor curling up from the vent tubes in the wingtip area. This is an excellent demonstration of why you should never smoke in the vicinity of a parked airplane!

AIR VENTS

The controls for the cabin heat and cabin air are located at the lower right side of the instrument panel. Pulling the "cabin air" knob opens a scoop on the left side of the fuselage and blows air on the pilot's knees. Pulling the "aux cabin air" knob opens a scoop on the right side of the fuselage and blows air on the co-pilot's knees. Pulling the "cabin heat" knob allows air warmed by the muffler to be ducted into the cabin. 210s tend to be hot; a great deal of radiant heat seeps through the firewall. Use of the cabin heat is seldom necessary except in very cold conditions. Additionally, a pair of overhead vents, positioned between the pilot and co-pilot seats, are manually operated by rotating the plastic valves open. These draw air from inlets located at the roots of the wing leading edges.

ELECTRICAL PROTECTION

When an airplane flies through the air, friction causes a static electrical charge to build on its surface. To help prevent an excessive charge from building, 210s utilize **static discharge wicks**, usually two per moveable control surface, which allow this charge to be dissipated into the atmosphere. (Static charges tend to concentrate at points having the sharpest curvatures.) The control surface hinges do not provide a good conductive path, so all of them are equipped with **bonding straps.** These are braided bands of metal with extremely low electrical resistance (.003 ohms being the maximum permissible) connecting the fuselage to the control surfaces and bridging or bypassing the hinge. As a secondary benefit, these bonding straps may help to prevent the hinges of the elevator, the ailerons and the rudder from being welded into a fixed position by the intense heat of a lightning strike. All wicks and straps must be installed and intact.

CIRCUIT BREAKERS

The primary apparent difference between the L, M and N models is the location of the circuit breakers. In the L model, *all* of the CBs are located in a single row on the lower left side of the instrument panel. (The hydraulic power pack circuit breaker and the alternator circuit breaker may have been relocated to other parts of the instrument panel, including, in some cases, the lower center console pedestal. Always take a moment to find these two breakers prior to departure in case you need to get to them quickly in flight.) Beginning with the 1977 M model, some of the CBs migrate to a rectangular plastic panel mounted on the sidewall next to your left knee when you are seated in the pilot's seat. Later, the cockpit layout was redesigned again so that *all* of the CBs wound up on this sidewall panel.

FUEL SELECTOR VALVE

In most of our airplanes, the fuel selector valve has three positions: LEFT, RIGHT and OFF***. There is no BOTH position.*** Switching tanks in flight periodically is required. In 1982, however, Cessna added a BOTH position to the 210's fuel selector valve for the first time. (They also replaced the dual reservoir tanks with a single reservoir, gave each fuel tank a separate vapor return line from the engine, vented the fuel feed lines and interconnected the vents.)

RIGHT SIDE SEAT INSTALLATION/REMOVAL

In the L model 210, the right (passenger) side seat may be removed or installed by taking out a section of floor track. The seat rides on four rollers which run on two tracks, an inboard track and an outboard track. The outboard track tapers to an end and the inboard side has a section which is secured to the deck by 12 screws instead of rivets. Remove these 12 screws using a #2 Phillips screwdriver. There is a screwdriver provided on the back of the airplane's fuel sample cup, but unfortunately this is actually a #3 Reed and Prince bit, not a #2 Phillips. A Reed and Prince bit is pointed, whereas the Phillips bit is blunt. Also, a #3 is larger than a #2. As a result, using the fuel sampler cup for this task often tends to strip out screw heads, especially when excessive force is used. You may wish to purchase your own #2 Phillips screwdriver, as I have done. Also, *never* over-tighten floor track screws and never use a power tool such as a drill to torque them down – this will make it difficult or impossible for the next pilot in the field to remove them by hand.

With this section of floor track removed, the seat may be slid to the rear and then lifted out. The section of floor track should then be replaced. Pilot and co-pilot (right front passenger) seats are interchangeable with each other and with other airplanes. *Left and right second -row seats, however, are **not** interchangeable with front-row seats or with each other.* This is because they are designed to be offset to the outside, leaving a gap in the middle so that a person can move between them.

A new floor track design was incorporated in later models where both the inboard and outboard floor tracks have gaps which allow the seat to be removed and replaced without the use of a screwdriver. Once the slide stop has been removed, the seat is simply slid to the rear until the rollers reach the gaps and then the seat may be lifted clear.

Regardless of the floor track design, the seat is not safe until forward and back slide stops have been installed. It is customary to install a forward stop on one track and a back stop on the other track. The stops consist of small pieces of metal secured with a miniature bolt and a cotter pin similar to a safety pin. These stops are not load-bearing and have very little structural strength; they merely prevent the seat from moving past a certain point.

In all 210s, the seat is not secure until it is locked in place. The seat must be wiggled from side to side and front to back until the two locking pins drop into the holes in the floor track. The locking pins can be retracted (for the purpose of adjusting the seat position or removing the seat) by squeezing a handle in the front underneath the seat. There are also two cranks underneath the seat. One reclines the backrest and the other lowers or elevates the seat cushion. It is usually easier to adjust these settings when you are standing next to the airplane, both for improved leverage and because you will be working against your own body weight if you are sitting in the seat.

IMPORTANT! In accordance with our General Operations Manual (GOM), Section XIV, paragraph 14-21, when installing or removing a seat from a company aircraft, always make a notation in the aircraft maintenance discrepancy log (AKA the "black book"). This notation does not have to consist of anything more than the date, the pilot's name and the fact that the seat was installed or removed in accordance with company procedure. It is *not* an official maintenance signoff, nor is it to be considered a "squawk" (discrepancy) under §91.213 or §135.179.

AVIONICS MASTER SWITCH

The L model 210s never had original, factory-installed avionics master switches. If you get into an L model and cannot find the avionics master switch, there is a good chance that it simply does not have one. If it *does* have one, it was probably installed by a previous owner. It may therefore take the form of any kind of switch in any location; there is no standardization since it is an aftermarket modification.

Beginning with the 1977 model M, however, factory-standard avionics master switches are present. The factory-standard avionics master switch is a white rocker switch located on the port bulkhead panel next to your left knee along with the CBs.

GEAR DOORS

The first 210s had clamshell main gear doors as well as nosewheel doors. The clamshell main gear doors were later abandoned from the design, starting with the 1979 M model. This was mostly a cost-cutting measure to bring down the price of production. It was also because the doors were heavy and mechanically complex, and the expense associated with maintaining them, combined with the weight penalty, overbalanced the small airspeed increase. Also, they were prone to tearing loose from the fuselage if the gear was operated at too high a speed. *All main gear doors have been removed from Flight Express 210s*. Some of them have a visible seam in the fuselage skin where the doors used to be. Others have no seam because they never had the doors. All 210s in our fleet do have nosewheel doors. If you see any reference to main gear doors in the POH, disregard it.

Some 210s will have the nosewheel doors open on the ground. Others will have the nosewheel doors closed on the ground. (Prior to serial number 21062955 – closed / 21062955 and after – open.)

FUEL GAUGES

The fuel gauges in our earlier airplanes are located on the upper right-hand side of the instrument panel. They were moved, starting with the 1978 M model, to a new position directly above the fuel selector valve near the bottom of the center console pedestal. This change coincided with a return to a float-type rather than a capacitance-type fuel quantity measuring system.

RUDDER TRIM WHEEL

The rudder trim wheel may be located directly below the throttle, prop and mixture controls (the more common arrangement) or it may be located at the bottom of the center console pedestal, directly above the fuel selector valve. This second, lower location is inconvenient because it forces the pilot to bend way over and reach down, blocking his forward view almost completely. Pilots of 210s with this setup need to be prepared to pick their moments carefully when it comes to adjusting rudder trim. Also, be aware of this very helpful but little-realized fact: ***the rudder trim works while taxiing!*** Because it directly tensions the entire system, you can use the rudder trim to relieve left-turning or right-turning pressure on the pedals. This can save you from stiff, sore legs, feet and knees and overheated brakes.

ELECTRICAL SYSTEM CONFIGURATIONS

There are four different electrical system configurations that you will see in the Flight Express 210 fleet.

- The first one is the most common: a single 28-volt, 60-amp alternator charging a single 24-volt, 17-amp-hour battery. (17 amp-hours means that the battery can provide 1 amp for 17 hours or 17 amps for 1 hour. Obviously the battery will not last long when avionics, flaps, lights, the hydraulic power pack etc. are being used.)
- The second one is a single large (95-amp or 100-amp) alternator, an installation found mainly (though not exclusively) on booted, known-ice-approved 210s.
- The third one is a pair of different alternators: a 90-amp primary unit and a 20-amp backup unit.
- The fourth one is also a pair of different alternators: a 60-amp primary unit and a 20-amp backup unit. This installation is found on TKS-equipped airplanes, mainly those with 550 engines.

NOTE: In configurations 3 and 4, the small secondary alternator has a very limited output, so even with it operating it will be necessary to reduce the draw to prevent the battery from being run dry. A flashing warning light will indicate that usage exceeds output. If it is necessary to use the backup alternator alone, shed loads until the light stops flashing. Otherwise, you will drain the battery and eventually have a total electrical power loss.

INTERNAL AND EXTERNAL LIGHTING

The internal lighting in the Cessna 210 series consists of an eyebrow map light, a yoke map light, instrument post lights and an overhead panel light.

The eyebrow map light is activated by a toggle switch underneath the center left glare shield. This light is poorly placed because it forces the pilot to hold the chart or other item up in front of the instrument panel. Therefore, it is seldom used.

The yoke map light is also poorly placed because most pilots have very little room between their legs and the yoke for reading. Because it is so inconvenient and rarely utilized, most of the yoke map lights have been removed from Flight Express airplanes.

In the L model, a white rocker switch allows the pilot to select either the instrument post lights or the overhead panel light but not both at once. When the instrument post lights are selected, each flight instrument has its own post light which glows white and is dimmable via a single rheostat which controls all of them together. When the overhead panel light is selected, a red glow shines on the entire instrument panel. The overhead panel light is also rheostat-dimmable.

When the overhead panel light is on, the pilot can reach up and slide open a small door which exposes the bare white light bulb. This produces a spot of bright white light directly on the pilot's lap. Many pilots prefer this light to read by. Many pilots also prefer the instrument post lights to fly by. Since, in the L model, you can only have one or the other, not both, this means that the pilot has to switch back and forth as he reads and flies. This is inconvenient.

Fortunately, in later models, Cessna corrected this ergonomic problem. The instrument post lights and the overhead panel light work together and are dimmed by the same rheostat. You can use the overhead light and the instrument post lights at the same time.

LANDING GEAR ANNUNCIATOR LIGHTS

In most of our airplanes there are two landing gear annunciator lights: an amber light indicating that all three "gear up and locked" microswitches are closed and a green light indicating that all three "gear down and locked" microswitches are closed. When the gear is in transit there is no light. There is also no light if any one of those six microswitches is not closed. Beginning with the 1983 N model (serial number 21064773), however, the amber light was replaced with a red "GEAR UNSAFE" warning light which activates whenever the gear is in transit and/or pressure drops below 1,000 PSI with the squat switch closed.

FLIGHT EXPRESS ANNUNCIATOR LIGHTS

Flight Express has gained field approval from the FAA to install annunciator lights of an iris-dimmable, press-to-test type for the starter motor (which illuminates whenever the starter is operating), the alternator (which illuminates whenever the voltage is excessively high or abnormally low) and the hydraulic power pack (which illuminates whenever the gear pump is running). These lights will usually be located at the upper left of the instrument panel.

AIRSPEED INDICATORS

In some of our airplanes the airspeed indicator's primary (outer) scale reads in knots. In many of them, however, the primary (outer) scale reads in miles per hour and you have to look at the little numbers in the small window on the inner circumference of the instrument to find knots. (Cessna officially switched from MPH to knots in 1976 with their L model.) If the POH lists V-speeds in MPH, then the primary scale on the AI must read in MPH. This cannot be changed later without an official revision to the POH. It is important to consider this item prior to commencing the flight. The Initial and Recurrent Flight Training Handbook requires verbally noting it during the taxi instrument check. Looking at the wrong scale can cause confusion – especially during training flights or checkrides. Normal visual final approach speed, for instance, is 85 knots. If you fly it at 85 MPH because you are looking at the wrong scale, your actual speed will be only 74 knots – uncomfortably slow for a normal landing.

LANDING GEAR HANDLE

In earlier airplanes the handle which controls the extension and retraction of the landing gear is small and white; in later airplanes it is larger and black. This change corresponded to a design evolution in which the electric switch was replaced by a direct-acting hydraulic shuttle valve. This was first seen with serial number 21062274, a 1978 M model.

UPLOCKS

The uplock pin system which held the gear in the gear wells in earlier planes was later abandoned; in subsequent models hydraulic pressure alone holds the gear up. This change affects the pilot in only one way: when hydraulic pressure is relieved (for instance, when the hydraulic power pack circuit breaker is pulled and the gear handle is selected to the down position) the gear will free-fall into a trailing configuration, about 25% extended. Accordingly, when extending the gear manually, it takes fewer strokes of the manual gear extension lever.

THE 550 UPGRADE

In accordance with a recently granted FAA Supplemental Type Certificate, Flight Express is slowly upgrading its 210s from the 520 series engines (IO-520-L, IO-520-L51, IO-520-L47, TSIO-520-R and TSIO-520-H4) to the 550 series engines (IO-550-P1, IO-550-P2, IO-550-P3 and IO-550-L). 210s have been using 520 engines since the 1964 D model came out, so this is the first major powerplant change in 40 years! The 550 engines run smoother, quieter, cooler and more efficiently, producing more power while burning less fuel. Because they are less maintenance-intensive and also less sensitive to pilot abuse than turbocharged engines, 550s were gradually phased in to replace turbo 520s first. Operating procedures and power configurations will be mostly the same but the maximum RPM for takeoff is reduced to 2700 instead of 2850. If you find yourself in a 550-equipped 210 you may notice that you climb and cruise faster with a lower fuel flow and cylinder head temperature. Enjoy!

WARNING!

It is virtually impossible to describe every detail about every minor variation in equipment configurations, systems and procedures among our 210s. If you look again at the fleet list on page 1 you will clearly see that there is a wide range of differences. The significant differences have been discussed in this handout; many more small distinctions have not. Although we are working towards some degree of standardization, this is a very slow and very expensive process and it will never be perfect or complete. Every airplane is, in at least some respects, unique. Long, heavy volumes of engineering data and personal experiences could be compiled about every model of 210 we operate and additional books could be written on each piece of mechanical, hydraulic and electrical gear found in them!

As the pilot in command, **IT IS YOUR RESPONSIBILITY TO STUDY AND REVIEW THE PILOT'S OPERATING HANDBOOK and/or APPROVED FLIGHT MANUAL, APPLICABLE SUPPLEMENTS AND CHECKLISTS FOR EACH SPECIFIC AIRPLANE THAT YOU FLY FOR THIS COMPANY.** The importance of this fact cannot be overstated. Failure to do so could result in incidents, accidents, property damage, injuries or even death.