Cessna 206 Notes (preliminary draft) NR 12/17/01

So far impressions are that this is a very capable aircraft and very comfortable. Remember it is a bit heavier than the Skylane and therefore tends to want to keep going. It takes a little while to dissipate any kinetic energy you build up. With 2 souls and partial fuel it goes like it was being chased by a colony of African bees. (PB)

In general, the airplane will handle much like the 182, but with heavier control forces. In particular, prompt and heavy right rudder pressure is needed at takeoff or go-around. Proper engine temperature management is critical. Fuel flow at T.O. is critical (and in an emergency, rpms must not be allowed to outrun the emergency max. fuel flow available, or the mixture won't stay properly rich). CHT's must be watched. Approaches are made with gradual power reductions, and power is carried all the way down to the ground, just as we used to do with the 210.

Those of us with 210 experience should not assume we know it all already. The engine will burn about the same amount of fuel and the tanks will have about the same endurance as the 210, but oil level is different, fuel system is different. Due to the wing-shape and the fixed gear, the 206's performance numbers, flap settings, best rate, angle, etc. speeds to use will all be different. Cruise speed and range will be less. Payload will be slightly less (but still pretty amazing!). Takeoff and landing will be better, without such a pronounced "personality change" between light and heavy loads as with the 210. When heavily loaded, the 210 used to trundle along forever during takeoff roll; with a moderately heavy load, this airplane appears to be much more enthusiastic about leaving the ground. Ground roll and distance to clear a 50' obstacle will be slightly shorter. Landings over an obstacle can be much shorter.

Always check the oil filler cap and the fuel tank caps. Note that (unlike the 210) minimum oil is 9 qt. (10 qt. optimum). Keep the tire pressures up. Always check cargo door security. When sumping, look to see what drains out is blue 100LL gas, not water, and that there are no particles. Note the existence of reservoir tanks and belly drains.

The procedures for a normal start. are pretty much as outlined in the POH. In the case of a hot start the throttle is opened about 1/3 and reduced to idle as soon as the engine starts. Try to minimize the rpm rise. So far this baby starts as easy as the Skylane. Several people have wanted to lean while taxing. At the moment I'd be inclined not to. This is a fuel injection engine and the fuel flow is very low while idling and taxing. (PB)

See Brooks's notes (attached below) on fuel flow, hot starting, avoiding vapor- or hydraulic lock, and other matters. The engine gives no clue by sound or roughness if the mixture or fuel flow isn't right. If these are set wrong, it can be ruined in short order. When setting mixture and cowl flaps, reducing power, etc., check the fuel flow and engine analyzer indications. Compare all engine instrument readings and settings with

previously-noted ones. There is an important machine-management aspect to flying this airplane.

For range and endurance calculations, don't put too much faith in what the fuel flow meter says: inherently it's just a pressure gauge. The resulting fuel flow indication may or may not be an accurate measure of flow.

Plan to adjust the cowl flaps as necessary to keep the CHT needle about 1/3 - 2/3 the way up (but no more) into the green; check CHT's, EGT's with the engine analyser.

Don't run the engine up until the oil warms up to 75°.

Be particularly careful to protect the prop from stones. Never try to pull yourself out of a hole with the prop! On bad pavement, gravel, dirt, etc., content yourself with a rolling mag check at 1400 rpm; at takeoff, start at 1400 rpm and do not push throttle clear in until the airplane is rolling and has picked up some speed.

Prior experience with the 210 says to be very careful about making unnecessary noise with the airplane. We will need to develop some recommended noise reduction settings and operating procedures. One thought is to "spread the wear" by not doing too many touch and goes at any one place. (We used to get on-field complaints at Hanscom: that on every touch and go with the 210 we were shaking the whole airport!) Always use full length and get some altitude before flying over houses of airport abutters. At other places, always follow local noise abatement rules. Reducing RPM while still within the airport boundary will help (and is OK to do); but don't sacrifice getting some altitude before making (gradual) power changes.

The thing not to do is throttle back or otherwise reduce fuel flow at high power. Brooks's big point is that this engine really needs the extra fuel for cooling. He notes that in the event of engine-driven fuel pump failure, with only the boost pump output working, it will be necessary to reduce rpms (and throttle, slightly), to prevent the engine "outrunning" the max fuel flow available.

In cruise, use 65% power or less. Our experience on the 210 was that higher power just thrashes the air, makes noise, and wastes gas.

When descending, enrich the mixture 'a little bit, not a lot' -- i.e. just enough to stay on the rich side of peak as pressure altitude changes.

When descending, making controlled, gradual power reductions is important. Shock cooling must be avoided. Don't ever let the windmilling prop drive the engine. Slow down gradually and carry a little power to prevent this. Windmilling will cause floating of the piston rings, and possible breakage.

Initial reports say smooth and slow transitions work wonderfully in this plane. Level out and reduce power a couple of notches at a time until you are at about 17" and at 85 knots

on downwind. At midfield, add 10° of flap and trim to level flight. Base, reduce power to 15" and go to 20° of flap. Turn final. If high or as you reach the glide slope from below, add full flap and hold 70 to 75 K. You are just at the edge of the green so engine cooling is between "0 cold" and "-20 cold" on the engine analyzer, which are good, conservative numbers. Better yet, the plane is flying straight down the glideslope with only a tad of trim. After crossing the threshold, ease the throttle back very slowly and add the slightest amount of steady back pressure. You will fly onto the main wheels with only a squeak to tell you they have hit. (JF)

No excessive cooling was seen when reducing to 12" on final after a going through the previous sequence of reductions (JF), but recommendation is to carry 15" mp until closing the throttle at touchdown.

Let the nosewheel come down by itself. Maintain back elevator while braking. Unless there is a real reason to do it (like a really short field needing heavy braking), don't raise the flaps. (Reason: development of a bad habit that might someday lead to a gear-retraction on the ground in some other high-performance airplane.)

Keeping the speed down when landing the 206 is important because the energy to be gotten rid of is proportional to the velocity squared (as well as to the mass). At full gross, there's maybe 50% more energy here to get rid of compared to the 182, hence the 206's big tires and brakes. Carry enough speed to flare, though, and don't drop the airplane on its nose. The big flaps give it plenty of short-field capability -- learn how to use it!

To make your landings come out right, adjust the approach IAS according to the square root of gross weight (adjust by half the percentage under gross). Avoid adding excessive speed out of carelessness or a misguided conservatism. You might add 5 knots for gusts, but don't add another 5 because it's Groundhog's Day, another 5 for Momma and the kids, etc., or you will wind up floating (or worse, wheelbarrowing), with the end of the runway coming up fast.

The same speed adjustment vs. weight also works for best rate of climb, best glide, etc. -- and even maneuvering speed (where it sort of works in reverse because you want to the thing to develop an unflyably high angle of attack (i.e.stall) before the wings come off). Reason: lift is proportional to velocity squared, therefore velocity for various purposes should go as the square root of the amount of lift needed (or tolerable).

The stall CAS changes similarly with weight or g's, and for flight at various loadings and CG's it actually changes only a small number of knots (viz. the KCAS tabulation in the POH) -- but the KIAS shown there varies much more, since the relative wind and angle of attack (and therefore angle at which the airflow meets the pitot tube will change considerably with CG location and loading (and also with flap setting, power being carried, bank angle, slip, possible presence of ice, etc). Fortunately, the airplane's stall characteristics are conventional and predictable; it seems quite well-behaved in stall. But you must use the rudder.

(Airspeed indication shouldn't be relied upon for stall avoidance, anyway. Sure, it's important, but flow separation is really what matters, and that can happen at any speed, depending on what you're doing with the airplane. In the absence of a proper angle-of-attack instrument, how well the wing (and elevator) is doing must be imagined, mentally calculated, and sensed; airspeed is only part of the story; g's being pulled is only part of the story; propwash, blanking, adverse yaw, structural ice, ground proximity, wind-shear all have an effect. A good idea -- in any airplane! -- to be able to takeoff, make turns, and land without the airspeed indicator.)

On a go-around, it is important to get full power and start the climb, then immediately reduce flaps to 20 degrees (much as with the 182!). After obstacles are cleared at 65KIAS, accelerate to 84 KIAS before milking off the flaps. Pitch effects of flap retraction will be minimized if the airplane is allowed to accelerate to best rate of climb speed before starting to retract.

The forced landing and ditching instructions are interesting. Note the possible interference between the front half of the double door and the right wing-flap. Cessna's fix is a placard over the rear door: "Open the front section of the rear door as far as possible, then unlatch the rear portion and force it open all the way." -- which leads to further questions noted by JF.

If the door should come open in flight, it will interfere with putting the flaps down. (We are warned that if the door does pop open in flight, everything loose will get sucked right out of the airplane!)

When parking away from Hanscom, give some thought to security. 206's are notably in demand by those who are up to no good.

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Brooks's notes:

The constant flow FI system 'knows' only throttle plate position. Engine fuel pump output is synchronous with engine RPM.

Check full throttle, full mixture fuel boost pump output. this is the max available in an emergency. Should be 16-18 gph; redline is 24 gph.

The emergency pump output will be less that required for takeoff power. If the engine driven pump fails, the engine's fuel requirement needs to be reduced by lowering rpm with prop control and slightly closing throttle to the point where fuel flow starts to fall off.

Watch fuel flow on takeoff -- should be at or near redline fuel flow. Will possibly be slightly less when the OAT is in the 90's.

Reduce RPM as soon as possible to save engine, fuel, noise. Keep fuel flow rich during climb, not necessarily full rich, but richer than same setting in cruise. (At least 75° rich according to the POH)

Report any stalling on rollout, as this is a sign of FI out of adjustment, or trouble with fuel pump, spider valve, throttle valve.

If the boost pump is left on, the engine may become liquid locked. If this is suspected, turn engine by hand twice, being careful to make sure cylinders are not full of gas. Better yet, remove plugs and crank over.

When starting: if engine won't catch immediately after enriching mixture, it may be vapor trouble. Run the boost pump at ICO to flush fuel through the pump and into the return lines, drawing new, cooler fuel back to pump.

When hot, the fuel system can vapor-lock. With mixture in the ICO position from the last shutdown, try to start engine, be ready to push in mixture when it catches. If you miss this one time opportunity, prime engine, then with mixture in ICO position, try to start -- essentially, make engine fuel-air ratio too rich with priming, then crank over while letting only air into the cylinders. When mixture becomes correct, it will fire.

(To admit air, slowly push throttle in while continuing to crank with mixture cut off, and don't stop. Within a few blades, somewhere during the throttle travel from nearly closed to full open, the right mixture will occur. Be ready to instantly advance mixture and retard throttle, to keep it going and avoid overspeed. Observe cranking time limits, don't kill starter or battery! If it's really flooded, you may need to hand prop 20 blades with throttle wide open, or wait a good long time. See API starting writeups.) (NR) .

Starting problems can be mag related, even though the mags check OK on runup.

The 206 is very well behaved in turbulence and X-wind. Like the other single-engine Cessnas, you can get it on or off the ground down quite nicely in even a big wind. There are some things to be aware of, though, if you encounter gusts or wind-shear. It's mighty heavy, and you will need to keep the airplane flying, avoid stall/spin, etc. Always be prepared to add power, get the nose down, and if necessary go around, or go to a different airport with a runway more into the wind! Proper use of the rudder is essential at all times, especially when landing and when taking off or going around.

One thing stands out: if the 206 is held in a slip for any length of time, it will develop a very healthy sink rate, and it will do this rather faster than you might be used to! To compensate for side drift in a big x-wind, you really have to crank in aileron and stand on the rudder, and then, unless you take steps to counter the resulting rapid sink rate, this heavy machine will come down like a rock! Use a little power to keep the thing straightened out and coming down nicely, and especially, at the very end of the approach, be prepared to use power to cushion the landing and help keep the nose straight.

Completely power-off landing is not a good idea in this machine, anyway, but it's especially not a good idea in a big cross-wind! I don't think prolonged slips are a good idea either, but individual tastes may vary. What works best for me is to come in crabbing in, maintaining a balanced flight regime and a normal descent rate right down to tree-top height. I remove the crab and transition to a drift-correcting slip only at the very end, standing on the rudder if necessary and putting a wing down to get it lined up, while adding some power to keep a comfortable rate of descent and margin for a slight flare. The object is to get a good solid landing -- on the mains first!

With the 206 (or the 182) in a cross-wind, do not use full flaps, or maybe use only 10 – 20 degrees of flap. Given the comparatively low airspeeds vs. x-wind velocities possible with full flaps, you can develop some truly horrendous crab angles. That's not so bad in itself, but if there's any turbulence, you will get blown around like a leaf! On old 182's, there used to be a warning to avoid slips with flaps extended. I really don't think things have changed that much: you can still get blanking of the elevator surfaces in a slip, especially in turbulence, and then things can get wild. In a big wind, you don't need flaps anyway. In turbulent cross-wind conditions, full-stall, hold-it-off-to-the-very end, minimum air-speed, squeak-it-on landings are both unnecessary and dangerous. Cross-wind landings don't have to be all that elegant: all you really have to do is accurately plant a main wheel and roll it on straight: if you can do that without dropping the airplane on its nose or letting it hit while drifting sideways, or letting the wind get under the upwind wing, the rest of the landing will work out OK!

In summary, in a cross-wind with either the 206 or the 182, approach the runway under control, using power. Run the engine up a bit toward the very last to counter excessive sink rate or potential inability to flare. Get the nose up to a proper (but not extreme) landing attitude, and let it land first on the upwind wheel. Then, as it touches, if the ailerons aren't already maxed out, crank in and hold full wing-down aileron. Also continue to hold enough back pressure to keep the weight off the nose-wheel. Once

down, never try to brake unless the weight is securely on the mains! In both the 182 and 206: keep some back pressure on the yoke to hold the load off the nosewheel!

In other words, in a crosswind, don't relax and let all three wheels flop down level on the runway right after it first touches down, like some people do! Without back pressure, braking, if needed, will be poor. (Also, you may get a lot of shimmy if the nosewheel touches at too high a speed.) Use rudder to steer, be ready with the engine if it needs a shot of power, keep the weight off the nosewheel until you have slowed clear down, after which you can use both elevator and ailerons to keep the wind from getting under the upwind surfaces. In short, keep "flying the airplane" all through the rollout (and all through the taxi afterward!).

Runway widths and individual tastes may vary, but under heavy wind conditions, I also prefer to land diagonally across the runway, into the wind. You can certainly minimize the amount of drift correction as well as drastically cut down on the ground roll by landing diagonally. A diagonal path can help on takeoff too. (Note, however, that if you do decide to steer more in line with the runway, you must make any direction changes with the rudder (and power); never try to do it with the ailerons!).

In a big cross-wind, takeoff might have to take place one wheel at a time (from a curved takeoff path, perhaps), but once safely in the air, you need to take out all the drift corrections: in balanced flight (and with no particular accelerations or decelerations) the airplane doesn't care where the wind is coming from, and you certainly don't want to be trying to climbing out while holding it some kind of a slip! Immediatly set up balanced flight and crab your way out of there along the runway centerline or other ground reference path you might have been given.