



“Riveting Reading” **North Carolina Wing Aircraft Maintenance**

Dec 1, '18. Vol #12
By Major Martin ‘Stryker’ Heller

← N9930E’s re-upholstered seats →



To: All NCWG Commanders, Operations Officers, Crew Chiefs and Aircrews;

1. November’s highlights: The month started out with a short-notice, high intensity, Army ATC training mission. Unfortunately, the Army didn’t request good weather, and lost two of the four days of training. While unofficial total, I project we’ll have logged just more than 300 hours in Nov. Also, with daylight savings time ended, night currency is easier to get.

2. Maintenance Month in Review: November was relatively slow, maintenance-wise, since **N938CP, N262CP, N963CP, N716CP, N179CP and N405CV** started their 100 hour/annuals the last week of October. All but N716CP had clean bills of health. N716CP ended up needing three cylinders rebuilt; two had scraped walls; the third had a burnt valve. It was down for 4 weeks as the cylinders get overhauled in Oklahoma (CAP contract). Not to be outdone, N963CP’s magnetos travelled to Montana for their overhaul. N908CP’s alternator problems (3rd one if you’re counting) continued and the crew diverted into Southport when they had an electrical failure. It was pretty much a total power loss by the time they landed; fortunately, the pilots had a hand-held radio. ATC called the airport and advised they were inbound, NORDO, since the transmission was weak. Turned out the Electronic Control Unit (ECU) was bad and burned out the alternator(s). New ones were installed & the aircraft was re-assigned to KILM (NC-023) to share. N4813C & N99885 started their 100-hour/annual inspections and should be out by the weekend. While I don’t project another annual needed before January, consolidated maintenance facilities normally shut down during X-Mas week. (Read: plan ahead.)

3a. Admin Tidbits: Aircraft Information Files (AIF) and Flight Logs updates: Until over-ruled, we’re now storing the hex key wrench for the VIRB mounts on a new inside pocket, on the inside cover of the AIF.

3b. Buying a used CAP airplane: Perhaps your spouse already bought you one; none currently on the list at: <https://www.gocivilairpatrol.com/members/cap-national-hq/logistics-mission-resources/aircraft-for-sale/> .

3c. Rescheduled NCWG Operations Conference: Sat, 19 January, 2019, at Rocky Mount-Wilson Reg’l Airport (KRWI). All NCWG airplanes are required to be there, along with squadron operations officers, crew chiefs and Emergency Services officers. For those working on their Operation’s Officer technical rating, attending one of these meetings meets one of the requirements.

3d. VIRB Mounts: We’ve had issues with the VIRB camera pivoting backwards in the wind, resulting in unusable (tail of the aircraft) photos. We’ve replaced the Philips head screw with 3mm hex head screw on N716CP and N908CP, and also the mounts on N963CP, N405CV and N179CP. Let me know if your aircraft has the same problem. We’ll replace all the screws, but only replace the mounts that need it. So those units with a Virb camera, please test it for pivoting on the mount; especially, N727CP, N726CP and N938CP.

3e. 500-Hour Magneto Checks: The new CAPR 70-1 now requires that same 10-hour cadet orientation flight restriction as a cylinder change-out. NCWG raised the issue/confusion and got clear guidance that, yes, the 500-hour magneto check is considered a rebuild. That should show up in print when CAPR 66-1 is updated.

4. Maintenance Musings:

4a. 100-hr/annual Inspection Preparation: The crew chief’s role for maintenance is more than just finding out when and where to send it. Some crew chiefs are great at staying on top of WMIRS and advising squawks to be addressed. But for those new to the job, or busy, we need a little more effort in researching what’s coming due. **Maintenance** shops are great at advisory directives, magneto 500-hour checks, and ELT battery

replacement. But pitot-static/transponder checks, corrosion protection, etc... are not as obvious; especially if those occur out of phase (100-hour inspections don't always fall on 24-month pitot-static cycle). And if missed, these items are costly to accomplish, or might even ground the aircraft. With 18 airplanes in NCWG, you have a vested interest in keeping your assigned aircraft operational. Same thing with squawks; get us the list before the airplane arrives, so maintenance knows what to look for and trouble shoot. They treat our aircraft as if they owned them, but hate the "oh, by the way," comments after they put the aircraft back together. If you have questions call us. Also, thanks for taking the aircraft logs with you if you're dropping the aircraft off near the end-of-the-month. Sometimes, the aircraft ends up staying past the 5th, affecting the end-of-month reports.

4b. **Aircraft Pick-up:** AOPA has a good article (attached) about retrieving aircraft up from maintenance. From arranging pick-up while the shop is open, to extra vigilance in the pre-flight check, it's a good reminder for what to be alert. Also on-line at: <https://www.aopa.org/news-and-media/all-news/2018/november/pilot/savvy-maintenance-test-pilot-mindset>

4c. **"Under Pressure?" "Tired of hearing about it?" Sorry but we need to 're-tread' the issue:**



A little more detail on the incorrect air pressure inspection write-up: Tires lose pressure in lower temperatures (lots of things condense in the cold). But the problem was that some tires were **OVER-inflated** (more often) than under-inflated; even on the same airplane. Over-inflated tires give you less traction, and might feel like you're landing on ice skates. **Seven of the nine tires checked had the wrong pressure.** Five of six **main tires were over-inflated.** **Nose wheels** (2 of 3) **were under-inflated.** One can't go by looks; use the aircraft's pressure gauge. Thanks for helping avoid a repeat write-up.

4d. **"Chocked Tires:"** Did you know CAPR 66-1 (para 8.6) requires "Corporate aircraft shall be locked, securely tied down, **and wheels chocked** when not in use." For those of us that don't, start doing that (SAV).

4e. **"Photo Finish:"** Thanks to KAVL, KLHZ and KECG for providing aircraft photographs for our records. I got all the others when they passed through KSUT. Similar to dental records, it gives us a visual history of our aircraft. This also prevents some phone calls to crew chiefs during our 'research' projects.

4e. **Survival Kits Expiration Date:** Please look to see if there is one on the kit in your airplane; if so, report it during the end of month reporting email. It's a staff assistant visit check item; and its for your own protection.

5. **Cold Weather Operations:** Remember, airplanes hate the cold like you do. Processes take longer; batteries are weaker, and oil is thicker. While Lycoming requires pre-heat below ~ 20 degrees, planes start a lot easier if you preheat anytime below 40 degrees. A bit hard for many of our ramp birds, but it saves engine wear and tear. Some units / airports have developed unique heating devices to off-set the cold. Of course, remove (brush) any ice or snow from the aircraft wings. Hosing them off with water is a very bad idea.... For those who don't subscribe to avweb.com, also attached is a great, cold weather flying article by Rich Durben.

6. Thanks for taking the time to read this and keep somewhere for your continuity. Riveting Reading can also be found on the NCWG Operations / Aircrew Maintenance Webpage. If you have questions, you can reach me at 703-732-3264.

- Stryker -

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Attachments

- AOPA article – Picking up aircraft from maintenance (separate .pdf file)
- AVWEB article – Cold weather operations – "Ready for Winter" by Rick Durden

The Pilot's Lounge #140: Ready For Winter

By Rick Durden

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As he does from time to time, Dave, the proprietor of the flight school here at the virtual airport, sent out a mass email to his aircraft rental customers—students and certificated pilots—asking them to come to an evening gathering to socialize and discuss an issue of interest to all of us. The evening's theme was getting ready for winter flying. We live where the snow can get pretty deep. Dave recognizes that even experienced pilots can use a refresher course and many of the newer pilots hadn't yet been exposed to much of what he was going to present. Dave's been around the aviation block a few times and a number of the pilots present had significant cold weather experience, so I sat back and took notes.

Take Your Time: Dave started the evening's discussion by emphasizing his main point: In the cold, allow extra time. For everything. Accept it. Plan for it. With that in mind, everything else goes pretty well. It's a good idea to show up about two hours before you intend to depart. It is likely that it will take that long to get the hangar opened, get the area in front of the hangar or tiedown cleared of snow, for the line folks to get the fuel truck started and service the airplane (Murphy's law requires that it wasn't fueled last night), to get the frost off the airplane, to get it started and to simply get to the runway. Too often, renters show up on time and work like mad to get the airplane ready to go, only to discover they have used up their time slot. As we say, it was nice of them to have gotten the airplane ready to go for the next pilot. Ever notice that smart renters never sign up for the first slot in the winter?

Dave had some tips for aircraft owners: Before the first snow is expected, take the wheel pants off. Wheel pants collect snow and ice, which in turn can prevent the wheel from rotating freely. If you happen to slide into something hard, a bare tire will bounce off. A wheel fairing will crack or break, especially when brittle from the cold.

Carry a good quality CO detector—not the nearly worthless brown spot stick-on-the-panel thing. Exhaust systems wear out. Every year, there are a few accidents due to CO poisoning.

The winter preparation topic started the pilots talking. Most of the Cessna owners said they cover up the cabin air inlet openings on the wings. Some use duct tape, while others use commercially available attachments. All said that it makes a big difference in cabin comfort. A Piper owner said that he covers the inlets as well, but he discovered the hard way that one of them goes to the avionics stack and the lack of cooling air had fried his radios—so make sure that you're only blocking cabin air inlets.

The pilots who have been around also make sure that the baggage curtain behind the back seat seals well. Most of the cold drafts come from the tail of the airplane. A bunch of the newer pilots were amazed to learn that the airflow within the airplane is from the aft fuselage toward the front, which explains why the rear seat passengers are so much colder than those in the front.

The more-experienced pilots and some of the guys who had taken survival training all said that it is wise to wear your warm coat while flying, not take it off once in the cabin. Should you have to make a forced landing, you won't have time to put on the warm stuff. These experienced cold-weather pilots also carry at least a sleeping bag in addition to their usual survival gear. Most have complete survival kits for cold-weather operations.

Preflight: Dave emphasized that, when it's cold, pilots tend to hurry the preflight. Lots of things can go wrong: Components are more brittle, hoses crack, liquids freeze. A hurried preflight means that the chances of missing something are way too high. The rule of thumb is that when a pilot feels the urge to hurry that is a red warning flag to slow down, to take one's time. And, it sounds silly but, as your mother told you, bundle up. Dress warmly so that you can spend enough time on the preflight to make sure everything works.

Get organized before you walk to the airplane. Have everything for the cockpit the way you want it so that you don't have to futz with stuff once you get in. While you sit in a cold airplane, before startup, you are fogging and freezing up the windows. The defroster may not be able to deal with that, particularly on the sides. Spotting traffic can be a bit of a problem with frosted-over windows.

As you approach an airplane parked outside, examine it closely for any snow, ice or frost. It should go without saying that any contamination must be removed from the wings, tail and fuselage before even thinking about starting the engine. Large accumulations of snow should be swept off with a broom, taking care not to damage control surfaces or antennas. A short ladder can help. Smaller accumulations and stubborn spots, including ice, should be dealt with by either rolling the bird into a heated hangar or by using deicing fluid. If you plan ahead, many FBOs will be able to put the plane in a hangar overnight—for a fee, of course. If none of these options are available, remove any remaining frost or snow with your glove or with an old rag—it's better on the paint than an ice scraper or a credit card. Take care to ensure that there is no snow, ice or slush in the gaps between control surfaces. Even if it's warm enough to melt this stuff on the ramp, it's likely to freeze at altitude—in the worst possible location at the worst possible time.

First thing on the preflight after opening the door: Put the ignition key on top of the panel so you and others can see it is not in the ignition. Then, turn on the master switch to see if you have electrical power. Do not drop the electric flaps, as you may need all of what may be limited battery power to crank the engine.

If fuel won't drain from a quick drain, the drain is frozen. Therefore, there is water in some form in the fuel system. No, you are not going anywhere until you get that one solved by a mechanic. You don't know where the water/ice is. The risk is simply too high. An engine failure due to ice in the fuel system could well delay your arrival at Grandmother's house.

When to Preheat: The twofold question that came up early in the discussion was pretty straightforward, and I saw a lot of nodding heads when it was asked: What defines “cold” when it comes to a cold start? When should you preheat?

Cutting directly to the point, there is a number that can be considered hard and fast: 20 degrees F. At anything below 20 degrees F (there are exceptions that go down to 10 degrees F—use 20 and be safe), the engine should be heated before starting. There is definitive guidance on the subject from the engine manufacturers — Continental Service Information Letter 03-1 and Lycoming Service Instruction 1505.

Both manufacturers are blunt about cold starting risks: For example, Lycoming says, "Improper cold weather starting can result in abnormal engine wear, reduced performance, shortened time between overhauls or failure for the engine to perform properly." I am of the opinion that the "or" in that sentence should be "and."

Continental warns, "Failure to properly preheat a cold-soaked engine may result in oil congealing in the engine, oil hoses and oil cooler with subsequent loss of oil flow, possible internal damage to the engine, and subsequent engine failure." Have they made themselves clear?

Once the temperature drops below 20 degrees F, there are three generally accepted methods of getting a piston aircraft engine warmed up to a temperature at which it can be safely started and operated: 1) sticking the airplane into a heated hangar, 2) a high-volume hot air heater (preheater) and 3) an engine-mounted electric heating system.

Keep in mind that even if you have preheated the engine, if you have single-weight oil in the engine and it's not the right viscosity for the cold, that summer-weight oil may not provide adequate lubrication.

Heated Hangar: If nature's warm air is not available, a heated hangar is best—it warms up the entire airplane. Continental says to allow four hours to assure congealed oil is flowing.

From a technique standpoint, once the time in the heated hangar is drawing to a close, the pilot should have everything ready to go the moment the airplane is towed out—ideally with everyone in the airplane so the pilot can hit the starter as soon as the tug is clear. It helps to open the windows until the engine is running and the heater putting out warm air as windows will fog and ice over quickly due to the respiration of the aircraft occupants.

Preheaters: Continental and Lycoming are explicit in calling for careful use of high-volume hot air preheaters to assure that all of the engine is heated—oil sump, external oil lines, cylinders, air intake, oil cooler and oil filter. Be careful not to damage non-metallic components such as seals, hoses and drive belts. As someone who once unknowingly melted the sleeve of a down jacket using a forced-air preheater and then filled the cabin of the airplane with feathers on getting inside to start up, be careful where you point the heater and what you touch with hot parts of it.

Continental says to preheat for a minimum of 30 minutes. Lycoming says to apply heat in 5- to 10-minute intervals and then “feel the engine to be sure that it is retaining warmth.” It goes on to say that during the last five minutes, the heat should be directed to the top of the engine.

Once preheating is complete, both manufacturers call for starting the engine immediately. We agree—we’ve seen too many pilots finish preheating, then start setting up their iPads and plugging in the headsets over 10-15 minutes and then discover the engine won’t start because it’s gotten cold again.

Engine-Mounted Heaters: Engine-mounted heating systems have been reviewed periodically in our sister publication Aviation Consumer. Continental recommends a system that includes “individual cylinder head heater thermocouples, oil sump heater and crankcase heater pad.” Having owned four airplanes with engine-mounted heaters, I have found them to be handy, especially when traveling, as the combination of a blanket over the cowling and a long extension cord allows preheating at almost any airport.

Starting

Both Continental and Lycoming urge immediate starting after preheating is complete. They caution the pilot to assure that the start is made at low engine RPM, not more than 1,000, due to risk of cylinder damage from lack of lubrication and to assure that oil pressure comes into the acceptable range soon after start.

Pumping the throttle before or during start is not a good idea. It creates a high risk of engine fire on a cold start. Pumping the throttle more than once usually does nothing but flood the carburetor.

For a carbureted engine, the proper procedure is to use the primer to put fuel directly into the cylinders. Many operators recommend leaving the primer out and letting it fill with fuel after the last pre-start priming shot.

Then, as the engine is cranking and fires, give another shot or two of prime.

Continental goes into detail regarding post-start procedures in cold weather. Briefly, it calls for frequently checking oil pressure to assure that there is not congealed oil somewhere in the system that can cause engine damage—it will manifest itself by high or low oil pressure indications. Do NOT let the RPM exceed 1,000 until some oil temperature is indicated. This is important—we’ve all seen the pilots who start the engine at 1,500 or 1,700 RPM; they’re damaging the engine, hot or cold. When the checklist says “throttle cracked,” it means a small fraction of an inch, not halfway to the firewall.

Continental says that if the oil pressure cannot be maintained above 30 psi or below 100 psi, shut down and repeat the preheat process. It also says not to close the cowl flaps during engine warm up.

Once oil temperature is indicating, the engine may be operated as high as 1,700 RPM; however, it should be approached gradually to make sure oil pressure does not exceed 100 psi. The runup can then be conducted.

Continental recommends cycling the propeller three or four times to move cold oil out of the propeller dome. On feathering propellers, do not let the RPM drop more than 300.

Only when oil temperature exceeds 100 degrees F and oil pressure does not exceed 60 psi at 2,500 RPM is the engine sufficiently warmed to accept full rated power.

I’ll add the suggestion that it’s a good idea to take an absolute minimum of five seconds in going from idle to full power during a cold weather takeoff—at least 10 seconds is probably better. I’ve seen engines cut out with rapid throttle movement in cold weather.

When the temperature is above 20 degrees F and below 40 degrees F, Continental does not require the use of preheat, but it recommends that the post preheat engine starting procedures regarding RPM, oil pressure and oil temperature be followed.

Taxi And Takeoff Considerations: If you are wearing boots, make sure you can work the rudders and brakes through full travel, and that you can work the rudder pedals without hitting the brakes inadvertently.

Naturally, check the brakes right away. If there is snow or ice on the taxiway, go more slowly than normal and be certain to hold the correct aileron deflection for the wind. On a slick taxiway, you may find yourself almost sailing the airplane, so make use of the aerodynamic controls in winter. If you taxi through any snow, assume that it is going to melt on the brakes and then freeze as you stop. If possible, try to plan your movements so that you have to use very little or no brakes at all. Stay on the center of the cleared area of the taxiway, but do not roll off onto soft ground doing so. As the wind blows and snow drifts, the painted centerline of the taxiway is rarely the center of the area between snow banks. Try to avoid rolling a wheel through loose, drifted snow as you attempt to keep the nosewheel on centerline. You will make a quick turn toward the snow and may find the prop cutting into the drift. Not fun, and sometimes expensive.

When you do the runup, make sure the tail isn't pointed at a building or another airplane so that you don't blow snow where it shouldn't be. You may clog someone's air intake or have the snow stick to and obscure a warm windshield, necessitating that the pilot shut down and get out to clear it.

Try to do the runup on a dry spot so you don't slide. Any time you have the throttle above dead idle, be looking outside as the airplane may be moving. Having the power at 1,700 RPM for the mag check while you put your head down to recite mantras is a poor way to discover you need a prop overhaul and engine teardown after you slid into a snow bank. Accordingly, keep the runup short. It is a time when the airplane can move unintentionally, so bring the power up, check the mags, prop, the alternate air/carb heat, eyeball the engine gauges and suction, then get the power back.

After the runup, assume that at least one brake will be frozen. So, have some room to maneuver as you add power. If the airplane does not roll freely, slowly continue to add power, being ready to bring it to idle. Most of the time the brakes will free up with a noticeable "bang" as the ice breaks, at somewhere around 2,000 RPM (of course, this was after you couldn't get the airplane to hold still during the runup). Keep the airplane moving and take off. Try to avoid stopping again, because you now have moisture on the brakes and they are likely to refreeze. They will probably freeze again after takeoff. This is usually not a serious problem, but it is something to keep in mind on landing.

On the takeoff roll, bring the power in smoothly over a time of 5 to 10 seconds. Keep the airplane tracking where you want it to go, as drifting snow may mean that you have to dodge and weave a bit to stay in the center of the open areas. If you run one main gear wheel through some snow, as little as a half-inch deeper than the other wheel experiences, the airplane will swerve. It may be violent, so be ready with the rudders. It may take rapid rudder pedal application, perhaps to the stop, to keep the airplane straight. On a tailwheel airplane, hitting loose snow has the added attraction of pitching the nose down abruptly. Therefore, once the tail is up, keep it low, so the thrust line of the airplane is upward, not purely horizontal. If the runway is slippery, keep the aileron correction in for the crosswind and accept that you may actually accelerate the last few knots to rotation speed sliding crabwise if rolling control is lost. You will have to point the airplane into the wind to keep it traveling in the desired direction.

In retractable gear airplanes, do not be in a hurry to suck the gear up after breaking ground. Give the wind time to blow snow off and dry the gear to lessen the potential for frozen brakes or freezing the gear in the wells.

Cruise: Check your power setting charts. In cold weather the engine develops significantly more power at a given altitude than on a standard day. You will see very high indicated airspeeds, mostly because it is cold, but partially because the summertime setting of 2,500 RPM at cruise was generating significantly less power than on a cold day. For example, in a Cessna 172N, at 4,000 feet on a warm summer day, 20 degrees C above standard temperature, 2,500 RPM is 67% power. At the same altitude and RPM setting on a day when the OAT is 20 degrees C below standard temperature, it is developing 76% power. Those who do not like to run their engines at above 75% power may be in for a surprise on a winter day.

Landing: If there is an overcast and snow on the ground, you can experience what is known as "flat light." This can cause a complete loss of depth perception. Until you experience it, you simply can't believe it. Twenty-foot-tall snow piles on the sides of runways appear to be completely and totally flat, level with the runway. Because one doesn't realize it is happening, and because there are still some snowplow drivers out there who are

boneheaded enough to pile snow at the ends of runways, rather than the sides, do not aim for the numbers on a normal landing in winter. There may be something sticking up you just can't see. A lot of pilots have hit snow piles at the ends of runways at night and in flat light conditions, so aim a few hundred feet down the runway, day or night (remember, runway lights are 200 feet apart).

Plan on touching down on the center of the open area on the runway. Doing so may or may not equate to the painted centerline if there is drifted snow on one side of the runway. Assume that the brakes are frozen, so you will not be surprised. If they are, you will hear the tires slide briefly, then two bangs and the wheels will roll normally. During the slide, the airplane may swerve or fishtail slightly. If only one brake is frozen the airplane may turn toward it at a rate that varies depending on the available friction. You can generally overcome it by using opposite rudder and brake. Yes, if you lock up the other brake you will have roughly the same friction on each side. That is rarely necessary, although it does happen, and folks who have experienced it say it works. I also have one friend, an instructor, who got too complacent with a student. They landed well off centerline with one brake frozen. Neither he nor the student reacted fast enough, so the Cessna 150 went into the snow bank and flipped. He is more alert now.

After Landing: A few of the pilots in the lounge described exciting excursions during rollout on runways that they thought were in good shape. Their recommendations boiled down to not being in a hurry to get wing flaps up or cowl flaps open or lights off or anything until you have that airplane hauled down and turned off the runway. In the winter, you simply never know what the condition of the next foot of runway is going to be in. Keep all the aileron for a crosswind cranked in, and be ready to add power at any time to get control or go around if things don't feel right.

After clearing the runway, take care of housekeeping chores and taxi carefully to parking. Keep in mind that the last area to get plowed on many airports is the general aviation ramp. If you have to get through some untouched snow, keep the yoke all the way back and the power on, so as to avoid coming to a stop, if possible. If you cannot maintain directional control, chop the throttle, stop and shut down. It's a lot less embarrassing walking the last hundred yards to the pilot's lounge and asking for help getting the airplane in than it is doing that same walk and then having to say you hit something.

Once you have shut down, go through your usual securing checklist, then put on covers or plugs as the case may be, plug in the engine heater if you desire, and do a post-flight walk around. Check the airplane for any dents from chunks of ice you might have kicked up and for any leaks from a split fuel or oil line. A quick post-flight inspection may uncover a small problem before it becomes a big one.

Winter can provide some of the most enjoyable and scenic flying you ever do, but it does present challenges. In general, the consensus of the folks here in the pilot's lounge was that if you are pretty conservative with weather and allow extra time to get things going at the front end of the flight, it is a delightful experience.

Rick Durden is a CFII, holds an ATP with type ratings in the Douglas DC-3 and Cessna Citation and is the author of *The Thinking Pilot's Flight Manual* or, *How to Survive Flying Little Airplanes and Have a Ball Doing it*, Vols. 1 & 2.