

Elmendorf Aero Club

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PIF 08 - 05

Cessna 182 Carburetor Icing

August 14, 2008

PIF 08 – 05 outlines the serious event of **Carburetor Icing** for operations of the Cessna 182 Aircraft with the power plant of the Continental O – 470 engines.

This engine is very susceptible to the formation of ice during operation due to engine design.

This PIF should be reviewed by all Elmendorf Aero Club members, even if the pilot is rated to fly the C – 182. It contains practical information that will assure proper operation of the O – 470 is accomplished as well as knowledge of engine operation equipped with Carburetor Heat.

The PIF also contains other information about the Cessna 182 and its operation.

This PIF is PERMANENT.

CESSNA 182

CARB ICE

Carburetor icing: The C182's Continental O-470 is a sturdy, reliable engine, but it is highly susceptible to ice formation. Pilots should use carburetor heat, especially during descent.

Carburetors

Note: The following advice is for naturally aspirated engines only. All turbocharged and turbo-normalized, carbureted engines must be at full rich for takeoff.

Taxi and Run-up: Leaning during taxi is sometimes required to prevent plug fouling and/or to provide smooth operation, especially at high altitude airports. At altitude (3000 feet and higher), leaning is definitely required to get an accurate magneto check.

Rich mixtures can give mag drops of 200 RPM and of only 75 to 100 RPM when leaned. To find the best mixture for mag checks, lean until the engine gets rough then enrichen back to highest RPM. Readjust the throttle to the mag-check RPM and do your check.

Some carburetor systems provide some challenges to this simple procedure in cold weather. The most common example that comes to mind is the O-470 in the C180 and C182. This is a great engine/airframe combination but can get cantankerous in very cold weather.

The carburetor sits down away from the engine where it cannot pick up much heat. Therefore, it will ice up a little easier and in very cold weather (low teens and subzero) has some problem getting the fuel to atomize once it is distributed into the induction airflow.

This can cause lean mixtures of sufficient magnitude to give really rotten mag drops; bad enough to fool some into thinking that the mag has just gone South with the geese. The best way to compensate for this malady is to pull the carb heat on, lean the mixture as previously described, adjust throttle to the mag check RPM and try again, all with carb heat "on."

The mag drop will be a little higher than normal (125-150 instead of 75-100), but will be smooth if everything with the mags is okay. This is to be expected because of the hotter induction air (causing lower engine power) with carb heat in the "on" position. (Carb heat in for Take Off.)

1956 through 1986 Cessna 182 Fixed Gear Skylane Buyers Guide Excerpt

Safety Aspects of the Skylane

Over the last few years, the staff of the Cessna Pilots Association has seen a number of incidents and accidents with Cessna 182 aircraft that have been caused by lack of knowledge of the aircraft's systems and idiosyncrasies. The CPA was so concerned about these problems that I wrote a letter to every 182 owner in the country outlining what these problem areas are and how to deal with them. A prospective 182 buyer would do well to acquaint himself or herself with these system-related problem areas.

It should be emphasized that while there are some areas where pilots have had problems with the 182 due to lack of specific systems knowledge, overall the 182 Skylane has an outstanding safety record for an aircraft of its capability. Even a low-time private pilot can operate a 182 Skylane safely provided he or she has received a good checkout from an instructor that knows the 182 well, understands the aircraft's systems, and does not try to exceed his or her limitations.

Here is what I wrote to the 182 owners concerning safety aspects of the 182 Skylane:

Dear Cessna 182 Skylane Owner,

FAA records indicate that you recently registered a Cessna 182 Skylane aircraft. I am writing to brief you on several safety-critical topics that we believe every Skylane owner should know about. Many 182 Skylane owners (even experienced ones) are not aware of certain important characteristics of this aircraft that are critical to safety.

I'm going to discuss the idiosyncrasies of the Cessna 182 Skylane fuel system and several other aircraft systems. At the end of this letter, I'm going to tell you a little about the Cessna Pilots Association and urge you to become a member of this valuable technical information service for Cessna owners. But whether you decide to join CPA or not, I want you to be safe when you fly your Skylane. So please take a few minutes to read this letter carefully.

FUEL BLADDERS AND FUEL CAPS

If you fly a 1956 182 thru a 1978 182Q, your airplane uses rubber bladder tanks in each wing. These bladders have a tendency to develop wrinkles along the bottom. The wrinkles act as little dams that can prevent water from moving to the sump drain. You can sump the tanks at pre-flight and see no water, yet water could still be present in your fuel tanks.

To make matters worse, Cessna originally installed flush-style fuel caps on these aircraft. The caps can leak if the aircraft is exposed to moisture. If your fuel caps have a small hinged pull-up handle that fits into a recess in the cap, you have the dangerous fuel caps. At CPA, we call them "killer caps."

There have been a number of engine failures immediately after take-off even though the pilot sumped the tanks thoroughly during pre-flight. Some of these incidents have been fatal. The FAA issued Airworthiness Directive AD 84-10-01 to deal with the problem. It requires inspection of the bladders for wrinkles, and suggests changing the flush-style fuel caps to umbrella-style caps.

If you fly a bladder-equipped 182 that still has flush-style fuel caps, the Cessna Pilots Association strongly urges you to change immediately to either the Cessna umbrella cap (kit SK-182-85 available through any Cessna service center) or the Monarch Development cap sold by Hartwig Aircraft Fuel Cell Repair (phone 800/843-8033 US or 800/665-0236 CAN).

I beg you not to overlook this fuel cap situation on your 182. Accident statistics show that the 182 Skylane has one of the highest rates of accidents caused by fuel contamination and the flush style fuel caps coupled with the bladder fuel tanks are the main cause.

CARBURETOR ICE

The Cessna 182 Skylane is prone to developing carburetor ice. The reason for this is because the design of the induction system has the carburetor positioned well below the engine in the cowling and away from the warm air around the engine. Because of this tendency towards carburetor ice many Cessna 182 Skylanes were delivered with a carburetor temperature gauge. The Cessna Pilots Association has strongly recommended to its members that they utilize carburetor heat in such a manner as to keep the carburetor temperature indication out of the yellow zone of the gauge. This may only require the use of partial carburetor heat, a practice that in standardized flight training is considered a poor procedure, being taught that carburetor heat should be all or nothing. The carburetor icing characteristics of the Cessna 182 Skylane make partial carburetor heat an acceptable practice for this aircraft.

AUTO GAS

1956 through 1976 model year Cessna 182 Skylanes can receive STC approval to operate on auto gas. The makeup of auto gas coupled with the Cessna 182 Skylane's induction system produce a couple of interesting operating characteristics. First of all because auto fuel vaporizes more readily than aviation gas it is possible to develop carburetor ice at higher outside air temperatures on auto gas than on aviation gasoline. The amount of ice that is produced remains the same but pilots will notice carburetor icing occurring at higher air temperatures on auto gas than they are used to experiencing with aviation fuel.

Another characteristic on auto fuel is that when the engine is shut down, remaining auto fuel in the induction system will condense in the intake tubes, run back down to the carburetor and drain out on the ground. The amount of fuel that will drain out will vary from a teaspoon to a cup or so. Members report seeing this situation most often in the fall of the year when conditions are most conducive to producing the condensation of fuel in the intake. While this is a normal situation when operating on auto gas, if bothersome to the operator it can be minimized significantly by idling at a lean mixture with the carburetor heat on for thirty seconds or so immediately prior to shutdown.

UNEVEN FUEL FEEDING

Have you been flying along and watched your fuel gauges show that your left tank is going down while the right tank remains full even with the fuel selector on "Both"? This is a common problem with Cessna 182 Skylanes before the 1979 model year. And the real shocker is that while the right tank is remaining full the engine is actually running off of fuel from the right tank!

What causes the situation is the way Cessna designed the fuel tank venting system. When fuel is used from a tank it must be replaced with something, otherwise a vacuum is created which will either cause interruption of fuel to the engine or cause the bottom of the bladder tank to be "sucked" up. To avoid this in almost all fuel systems, whether they are in an aircraft, a car or a lawnmower, fuel that is used from the tank is replaced by air from the outside.

In the Cessna 182 Skylane this venting occurs by connecting the upper outboard portion of the left tank to the "L" shaped vent tube underneath the wing behind the left wing strut. This allows air into the left fuel tank as fuel is used. To vent the right tank, a vent inter-connect line is run from the upper inboard area of the left tank to the upper inboard area of the right tank thus, in theory, venting the right tank to the vented airspace of the left tank.

Unfortunately, wing dihedral, where the wing tip is higher than the wing root, was not sufficiently considered. When the wing tanks are full, the vent interconnect line is actually submersed in fuel and thus as fuel is used from the left tank, the air coming in from the vent pushes fuel from the left tank through the vent interconnect line into the right tank, thus replacing fuel that is used from the right tank. And even after enough fuel is used from the left tank to bring the fuel level below the vent interconnect line the condition will continue as fuel sloshing in the tank periodically gets into the interconnect line and pushed through to the right tank.

In really severe cases fuel usage from the right tank might not be indicated on the gauge until the fuel level in the left tank is as low as 1/3 capacity. The positive thing to keep in mind when experiencing this condition is that fuel is actually being used from the right tank and that fuel being used from the right tank is merely being replaced by fuel from the left tank. This means that even if the left fuel tank should go to empty you will not experience fuel flow interruption as long as there is fuel in the right tank and the fuel selector is on "Both".

This condition can be minimized somewhat by adjusting the position of the fuel vent behind the lift strut on the left wing, making sure that fuel caps seal tightly so that the "head pressure" in one tank is not altered by a leaking cap, and assuring that the wing strut fairing is sealed against the strut, thus avoiding burbling air right in front of the vent. However, in the end the design of the system does not allow for complete resolution of the problem. The Cessna Pilots Association has a handout available to its members that discusses this situation in even greater detail.

Beginning with the 1979 model year the Cessna 182 Skylane went to an integral bay "wet wing" fuel system with vents under both wings which went a long way to reducing the problem.

DRIPPING FUEL FROM THE VENT ON THE GROUND

Earlier I mentioned that the fuel tanks are vented to replace the fuel being used with air. To prevent fuel from going the other way, that is, fuel leaking out the vent when the tanks are full or the left wing with the vent is lower than the right wing, a check valve is installed in the vent line.

However, fuel is not a totally stable product, it will contract when cooled and expand when warmed. This means that if your aircraft is topped off with cool fuel from an underground tank and your caps sealed tightly and your check valve sealed tightly, then as the fuel warmed and expanded there would be no way to relieve the pressure and eventually the tank and perhaps some wing rivets would fail. To prevent this Cessna uses a check valve with a small hole in it to allow fuel to drip out the vent line when pressure builds up in the tank.

Normally this drip will stop when the fuel cools or the fuel level drops a little bit. However sometimes the pressure can build up so rapidly that a solid stream of fuel can come out the vent which is situated below the tank and a siphon effect can be established where several gallons will drain out before the stream stops. In addition if the aircraft is parked in such a manner that the wing with the vent is on a low side then fuel could continue to siphon for some time as the fuel siphoning out of the tank is being replaced by fuel from the other tank passing through the vent interconnect line.

A FAA Airworthiness Directive required the use of fuel caps that have vents installed in them in case the primary venting system became blocked by such things as bugs or ice. These cap vents are only secondary vents that are normally closed and only open if a vacuum is being created in the tank.

SEAT TRACKS

There have been a number of accidents caused by the pilot's seat slipping aft just as the aircraft rotates. Normally the seat is kept from sliding after the pilot releases the latch by one or two pins from the seat that fit into holes in the seat tracks. However if the seat tracks or seat latching mechanism become worn, the pin may hang up on the edge of the hole and not be fully engaged thus allowing the seat to slip when the nose of the aircraft pitches up. The FAA issued Airworthiness Directive AD 87-20-03 R2 which calls for seat tracks and latching system inspection at every annual or 100-hour inspection. The Cessna factory now has available a secondary seat latching system which will

catch the pilot's seat if it starts to slide. The secondary seat stop system can be installed by any Cessna Service Center.

A good habit to get into is having a "Cessna Fanny". That is every time you pull the seat into position on a Cessna single engine aircraft you wiggle your hind end to try to dislodge the seat from its latched position.

AND NOW...A WORD FROM YOUR SPONSOR

The Cessna 182 Skylane is a great aircraft. It has great load carrying capabilities, moderate speed, and relatively easy maintenance. But as with any mechanical device, time and service have shown that there are areas of concern that owners/operators need to be aware of. Which is why the Cessna Pilots Association exists.

The principal purpose of the Association is to provide our members with in-depth technical information about their aircraft that is simply not available anywhere else. Members receive our monthly CPA Magazine; each 32-page issue is jam-packed with news, technical articles, details of ADs and service bulletins, service difficulty reports, general aviation alerts, and other vital Cessna-specific information.

CPA also has developed a long list of informational handouts that deal with the most frequently-seen problems and frequently-asked questions about Cessnas: nosewheel shimmy, oil on the belly, uneven fuel feeding, and many other subjects. These handouts are available at no cost to CPA members.

One of the most valuable aspects of CPA membership is access to the CPA Technical Hotline. CPA is the only Cessna owners association with a full-time staff of A&P mechanics available daily to answer your questions. Each one is a real Cessna expert. We also maintain the largest Cessna technical library outside of the factory. If you need help troubleshooting an elusive problem or locating a hard-to-find part, we can help. We can also save you big money on high-ticket parts by telling you where to get the best deals.

The Cessna Pilots Association also has a great aircraft insurance program managed by the Falcon Agency. Should you wish information on the program, call Falcon's Bob Haag at 800/880-2727.

If you join CPA and call with a 182-related problem you'll wind up talking to one of our Tech Reps. Their job at the Cessna Pilots Association is to provide technical support to our members who own 182s. They know the aircraft intimately and can answer almost any 182 question you might have. If our Tech Rep doesn't know the answer, he knows who knows.

CPA also offers a terrific two-day Cessna 182 Systems and Procedures Course. The seminar is given several times a year at the CPA Technical Center in California, and once a year in several other parts of the country. Our instructors are all world-class 182 experts. When you graduate from this course, you will know more about your Skylane than 99% of all 182 owners, and you'll probably understand its systems better than most A&Ps do. There is no better way to learn so much about your aircraft so quickly.

CPA membership costs just \$55. Most of our members feel that CPA membership is one of the best bargains in aviation. But whether or not you choose to join CPA, please pay careful attention to the information in this letter, particularly the cautions about fuel contamination. The 182 has a history of fuel-contamination accidents. A little knowledge and reasonable caution will prevent you from adding to the statistics. It is easy to join, simply fill out an application or call our Headquarters at 800/343-6416.

Lets All Of Us Be Careful Up There,

John M. Frank