

Safe Flying Tip number two: Fuel exhaustion and Fuel starvation

Fuel exhaustion is when you run out of gas.

Fuel starvation is when you still have gas but the engine quits because you did not switch tanks or did not put on the electric fuel pump after the engine driven fuel pump failed. Most small low wing aircraft require that the electrical back up pump be used for takeoff and landings.

If you put on the fuel pump for landing in a plane that has a high pressure pump that is only to be used in the event of engine driven pump failure it can also cause the engine to fail.

The FAA states that for Day-VFR your minimum landing fuel requirement is 30 minutes.

A new pilot should always land with 1:30 minutes fuel still remaining for an extra safety cushion. What if you get lost? What if the runway is closed and you have to fly to a different airport?

The 30 minute minimum is for a more experienced pilot, who:

- Fly's the same plane all the time.
- Has visually assured the plane is fully topped off.
- Has a diary of x-c flights with precise fuel burns.
- Has an alternate airport within 5 minutes of the destination airport.
- Has a fuel management computer on board and can predict his/her fuel burn within one half gallon on every flight.

A top off is usually not a full top off.

A typical top off in a car is one that leaves a few inches left. All the signs in gas stations say do not top off. They do not want fuel spills that contaminate the ground and the air. Most of us are trained not to completely top off a tank. The aircraft manufactures endurance numbers are based on a tank that is topped off to the brim. There is room for no more than a shot glass full of fuel. It is rare to get this type of top off, especially in the summer when linemen leave room for some heat related fuel expansion. Most tanks have room for a gallon or two more fuel after a top off. Depending on the type of aircraft, a typical top off could result in an endurance number one half hour less than published in the Pilot Operating Handbook for that aircraft.

A NEWLY CERTIFICATED PILOT SHOULD ALWAYS PLAN TO HAVE ONE AND ONE HALF HOURS FUEL AT TIME OF PREDICTED LANDING!!!

We had one of our renter pilots land in a farm field after he ran out of gas. He had fuel in one tank, but failed to switch to that tank. This is fuel exhaustion verses fuel starvation.

We had an instructor with a student take off with near empty tanks. They requested a top off and thought the tanks were full. They did not visually check the fuel quantity. They safely landed on a highway after flying for only thirty minutes.

When using your take off check list, you should touch the fuel gauges and fuel selector valve with your finger to assure you have enough fuel. The touching helps keep your mind focused and is better than a quick scan.

I was taught C.I.G.A.R. for my take off check list and I still use it when flying small GA planes.

C-Controls-free and correct

I-Instruments-Touch each one.

G-Gas

Touch the fuel gauges-Enough for this flight plus one and one half hours reserve. Verify fuel selector valve is on fullest tank.

A-Attitude Trim Tab

Adjust the trim for takeoff setting.

R-Run Up

VERIFYING ADEQUATE FUEL IS THE MOST IMPORTANT PART OF THIS CHECKLIST.

In 1978 we had one of our Pilots flying a 152's make an off airport landing in North Carolina.

There was nothing wrong with the plane. Upon further investigation it was learned that the engine quite after three hours of flying. It still had about 6 gallons of fuel on board. After the flight the FAA found water in the fuel. The engine quit due to fuel starvation, but not fuel exhaustion.

It was February and it was an unusually cold winter. The temperature had remained below freezing for weeks. There had been frozen water in the tanks and it melted upon reaching the warm weather causing the engine to quit.

Lesson to be learned: If it has been below freezing for weeks, you need your plane to be put in a warm hangar prior to safe flight.

FUEL STARVATION IS MORE LIKELY THAN FUEL EXHAUSTION.

I recently talked at an FAA safety seminar about Light Sport Aircraft. Part of the presentation was showing the attendees the Rotax engine. After the seminar I pulled the Tecnam Sierra out of the hangar, started the plane and began taxiing to the runway. I got about 100 yards away from the hangar and the engine quit.

The mechanics had shut off the fuel valve while the plane was in the hangar. Some planes will run for much longer after the fuel is shut off. If you make a quick run up you might even get to 300' AGL before the engine quits.

Following are a couple of NTSB accident reports for pilots who took off with the fuel valve in the OFF position. Before I share the NTSB reports, I will advise you on what you should do so this never happens to you.

- Touch the fuel valve before starting the engine and verify you have enough fuel for the flight.
- Touch the fuel valve again during run up to verify you are on the correct tank.
- Select the fullest tank or both, if both tanks is an option in the plane you fly.
- Do a thorough run up. At most airports you will taxi far enough and run up long enough that the engine would quit before takeoff if the fuel was turned off.

Here are two NTSB reports where a Cessna 172 had enough fuel in the lines to allow a pilot to takeoff even though the fuel selector was in the off position.

3/21/2004 Creswell, OR. Beautiful VFR weather

Pilot Experience 535TT 135TT in C172s

4 hours in the last 90 days.

After a previous flight the pilot turned his fuel selector to the off position. He had never done this in over twenty years, but decided to shut off his fuel for some reason this day. Eight days later he

was going flying by himself. The fuel valve happens to be 180 degrees in the opposite direction from both, when in the off position for a C-172. When the pilot glanced at his fuel selector, it appeared normal. He took off, the engine quit at a few hundred feet above the ground. He did not try to switch tanks. He landed straight ahead in a field. He hit a tree and a fence but was not injured.

6/15/2003 Gridley, IL Good VFR weather

Pilot Experience 302TT all in C172's

Hours not known in last 90 days.

Last BFR in log book...1997

Pilot took off and the engine quit on climb out.

Pilot did not attempt to switch tanks.

Plane was substantially damaged when it pitched over after an emergency landing. Pilot sustained minor injuries.

If you go the NTSB web site, www.nts.gov and type in Fuel Starvation you will find dozens of similar accident reports.

10/27/2005 JOLIET, IL. Good VFR.

Middle age pilot flying a VANS RV-6A

After a long cross country flight and successful arrival at his designated fuel stop the pilot learned that the pumps were closed for the day.

Another pilot offered to drain 5 gallons from his plane for the stranger. The pilot declined saying there was another airport 10 miles up the road.

The RV 6A pilot departed, ran out of gas, and was killed in the forced landing.

Some lessons to be learned about fuel management are:

- Call ahead and verify the FBO will be open during your planned fuel stop.
- If your engine quits, switch tanks!!!
- Plan on landing with 1.5 hours fuel onboard.
- Do not rush your run up.
- Learn how long your engine will run with the fuel selector in the off position.