

# FAA Aviation news

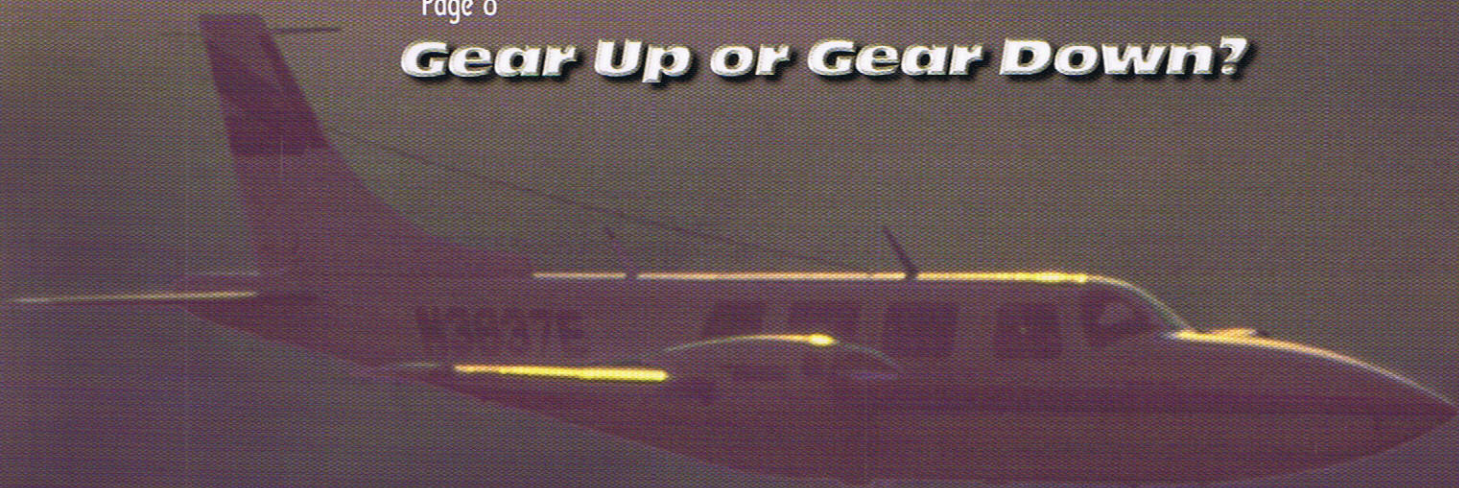
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***Gear Up or Gear Down?***







G. S. Livack photo

# Gear Up or Gear Down?

by Harry Kraemer

**A**n's earliest airplanes used skids as landing gear. It wasn't long before wheels were attached to the skids. Since that time, there have been various airplane designs with great progress and attention given to the landing gear. One improvement was the invention of retractable landing gear, which was a result of man's quest for more speed. However, with the invention of retractable landing gear, came mechanical problems in extending the landing gear.

The gear handle is placed in the down position. One green. Two green. Two green was it! What now? The pilots is now faced with many decisions, when one (or more) gear(s) doesn't extend. Land gear up? Land

on the runway or grass? Foam? These are just a few of the considerations pilots are faced with when a gear problem arises.

Not much has been written on this topic. One reason may be that it is hard to test any theory or recommendations. Who wants to land a plane gear-up or partial gear up to test a theory? My research led me to the FAA, NTSB, and NASA's Aviation Safety Reporting System (ASRS) in an attempt to find out more about this problem.

One thing that a pilot can do is to try to prevent problems (specifically, extending the gear). A good percentage of aircraft landing gears are operated electrically. Hydraulics is usually involved also. When an electric mechanism is involved, any sign of an alternator or generator (as indicated by a

gauge or other source) problem may lead to a gear extension problem. Loosing an alternator or generator means that your only electrical supply comes from the battery. It will only be a matter of time before battery power is depleted. I have reviewed the one hundred most recent reports involving gear up incidents (from NASA's data base) and a large number of those were attributed to an alternator or generator failure that the pilot did not notice until it was time to extend the gear. By this time, the battery was also drained. Your scan should include the entire panel. At the first sign of an electrical problem (loss of an alternator or generator), your focus should be to trouble shoot or determine the cause. If it can not be corrected in a relatively short time and your gear system relies





on electrical power, you may want to drop the gear while you still have power left in the battery. Having your pilot operating handbook (POH) and/or the emergency checklist handy is a good reference during a time like this.

This is another reason not to cut it too close on fuel. A gear problem at the end of a long trip with minimum fuel has the potential for major problems. You may be carrying enough fuel as required by the Federal Aviation Regulations (FAR). However, this may not be enough to trouble shoot a gear problem. Low fuel or minimum fuel can add more stress to your situation. Worried about running out of fuel, you may have decided to land gear up. Then, after all of the excitement, you have time to look at the POH and find that your gear extension problem had a simple fix that could have been solved in the air—if you would have had more time (and more fuel).

If you discover the gear problem in the pattern, depart the pattern and climb to a safe altitude. Use the autopilot (if installed) this can be especially useful if you are by yourself. Read the POH and the emergency checklist. Take your time. Follow all checklists. Call for help on the ground. Talk to a mechanic, another pilot, or a flight instructor who is familiar with the type aircraft you are flying. You may even be able to talk to the manufacturer for assistance. This is where having a lot of fuel helps.

Know the proper emergency extension procedures for your aircraft. Some aircraft have a "one shot" emergency system. Quite a few pilots have wasted this "one shot" because they didn't have the handle or switch in the "down position" and it was required to be there for the system to work. If you are or have been in freezing conditions, the gear may be frozen up. It may just be a matter of time waiting for it to thaw-out. Sometimes pulling a few G's (stay within the limits of the aircraft) may extend the gear. If you are flying with another pilot or you are part of a two-man crew, one pilot should fly the airplane while the other works on the problem. Always monitor your fuel. If you left the pattern to

work on a gear problem and fuel gets low, you will have to land.

There may be times when nothing works. All three are stuck up, or only one or two are extended. It could be that they all are partially extended. Most POH's do not prescribe procedures for this. You are on your own! Decision time! Land all gear up? Leave down what will come down? Etc.

It is hard to say whether you should always land gear up or not. The pilot in command (PIC) will have to look at his or her own situation and consider all factors. The PIC has the final authority. Do not do something that you are uncomfortable with, regardless of recommendations from help on the ground. An extended or partially extended gear will definitely have a protective effect on the cockpit and cabin area. If you do decide to land all gear up, land at the minimum speed at which you are comfortable with and at which the aircraft will fly safely. If flying a plane (single or multi-engine) with a two-blade propeller, you can shut down the engine or engines once the runway is made and stop the prop at the horizontal position. This will minimize damage to the engine and also lessens the chance of fire. Dumping fuel or burning off fuel will also lower the chance of fire.

Let's say that only the left main gear didn't extend. You have a choice to land with a left or right crosswind. With no wind, the airplane will tend to turn to the left on the rollout. If you have a choice, land with a right crosswind. The tendency for the plane to weather vane into the wind may help fight the tendency for the plane to turn left. If the aircraft is equipped, aileron trim could be used to keep the left wing up as long as possible after touch down.

Selection of airports is something else to consider. A large, long, wide runway may be preferable over a short, narrow runway. The aircraft may slide off the runway during the rollout. Small airports often park planes along the runway. The gear-up landing may not cause too many problems, however colliding with parked planes could ruin your day. If the

problem occurs close to your home airport, you may choose to return there. Most pilots are more comfortable landing at their home airport. This will help to reduce the stress factor and allow you to focus more on flying the plane and dealing with your problem. Availability of emergency equipment is also something to consider. Returning to an airport where you have maintenance personnel who are familiar with the aircraft can be a big asset.

The grass next to the runway is not as good as some think. While landing on the grass next to the runway, part of the gear or other parts of the aircraft could catch causing the aircraft to cartwheel. The grass can also cause the aircraft to dig in and stop suddenly (like hitting a brick wall). Landing on a paved runway will allow the aircraft to slide to a stop, only after it has lost momentum.

Another question that often comes up is "to foam or not to foam?" Foam is used as a protection against fire. Foaming the runway may cause the aircraft to slide more or slide out of control changing directions. We know what it is like trying to stop or control a car on ice or snow. The entire runway is not normally foamed. This puts pressure on the pilot to try and land in the foam. In reviewing the one hundred most recent NASA/ASRS reports, not one reported a fire nor did any report mention using foam.

Gear-up landings usually result in very little aircraft damage. In the NASA/ASRS reports (the reports included small general aviation aircraft up to large airliners capable of carrying hundreds of passengers), not one resulted in any injury to any persons. One pilot reported that having a lot of fuel was his biggest asset. This allowed the crew time to think and get assistance from company maintenance personnel on the ground. They were able to resolve the problem, extend the gear, and land without incident.

It is difficult to give any hard-fast rules on gear up landings. However, I have provided you with some information that you can store and recall when and if it is ever needed. ✈

