



For much more on flying safely see www.thomaspturner.net.

©2008 Mastery Flight Training, Inc. All rights reserved

FLYING LESSONS for August 28, 2008

suggested by this week's mishap reports

FLYING LESSONS uses the past week's mishap reports as the jumping-off point to consider what *might* have contributed to accidents, so you can make better decisions if you face similar circumstances. In almost all cases design characteristics of a specific make and model airplane have little direct bearing on the possible causes of aircraft accidents, so apply these *FLYING LESSONS* to any airplane you fly.

Feel free to forward this message for the purpose of pilot education. *FLYING LESSONS* is also available in PDF through a link in the left column at www.thomaspturner.net.

FLYING LESSONS IS AN INDEPENDENT PRODUCT OF MASTERY FLIGHT TRAINING, INC.

This week's lessons:

August has been a (typically) bad month for the classic gear up landing. Permit me to delve into the *FLYING LESSONS* archives for these observations about retractable landing gear airplanes....

Whether pilot- or maintenance-induced, landing gear-related mishaps (LGRMs) continue to account for nearly half of all reported mishaps in complex aircraft. Given the NTSB reporting requirements that specifically exempt most LGRMs, and information from providers of LGRM-related parts and repairs, the true figure appears to be even higher.

The industrial safety industry tells us that the effectiveness of mishap avoidance solutions falls in this order:

1. **Design.** By far the most effective mitigation technique is to design equipment to eliminate the possibility of accident. In aviation, Diamond Aircraft and most notably Cirrus Design have followed this approach, fielding fixed-gear designs that (owing to advanced drag reduction) provide performance equal to or exceeding their much more complex and LGRM-prone competitors.

In designs where there are few differences between a fixed- and retractable-gear version the increase in airspeed is fairly slight while adding the complexity, cost and hazard of retractable gear. Manufacturer temptation (and the buyer's market) to tuck up the gear and get just a little more speed (and fly-by appeal) is great, and larger fixed-gear airplanes have rarely had lasting success when an RG version of the same airframe sits on the showroom floor. Consider the Cessna 206 versus the 210, or Piper's fixed gear and RG versions of the Saratoga. Few remember the Cessna 336, quickly punted in favor of an RG version of the Skymaster. Perhaps reflecting the struggle between efficiency and marketability, Cessna brought the 206 back into production, leaving the complex 210 behind, while Piper has long since abandoned the fixed-gear Saratoga in favor of the RG variant.

In twin-engine airplanes the lone fixed-gear product is the Partenavia P68, mainly sold in its niche Observer version, while the best-selling Diamond DA42 incorporates the expected RG design—as do all they other twin-engine offerings.

The ultimate test should be the single-engine jet market, should it flourish. Diamond has gone RG with the D-Jet. Rumor was that Cirrus was planning a fixed-gear layout for what it called "the Jet," but it now has broken from its own ranks and gone RG with the final SJ50 design. Would anyone purchase a fixed-gear jet, even if it was only a few knots slower than a retractable? Probably not. The market has apparently determined that "design" is only partially effective in addressing the LGRM epidemic.

2. **Engineering.** By engineering I mean features added to RG airplanes meant to prevent inadvertent movement of gear selectors, to advise the pilot when the gear is still up close to the ground, to automatically deploy the landing gear if the pilot forgets, or to minimize the damage resulting from a gear-up landing.

Any number of safety latches, guards and warning devices have been tried to protect gear switches, with limited success (read my observations on [landing gear squat switches](#)).

Audible gear warning devices are the industry standard. But modern cockpit technology may severely minimize their effectiveness. Since the introduction of noise-canceling headsets I've noticed in most RG airplanes that the gear warning horn is often inaudible when the noise-canceling feature is turned on. FAA subsequently published an Information for Operators (InFO) letter carrying this warning:

An [informational letter](#) from the Federal Aviation Administration recommends pilots test their ability to hear cockpit noises, alarms and warnings while wearing noise-canceling headsets.

The non-regulatory InFO ("Information For Operators") letter alerts pilots "who may be using noise-canceling headsets [to] the potential for misdetection of audible alarms and other environmental sounds." FAA recognizes the "many beneficial effects" of noise cancellation but, "since the specific frequencies" masked by different headsets "varies by make and model" and those frequencies are "often proprietary to the manufacturer," recommends pilots determine, both on the ground and in flight, if they can adequately hear

- audible alarms
- abnormal engine or mechanical noises
- vibration or wind noises
- communications with passengers not wearing headsets
- other aircraft during ground operations

with the noise-canceling feature engaged. If the pilot cannot hear these sounds with noise canceling engaged, the FAA suggests they "find other solutions" to detecting these sounds or "discontinue the use of noise-canceling headsets." For more read the FAA's [InFO letter](#).

"Finding other solutions" include working with your avionics shop to increase the volume of gear warning horns, or to wire gear warning horns to sound directly through the intercom system, or adding "Noise canceling—OFF" to your Before Landing checklist, turning off the feature that can blank out gear warning horns before every landing.

Most aircraft manufacturers at one time or another fielded automatic landing gear extension systems, but they were never widespread successes, and in one case (Piper's system) even ordered disabled by Airworthiness Directive after the system actually *caused* accidents by extending the gear at an inopportune time, drag driving the airplane into a stall.

[AOPA Air Safety Foundation](#) executive director Bruce Landsberg has told me he envisions a GPS-based system that automatically extends the landing gear when below pattern altitude within a defined distance from the GPS-loaded destination airport. To date no manufacturer has tried this approach, to the best of my knowledge.

A scheme long since relegated to history, but common in the early days of RG airplanes (notably in the Boeing 247, Douglas DC-3 and Boeing B-17), the main landing gear wheels were left partially exposed when retracted to provide some rolling cushion in the event of a gear-up landing.

Landing gear inspection, maintenance and preventive overhaul or replacement procedures can be considered a means of engineering out the RG hazard. Overwhelmingly, however, attempts at addressing the risk of LGRMs in RG airplanes through guards, warnings, automatic systems, gear geometry and maintenance practices have obviously been ineffective at reducing the LGRM threat.

3. That leaves us with **Training**, by far the least effective means of overcoming the inherent risk of a technological design, according to industrial safety research. Yet given the existence of RG airplanes--the market consciously choosing to accept the risk to gain greater airspeed or efficiency by demanding retractable landing gear in most cases--and the ineffectiveness of engineering out the risk in most efforts to date, we are pretty much entirely reliant on training to avoid LGRMs--pilot training, and the training of mechanics to inspect for and repair RG issues.

What's the take-away for *FLYING LESSONS* readers? **If you fly RG airplanes, you are dependent on industry's LEAST likely means of avoiding LGRMs.** Develop strong habits aimed at anticipating situations with a high risk of LGRMs, and confirming gear position before landing. Think LGRM avoidance every time you fly. If you own or maintain an RG airplane, don't skimp on recommended landing gear inspection and servicing recommendations made by manufacturers or aircraft owners' groups.

See

www.thomaspturner.net/TTweb.2007.1115/Squat Switches and Gear Collapse Mishaps.pdf

www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2007/info07001.pdf

www.aopa.org/asf

[/www.thomaspturner.net/LGRM%20observations.htm](http://www.thomaspturner.net/LGRM%20observations.htm)

Questions? Comments? Send me a note at mastery.flight.training@cox.net.

DVD from MFT!

You know you've heard it: there are those who have, and those who *will* have a gear up landing. Become one of [Those Who Won't](#) with this DVD detailing **10 tips for avoiding landing gear-related mishaps**. By Master CFI Thomas P. Turner, the 15-minute DVD is the result of over six years of studying why pilots make landing-gear mistakes. Great for airport, flying club and FAASafety meetings. \$25 plus shipping and handling [online](#) or by calling 316-945-1700.

See <https://secure5.webfirst.com/ABS/Store/#ThoseWhoWont>

STORM WARNING

The National Transportation Safety Board (NTSB) recently posted *Safety Alert 011*, warning pilots about instrument flight in areas of thunderstorms. Highlights include:

- IFR pilots need to actively maintain awareness of severe weather along their route of flight.
- Recent NTSB investigations have identified several accidents that appear to be wholly or partly attributable to in-flight encounters with severe weather.
- Each pilot [in these accidents] had readily available alternatives that, if utilized, would have likely prevented the accident.

- ATC training and briefings to controllers have not been sufficient to ensure that pilots receive the weather advisories needed to support good in-flight weather avoidance decisions.

NTSB reminds pilots that:

- Severe weather avoidance is primarily *your responsibility*.
- The primary job of ATC is to keep IFR aircraft separated. When their workload permits, controllers are also required to provide additional services such as weather advisories, and, upon pilot request, suggested headings to avoid radar-displayed precipitation.
- The precipitation detection and display capabilities of ATC facilities vary from poor to excellent.
- Approach control radar systems provide near-real-time weather depiction. En route centers receive weather radar information from National Weather Service NEXRAD sites that refresh the color precipitation data on ATC displays every 4 to 5 minutes.
- ATC radar systems depict *only* precipitation. Controllers cannot use radar to warn of turbulence, icing, freezing rain, or other hazards to flight.
- The descriptive words for [precipitation] intensity were recently changed.
- Not all ATC radar systems can provide intensity information.
- Ambiguous use of the term “when able” has also led to confusion.
- Give pilot reports. Controllers use them to confirm their radar weather depiction.
- If you find yourself in need of ATC assistance, ask specific questions [as suggested in the Safety Alert].

I'll repeat the NTSB's first statement for emphasis: “Severe weather avoidance is primarily *your responsibility*.”

For the full text read NTSB's [Safety Alert 011](#).

See http://ntsb.gov/alerts/SA_011.pdf

NEW PISTON BEECHCRAFT REPORTS THIS WEEK

The August 28, 2008 Weekly Accident Update is now posted at www.thomaspturner.net, including these reports:

- A K35 landed gear up....
- A B55 landed gear up....
- A J35 landed gear up....

There are also NTSB updates on the August 12th triple-fatality G35 loss of control on the ILS approach at Boston, and the fatal August 14th 58TC crash attempting to return to the airport immediately after takeoff at Marysville, Ohio.

For more information, commentary and analysis see the Beech Weekly Accident Update link at www.thomaspturner.net.

See www.thomaspturner.net/WAU_2008.htm

Fly safe, and have fun!

I welcome your comments and suggestions. Contact [Mastery Flight Training, Inc.](#)

If someone has forwarded this message to you and you want to have *FLYING LESSONS* sent directly to you each week, [tell me](#).

If you received this message directly (as opposed to through a digest or chat room) and wish to be removed from the *FLYING LESSONS* list, [tell me](#).

©2008 Mastery Flight Training, Inc. All rights reserved.



Holder of an ATP certificate with instructor, CFII and MEI ratings, a Masters Degree in Aviation Safety, and **2008 FAA Central Region CFI of the Year**, Master CFI Thomas P. Turner ([resume](#)) has been Lead Instructor for FlightSafety International's Bonanza pilot training program at the Beechcraft factory; production test pilot for engine modifications; aviation insurance underwriter; corporate pilot and safety expert; Captain in the United States Air Force; and contract course developer for Embry-Riddle Aeronautical University. He is now the Manager of Technical Services for the [American Bonanza Society](#). With over 3500 hours logged, including more than 2200 as an instructor, Tom writes, lectures and instructs extensively from his home at THE AIR CAPITAL--Wichita, Kansas.



See www.thomaspturner.net/TTweb.2008.0619/Resume.htm