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Squat switches and gear collapse accidents

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Although the lessons learned derive from my experience in Beech airplanes, they may apply equally to all retractable-gear airplanes.

In 2001 the company I worked for at the time bought a 1998 Baron 58 equipped with a KT76 transponder and (then BF Goodrich, now L-3 Communications) Skywatch traffic avoidance system. Both these devices have ground operating modes that engage automatically to prevent transponder transmissions and traffic callouts while on the ground. They accomplish this by taking input from the landing gear squat switches—when there's weight on the wheels the struts compress and the squat switches open, cutting off electrical power to a switch that changes the avionics' operating mode. When weight comes off the wheels and the struts extend, the switches close and the transponder and Skywatch go to active flight modes.

Of course the originally designed function of the squat switches is to remove electrical power from the landing gear motor when the switches are open, to prevent inadvertent gear retraction if the pilot accidentally moves the gear selector on the ground.

I was interested to note on my first couple of flights in the 1998 Baron that the Skywatch system still called out traffic even while I was rolling down the runway after landing. One day I had a pilot-qualified passenger in the front seat, and I asked him to monitor the Skywatch closely. I told him to say simply "NOW" at the instant the Skywatch went into the ground standby mode after landing. We flew several legs that day, and on every landing the result was the same—the Skywatch remained in flight mode until we slowed to nearly a walking pace and began a turn off the runway. The King KT76 transponder confirmed this by switching to STBY mode at the same time.

Phone calls to BF Goodrich, Honeywell Avionics and experts on the Beech landing gear system all confirmed that there is no delay timer or similar function built into the transfer from ground to flight modes.

Supporting evidence

My research is entirely unscientific and limited to a small number of airplanes. Here, however, is what I have learned:

- Instructing in an F33A operated by L-3 Communications for sales and demonstration of its products, including the Skywatch traffic warning system, I found the Skywatch did not go into ground standby mode until clearing the runway after landing, and remained in ground mode until just before liftoff on takeoff.
- I recently taught in a B36TC with the Garmin GX330 transponder, which has a GND (ground) mode wired through the squat switches with a default to ALT

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mode when airborne. Like the King transponders and the Skywatch system, the Garmin transponder shows the landing gear squat switches are not open until the airplane reaches near 60 knots on takeoff, and do not engage until the airplane is brought nearly to a halt after landing.

- Flying a factory demo G36 I found its traffic advisory and transponder functions, wired through the squat switches, do exactly the same thing.

In fact, since I became aware of this phenomenon in about 2001 whenever workload permits I've looked at any panel equipment that changes modes as a function of squat switch position, and have found that in *every* case the squat switch circuit appears to close upon reaching about 60 knots on takeoff, and does not to open until completing the landing roll and coming to an almost complete stop. My sample now includes dozens of relatively late-model Beechcraft.

My conclusion? At least in A36s, B36TCs, F33As and Barons, it appears lift makes struts move so *the landing gear squat switches close while still on the runway before takeoff*, and does not dissipate sufficiently until the airplane is almost stopped, so squat switches *do not open again until after the completion of a landing roll*.

Implications

What are the implications of this knowledge?

- After landing, there is no protection against a landing gear collapse if you accidentally move the landing gear position switch.
- During the entire on-runway portion of a touch-and-go landing, there is no active safety system to prevent landing gear operation if you accidentally move the landing gear position switch.

So what?

What's the practical application of knowing this?

1. **Know your airplane.** If your aircraft has panel equipment that automatically changes modes when on the ground, repeat my experiment and see when *your* squat switches engage. Some makes and models, and even individual airplanes, may have earlier squat switch activation than others.
2. **Don't attempt to reconfigure the airplane after landing until you bring the airplane to a stop.** Although many gear collapse mishaps result from mechanical failures, a great many pilots admit to *grabbing the wrong handle* and retracting gear instead of flaps in their hurry to "clean up" during the landing roll.
3. **Avoid touch-and-goes.** Except in carefully briefed and flown training scenarios to prepare you for on-runway collision avoidance or a landing abort, make all landings to a full stop.

Thomas P. Turner is a NAFI Master CFI who writes extensively on aviation safety and single-pilot operations. Permission is granted to post or publish this article in its entirety with appropriate citation to the author and/or Mastery Flight Training, Inc. For much more on flying safely, see www.thomaspturner.net.

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