

Upsetting, still

The PC12 has a great safety record, and until earlier this year, had gone without any fatal accidents, worldwide, for more than four years. I would of course prefer to never hear or read about any accidents, but with over 1500 aircraft delivered and 6+ million flight hours it is statistically inevitable.

The last time I wrote about being “upset” [POPA Fall 2014] was after the NTSB conclusion regarding the Lake Wales, FL enroute fatal accident [June 2012] LOC-I (Loss of Control – Inflight) with an apparent beginning of the accident chain being an autopilot issue/distraction. A half year after the Lake Wales accident the last fatal domestic PC12 accident occurred in Burlington, NC, Jan 2013 (until earlier this year). This flight had just departed at night, light winds and had initially checked in with Approach/Departure control when contact was lost. When the final report was issued in 2015 the NTSB cited the pilot for LOC-I. Also noted was spatial disorientation with dark/cloud conditions, and resetting the transponder (distraction). Not in the conclusion but addressed, was a possible autopilot issue due to masking of a trimming error caused by internal malfunction (not proven).

Then in March 2017 a U28A (US Special Forces PC12) fatally crashed while training in night conditions. In the following month a PC12 medical flight, after departing in night/light rain/windy conditions, crashed shortly after having made initial contact with Approach/Departure control. No further information is available, as both currently are being investigated.

What is striking to me is that the last two domestic, non-governmental, fatal accidents involved commercially operated, single pilot PC12's. In these cases the pilot's experience level is generally greater than the average PC12 driver and it would seem less likely for an event of this magnitude to occur. There is not enough information yet available to say that the investigation of these two accidents will reach the same conclusion, this article will delve further into the environmental aspect of the majority of the fatal accidents.

Both aircraft were roughly at 3000' AGL when in contact with ATC, IFR and night. It is assumed, but not verified, that both were using their autopilots. I have

included a statistics chart showing worldwide reported PC12 accidents from the period of January 2006 until May 2017. The chart shows takeoffs and landings within 5 nm of the airport and at or below 3000' AGL. For brevity I included in the landing column any aircraft that may have been descending, with Approach control, for landing, which was only one of the international accidents. So for the past 10.5 years, there were 15 international and 18 domestic accidents, 14 of the 33 fatal, which doesn't look that bad, considering the growth of the fleet over that time span as well as the increasing flying hours. I still prefer zero fatal accidents.

From here out I will only be referring to the fatal accidents. From the chart, 3 of the 5 international flights were weather-related, night-related or both, while 7 of the 9 domestic flights were either weather or night. So it would appear that flying by instruments and use of the autopilot was probably required. One of the international and both of the domestic enroute flights should have had sufficient decision making time, in my opinion, to avoid the ultimate outcome due to altitude and fuel.

That leaves just 1 international flight, the landing-go around/weather while domestically, in addition to the two recent accidents already mentioned, 1 additional takeoff-weather and 1 landing-night, all of which appeared to require reference to instruments and use of autopilot (the 1 international / 1 domestic government accidents not included).

So where am I going with this? In all of these accidents it would appear that use of the autopilot would be an absolute, if available. When flying the PC-12 single pilot, using the autopilot is standard but not mandatory operating procedure as long as it is operational. The FAA requires a functional, available autopilot, for Part 135 Single pilot to supplant having a copilot. They are not saying it MUST be used, just readily available to decrease pilot workload otherwise 2 pilots are required. And I would agree with that.

It is when and where the autopilot is operated that concerns me. When conditions are not solid or near IMC I tend to manually fly the PC12, whether ascending or descending, below 10,000 feet. Why? Hand flying keeps muscle

memory active - including the “butt sensor”- regarding the feeling of movement and coordination.

In the official crash investigations, references were made on several occasions to the autopilot possibly masking a flight control mistrim. This reinforces my opinion regarding hand flying. I am not saying that the autopilot is at fault but rather that combinations of weather, flight control position and power can contribute to an out-of-trim condition that may not be sensed in a timely manner by the autopilot fault systems. Just the Yaw Damper in use alone can sometimes cause an out-of-trim condition but how would the pilot know it if simultaneously, shortly after takeoff or just prior to landing, the entire autopilot is engaged or disengaged?

Looking at the accidents from the chart, commercial or non-commercial, if the aircraft did have a mistrim event while possibly night/IMC, how would the pilot *SEE* this? If the autopilot is on, it probably would not *SEE* anything but would be waiting for or listening for some kind of autopilot annunciation since it would most likely be in the process of making heading, altitude and frequency changes while also monitoring ADI/HSI for correctly set flight parameters. That is a very good reason for autopilot since it appears like workload is high, especially at low altitude night/IMC.

What could the pilot actually *SEE* before, during or after an Autopilot/Yaw Damper problem? The good old Ball Inclinator or Slip/Skid indicator on the Digital Flight Displays. Remember that reference piece of equipment? How often, percentage wise, do any of you actually look at it? Just about zero percent, probably. That’s because of our appropriately founded reliance on our installed equipment. Why would the pilot even be looking for this? The “butt sensor” or other feeling of unusual movement that needs instant verification. While in doubt “FTFA” – Fly The Freaking Airplane! Grab the yoke, disengage the autopilot, fly the attitude indicator/altitude to wing’s level-pitch towards level or reduce and power back (most likely).

How would the “Butt Sensor” work for you if you are **ALWAYS** using the autopilot? It probably would not work. If you use sight vision by looking at the Ball or Slip/Skid, that would definitely help. But again, how often do you actually look

at it? That is why hand flying, when able, is important for maintaining our basic flying skills. How often could you actually hand fly your aircraft, even when filed IFR, to somewhere near the 10,000' AGL level that I like to do? Is your departure/arrival environment really that difficult that you could not hand fly while at the lower altitudes? Are you always actually IMC, low altitude, even though you have filed IFR?

Workload is definitely manageable, even in a very busy airspace (non-weather issues of course) by not being in a hurry. Comply with ATC requests, not forgetting that we are PIC, not them, while manually trimming pitch (Yaw Damper is ALWAYS in use) and managing power while setting instruments for your continuing flight. Flying this way is actually good not only for our physical "sensors" but also for scan/instrument management (situational awareness). We can always move the aircraft faster than the autopilot if the situation arises.

Back to the accidents. What if the pilots did not have the autopilot ON or had "FTFA"ed the plane after an initial problem? One possibility could be the Yaw Damper/Rudder trimming error. Both autopilot systems used by the PC12 fleet are primarily designed for Stabilizer Pitch trim monitoring with secondary monitoring of Rudder trim. If there is a Pitch trim problem we get an "aural" Master Caution/Warning and annunciations but Rudder/Yaw indications are less timely and more subtle due to the sometimes constant movement of the Yaw Damper during flight conditions.

How would you *SEE* this? What could the aircraft "feel" like? What would you initially do?

The *SEE* part might not be obvious by the ADI so looking at the Slip/Skid or Ball would be ideal along with any ADI banking indications. The "feel" could be very bad and misleading due to potential side-slipping. This can be enhanced by the Aileron/Rudder interconnect since an out-of-trim rudder will tend to roll the aircraft, depending on torque-airspeed plus the aileron system may also be rolling with the rudder. The Initial response here is what it has always been in the emergency procedures, which is for anything to do with the Autopilot, to hold the yoke disengage/overcome the autopilot servos until manual control is

established. Pilatus issued a Service Information Letter (SIL) earlier this year addressed “Trim System” www.pilatus-aircraft.com/#196 SIL 003. If you are not already in possession of it you should download and read or review it as it happens to relate to this article.

But what if that is not enough? At low altitude there is not much time to react. Pitch, Power, Rudder, and Roll is the general mantra for upset recovery. But at a low altitude will that be sufficient? What I suggested earlier, “FTFA”, hopefully is all that is needed to recover by earlier recognition.

In general, for the past 10+ years, the fleet appears to be operating safely, but “stuff” happens that makes it “upsetting”, still. I believe adding hand flying into flight operations, when possible or even just going out on a non-mission hand flying flight, can do nothing but increase our safety and enjoyment of flying the PC12 without always using “George”. PS. Try a flight, no passengers, with the Yaw Damper OFF. You will have to manually trim. Damn!

A Safe Pilot is always learning

John Morris

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Reported PC12 Accidents 2006-mid 2017

International			
	TAKEOFF	LANDING	ENROUTE
Airframe only	1-p	7	2-p
Fatal - All	1	1-ga/w, 1-g/n	1-w/n, 1-s
Fatal - [non c] From All	[1]	[1]	[1]
Domestic			
	TAKEOFF	LANDING	ENROUTE
Airframe only	1-p/c	7	
Fatal - All	1-t, 1-w, 2-n/c	1-n, 1-s/ga 1-n/g/t	1-w/s, 1-w/s
Fatal – [non c] From All	[2]	[2]	[2]
<p>Related and (possible) Relevance to accident:</p> <p>ga-Go Around s-Systems t-Training p-Power loss n-Night c-Commercial (includes 91 Part K) w-Weather g-Government</p>			