

Factual Report – Attachment 2
Letter from ACFT Services, LLC Instructor

OPERATIONAL FACTORS

CEN17FA168

Hello Mr. Frantz,

My normal Initial and Recurrent training regarding the use of the autopilot always follows Pilatus AFM limitations, including standard wing-level mode during severe turbulence.

Pilatus does specifically state use of autopilot is not authorized (must be disconnected) below 1000' AGL unless for approved approaches (see attached Pdf's).

I did Robin Shaw's PC12 Initial Ground and Flight training. Ground time was approximately 20 hours and Flight time was 5.2 hours. Rico completed his IOE training after completion of my training.

When I teach the Initial I use the Pilatus AFM, primarily using Section 7 – Systems and starting from the beginning page of Section 7. As I proceed through this section I can bring other sectional components of the AFM into play, such as limitations, emergency procedures and normal operating procedures as a part of the training discussion. I also use additional slides created by me to further enhance the training experience.

For takeoff I recommend not engaging the autopilot until after 1000' AGL as general rule considering possible low altitude engine problems. Following the engine limitations standard, takeoff is full power (with 5 minutes as the limit) to 1000' followed by normal engine operating limits. I recommend hand flying the aircraft as often as possible until 10,000' AGL to maintain feel / skill of the aircraft. Of course if weather and or ATC dictate plus single-pilot then logically the use of the autopilot is in order.

For initial takeoff I recommend using the go-around, pitch mode of the Flight Director – inverted "V" command cursor, Honeywell/Pilatus preset to 9 degree, wing level positive pitch and hand fly following the cursor. This will allow for acceleration, after takeoff and clean-up of aircraft to approximately 140 KIAS by 1000' AGL. I consider this a fair tradeoff to the V_x (110 KIAS) which is a higher initial angle-of-attack pitch and below engine failure glide speed of 114 KIAS and V_y (120 KIAS). I believe Rico incorporated the 140 KIAS climb speed as their operations standard for enroute climb.

There are no published restrictions to normal operational use of the autopilot. The Legacy PC12's [MSN 101-888] all use the KFC 325 autopilot. Accident aircraft was MSN 105

The most common autopilot problem - disconnect complaint from owner/operators is from turbulence causing the autopilot to disconnect. This is most likely due to the wing loading of the PC12 and a low threshold accelerometer in the KFC 325 system. The disconnect will normally cause disengagement of the autopilot servo's only with no loss of visual Flight Director command functions and the Yaw Damper remains engaged as this unit is consider an auto trim device . A disengage audible tone will be heard, a CAWS (Central Advisory and Warning System) amber caution annunciator will illuminate "A/P DISENG" along with the Master Caution audible tone and illumination, above both the Pilot and Co Pilot's EADI's. The Master Caution can be

reset to clear only that Master annunciator and the CAWS "A/P DISENG" will extinguish after 60 seconds as this is considered an advisory, since the aircraft can also be flown manually. So an inflight disconnect of the autopilot due to no apparent mechanical problem is resolved by re-engaging the autopilot as the only step or slowing down, then re-engaging the autopilot if it appears that too much speed/turbulence may have been causing the disconnect.

The published Pilatus Autopilot Emergency Procedure, formatted for Rico Aviation's QRH, is attached along with another procedure related to the autopilot/auto trim.

I demonstrate what is known to me as the most common occurrence / scenario related to the autopilot emergency procedure with most, if not all of my clients while inflight in Legacy PC12's. Attached is the audio file for what it sounds like in the headsets while the autopilot is having a "malfunction". I quote malfunction because when the problem first appears, with audible and visual annunciations, the KFC 325 reaction is to hold at its present Flight Director Cursor position-fully engaged, whether in a climb/descent/level and/or turning or a combination, until a pilot corrective action – no runaway or change to Flight Director Attitude. I consider this to be rather benign compared to a Stabilizer runaway. However, it does require pilot action to overcome and control the aircraft [procedure].

This cause is what I believe to be the purpose for the Pitch Trim Adapter – a component of the KFC 325, which is to monitor for autopilot pitch trim commands the system considers "unsafe". Usually when this event occurs the aircraft is either normally climbing or descending (But can happen even in level flight) while on the autopilot with no apparent undo surrounding effects that would cause the event to begin. After regaining control the emergency procedure calls for pulling the A/P circuit breaker and continuing the flight without the autopilot until maintenance resolution.

However, what most likely occurs at this point, due to the repeating tone and no other apparent problem(s) is the pilot pressing the autopilot test button. This stops the repeating tone while the system does a complete test. Usually it will pass its test and all fault annunciators associated with the autopilot pre-test will clear allowing use of the autopilot once again. Of course this is not what Pilatus requires at all but it is almost always the process done by pilots experiencing this event, myself included when I first had this event in 1999 when I was in level flight with the autopilot on. This reaction stems from seeing what looks exactly like what is observed on the ground before doing the autopilot test procedure. Except that not airborne and no audible repeating tone.

I have a very hard time believing that this type of autopilot malfunction caused this particular accident. This same malady did, *I believe*, start the chain of events leading to the Lake Wales PC12 accident from several years ago and I discuss that accident as well as other incident/accidents as a part of all of my training sessions. The difference, relating to the Lake Wales accident is the pilot's lack of instrument experience, not apparently grasping the control yoke at the onset of the autopilot malady and then, since the aircraft was in a climbing, slow speed - high torque condition turn, pressed the autopilot test button which will completely release the autopilot servo's and Yaw Damper and then letting the aircraft start a turning descent with climb power.

I have been racking my brain trying to determine why this and any other PC12 accidents occur. This one is very similar to the LabCorp PC12 accident in Burlington, NC. About the only possibility of a system component contribution to either of these accidents that I believe might be causal would be the Yaw Damper trimming extremely, a runaway event. A Rudder trim/Yaw runaway will not make any audible sounds. The only indication would be the triple trim indicator on the center console visually indicating the trim movement. The first 20 PC12's build, MSN 101-120, the CAWS panel blue annunciator "A/P TRIM" does not illuminate during auto trim action of the Rudder, only the Stabilizer. Also, the Triple Trim indicators, in later aircraft but not MSN 105, have a white light next to each to indicate auto trim activation. Since both aircraft were apparently leveling at 3000' AGL, engine power may still have been high with airspeed lower but accelerating and no indication of the autopilot even in use at that point but almost guaranteed that the Yaw Damper was on as this is activated shortly after takeoff. IF the Yaw Damper was in a runaway, along with the dark condition, instruments only and no visual way of knowing the trim was active [the LabCorp aircraft did have the CAWS blue annunciator available for visual indication and Triple Trim lights]. However, realistically speaking, the pilot would not be looking for these indicators at that moment of flight if they did not suspect anything. The rudder is a large surface area on the PC12 and I believe it is possible to be rolled by the rudder action along with high engine torque, if not felt or seen to correct.

When playing the audio file I have sent it starts with a repeating tone [beginning of malfunction] – this is the disengage tone of the autopilot but it continues to repeat until pilot action, which is when you will hear a break followed by a single, different tone (the CAWS "gong" tone). The break is when the pilot grasps the control yoke and presses the autopilot disconnect button. The repeating tone begins again until power is removed from the autopilot. Pilatus is, I believe, calling this audible tone the "Unidentified Warning Tone" since there has never been a mention relating to the autopilot repeating tone in the POH until the revision this [Revision 19, Jan. 2016]. Note that when pressing autopilot disconnect (red) button on control yoke all flight director functions/indications are cleared, all autopilot servo's are disconnected and the Yaw Damper is disconnected.

I recall Robin being a competent pilot to Commercial standards with a varied aircraft background and extra enthusiasm for the job. I say this because I was training a new PC12 pilot for Rico one week before the accident and he elected on his own time to sit in on my ground training for the first day (weathered in so all day ground) and most of day two.