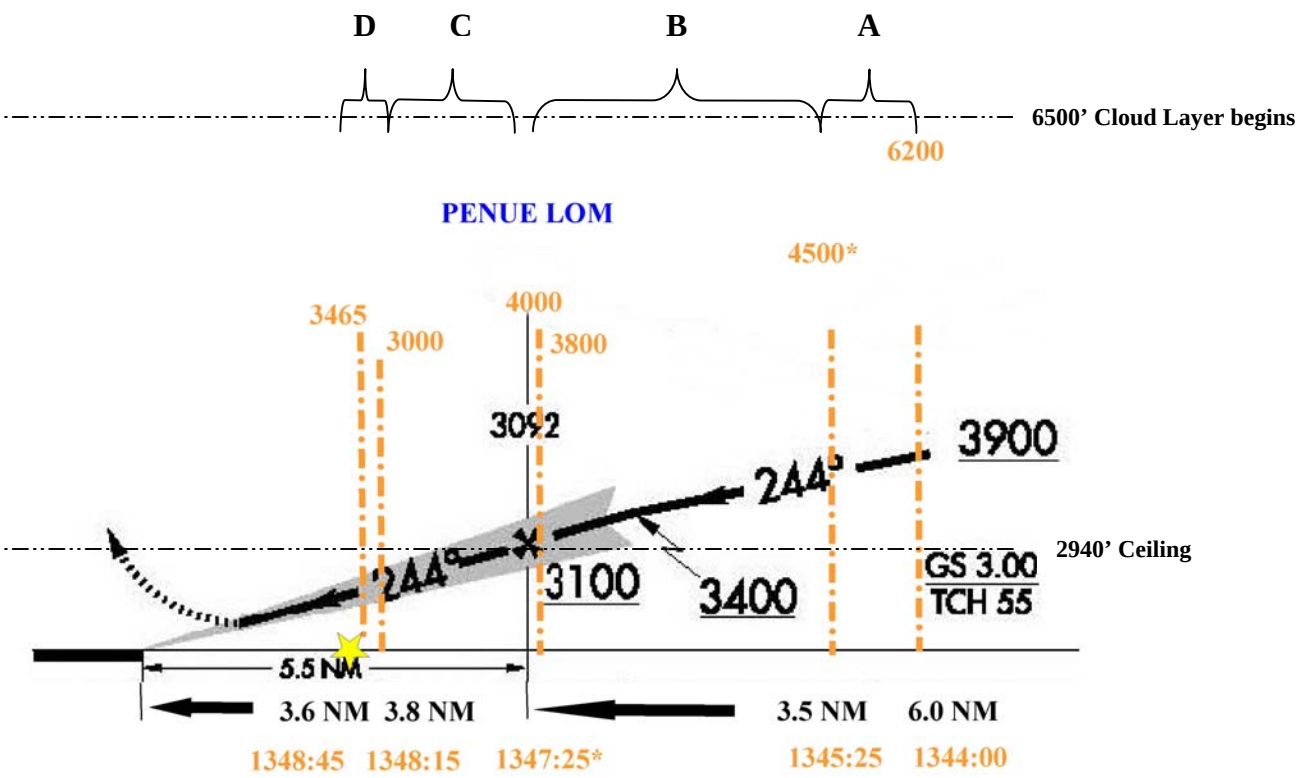

* Estimated-Data not given

A. **Based on the data the estimated ground speed would be 100 Knots, the descent rate was 1200 fpm and the 4500’ estimate 1-½ dots above a 3° slope at that distance from the threshold.**

B. **Based on the data the estimated ground speed would be 100 Knots, the descent rate was 350 fpm until reaching PENUE LOM (5.5 NM from the threshold) at between 3800’ and 4000’.**

C. **Based on the data the estimated ground speed would be 120 Knots, the descent rate is reported to be 2100 fpm until reaching 3000’.**

D. **Based on the data the estimated ground speed would be (?) Knots, the climb rate is reported to be 2500 fpm until last radar contact at 3465’.**

It is always better to be proactive than reactive, but we usually learn from someone else's misfortune. As is normally the case a series of events, links for the chain, lead to the final outcome.

We will review the data (NTSB IAD05FA047, March 26, 2005) from the PC12 Bellefonte, PA accident. Starting from the New York Center handoff until the end of the flight we will examine the Instrument Procedures related factors (State College, PA ILS Rwy 24, see diagrams) and the PC12 performance/operations factors. Authors note: The following review is not meant to lay blame on any individual(s) or companies but is my interpretation of the factual data and is to be used for furthering the safety and operation of the PC12.

Lets first preface this flight by starting with the day before. The owner/pilot completed a recurrent course at Simcom-Orlando, Fl followed by flying to Naples, Fl for the evening. The next morning departed Naples (KAPF) for Bellefonte, PA (KUNV) to observe his son in a Lacrosse game (Penn State). Passengers were 4 adults and 2 children with the PIC the only qualified pilot on-board. With standard FAA winter weights and typical baggage, the PC12 should have had near full fuel onboard. Flight time enroute would have been approximately 4 hours. Possible contributing factors to the start of the chain is the start time of the Lacrosse game (get home itis) and an aircraft preceding his arrival to the same airport declaring an icing emergency (unknown if this flight was informed).

Refer to the modified profile diagram from the State College, PA ILS 24 approach plate for the following:

Section A: The ATC controller clears the PC12 for the ILS 24 approach. The aircraft is at 6200' and 6 miles from PENUE LOM. At 10 miles from the LOM the minimum segment altitude is 3900' so the PC12 is approximately 2000' above and is establishing an intercept to final.

Chain link: Why was the aircraft 2000' above at this point? No data is provided but reported icing conditions probably contributed. Still, could this have started out better? What options were available?

Link break: The pilot could have requested a lower altitude sooner (or vectors in order to lower his altitude), could have requested to enter the holding

pattern (located at PENUE) in order to reduce altitude or could have initiated a somewhat steep dive using the performance of the PC12. The last option appears to be what was chosen.

The problem with this solution is airspeed. Since icing conditions existed the normal tenet is for a higher than usual airspeed. The PC12 was determined (from the investigation) to be configured for icing conditions (switch positions and CAWS annunciations, with the PUSHER ICE MODE CAWS annunciator illuminated) indicating a PUSHER ICE MODE approach. Pusher Ice Mode approach speed, 0° Flaps (aircraft was found to have not extended flaps), requires a 1.3 ref speed of 134 KIAS. However, it appears that the airspeed was reduced, and therefore the power, in order to initiate the descent of 1200 fpm.

Section B: At 3.5 NM from PENUE LOM, and approximately 4500', the pilot reduces the descent rate from 1200 fpm to 350 fpm until approximately reaching PENUE LOM, where the PC12 levels at 3800' and then climbs to 4000'.

Chain link: The pilot had reported to New York Center established and center advised switching to the airport advisory frequency yet he was a still at least 1-½ dots above the glide slope when the descent rate was reduced.

Link break: What should the descent rate be *if* established on the glide slope with a ground speed of 140 Kts. (Pusher Ice Mode, 0° Flaps)? <u>753 fpm</u>. It appears that the power may have only been minimally added in order to maintain a very slow approach speed and never established on the glide slope! Not established at this point the pilot should have missed the approach.

Section C:

Chain Link: At the beginning of this section it is possible that passing over the PENUE LOM the pilot may have lowered the landing gear upon receiving the Middle Marker beacon. The PC12 then began a 2100 fpm descent rate with a slightly better ground speed. Still not able to acquire the glide slope after 1.7 NM inside the LOM (and approximately: 50 seconds).

Due to the lowering of the landing gear the pilot may have decided to add some power due to the added drag. Where is the glide slope?

Link break: Missed approach, talk to somebody.

Section D: **It is hard to say what was the ground speed or power at this point. Even the exact time from the decent rate to the ascent point is not precise but the radar return showed a climb rate of 2500 fpm even though the last return only has a altitude gain of 465' from its lowest point approximately: 30 seconds earlier.**

Chain link: **I believe that the pilot pitched upward (for unknown reasons) without adding power until the Stick Shaker and/or the Stick Pusher would have activated. With the apparent low airspeed, power and no flaps (and Pusher Ice Mode) it would not take much time for the PC12 to approach a stall.**

Link break: **Was the pilot going around? Applying power first and a smooth pitch up (or Go-Around mode-EFIS) could have broken this chain.**

In any case, I believe that the Stick Pusher was either deactivated (Pusher Interrupt Switch held down) or overcome (60-70 lbs of force, which is not that tremendous if the yoke is already pulled rewards). The pilot allowed the PC12 to enter a natural stall and then added power causing the aircraft to roll left due to the torque, causing a spin with insufficient altitude to recover due to configuration. It should be noted that entering an approach to stall (Stick Shaker) with low power, low airspeed and a high initial pitch angle will probably cause the Stick Pusher to activate almost simultaneously.

Conclusion: **Lets first review the Instrument Procedures and what probably went wrong, then the stall/spin.**

It was noted from the investigation that the OBS selector was ON. The PC12's with the Bendix/King KLN 90B GPS have an OBS selector installed to the right of the DME N1/N2 selector under the Pilot's Altimeter (the Garmin GPS's have the OBS selector incorporated within its units and would have made it impossible to make the determination of OBS use). The NTSB has concluded that the pilot was using the GPS, and the OBS feature, for course inbound reference but failed to select the ILS mode for the EFIS. This would explain the apparent lack of glide slope intercept but a "localizer" intercept (actually a GPS course intercept). The pilot probably inputted the PENUE Int. on the GPS then selected OBS and set the 064/244 course. The reason I say the pilot inputted this intersection is the KLN 90B does not incorporate in its database approaches that are not full GPS or GPS

overlay approaches. The pilot would not have a waypoint for the runway or the PENUE IAF/FAF unless inputted by the pilot. I like this "old technology" because it does not make it that simple to shoot an approach (hey, you have to brief the approach-what a concept!). However, it was discovered that a handheld GPS was found in the cockpit indicating that the pilot might have been trying to overcome that deficiency but instead compounded the problem with more distractions (and not approved for instrument approaches!). We enjoy using GPS so much that we can be lulled into something very wrong if we are not aware of the correct procedures and when to use them. Take you time to set up an approach. When in doubt, toss the ego and fly away/talk to somebody!

I can personally vouch for this event happening. From my years of simulator instructing I have observed this scenario several times including when I would be "bamfuzzelled" from my position behind the pilot, in the cool seat, wondering what's wrong with this picture? Of course in the sim there are not some of the distractions that can happen out in the real world, which makes it even harder to believe that it can happen.

As for the NTSB conclusion of the pilot's failure to maintain sufficient airspeed to avoid a stall, what was wrong with the airspeed during this entire approach? Was there a Pitot/Static problem? Heat failure to the Pitot/Static system? The investigation reported no DEICE/ANTI ICE CAWS annunciator indications. Not known, however, is if the aircraft was a dual or single Pitot/Static equipped PC12. Without going into system details, if the pilot's airspeed indicator was malfunctioning, could you still have an idea of airspeed? Yes Power (Torque). At Simcom we always taught 15 psi as the "catch all" power. With a clean configured PC12, level, this will give approximately 150 KIAS. Even in icing conditions this number sets up well. We can also reference the AOA for flap configuration/1.3 reference speed (Normal or Pusher Ice Mode) and use the GPS groundspeed (Note: which indicates faster in a descent: GPS GS or Airspeed?).

I strongly believe that if the pilot had ever done (or a refresher of) an in-aircraft demonstration, in all flight/landing configurations, of the PC12's Stick Shaker/ Pusher System and recovery that the final outcome may have been different. Pilatus has built a remarkable aircraft, very pilot friendly and extremely safe. However, the human equation always is looking to beat the "mouse trap". I have always been a strong advocate for in-aircraft training. I believe that it should be required at the completion of the Initial training and at intervals of training thereafter. At the very least to have the pilot experience an actual Stick Shaker *and* Stick Pusher recovery, removes the unknown "doubt" as to how it really feels and fly's.

A Safe pilot is one who is always learning

John Morris
ACFT Services