“Props”

Slang word used frequently in the English language since the 80’s referring to proper respect or “just dues”. In the case of Pilatus they have continued to earn their “props” by the recently on-time certification of the PC24!

But I want to discuss props as they relate to the propellers currently available for the PC12 fleet.

Pilatus recently issued new revisions to the three versions of the Pilot’s Information Manual (PIM). The most interesting items to me were the new (to the PC12/41, /45 and /47 aka Legacy PC12s) performance data relating to takeoffs, accelerated/stops and landings in known icing. The PC12/47E (NG) PIM data was first published November2015. This coincided with the 2016 model NG with the new 5-Blade Hartzell composite propeller. Prior to this date no “charted” performance data was published for the fleet. Textual information regarding basic icing performance was printed in the performance section in-lieu of charts.

Did the prop have something to do with this new data? To some extent I will “guestimate” yes! The first part of my guess is based on the fact that an aftermarket 5-blade, composite propeller was already being bought and installed on PC12s since 2009. The MT 5-Blade propeller definitely improved the takeoff and initial climb performance of the PC12s I flew. And I am sure that Pilatus was listening to what was being said about this propeller and probably made inquiries with MT as well as their OEM supplier Hartzell regarding a new addition to the fleet.

Now adding to the guess is the fact that Pilatus had been working on Commercial IFR Single-pilot, night certification in Europe since the first certified PC12 built in 1994. Finally last year Pilatus got the certification, probably using a 2016 NG with the now standard 5-Blade propeller. To help appease the EASA Feds, more stringent icing data was required. But since the NG is an STC to the original PC12/41 it was most likely requested by the feds that more data regarding the other, OEM *metal* 4-blade PC12s would need to be added to the entire fleet. No extensive data is currently available, or required, for the MT 5-Blade since it is aftermarket.

For the purposes of this article I am only using the data regarding icing performance but I believe observations can be made from this data and from personal experiences with the various PC12s I have operated over the years.

I have to assume that since no mention is made regarding 4 versus 5 Blade propellers that the current published data for the /47E is related to the 5-Bladed NG. There are some interesting differences between the Legacy 4-Blade propeller and the current NG 5-Blade propeller.

Some may not recall that the NG and Legacy /47s have a Maximum Takeoff Weight of 10450 lbs, but ALL except the /41 PC12s have a maximum landing weight of 9921Lbs. So all landing data should be similar, correct? Also, since the data now includes altitudes ranging from Sea Level to 14000 feet I will average the data to 5000 feet.

Takeoff, in icing conditions, has always required adding +9 kts for rotation [Ground Roll] (+10 NGs) and then an additional +12 kts by 50 feet [Total].

Ground Roll distance increase for the Legacy PC12s average is 29%. The /47E had a decrease from 1st data of 31% to 2nd data of 29% average distance increase.

Takeoff Total distance decreased 50% for the /41 to 28% average increase with the /45 constant at 29%. The /47E had a decrease from 1st data of 35% to 2nd data of 30% average distance increase.

Accelerate/Stop has not changed [29% increase average distance] except for small percent due to takeoff altitude.

Approaching to land with faults is where the interesting data starts.

The first BIG change, in my opinion, is Emergency Procedures Airspeeds with icing equipment failures. Minimum airspeed has been *reduced* 5% for the /41 and /47E, 3% for /45!

Estimated Landing distances relating to above decreased airspeeds have been ***increased*** [Zero Flap, Pusher Ice Mode] (up to) 77% for the /47E , 66% and 67% respectively for the /45and /41s.

For the other icing related failures when Flaps 15 are available: increased landing distances of 29% for/47E, 22% /45 and 24% /41.

All of the following Landing data is based on first performing the landing calculations using the standard 40° Flaps charts and then using the percentage changes as required for accuracy.

Landing-15° Flaps - Ground Roll, No Reverse: A significant correction of 49% decrease to an average increase of 60.5% for the /41 with the /45 and /47E constant average increase at 60.5%
Landing 15° Flaps - Total distance, No Reverse: Average increases of 50.8% for /41 and 52 % for /45.The /47E had a correction from 1st data to 2nd of 50.2% decreased to 49.1%.

Landing - 15° Flaps, Ground Roll, with Reverse: 39% decrease to an average increase of 101% for the /41 and /45. Again, the /47E had a correction 102% decreased to 100.5%.

Landing - 15° Flaps, Total distance, with Reverse: The /41 and /45 average remained constant at 45% increase with the /47E at 43%.

Landing - 0° Flaps, Ground Roll, No Reverse: A significant correction of 35% decrease to an average increase of 118% for the /41 with the /45. The /47E had a correction from 1st data to 2nd of 126.8% decreased to 122.8%.

Landing 0° Flaps - Total distance, No Reverse: Average increases of 29% to 97% for /41 and 100 % for /45.The /47E had a correction from 1st data to 2nd of 113.6% decreased to 108.6%.

Landing - 0° Flaps, Ground Roll, with Reverse: 39% decrease to an average increase of 101% for the /41 and /45. Again, the /47E had a correction 102% decreased to 100.5%.

Landing - 0° Flaps, Total distance, with Reverse: A significant correction of 30% increase for the /41 with /45 average remained constant at 100% increase with the /47E at 99%.

With this data it is apparent that Takeoff distances are reduced when operating with the 5-Bladed propeller. I can attest to this from actual flights but the Hartzell propeller is less significant than the MT with respect to acceleration to Vr and initial climb. To be fair I have flown both types and the MT observations can be skewed since this prop is an aftermarket installation generally put on older PC12s. Engine fuel control and propeller governing adjustments can significantly alter the performance. Having said this I have also flown the 2017 NG with the 5-Blade prop and have noticed a reduction in the normal propeller governing rpm which could possibly have an effect on certain areas of performance. Anyone noticed that the fleet, since late 2015, now has a corrected normal steady state propeller rpm range of 1670 to 1730?

The data indicates that Landing distances were longer in some instances when flying the /47E with the 5-Blade prop than the 4-Blade with the first published data but have been reduced to basically match the 4-Blade propeller data with the second data release. Again from my observations in the last paragraph, in all of the 5-bladed PC12s I have flown the landing distances mostly have been longer due to the “speedier” props under normal conditions unless the engine fuel control-near idle and propeller governing are properly in sync. Just having flown a couple of 2017 NGs, where the average propeller rpm is reading 1675 the landings are acting very similarly to the 4-Bladed PC12s.

I could, and have, gotten into other discussion areas regarding the 4-blade versus 5-bladed propellers but I just wanted to cover this particular area since published data was available.

The airspeed adjustment is the most amazing change to me. I do not recall ever seeing a reduction to approach speeds with a corresponding increase in landing distances.

Also want to note that now the ***entire fleet*** has two common published airspeeds: **Pusher Ice Mode – Go Around, 0° Flaps and Landing Gear down - 130 KIAS**. Also for the fleet: **Pusher Ice Mode – Climb 0° Flaps - 135 KIAS**.

“A safe pilot is always learning”

John Morris - ACFT Services

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