Angle-of-attack versus airspeed

Congratulations on another great issue!

As I read the Causal Factors article on the Colgan Air accident (*ASW*, 3/10, p. 20), I became confused where it reads as follows:

"The crew set the V_{REF} 'bugs' on their airspeed indicators to 118 kt. This value was appropriate for an uncontaminated airplane. However, when the crew activated the deicing equipment during departure from Newark, they also set the 'REF SPEEDS' switch on the ice-protection panel to 'INCR' (increase). This action is required by the Q400 airplane flight manual before entering icing conditions and results in activation of the stick shaker at a lower angle-of-attack — thus, at a lower airspeed."

Whoa, pardner! I don't think the author should make a simple linear comparison between AOA and airspeed. There's another factor in there called "induced drag." If weight, bank angle and other factors are held constant, a slower airspeed demands a higher angle-of-attack to produce the same lift.

Conversely, if the stick shaker artificially fires at a lower AOA for a given wing design and its own unique lift and drag characteristics, we can generally assume it is occurring at a higher airspeed than V_S … can't we?

I think this is fundamental to the understanding of how these pilots were startled by the stick shaker at an airspeed some 13 kt above their "clean wing" and unmodified bug speeds.

I respectfully disagree with the NTSB, which downplayed the potentially negative effect of the FAA-approved training program's inclusion of the NASA research video "Tailplane Icing," which includes information on tailplane stall and recovery characteristics. The NTSB waltzed around it when they acknowledged that the Q400 is not subject to the phenomenon. I firmly believe this startled captain, experiencing stick shaker at a higher-than-expected airspeed, instinctively began to raise the nose and subsequently fought the stick pusher — which he probably attributed to the forward stick force demonstrated in the video.

Why else would the first officer raise the flaps, uncommanded by the captain, other than the fact that the FO in the video does this? Some theorize she wanted to return to the last stable configuration. But basic flying instruction warns against this on the back side of the power curve. At 100 kt, the only things keeping them in the air were the props.

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The editor replies: *The reader is correct. Increasing the reference speeds for icing conditions would cause the stick shaker to activate at a lower angle-of-attack and, thus, at a* higher *airspeed. The NTSB report noted that the appropriate landing reference speed (V_{REF}) under the existing conditions was 138 kt. We have corrected the on-line edition of the magazine.*

AeroSafety World encourages comments from readers, and will assume that letters and e-mails are meant for publication unless otherwise stated. Correspondence is subject to editing for length and clarity.

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