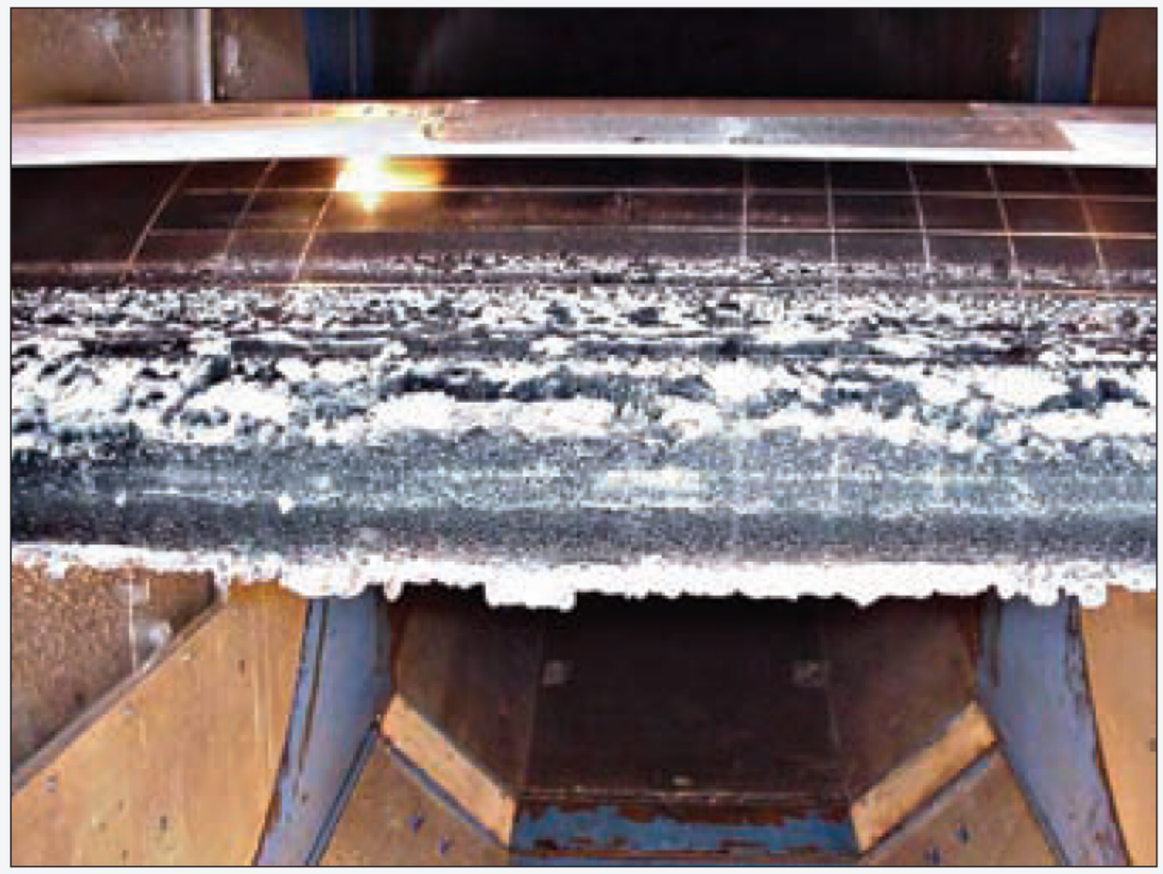
DE-ICE BOOTS: CYCLE THEM EARLY AND OFTEN

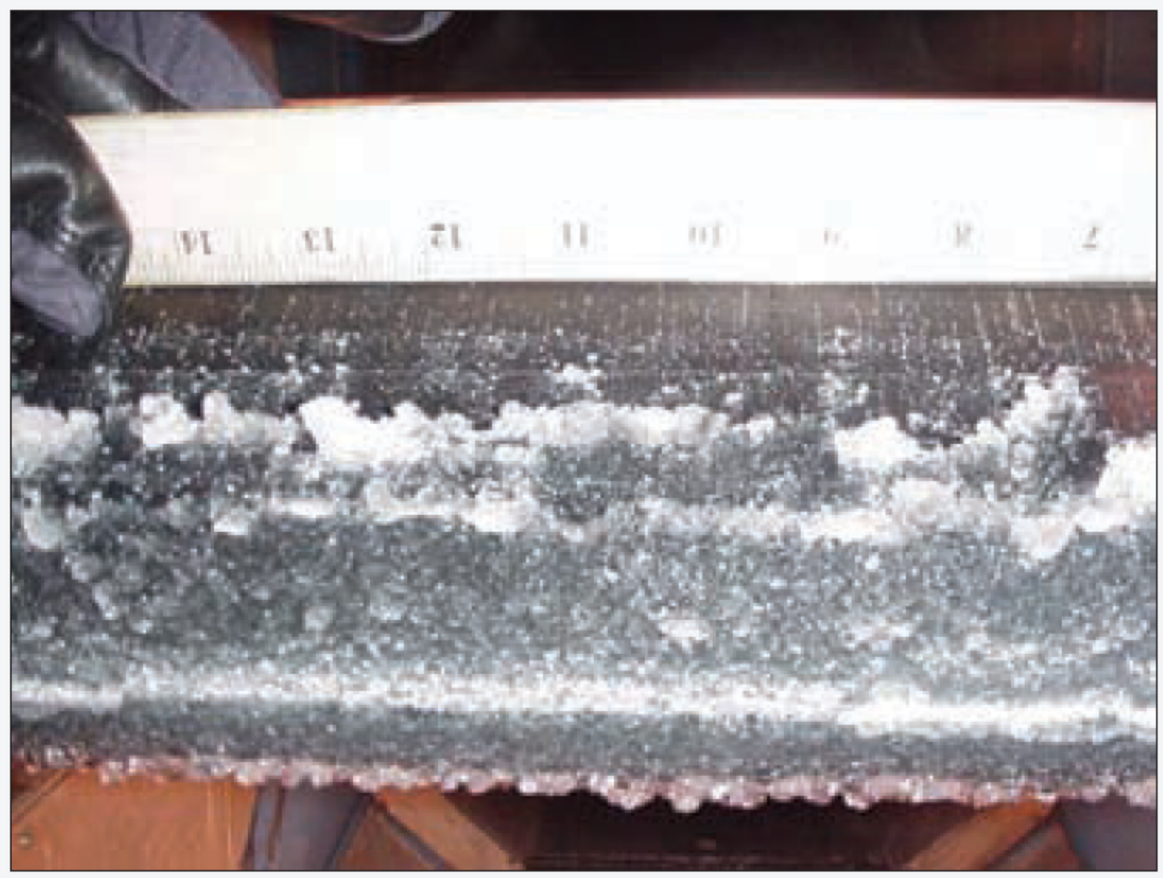
The how and when of using de-ice boots often has been referred to as something of an art. Old-timers flying the DC-3 swore by a "wait-and-see" approach to whether and when to inflate their boots. Those older aircraft, with their relatively low-pressure systems, sometimes had trouble inflating their boots when ice accumulated quickly. On the other hand, inflating them and not quickly deflating risked ice building on the expanded boot. When the boot collapsed, leaving behind an "ice bridge" impervious to the boots was a real risk, the old-timers believed.

After a series of highly publicized accidents involving iced-up regional turboprops, the NTSB issued its December 2008 Safety Alert headlined, "Activate Leading Edge Deice Boots As Soon as Airplane Enters Icing Conditions." In it, the NTSB noted, "For 60 years, pilots have been taught to wait for a prescribed accumulation of leading-edge ice before activating the deice boots because of the believed threat of ice bridging." The Safety Alert continued, "The Safety Board has no known cases where ice bridging has caused an incident or accident.... Ice bridging is extremely rare, if it exists at all." The NTSB then concluded, "Leading-edge deice boots should be activated as soon as icing is encountered, unless the aircraft flight manual or the pilot's operating handbook specifically directs not to activate them."

Of course, the NTSB's deference to the manufacturer's AFM/POH is something of a cop-out. If the Board strongly believes the so-called "ice bridge" phenomenon doesn't exist, it should not only say so but recommend the FAA take appropriate steps to revise or remove AFM/POH admonitions against early and often boot cycling.

Thankfully, someone has done some research on how and when to cycle de-icing boots. The FAA's Office of Aviation Research and Development in November 2006 released a 160-page report entitled "Investigations of Performance of Pneumatic Deicing Boots, Surface Ice Detectors, and Scaling of Intercycle Ice," which presented "results from collaborative icing wind tunnel and flight test investigations of pneumatic deicing boot deicing performance." The images at right are from that report, which focused on airfoils typical of those installed on regional turboprops and "flew" them at 170 KIAS in a wind tunnel simulating icing conditions. The study is available for download as a PDF file at tinyurl.com/avsafe-ice.





The images above are from the 2006 study described in this sidebar. The top image depicts the results after an 11-second ice detector delay and a three-minute rest interval. After three additional minutes of exposure, the testing was interrupted to simulate exposure to Part 25 (Transport Category Aircraft) certification rules. The bottom image also resulted from an 11-second delay "but with one-minute deicer rest intervals. Ice did not begin to form until after the first boot cycle. There was very little intercycle ice and not a lot of residual ice," according to the study.

What did it conclude? Among other things: "The test results also provide information that supports the activation of lifting surfaces' deicers at the first detection of ice formation on the aircraft's lifting surfaces and for the operation of deicers in the automatic cycling mode."