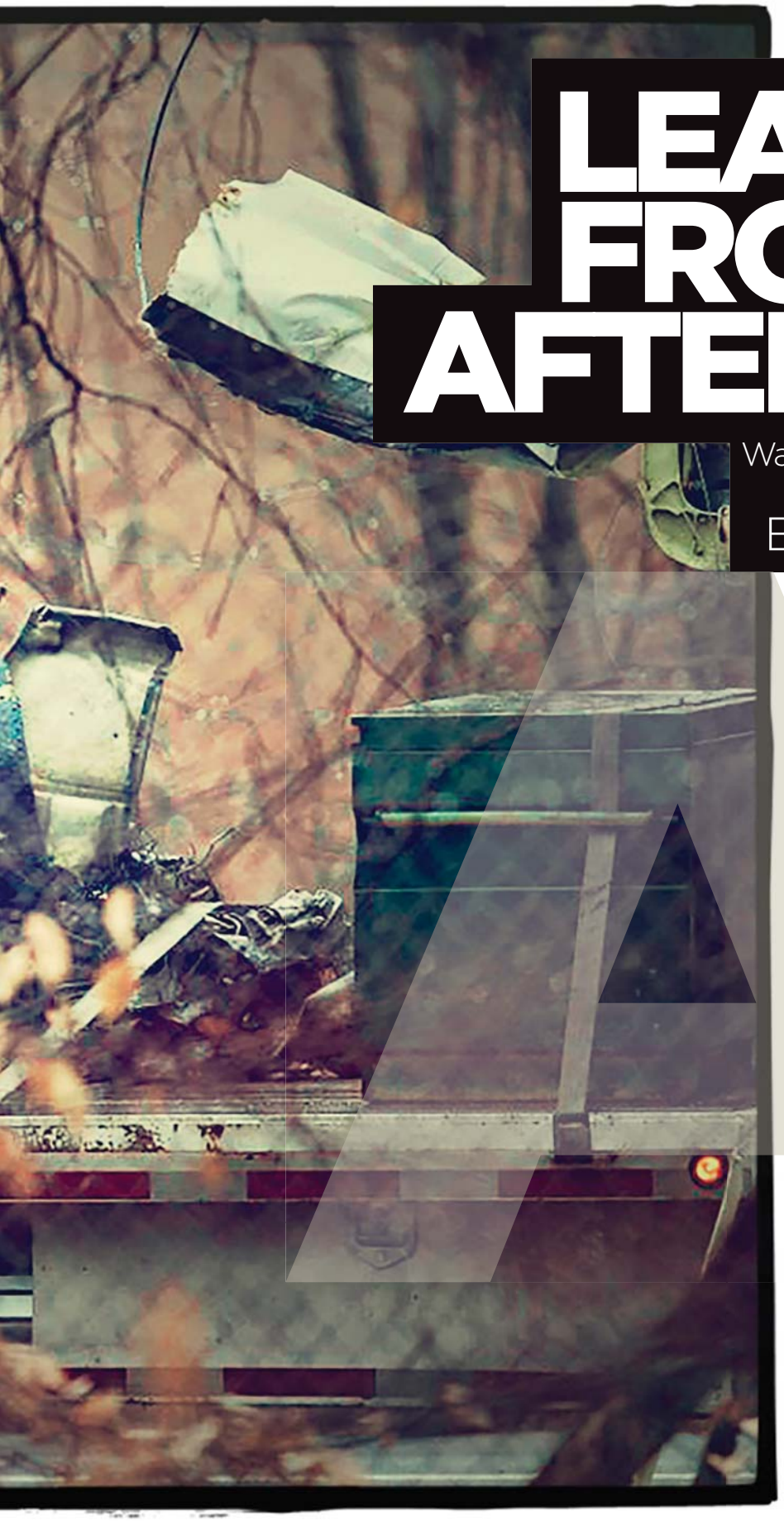
The wreckage of N731CA loaded onto a flat-bed trailer



LEARNING FROM THE AFTERMATH

Was icing to blame — or something as simple as a checklist item?

BY ROGER PELLETIER

As a TBM pilot, I took a personal interest in the NTSB investigative report and the subsequent AOPA safety video and article on the accident of N731CA on her departure from Teterboro, N.J., (KTEB) Dec. 20, 2011. I can easily see myself taking off that morning with the weather information available. My first thoughts on the investigation and subsequent comments on this accident were, "What was the actual cause of this accident so it does not happen to me!" My experience with this airplane, I believe, leads to a more complete scenario, so far unpublished, as to the actual cause of this accident.

The pilot of N731CA, it seems, made a reasonable decision to "go" with the weather information he had that morning. The question is whether the unanticipated weather he flew into that morning resulted in enough structural icing, combined with his delayed exit from the icing conditions, to be the primary cause of the accident. These purported causes seem to me tangential issues in this accident. A strong case can be made that, even in less-than-severe icing conditions, this pilot would have had a problem.

Let's look a bit closer at the NTSB report. To the investigators' credit, without a cockpit and performance recorder, they are certainly limited to what they can state as facts in this accident. The investigators seemed captivated, like a bird dog on the scent, of a sudden encounter with severe icing. This scent constructed the basis for an explanation of this accident.

Learning From the Aftermath

About half the NTSB file concerns the weather information collected that morning. To my mind, this was the NTSB's catch-all cause on the list. The plane did fall out of the sky, and we cannot find other reasons, so it must be structural icing. The NTSB report, without much to go on, ends up citing structural icing — and the pilot's failure to get out of it — as the cause. An opinion primarily based on other pilot reports of severe ice in the area and computer modeling.

What are the facts to support this assumption. Not much! Though severe icing was encountered by pilots in the general area, the idea that this plane picked up enough ice to lead to a loss of control is an extrapolation. Remember, dozens of other airplanes were flying in the same area, with some picking up a considerable amount of ice, yet none lost control. Why just the TBM?

TBMs do not have an operational history of difficulties in icing flight conditions. The pilot himself, in one of his last statements, reported at 16,800 feet, "Light icing has been present for a little while. A higher altitude would be great." It's hard to believe he was actually in severe icing when he made that statement.

We know that pilots who start picking up any ice will normally start asking for lower or higher, as he did. They, as I do, keep a sharp eye on how much ice is accumulating on the wings. We have no reason to think this pilot acted otherwise. I've yet to meet a pilot who is oblivious to how much ice he is picking up while in it. It is very hard to imagine that if he had started to pick up severe icing, as the only issue, in that last 1,000 feet he would not have been more insistent. "I need to get out of here now!" By 17,800 feet, he had lost control and started his descent. This happened within a minute or two, at the most, with a climb rate of 800 to 1,000 feet per minute.

Assuming this plane picked up inches of ice within a few minutes and stalled, why was no ice reported on any part of the airframe on the ground, even though people were at the accident site within minutes? Not one witness statement in the NTSB files reports ice on any structural parts. **[See Image A]** It is very common in the case of airframe icing accidents for people on the ground to report ice on the wings or tail parts flung from the main body of the plane and not subject to fire.

From personal experience flying the TBM, I find it hard to believe that, in this case, the plane was brought down by just ice on the airframe in its last 1,000 feet of climb. I can vouch for the TBM that it is as a very robust airplane when encountering ice. Before people get too excited, any airplane can be brought down by structural icing, certainly even the TBM, though I am doubtful it was that simple, in this case.

So, if structural icing ends up as a speculative cause of the accident, could the real cause be something as mundane as a failure to follow the checklist? Is there evidence for this as the actual cause? I believe there is.

The NTSB report itself documents that the Inertial Separator, common on most turboprop airplanes, sometimes called "ice vane," was in the OFF position. **[See Image B]** The NTSB report, however, does not comment on the implications of this fact at all! This was not the scent trail it was on. The report cites a passage from the POH that warns of "flight into severe ice." Since this is true for almost all aircraft, it is not much of a causal explanation. The documentation of the separator switch, however, does point the direction in which to look.

The AOPA safety video picks up on the separator switch being in the OFF

position and does mention that the POH requires the separator be in the ON position when entering IMC with possible ice formation. The video even states that it may explain the pilot's use of the word "rattle" as the possible sound of engine ice ingestion. This is very likely, since it is not a sound I have heard other TBM pilots describe before the aircraft stalls. If N731CA were about to stall because of structural icing accumulation, I do not see how it would "rattle." The video, however, does not follow up on the implications of the separator not being ON.

The AOPA article does get into the issue of the separator a bit more and muddles on about how the POH requires it to be ON in these conditions and that

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it could lead to a loss of engine power. The article, along with the investigators and subsequent writers, again do not forcefully follow through and explain the consequence of this fact. Almost regardless of the severity of the ice conditions, this one documented fact is enough to bring the plane down. Without the separator in the ON position and with the plane entering even light-to-moderate ice, the engine intake screen can become obstructed and/or the ingestion of ice into the engine can cause the engine to lose significant, if not total, power. The pilot's report of a "rattle" was certainly the sound of the engine vibrating as it ingested ice. I believe the evidence exists for this in the NTSB picture of the compressor blades. **[See Image C & D on next page]**

This blade damage, in a disagreement with the NTSB report on this point, seems to me to match blades I've seen that have had ice FOD damage! A turbine mechanic, when shown the picture of these engine compressor blades, agrees that this engine ingested something to cause such damage. Notice how the blade tips are unevenly chewed up and gouged. If the damage had been caused by impact with the ground, you would expect the blades to

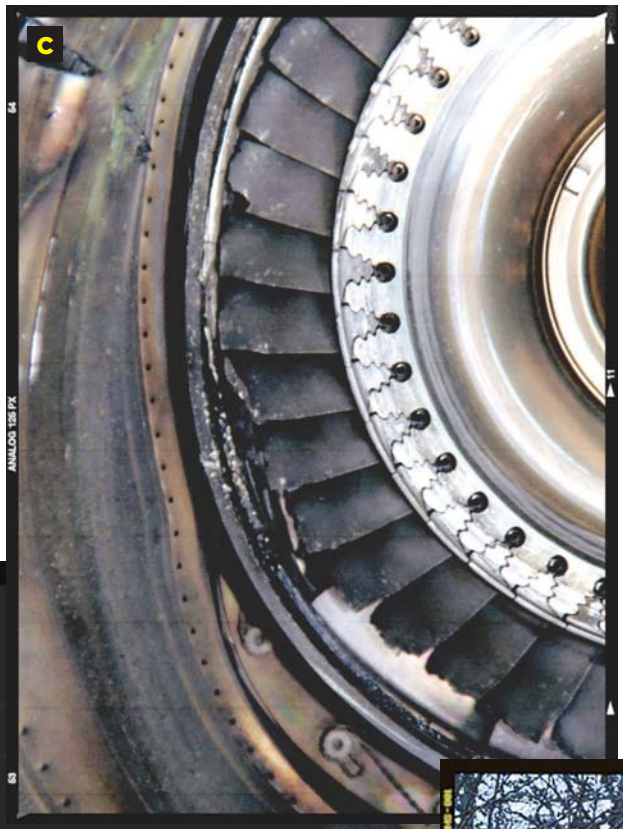
be more evenly bent or broken off. A picture of the complete compressor wheel shows very little, if any impact damage that deformed the compressor wheel. How did this damage happen if not from ice ingestion damage?

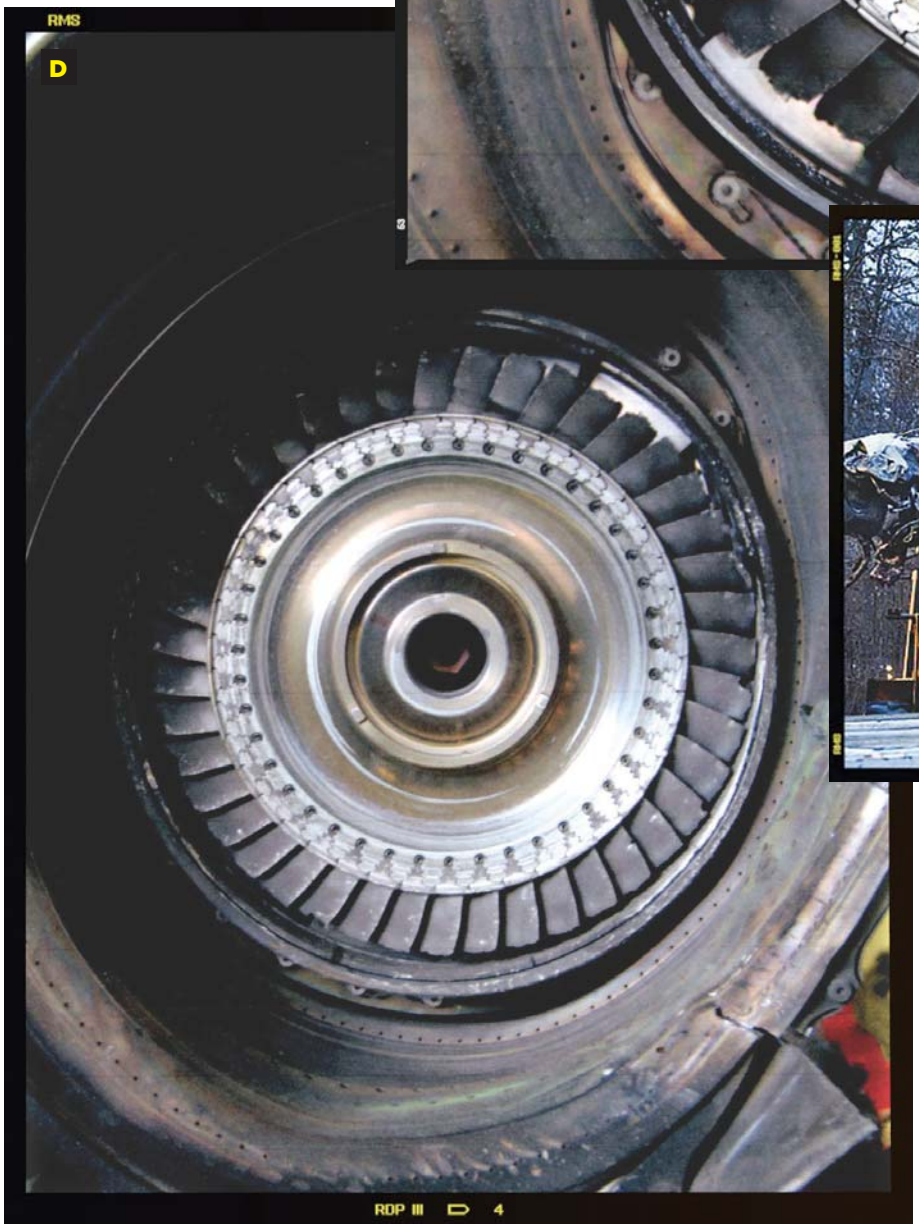
But, even if one were to claim this engine damage evidence is inconclusive, the engine intake screens could have always iced up leading to the same engine loss of power. Once the engine was torn down and the ice all melted, of course, no evidence would exist.

Depending on how the autopilot was configured, the plane in that last 1,000 feet would have been losing power in a climb while, at the same time, losing airspeed. Meanwhile, the pilot's attention, the probable cause of his "delayed reaction" as the video states, is focused on the inexplicable fact that his airplane is losing power while the throttle is in full.

This would have been very baffling for the pilot since this specific condition of losing power with full throttle and engine rattle sounds is not normally covered in training. The brain can quickly become overloaded when facts do not match previous experience. He may have tried to pull out the engine out checklist, etc. However, the result was that while his attention was fixated on the engine issue, at some point the autopilot disconnected and the plane stalled — or vice versa. The fate of the plane would have been sealed at that point for most pilots.

How could it happen that the Inertial Separator was not ON?





Given the high ceiling on take-off that morning, the pilot would normally have had the separator ON for taxi and probably for take-off. Once airborne, he would have then switched it OFF for better climb-out performance. The boots, prop heat, etc., would have been OFF since he was in the clear. Most likely, when he was about to enter or just entered IMC, he switched his de-ice equipment ON but not the Inertial Separator as called for in the checklist. From then on, the pilot probably had the mind-set that all of his ice equipment had been switched on.

We will never know why he failed to

switch the separator ON. Perhaps his attention was drawn to something else at the time — who knows? Missed checklist items are not that uncommon for pilots but usually without critical implications. Unfortunately, this was not the case with this missed item.

I am sure there will always be multiple explanations proffered for this accident. But from my experience flying this airplane, I am reasonably sure that if the separator had been ON, as required by the checklist, this airplane would have had a good chance of landing safely in Atlanta. It must be kept in mind that dozens of other pilots in the general area all landed safely, some picking up a considerable amount of airframe icing. There is no reason to believe that, with full engine power, this TBM could not have been one of them.

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The AOPA's video and article offer a laudable suggestion that pilots always have the most up-to-date weather available and a warning that immediate action is sometimes required when airspeed starts to decay. The catch-all basket, however, of severe icing as the cause of this accident and the pilot's delayed reaction does not help much in explaining why this particular aircraft came falling out of the sky one December day.

The lesson, I hope we remember, from my evidence cited, is to obtain as complete a weather picture as possible before take-off and, when you encounter icing conditions, strict adherence to the checklist really can have a life-or-death implication.

However, regarding the pilot of N731CA and his decisions on that day, we should humbly, without hubris, remember the Spanish proverb, "It is not the same to talk of bulls as to be in the bullring." TBM

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