

The Little Things

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Every time I teach a Human Factors (HF) course, I always like to talk about the little things. What I mean by the little things is screws, bolts, fasteners and other types of hardware. The things that can probably fit in the palm of your hand and only cost a few dollars. Yet, these little things have caused some big maintenance-related aircraft accidents and incidents:

- One of the most well-known accidents is Continental Express Flight 2574, an Embraer 120 that crashed in Texas in 1991. All 14 onboard were killed. The accident happened because 47 screws were not put back on the horizontal stabilizer after a shift change.
- A de Havilland DHC8, operated by CC Air, lost the number 1 right-hand leading edge on departure from Charlotte, North Carolina. The leading edge panel had been removed for maintenance and the bottom screws had not been reinstalled. The flight crew was able to land the aircraft without further incident.
- A de Havilland DHC8, operated by Jazz Air, had a three-foot piece of the wing leading edge (with the de-ice boot attached) separate from the left wing on the takeoff run. The aircraft returned to the departure airport and landed without further incident. When the leading edge section was examined, it was determined that the 14 screws that secure the leading edge section to the bottom of the wing were missing.
- An aircraft (undisclosed type) had a tailpipe/thrust reverser depart the aircraft, causing substantial damage to the pylon and engine. The investigation revealed that only 4 of 42 bolts holding the tail pipe assembly were tight. This was due to a lack of documentation during a shift turnover to inform the incoming crew that 38 of the 42 flange bolts that held the assembly to the core were loosened. The examples could go on and on...

What was the common thread in each of these accidents and incidents? The maintenance errors occurred during shift turnovers and they involved the little things (screws and bolts). One does not have to be a rocket scientist to figure out what went wrong. It's very straightforward. The errors boiled down to slack shift turnovers that led to screws and bolts being forgotten about due to a lack of communication. When something gets taken apart, it usually needs to be put back together again the same way, including the screws and bolts that secure the component.

None of the above accidents and incidents would have happened if procedures were being followed. Aircraft maintenance is not based on luck. It's based on documented procedures; procedures that, if not followed, can cause bad things to happen. Forgetting to put back 47 screws on an airplane may not sound like a big deal, but it certainly was for the passengers and crew of Continental Express Flight 2574. They paid for the error with their lives. And even though that particular accident happened a few decades ago, the same problem exists with some shift turnovers to this very day. This is totally unacceptable.

Typically not the fault of a single mechanic, these events are almost always the manifestation of an unhealthy safety culture, with the mechanic simply acting as a trigger puller for upstream organizational pathogens that have been lying dormant in the system for years.

HF training helps to prevent these types of events from occurring, but HF training is not a magic bullet; it's an awareness building tool, and it's still up to each and every single maintenance organization to support the transfer of learning from the classroom to the hangar floor. That means that management must be onboard!

In closing, I can teach you all you need to know about HF. But in the end, it's up to your organization to foster a safety culture that will prevent the little things from causing big problems. Take a good look at your shift turnover process. Are procedural deviations becoming the norm? Are shift turnovers too casual, where there's a lack of communication (documented, verbal, or both) between the incoming and outgoing shifts? If you answered yes to one or both of the above, you might be heading for trouble. And that trouble might just be due to the little things.

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About The Author

Dr. Bob Baron is the President and Chief Consultant of The Aviation Consulting Group, Inc. He conducts extensive training, research, and program implementation in Human Factors, SMS, CRM, and LOSA. He consults with, and provides training to, hundreds of aviation organizations on a worldwide basis.

Bob was an adjunct assistant professor at Embry-Riddle Aeronautical University from 2009-2012. He taught the Graduate Capstone Project and Research Methods for Aviation/Aerospace courses. He was also a full-time faculty member at Everglades University from 2004-2011, where he taught Safety Management and Human Factors courses at the Graduate and Undergraduate levels.

Bob has also served as a consulting editor for the FAA's International Journal of Applied Aviation Studies (IJAAS) and currently serves on the editorial board for the Journal of Airport Management (JAM) and the Journal of Aviation/Aerospace Education and Research (JAAER).

Bob is typed in Learjets (LRJET series) and Citations (CE500 series), and was a Part 135 contract Learjet captain and check airman for numerous operators in the south Florida area from 1996-2004. He was also a simulator and ground instructor for the Lear 35a at Pan Am Intl. Flight Academy in Miami and FlightSafety in West Palm Beach during that same period of time.

Dr. Baron's full bio can be viewed at www.tacgworldwide.com/About-TACG/Bob-Baron-Bio