NTSB

SAFETY ALERT

National Transportation Safety Board

★ Mechanics: Manage Risks to Ensure Safety ★

Carefully follow maintenance and inspection procedures to help prevent aircraft accidents

The problem

- Mistakes made while performing aircraft maintenance and inspection procedures have led to in-flight emergencies and fatal accidents.
- System or component failures are among the most common defining events for fatal accidents across various sectors of general aviation (GA).[1]

Related accidents

Sadly, the circumstances of each new accident are often remarkably similar to those of previous accidents. This suggests that some mechanics are not taking advantage of the lessons learned from such tragedies that could help them avoid making the same mistakes. The following accident summaries[2] illustrate some common—and preventable—maintenance-related accident scenarios:

- A commercial pilot was killed when his Beech 36 airplane struck a tree and the ground during an emergency landing in night instrument meteorological conditions following a loss of engine power in flight. The investigation found that the engine had been reassembled incorrectly during a recent overhaul. Maintenance personnel had applied silk thread and gasket-making material to the sealing surfaces of the main bearing bosses, which is inconsistent with the engine manufacturer's maintenance instructions. The improper sealing of the crankcase prevented adequate clamping at

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[1]Each year, the NTSB investigates about 1,500 GA accidents in which about 475 people are killed. See the NTSB data for GA fatalities for calendar years 2007 – 2011. The defining events information is derived from the NTSB's Review of U.S. Civil Aviation Accidents, 2007 – 2009. Both data sources are available from the NTSB's Aviation Statistics web page at www.ntsb.gov/data/aviation_stats_2012.html.

[2] The accident reports for each accident referenced in this safety alert are accessible by NTSB accident number from the NTSB's Accident Database & Synopses web page at www.ntsb.gov/aviationquery/index.aspx. (The accident numbers are ERA09FA093, WPR10LA284, and DEN08FA058, respectively.) Each accident's public docket is accessible from the NTSB's Docket Management System web page at www.ntsb.gov/investigations/dms.html.

the main bearing bosses, which resulted in the fragmentation of a main bearing and the failure of the crankshaft.

- A private pilot and an instructor were injured (one seriously) during a forced landing of a Piper PA-46-310P airplane following a loss of engine power during cruise flight. The induction elbow for the Nos. 1, 3, and 5 cylinders was displaced from the throttle and metering assembly where the elbow couples with the assembly by an induction hose and clamp. The investigation found that the securing clamp was not properly positioned per the manufacturer's instructions, which allowed the induction tube elbow to separate from the assembly in flight. The induction system had been recently removed during maintenance.

- An airline transport pilot was killed during a positioning flight after the Piper PA-23-250 airplane he was flying entered an uncontrolled descent to the ground following an in-flight separation of the stabilator trim pushrod. The investigation found that the nut that secured the pushrod to the trim tab had backed out during flight; neither the nut nor its cotter pin were located. Although the airplane had undergone an inspection about 73 flight hours before the accident, the investigation found evidence of prolonged inadequate maintenance. This evidence included an elongated attach hole for the left stabilator trim bellcrank, which allowed for significant freeplay, and extensive aft streaking along the forward rivet line of both stabilators, which is indicative of loose, vibrating rivets.

What can maintenance technicians do?

- Remember that well-meaning, motivated, experienced technicians can make mistakes. Learning about and adhering to sound risk management practices can help prevent common errors that can lead to tragic consequences.

- Understand the safety hazards associated with human fatigue and strive to eliminate fatigue contributors in your life. Fatigue has been linked to forgetfulness, poor decision making, reduced vigilance, and other factors that can interfere with your ability to do your job safely.

- Pay particular attention to the safety and security of the items that undergo maintenance and any surrounding components that may have been disconnected or loosened (possibly to ease access) during that maintenance.

- Carefully follow manufacturers' instructions to ensure that the work is completed as specified. Always refer to up-to-date instructions and manuals when performing a task, and ask questions of another qualified person if something is unfamiliar to you.

- Have a qualified person, other than the person who performed the maintenance, inspect the safety and security of critical items that have received maintenance.

- Be thorough when performing routine inspections. Ensure that items needing immediate attention are addressed rather than deferred.

Interested in more information?

Education and training are critical to improving GA safety. The Federal Aviation Administration (FAA) Safety Team (FAASTeam) provides access to online training courses, seminars, and webinars as part of the FAA's "William (Bill) O'Brien Aviation Maintenance Technician Awards Program," which provides mechanics with recurrent training that focuses on accident and incident causal factors, special emphasis items, and regulatory issues. The courses listed below (and many others), as well as seminar and webinar information, can be accessed from the FAASTeam website at www.faasafety.gov. (Course access requires login through an existing or creation of a free FAASTeam account.)

- Aircraft Maintenance Documentation for AMTs
- Dirty Dozen: Human Error in Aircraft Maintenance
- Failure to Follow Procedures: Landing Gear Failure
- Human Factors Primer for Aviation Mechanics
- Working Healthy: 8 Steps for Protecting Your Health
- Failure to Follow Procedures: Inspections
- Failure to Follow Procedures: Installation
- Fatigue Countermeasure Training

Other FAA resources:

- "Acceptable Methods, Techniques, and Practices—Aircraft Inspection and Repair" (FAA Advisory Circular [AC] 43-13-1B) contains a Personal Minimums Checklist in chapter 13 that lists actions to accomplish before and after maintenance tasks to reduce maintenance errors.

- "Aviation Maintenance Technician Handbook – General" (FAA-H-8083-30), includes an "Addendum/Human Factors," which discusses the human factors-related conditions behind most maintenance errors. The addendum (which is also called chapter 14) can be accessed from the FAA's website at www.faa.gov.

- Aircraft Safety Alerts, including airworthiness directives, maintenance alerts, special airworthiness information bulletins, and unapproved parts notifications, can be accessed from www.faa.gov/aircraft/safety/alerts.

- The Aircraft Maintenance Human Factors Web Portal provides educational resources, including videos and presentations related to mitigation strategies for preventing human-performance-related maintenance errors. It can be accessed at https://hfskyway.faa.gov/hfskyway/index.aspx.

This NTSB safety alert and others can be accessed from the NTSB's Safety Alerts web page at www.ntsb.gov/safety/safety_alerts.html.