



NTSB

SAFETY ALERT

National Transportation Safety Board

★ Pilots: Perform Advanced Preflight After Maintenance ★

Be vigilant for flight control and trim anomalies

The problem

- In-flight emergencies, accidents, and deaths have occurred after pilots flew aircraft with incorrectly rigged flight control or trim systems.
- Four such mishaps within a 2-year span share common safety issues:
 - Maintenance personnel who serviced or checked the systems did not recognize that the control or trim surfaces were moving in the wrong direction.
 - Pilots who flew the airplanes did not detect the control anomalies during their preflight checks.
- In many cases, although maintenance personnel made mistakes, the pilots could have prevented the accidents by performing thorough or advanced preflight checks.

Related incident and accidents:

- In December 2014, the pilot of a Cessna T182T airplane experienced extreme nose-down control forces on the yoke shortly after takeoff. The airplane had just undergone maintenance on the elevator trim system, and the mechanic briefed the pilot about the work before the flight. Both the pilot and the pilot-certificated passenger needed to pull hard aft on the yoke to prevent the airplane from pitching down, even though the elevator pitch trim indicator showed a nearly full nose-up trim position. The pilot remembered that work had been done on the elevator trim system, and he thought that there might be some kind of control-reversal problem. While maneuvering for the emergency landing, the pilot applied nose-down trim control inputs and found that the extreme control forces lessened, and he successfully landed the airplane. The elevator trim control cables were misrigged such that the elevator trim control was reversed. The airplane's checklist for the exterior inspection of the empennage during preflight included "Trim Tab – CHECK security." ([CEN15IA079](#))¹

¹ These pilots and the mechanic are featured in the NTSB's safety video, "Airplane Misrigging: Lessons Learned from a Close Call," which is available on the NTSB's [safety videos web page](http://www.nts.gov/safety/safety-alerts/Pages/Safety-Videos.aspx) at <http://www.nts.gov/safety/safety-alerts/Pages/Safety-Videos.aspx>.

- In October 2013, the private pilot and passenger in a Piper PA-22 received serious injuries when the airplane crashed during takeoff on its first flight since an annual inspection in which frayed elevator control cables were replaced. During the takeoff roll, when the pilot applied forward stick controls to raise the tail, the tail did not rise, and the airplane instead “jumped” off the runway. The pilot reduced engine power and attempted to control the airplane’s pitch, but the airplane responded abnormally and crashed. The elevator control cables were installed incorrectly such that the elevator moved in the direction opposite to that commanded. The pilot’s preflight check of the airplane was also inadequate. ([ERA14LA015](#))
- In July 2014, the pilot of a Piper PA-12 airplane was fatally injured after his airplane pitched up steeply during takeoff and crashed. The investigation found that the elevator control cables were installed incorrectly such that the elevator moved in the direction opposite to that commanded. The preflight checklist for the airplane required the pilot to verify that the flight controls were free and correct. ([ANC14FA050](#))
- In May 2013, the pilot of a Schweizer SGS 2-33A glider received serious injuries after the glider crashed due to improper rigging of the rudder control cables. The glider had just received an annual inspection, and its rudder had been removed and reinstalled. If the pilot had conducted a thorough preflight inspection, he should have been able to detect that the rudder control cables were rigged incorrectly. ([ERA13LA229](#))

What can pilots do?

- Become familiar with the normal directional movement of the flight controls and trim surfaces of the aircraft you fly before it undergoes maintenance. It is easier to recognize “abnormal” if you are already very familiar with what “normal” looks like.
- After maintenance, check systems more thoroughly than the normal preflight checklist implies. For example, if a preflight checklist states, “Trim – Set Takeoff,” verify not only the trim setting but also proper directional travel.
- Be prepared to abort the takeoff if something does not seem right.
- Avoid interruptions and distractions during your preflight inspection to ensure that you do not skip or misevaluate the items you are checking.
- If you suspect that there is a problem with a flight control or trim system, ask qualified maintenance personnel to inspect the aircraft. Do not attempt to perform such work yourself if you are not appropriately qualified, certificated, and authorized to do so.

Interested in more information?

The accident reports for each accident summarized in this safety alert can be searched by accident number from the NTSB’s Aviation Accident Database & Synopses web page at <http://www.nts.gov/layouts/nts.aviation/index.aspx>.² Each accident’s public docket is available on the NTSB’s Accident Dockets web page at <http://dms.nts.gov/pubdms/>.

² Less-recent fatal accidents that may also be of interest are [CHI05FA038](#), [CHI08MA270](#), and [DCA03MA022](#).

The Federal Aviation Administration (FAA) Safety Team (FAASTeam) pamphlet, “[Advanced Preflight](#),” (FAA-M-001) provides guidance to help pilots develop the necessary knowledge and techniques to reduce the risk of undetected maintenance problems, including how to:

- Conduct a complete review of maintenance-related records and data
- Develop an “additional items checklist” to be used in conjunction with the aircraft’s preflight checklist

The pamphlet can be accessed (without login) from the FAASTeam website at http://www.faasafety.gov/gslac/ALC/libview_normal.aspx?id=63083.

The FAA’s [Pilot’s Handbook of Aeronautical Knowledge](#) (FAA-H-8083-25A) discusses aeronautical decision-making and risk management in [chapter 17](#). It provides basic tools to help pilots assess risk and manage it in a positive manner; proper preflight inspections are an important part of risk management and risk intervention. The [Risk Management Handbook](#) (FAA-H-8083-2) provides a more in-depth discussion of risk management principles. Both handbooks can be accessed from the FAA’s website at www.faa.gov.

An online article in *Flight Training* (an Aircraft Owners and Pilots Association publication), “[How to Pre-flight an Airplane: Understanding How Is as Important as Actually Doing It](#),” provides tips on checking controls and other items. It is available at <http://flighttraining.aopa.org/students/presolo/skills/howtopreflight.html>.

An online article, “[Things You Miss on Preflight](#),” provides several anecdotes about preflight-related mishaps. Originally from *Aviation Safety* magazine, it can be found at http://www.avweb.com/news/redundant/preflight_pilot_airplane_flight_nts_b_inspection_207_912-1.html.

Related regulations:

- Title 14 *Code of Federal Regulations (CFR)* 91.7 states, in part, that “the pilot in command of a civil aircraft is responsible for determining whether that aircraft is in condition for safe flight.”
- Title 14 *CFR* 91.407 states, in part, that: “No person may operate any aircraft that has undergone maintenance...unless...it has been approved for return to service.” Also, “no person may carry any person (other than crewmembers) in an aircraft” that has undergone certain maintenance until the aircraft has received an operational check flight that is logged in the aircraft records.

This NTSB safety alert and others can be accessed from the NTSB’s Safety Alerts web page at <http://www.nts.gov/safety/safety-alerts/Pages/default.aspx> or searched from the NTSB home page at <http://www.nts.gov/Pages/default.aspx>.