# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

**Date:** August 30, 2006

**In reply refer to:** A-06-53

Honorable Marion C. Blakey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On April 17, 2004, about 1310 mountain standard time, a 1962 Cessna 205 (serial number 205-0015), N1815Z, sustained substantial damage during a hard landing at Page Municipal Airport, Page, Arizona.[1] The private pilot/owner and one passenger were not injured. Visual meteorological conditions prevailed for the 14 *Code of Federal Regulations* (CFR) Part 91 cross-country flight, which departed Fort Collins Downtown Airport, Fort Collins, Colorado, about 0830 destined for Page. As a result of the accident, the airplane sustained damage to the firewall, propeller, and wing strut.

The pilot stated during postaccident interviews that he configured the airplane for landing as it neared Page Municipal Airport. After performing a stabilized approach, the pilot flared the airplane just before touchdown. He reported that during the landing flare, the control wheel fractured at the upper left corner, the airplane's nose dropped rapidly, and he momentarily experienced a loss of control. The pilot further stated that the nose wheel contacted the runway first, resulting in the airplane bouncing off the surface and becoming airborne. In an effort to maneuver the airplane back to the runway surface, the pilot repositioned his hand from the broken control wheel to the control column and moved it forward. Upon touchdown, the nose landing gear bent and the propeller impacted the runway. The pilot taxied the airplane off the runway where he shut off the engine and exited the airplane.

Both control wheels from the accident airplane were sent to the National Transportation Safety Board's Materials Laboratory for examination. The pilot's hard plastic (acrylic) control wheel, part number (P/N) 0513166, was fractured near the upper left corner where the handle adjoins the crossbar (see figure 1). The examination of the fracture surface revealed smooth crack arrest markings, as well as bands of slightly different colors, which are indications of fatigue cracking. Some surface discoloration and crazing were also evident, indicating the effects

[1] The description of this accident, LAX04LA194, can be found on the National Transportation Safety Board's Web site at <http://www.ntsb.gov>.

of age. Discontinuities of the fracture surface revealed that the fatigue cracking originated at several locations. The location of the fracture, which propagated through about 95 percent of the cross-section, indicated that the fatigue crack propagated as a result of tensile stress from the repetitive force of the pilot manipulating the control wheel forward and aft. The copilot's control wheel showed no evidence of similar fatigue cracks.

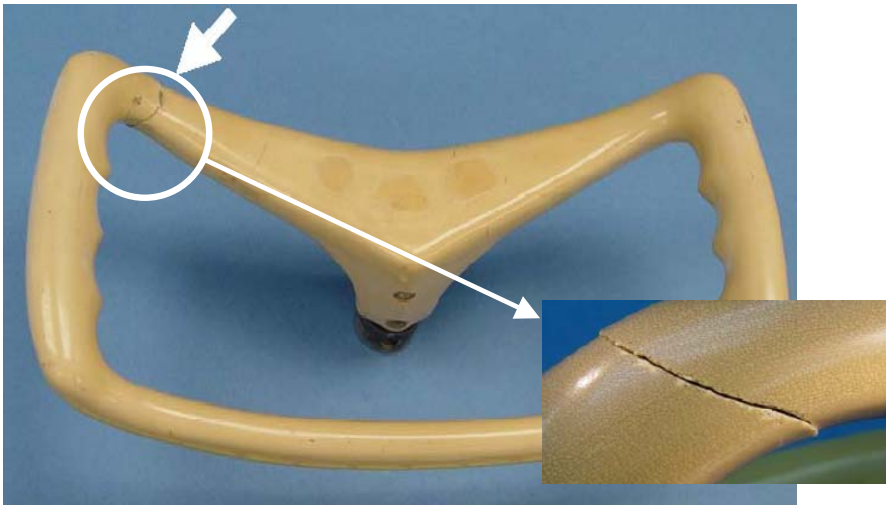

**Figure 1.** Control wheel fracture

After the initial examinations of the control wheels from the accident airplane, a Safety Board investigator discovered another fractured pilot's control wheel, also P/N 0513166,[2] installed on a Cessna 210[3] and sent it to the Materials Laboratory for examination. The Cessna 210 pilot's control wheel was fractured in the same area as the control wheel from the accident airplane. The laboratory examination found that fatigue cracking had initiated at multiple locations on the inside bend of the control wheel and propagated through at least 50 percent of the cross-section. The fracture features in this control wheel were virtually identical to those in the pilot's control wheel from the airplane from the Page, Arizona, accident.

The fracture locations on the control wheels from the accident airplane and the Cessna 210 were consistent with the typical operation of the aircraft during maneuvers such as takeoff and landing, in which the pilot's left hand holds the control wheel while the pilot's right hand operates the throttle. In this mode of operation, repetitive stresses would generally occur at the location of the fractures—in the corner between the crossbar and the handle on the left side of the control wheel.

[2] In the early 1960s, Cessna equipped a series of approximately 12,500 airplanes within certain blocks of serial numbers with the P/N 0513166 control wheel. Applicable airplanes include 150, 150A, 150B, 150C, 172A, 172B, 172C, 172D, 172E, P172, 175A, 175B, 175C, 180C, 180D, 180E, 180F, 180G, 182C, 182D, 182E, 182F, 182G, 185, 185A, 185B, 185C, 206, 210, 210A, 210B, 210C, 210D, 210-5 (205), 210-5A (205A).

[3] The Cessna 210 aircraft is similar to the Cessna 205. The primary difference is that the 205 is a fixed gear airplane with a strut-braced wing, whereas the 210 is equipped with retractable landing gear and does not have struts.

On February 14, 1964, Cessna issued Service Letter (SL) 64-8, recommending a one-time inspection and proof testing[4] of P/N 0513166 series control wheels because of temperature exceedances that occurred during the molding process, which led to cracking in the control wheels. The SL instructed operators to replace any control wheels with cracks that opened when force was applied. After completing the inspection stated in the SL, a red dot was to be placed on the forward rivet butt on the bottom of control wheels that were found not to be cracked (evidence of a red material was found within the forward rivet butt of both control wheels installed on the accident airplane). The SL further stated that once a control wheel had been checked in accordance with the SL, no further control wheel inspection was required. A supplement to SL 64-8, issued on February 28, 1964, provided clarification regarding the types of cracks that required replacing the control wheels. It stated that "control wheels having crazed marks or slight checks need not be replaced" and that "these are not to be confused with real cracks which will open when force is applied." The letter and supplement only recommended replacing the control wheel if cracks that opened were present. Subsequent to the SL and supplement, Cessna changed the material used to manufacture the control wheel from plastic to magnesium.

On December 29, 2000, the Federal Aviation Administration (FAA) issued Notice of Proposed Rulemaking (NPRM) "Airworthiness Directives; Cessna Aircraft Company 150, 172, 175, 180, 182, 185, 206, 210, and 336 Series Airplanes," which proposed a repetitive inspection and pull test of the control wheel and replacement if cracks were found or if the control wheel failed the pull test. Eight[5] objections were submitted during the comment period citing "minimal risk" and the "small" number of reported cracks in recent years. The FAA withdrew the NPRM on December 11, 2001, citing only four service difficulty reports (SDR) about the issue and the fact that the affected airplanes have dual controls, which could provide an alternative means to control the airplane should failure occur. Instead of proceeding with the NPRM, the FAA issued Special Airworthiness Information Bulletin (SAIB) CE-01-41 on September 10, 2001, recommending that, during periodic (100-hour or annual) inspections, "special emphasis" be placed on inspecting the original plastic control wheels installed in applicable Cessna airplanes for cracks. If crack indications were unclear, the SAIB recommended that a proof test be performed in accordance with Cessna SL 64-8 but with reduced force. The SAIB did not recommend replacing the control wheel if cracks were found and indicated that the risk of accidents was negligible due to the redundancy provided by the availability of the copilot's control wheel.

A query of the FAA's SDR database for reports of control wheel failures in applicable Cessna airplanes reveals a history of 18 failures between May 20, 1984, and April 17, 2004; five of these failures, including the control wheel from the Page accident, were reported after the issuance of SAIB CE-01-41.[6] Almost all of the reported failures occurred during critical phases of flight or maneuvers, such as takeoff, initial climb, landing flare, or during spin recovery, when high forces are applied to the control wheel. However, the FAA only requires aircraft operating

[4] The SL indicated that proof testing was to be conducted by means of a force applied to each control wheel handle using a lever.

[5] An additional objection was made, but the author believed that the NPRM applied to his 1980 Cessna TU206, which was not included as an applicable airplane.

[6] It is unknown whether these control wheels had been inspected per the SAIB.

under 14 CFR Parts 121 and 135 to complete SDR reports, and a majority of the affected Cessna airplanes are operated as general aviation flights under Part 91 with no mandatory SDR reporting requirements. Therefore, the Safety Board is concerned that the number of control wheel failures might be significantly higher than the number represented in the SDR database.

The Safety Board notes that SAIB CE-01-41 provides no guidance regarding where the inspection should focus. The SAIB also promotes continued operation of airplanes with any cracks present in the control wheel even though these cracks can propagate over time and lead to failure. The fractures in the inside upper corners of the control wheels observed during the Board's examinations were a result of fatigue cracking that occurred over time and that should have been discovered during inspection. The integrity of the control wheel is critical to the safe operation of applicable Cessna aircraft. As the Page, Arizona, accident demonstrates, a control wheel with fatigue cracking is more likely to fail during critical flight maneuvers (such as landing) when large forces are applied, resulting in a sudden loss of control and likely an accident.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require recurrent inspection of part number 0513166 series control wheels in applicable Cessna airplanes for cracks, with specific emphasis on the inside upper corners where fatigue cracking has been found and replacement of the control wheels if any cracks are detected. (A-06-53)

Chairman ROSENKER and Members HERSMAN and HIGGINS concurred with this recommendation.

[*Original Signed*]

By: Mark V. Rosenker
Chairman