# Aviation Investigation Final Report

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| **Location:** | Ames, Iowa | **Accident Number:** | CHI07LA011 |
| **Date & Time:** | October 22, 2006, 14:30 Local | **Registration:** | N5274S |
| **Aircraft:** | Cessna R182 | **Aircraft Damage:** | Substantial |
| **Defining Event:** | | **Injuries:** | 2 None |
| **Flight Conducted Under:** | Part 91: General aviation - Instructional | | |

## Analysis

The airplane was operated as an instructional airplane when the nose landing gear collapsed during landing. The flight instructor stated that he and the dual student did not receive "a green light indicating gear down and locked" when landing. They reported cycling the landing gear several times but could not get a down and locked indication. Examination of the landing gear revealed that the two nose gear down lock actuator pins exhibited fatigue fracture over 70 percent of the fracture surface. Cessna service bulletin SEB95-20, recommends a reoccurring 200-hour inspection of the down lock pins for looseness. If looseness or movement is observed, Service kit SK210-155 is to be installed prior to further flight. The service bulletin does not provide for the visual inspection of the pins for fatigue cracks The pins were of the older design, and were reportedly inspected and no looseness was observed. Following the accident, the operator reported that one of the fractured pins was still not loose until he exerted a greater amount of force to check for looseness.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The fatigue failure of the landing gear actuator pin and the exterior visual maintenance inspection for cracks not possible by company maintenance personnel.

### Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: APPROACH

Findings
1. (C) LANDING GEAR,GEAR LOCKING MECHANISM - FATIGUE
2. (C) MAINTENANCE,INSPECTION - NOT POSSIBLE - COMPANY MAINTENANCE PERSONNEL
3. MAINTENANCE,OVERHAUL - NOT PERFORMED - COMPANY MAINTENANCE PERSONNEL
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Occurrence #2: NOSE GEAR COLLAPSED
Phase of Operation: LANDING - ROLL

Findings
4. TERRAIN CONDITION - RUNWAY

## Factual Information

On October 22, 2006, at 1430 central daylight time, a Cessna R182, N5274S, operated by Hap's Air Inc., received substantial damage on impact with terrain when the nose landing gear collapsed during landing at Ames Municipal Airport (AMW), Ames, Iowa. Visual meteorological conditions prevailed at the time of the accident. The 14 CFR Part 91 instructional flight was not operating on a flight plan. The commercial pilot and certified flight instructor (CFI) were uninjured. The local flight originated from AMW at 1400.

The CFI reported that he was practicing takeoffs and landings with the commercial pilot during a dual instructional flight. During the final landing attempt, the pilots did not receive "a green light indicating gear down and locked." The pilots could visually see that the main gear was extended; however, they could not determine whether the nose gear was locked down. The pilots reported that they cycled the landing gear several times but could not get a down and locked indication. The CFI stated that during the landing, he attempted to keep "the nose wheel off of the ground as long as possible." As the airplane slowed "to nearly taxi speed," the nose gear collapsed.

Inspection of the landing gear system revealed that one of the two landing gear down lock actuator pins (part number 1280209-1) was partially extended out of the nose gear actuator assembly bearing end (part number 1280600-5). The extended pin was loose and the other pin could not be moved until company maintenance personnel had to "get rough with it" and at that time looseness of the pin was noted.

The pins were cylindrical steel dowels with grooves machined into the outer diameter for a transverse roll pin in the assembly. The groove was cut nearer to one end of the locking pin and oriented to the outer edges of the bearing end when assembled.

The two pins and actuator bearing end were sent to the National Transportation Safety Board (NTSB) Materials Laboratory for a metallurgical examination. The pin fracture surfaces were relatively smooth, flat fracture surfaces with feature typical of fatigue progression in both pins. In both pins, the fatigue initiated at the bottom of the groove on the side nearest the longer portion of the pin. Both pins also displayed multiple fatigue origins around the groove diameter. The total fatigue area was about 75 percent of the groove cross section.

Cessna issued SB SEB95-20 on December 29, 1995, recommending a reoccurring 200-hour inspection of the down lock pins for looseness. SEB95-20 stated, in part:

> E. Visually inspect [down lock] actuator pins while physically attempting to rotate and/or move actuator pins about all three axes in the bearing end. No movement is allowed, as pins are a press fit.

F. If any looseness or movement is observed
(1) Install SK210-155 prior to further flight

Cessna Aircraft Company has designed and manufactured updated down lock actuator pins that have been available through SK210-155 since December 29, 1995. The incident fractured pins were of the older design, and the actuator bearing end had not been modified for installation of the newer pins.

The diameters of the locking pin holes in the bearing end were measured at the outer and inner edges. At the outer edges, the hole diameters measured 0.377 inch for the left side hole and 0.376 inch for the right side hole. The diameters at the inner edges of the holes were larger, measuring 0.387 inch and 0.383 inch for the left and right holes respectively. As defined in the instructions for Cessna Service Kit SK210-155, the maximum allowable hole diameter is 0.3760 inch.

The airplane was last inspected during an annual inspection on August 1, 2006, and accumulated a total time of 6,406.2 hours at the time of the accident. The company director of maintenance stated that the landing gear actuator pins were inspected within the 200-hour time frame cited in SEB95-20. There was no logbook entry pertaining to the inspection of the pins.

The director of maintenance also reported that the airplane propeller (McCauley B2D34C218-13) accumulated a total time of 3,423.6 hours since last overhaul. McCauley Propeller Systems service bulletin (SB) 137W, states in part the overhaul frequency of B2D34C218 model propellers to be 2,000 hours or 72 calendar months, whichever occurs first.

The NTSB investigated a fatigue failure of a landing gear actuator pin on a Cessna R182 under IAD05IA066.

## Pilot Information

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| **Certificate:** | Commercial | **Age:** | 21,Male |
| **Airplane Rating(s):** | Single-engine land | **Seat Occupied:** | Rear |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | Yes |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | No |
| **Medical Certification:** | Class 2 With waivers/limitations | **Last FAA Medical Exam:** | January 1, 2006 |
| **Occupational Pilot:** | No | **Last Flight Review or Equivalent:** | February 1, 2006 |
| **Flight Time:** | 524 hours (Total, all aircraft), 102 hours (Total, this make and model), 478 hours (Pilot In Command, all aircraft), 93 hours (Last 90 days, all aircraft), 12 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft) | | |

## Flight instructor Information

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|---|---|---|---|
| **Certificate:** | Commercial; Flight instructor | **Age:** | 21,Male |
| **Airplane Rating(s):** | Single-engine land; Multi-engine land | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | Glider | **Restraint Used:** | |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | Yes |
| **Instructor Rating(s):** | Airplane multi-engine; Airplane single-engine; Glider; Instrument airplane | **Toxicology Performed:** | No |
| **Medical Certification:** | Class 2 With waivers/limitations | **Last FAA Medical Exam:** | December 1, 2005 |
| **Occupational Pilot:** | Yes | **Last Flight Review or Equivalent:** | March 1, 2006 |
| **Flight Time:** | 1303 hours (Total, all aircraft), 136 hours (Total, this make and model), 1261 hours (Pilot In Command, all aircraft), 133 hours (Last 90 days, all aircraft), 50 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft) | | |

## Aircraft and Owner/Operator Information

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|---|---|---|---|
| **Aircraft Make:** | Cessna | **Registration:** | N5274S |
| **Model/Series:** | R182 | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | | **Amateur Built:** | |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | R18201534 |
| **Landing Gear Type:** | Retractable - Tricycle | **Seats:** | 4 |
| **Date/Type of Last Inspection:** | August 1, 2006 Annual | **Certified Max Gross Wt.:** | 3100 lbs |
| **Time Since Last Inspection:** | | **Engines:** | 1 Reciprocating |
| **Airframe Total Time:** | 6406.2 Hrs at time of accident | **Engine Manufacturer:** | Lycoming |
| **ELT:** | Installed, not activated | **Engine Model/Series:** | O-540-J3C5D |
| **Registered Owner:** | Hap's Air Inc. | **Rated Power:** | 235 Horsepower |
| **Operator:** | | **Operating Certificate(s) Held:** | None |

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | AMW,955 ft msl | **Distance from Accident Site:** | 0 Nautical Miles |
| **Observation Time:** | 14:53 Local | **Direction from Accident Site:** | |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 10 miles |
| **Lowest Ceiling:** | Overcast / 4900 ft AGL | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 10 knots / | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | 320° | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 30.12 inches Hg | **Temperature/Dew Point:** | 4°C / -6°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Ames, IA (AMW ) | **Type of Flight Plan Filed:** | None |
| **Destination:** | (AMW ) | **Type of Clearance:** | None |
| **Departure Time:** | 14:00 Local | **Type of Airspace:** | |

## Airport Information

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| **Airport:** | Ames Muni AMW | **Runway Surface Type:** | Asphalt |
| **Airport Elevation:** | 955 ft msl | **Runway Surface Condition:** | Dry |
| **Runway Used:** | 31 | **IFR Approach:** | None |
| **Runway Length/Width:** | 3492 ft / 100 ft | **VFR Approach/Landing:** | Full stop;Precautionary landing;Traffic pattern |

## Wreckage and Impact Information

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| **Crew Injuries:** | 2 None | **Aircraft Damage:** | Substantial |
| **Passenger Injuries:** | | **Aircraft Fire:** | None |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 2 None | **Latitude, Longitude:** | 41.991943,-93.621948 |

## Administrative Information

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| **Investigator In Charge (IIC):** | Gallo, Mitchell |
| **Additional Participating Persons:** | Joseph Quiring; Des Moines FSDO; Des Moines, IA |
| **Original Publish Date:** | January 31, 2008 |
| **Last Revision Date:** | |
| **Investigation Class:** | Class |
| **Note:** | |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=64844 |