# Aviation Investigation Final Report

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| **Location:** | Corvallis, Oregon | **Accident Number:** | WPR09LA184 |
| **Date & Time:** | April 7, 2009, 15:30 Local | **Registration:** | N719HT |
| **Aircraft:** | Sikorsky CH-54B | **Aircraft Damage:** | Substantial |
| **Defining Event:** | Miscellaneous/other | **Injuries:** | 2 None |
| **Flight Conducted Under:** | Part 91: General aviation - Instructional | | |

## Analysis

The pilot and certified flight instructor departed for a local area instructional flight during which the pilot practiced a series of takeoffs and landings. During ground operations, the crew stated that they felt an unusual vibration, which was partially mitigated by keeping the collective pitch raised about 2 inches from the full down position. The pilot reported that he decided to adjust his seat position so he landed and handed off the controls to the certified flight instructor (CFI). The CFI lowered the collective to the full down position in preparation for the seat adjustment operation. At this time he noticed a vibration, which was followed by a loud "bang." The subsequent helicopter examination revealed that two of the six main rotor blades had diverged from their normal plane of rotation and impacted the tail rotor drive system, resulting in the number 5 and 6 tail rotor drive shaft sections separating from the helicopter. The investigation and examination of the helicopter found that during maintenance performed at an undetermined date by the operator's mechanics, the bell cranks that connect to the main rotor blades' control rods had been incorrectly installed in a reversed manner. This allowed the swash plate to travel outside of its designed range.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The improper assembly of main rotor blade control components by the operator's maintenance personnel, which resulted in the main rotor blade's divergent path and their contact with the tail rotor drive shaft during ground operation following landing.

## Findings

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| **Personnel issues** | Incorrect action performance - Maintenance personnel |
| **Aircraft** | (general) - Incorrect service/maintenance |
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# Factual Information

## History of Flight

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| **Prior to flight** | Aircraft maintenance event |
| **Standing-engine(s) operating** | Miscellaneous/other (Defining event) |

On April 7, 2009, about 1530 Pacific daylight time, a Sikorsky CH-54B (Skycrane), N719HT, was substantially damaged following touchdown at the Corvallis Municipal Airport, Corvallis, Oregon, when the main rotor blades diverted from their normal rotation plane and severed the tail rotor drive shaft. The helicopter was operated by Helicopter Transport Services, Corvallis. Visual meteorological conditions prevailed at the time, and no flight plan had been filed. Neither the airline transport certificated pilot, who held a certified flight instructor (CFI) certificate, nor the second crewmember-pilot was injured during the instructional/proficiency flight. The flight was performed under the provisions of 14 Code of Federal Regulations Part 91 and originated from Corvallis about 1500.

The CFI reported to the National Transportation Safety Board investigator that the helicopter had operated normally prior to the mishap, although a vibration was felt during ground operation. Therefore, the collective position was kept up about 2 inches, which seemed to reduce the ground vibrations.

After practicing four or five landings from a hover, the pilot, who was receiving instruction, landed to adjust his seat position. He handed off the controls to the CFI. The CFI lowered the collective to the full down position, in preparation for the seat adjustment. The terrain on which he landed was sloped. The CFI reported that as he "lowered the collective to the full down position, a vibration was noticed, followed by a loud 'bang', followed by severe vibrations. An emergency shut down followed, with immediate application of the rotor brake." After exiting the helicopter, it was determined that the number 5 & 6 tail rotor drive shaft sections had departed the helicopter, with damage to 2 of the 6 main rotor blades.

During the subsequent examination of the helicopter, the CFI verbally reported to the Safety Board investigator that the accident occurred when the main rotor blades diverged from their normal plane of rotation and contacted the tail rotor drive shaft.

The operator's director of maintenance verbally reported to the Safety Board investigator that maintenance of the helicopter was by the company's mechanics. During maintenance, the bellcranks that connect to the control rods had been incorrectly installed (in a reversed manner) thereby allowing the swashplate to travel outside of its designed range.

Federal Aviation Administration (FAA) personnel, who examined the wreckage and interviewed the operator's mechanics, stated they were unable to ascertain the date on which the subject

bellcranks had been installed, but it appeared to have been several years prior to the accident date. To reduce the likelihood for recurrence of this type of accident, the operator modified its maintenance procedure regarding bellcrank installation.

## Flight instructor Information

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| **Certificate:** | Airline transport; Flight instructor | **Age:** | 58,Male |
| **Airplane Rating(s):** | Single-engine land; Single-engine sea; Multi-engine land | **Seat Occupied:** | Right |
| **Other Aircraft Rating(s):** | Glider; Helicopter | **Restraint Used:** | |
| **Instrument Rating(s):** | Airplane; Helicopter | **Second Pilot Present:** | Yes |
| **Instructor Rating(s):** | Airplane multi-engine; Airplane single-engine; Helicopter; Instrument airplane; Instrument helicopter | **Toxicology Performed:** | No |
| **Medical Certification:** | Class 2 With waivers/limitations | **Last FAA Medical Exam:** | November 5, 2008 |
| **Occupational Pilot:** | Yes | **Last Flight Review or Equivalent:** | September 17, 2008 |
| **Flight Time:** | 19000 hours (Total, all aircraft), 1100 hours (Total, this make and model), 18700 hours (Pilot In Command, all aircraft), 50 hours (Last 90 days, all aircraft), 15 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft) | | |

## Co-pilot Information

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| **Certificate:** | Commercial; Flight instructor | **Age:** | 37,Male |
| **Airplane Rating(s):** | Single-engine land | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | Helicopter | **Restraint Used:** | |
| **Instrument Rating(s):** | | **Second Pilot Present:** | Yes |
| **Instructor Rating(s):** | Helicopter; Instrument helicopter | **Toxicology Performed:** | No |
| **Medical Certification:** | Class 1 None | **Last FAA Medical Exam:** | November 28, 2008 |
| **Occupational Pilot:** | Yes | **Last Flight Review or Equivalent:** | October 17, 2008 |
| **Flight Time:** | 2982 hours (Total, all aircraft), 1100 hours (Total, this make and model), 2356 hours (Pilot In Command, all aircraft), 180 hours (Last 90 days, all aircraft), 60 hours (Last 30 days, all aircraft) | | |

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | Sikorsky | **Registration:** | N719HT |
| **Model/Series:** | CH-54B | **Aircraft Category:** | Helicopter |
| **Year of Manufacture:** | | **Amateur Built:** | |
| **Airworthiness Certificate:** | Experimental (Special); Restricted (Special) | **Serial Number:** | 69-18469 |
| **Landing Gear Type:** | Tricycle | **Seats:** | 3 |
| **Date/Type of Last Inspection:** | March 1, 2009 AAIP | **Certified Max Gross Wt.:** | 47000 lbs |
| **Time Since Last Inspection:** | 12 Hrs | **Engines:** | 2 Turbo shaft |
| **Airframe Total Time:** | 5365 Hrs at time of accident | **Engine Manufacturer:** | P & W |
| **ELT:** | Installed, not activated | **Engine Model/Series:** | JFTD12A-5A |
| **Registered Owner:** | U S LEASECO INC | **Rated Power:** | 4800 Horsepower |
| **Operator:** | Helicopter Transport Services, Inc. | **Operating Certificate(s) Held:** | |

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | CVO,250 ft msl | **Distance from Accident Site:** | 0 Nautical Miles |
| **Observation Time:** | 14:55 Local | **Direction from Accident Site:** | |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 10 miles |
| **Lowest Ceiling:** | None | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 8 knots / | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | 120° | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 29.76 inches Hg | **Temperature/Dew Point:** | 19°C / 9°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Corvallis, OR | **Type of Flight Plan Filed:** | None |
| **Destination:** | Corvallis, OR | **Type of Clearance:** | None |
| **Departure Time:** | 15:00 Local | **Type of Airspace:** | |

## Airport Information

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| **Airport:** | Corvallis Municipal CVO | **Runway Surface Type:** | |
| **Airport Elevation:** | 250 ft msl | **Runway Surface Condition:** | |
| **Runway Used:** | | **IFR Approach:** | None |
| **Runway Length/Width:** | | **VFR Approach/Landing:** | Full stop |

## 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:** | 44.497222,-123.289443(est) |

## Administrative Information

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| **Investigator In Charge (IIC):** | Pollack, Wayne |
| **Additional Participating Persons:** | Tim Moon; Federal Aviation Administration; Portland, OR |
| **Original Publish Date:** | April 22, 2010 |
| **Last Revision Date:** | |
| **Investigation Class:** | Class |
| **Note:** | |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=73618 |