Aviation Investigation Final Report

Location:	HOMER, Alaska	**Incident Number:**	ANC03IA037
Date & Time:	February 28, 2003, 17:10 Local	**Registration:**	N8337Q
Aircraft:	Cessna 206	**Aircraft Damage:**	Minor
Defining Event:		**Injuries:**	2 None
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled		

Analysis

The airline transport certificated pilot was landing a nose wheel-equipped airplane at a remote gravel surfaced airstrip during a VFR air taxi flight. The airplane landed hard, and the right main landing gear, a spring steel strut, fractured and separated from the fuselage just outboard of the landing gear fuselage support clamp. The airplane settled onto the belly-mounted cargo pod and sustained minor damage. The airplane had accrued about 17,120 total flight hours. The right main gear was replaced in 1994, at an aircraft total time of 11,848 hours, with a "serviceable unit." Visual examination of the fracture surface revealed beach marks radiating in successive arc patterns from mulitple locations, along the underside of the gear strut. A metallurgical examination revealed that the landing gear spring had two different layers of paint. Multiple fatigue crack initiation sites, coinciding with corrosion pits, were found along the lower surface of the gear. Particles in the pits contained titanium, a component of paint, indicating the corrosion pits were present at the time the gear was painted. Periodic visual inspection of the landing gear is required by 14 CFR Part 43. Neither the manufacturer nor the FAA have established time in service limits (hours or cycles) for the main landing gear strut. Removal of the gear strut for inspection, or the use of nondestructive inspection techniques is not required by the manufacturer or the FAA. On March 16, 2001, the NTSB recommended that the FAA issue an airworthiness directive (AD) to require an initial and recurring inspection of Cessna main landing gear spring steel struts, using nondestructive inspection techniques. On August 31, 2001, the FAA reported to the NTSB that the current inspection criteria outlined in the Cessna Maintenance Manual are adequate to detect cracks in the main landing gear struts, and that additional airworthiness action is not warranted. On March 25, 2002, the NTSB responded by stating, in part: "The Safety Board continues to believe that a visual inspection alone will not detect cracks in the Cessna main landing gear spring struts. However, the Safety Board acknowledges that the statistical evidence does not warrant issuance of ADs at this time as called for in the Board's recommendation." The safety recommendation was then classified as: "Closed-Reconsidered."

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: The separation of the main landing gear spring strut during landing touchdown due to corrosion and fatigue. Factors contributing to the accident were the manufacturer's and the FAA's insufficient standards/requirements for inspection procedures.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
1. (C) LANDING GEAR,MAIN GEAR SPRING - CORRODED
2. (F) ACFT/EQUIP,INADEQUATE STANDARD/REQUIREMENT - MANUFACTURER
3. (F) INSUFFICIENT STANDARDS/REQUIREMENTS - FAA(ORGANIZATION)
4. (C) LANDING GEAR,MAIN GEAR SPRING - FATIGUE
5. (C) LANDING GEAR,MAIN GEAR SPRING - SEPARATION

Factual Information

On February 28, 2003, about 1710 Alaska standard time, a wheel-equipped Cessna 206 airplane, N8337Q, sustained minor damage when the right main landing gear strut fractured during the landing touchdown at the Bradley Lake airstrip, located about 23 miles northeast of Homer, Alaska. The airplane was being operated as a visual flight rules (VFR) on-demand passenger flight under Title 14, CFR Part 135, when the incident occurred. The airplane was operated by Homer Air Inc., Homer. The airline transport certificated pilot, and the sole passenger, were not injured. Visual meteorological conditions prevailed. VFR company flight following procedures were in effect. The flight originated at the Homer Airport about 1700.

A Federal Aviation Administration (FAA) aviation safety inspector, Anchorage Flight Standards District Office, reported that the airplane was landing on runway 06, which has a gravel surface that is 2,000 feet long and 75 feet wide. The FAA inspector said the pilot encountered gusty wind conditions during the landing flare, indicating a wind from the east at 15 knots, with gusts to 25 knots. The inspector said the airplane landed hard, the right main gear separated from the fuselage, and the airplane settled onto the belly-mounted cargo pod.

During a telephone conversation with the National Transportation Safety Board (NTSB) investigator-in-charge (IIC), on March 3, a mechanic for the operator reported that the gear separation occurred just outboard of the landing gear fuselage clamp. He said the separation was oriented 90 degrees to the gear strut span. The mechanic also indicated the airplane had accrued about 17,120 total flight hours. Maintenance records revealed that the right main gear was replaced in 1994, at an aircraft total time of 11,848 hours, with a "serviceable unit." Individual time in service records (hours or cycles) for the landing gear strut were not maintained, nor are these records required by the manufacturer or the FAA.

The mechanic forwarded the landing gear strut to the NTSB Alaska Regional Office on April 3, 2003. Visual examination of the fracture surface of the gear strut revealed flat fracture planes, oriented perpendicular to the longitudinal and lateral axis of the gear strut. On the underside of the strut, along the edge of the fracture, beach marks were visible radiating in successive arc patterns from multiple locations.

The landing gear was examined by metallurgical laboratory personnel at the Cessna Aircraft Company, Wichita, Kansas. The examination was overseen by FAA personnel from the Wichita Aircraft Certification Office. Cessna Aircraft produced a material and process engineering report on July 1, 2003. The examination revealed that the landing gear spring had two different layers of paint. Multiple fatigue crack initiation sites, coinciding with corrosion pits, were found along the lower surface of the gear. Particles in the pits contained titanium, a component of paint, indicating the corrosion pits were present at the time the gear was painted. The Cessna Aircraft report of the examination was reviewed by NTSB Materials

Laboratory personnel in Washington, DC. The landing gear strut was released to the operator on July 31, 2003.

The landing gear on the accident airplane is a spring steel strut that is shot peened during manufacture, and is bolted to the fuselage at its upper end. It is braced by a fuselage support bracket at the outer edge of the fuselage. Visual inspection of the landing gear strut is required at prescribed intervals by 14 CFR Part 43. Removal of the gear for visual inspection, or the use of nondestructive inspection techniques (NDT), is not required.

Cessna Aircraft Company has a 100 Series Continuous Airworthiness Program for Cessna 180 and 185 series airplanes that recommends visual inspection of spring steel fuselage support brackets for corrosion, by removing the spring steel strut every 1,000 hours, or every 3 years. A Cessna Aircraft 200 Series Continuous Airworthiness Program for Cessna 205, 206, and 207 series airplanes recommends a visual inspection of the outboard fuselage support forgings for cracking, by the removal of the gear fairing and floorboard inspection plates. Neither inspection program recommends a procedure for inspecting the landing gear strut either by removal of the gear, or the use of NDT.

The Safety Board issued Safety Recommendations A-01-01 and A-01-02 on March 16, 2001, that recommended the FAA issue airworthiness directives (AD) for initial and repetitive inspection of tailwheel-equipped Cessna 170, 180, 185, 190, and 195 series airplanes main landing gear spring struts. The Safety Board noted that Cessna tailwheel-equipped airplanes and Cessna nose wheel-equipped airplanes have main landing gear spring struts of similar design, but also indicated that there were only 5 reports of nose wheel-equipped main landing gear fatigue failures.

On August 31, 2001, the FAA disagreed with the Safety Board's recommendation, and indicated that not enough evidence was found to support an AD. The FAA indicated that the Cessna Maintenance Manual specified inspections of the landing gear every 50 hours and during annual inspections, and that these inspections were adequate to detect cracks in the main landing gear struts and additional action was not warranted. The FAA also indicated that a General Aviation Alert in Advisory Circular 43-16A (August 2001) was published to reiterate that visual inspections of the spring strut should be performed every 50 hours and during annual inspections as required by the Cessna maintenance manuals.

On March 25, 2002, the NTSB responded to the FAA by stating, in part: "The Safety Board continues to believe that a visual inspection alone will not detect cracks in the Cessna main landing gear spring struts. However, the Safety Board acknowledges that the statistical evidence does not warrant issuance of ADs at this time as called for in the Board's recommendation." The Safety Board subsequently classified Safety Recommendations A-01-01 and A-01-02 as "Closed, Reconsidered."

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	37,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	September 21, 2002
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	July 1, 2002
Flight Time:	2328 hours (Total, all aircraft), 580 hours (Total, this make and model), 2198 hours (Pilot In Command, all aircraft), 205 hours (Last 90 days, all aircraft), 58 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N8337Q
Model/Series:	206	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	U20603198
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	February 7, 2003 100 hour	**Certified Max Gross Wt.:**	3600 lbs
Time Since Last Inspection:	71 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	7050 Hrs as of last inspection	**Engine Manufacturer:**	CONTINENTAL
ELT:	Installed, not activated	**Engine Model/Series:**	IO-520-F
Registered Owner:	HOMER AIR INC.	**Rated Power:**	300 Horsepower
Operator:		**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	ENEC

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	30 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	15 knots / 25 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	60°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.92 inches Hg	**Temperature/Dew Point:**	5°C / 0°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	HOMER, AK (PAHO)	**Type of Flight Plan Filed:**	Company VFR
Destination:	BRADLEY LAKE, AK	**Type of Clearance:**	None
Departure Time:	17:00 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	BRADLEY LAKES AIRSTRIP	**Runway Surface Type:**	Gravel
Airport Elevation:	20 ft msl	**Runway Surface Condition:**	Wet
Runway Used:	06	**IFR Approach:**	None
Runway Length/Width:	2000 ft / 75 ft	**VFR Approach/Landing:**	Full stop;Straight-in

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Minor
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	59.75,-150.75

Administrative Information

Investigator In Charge (IIC):	Erickson, Scott
Additional Participating Persons:	JIM HELBERG; FAA-AL-ANC FSDO 03; ANCHORAGE, AK
Original Publish Date:	November 25, 2003
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=56741