Aviation Investigation Final Report

Location:	Denver, Colorado	**Accident Number:**	CEN10LA315
Date & Time:	June 12, 2010, 16:25 Local	**Registration:**	N195GL
Aircraft:	Beech 1900D	**Aircraft Damage:**	Substantial
Defining Event:	Landing gear collapse	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Ferry		

Analysis

When the crew retracted the landing gear after takeoff, they heard a loud "bang." When they lowered the gear, all three landing gear annunciator lights indicated SAFE, but the left gear light also indicated IN TRANSIT. After consulting with their maintenance department, the crew landed and, during rollout, the left main gear collapsed. Postaccident examination revealed the drag leg assembly was fractured. When the gear collapsed, a portion of the wing spar was torn out. Metallurgical examination revealed that both lugs that attach to the landing gear actuator and the rig plate were fractured and the drag leg was bent. The right-hand lug contained a fatigue crack that progressed to an overload failure. The other lug fractured completely through overload. The damage was pre-existent to that cracking, and served as a stress concentrator leading to the initiation of a fatigue crack. Spectrographic analysis of the upper drag leg arm showed that it met specified chemical composition requirements. At time of accident the aircraft had operated about 82.9 hours and 95 cycles since a detailed inspection of the landing gear was accomplished on May 28, 2010; no discrepancies related to the lug were noted at that time.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pre-existent damage of the right-hand landing gear actuator attachment lug which led to fatigue cracking and eventual overload failure resulting in a collapsed gear upon landing.

Findings

Aircraft	Landing gear actuator - Fatigue/wear/corrosion

Factual Information

History of Flight

Initial climb	Aircraft structural failure
Landing-landing roll	Landing gear collapse (Defining event)

On June 12, 2010, approximately 1625 mountain daylight time, a Beech 1900D, N195GL, registered to and operated by Great Lakes Aviation, Ltd., Cheyenne, Wyoming, was substantially damaged when the left main landing gear collapsed on landing at Denver International Airport (DEN), Denver, Colorado. Visual meteorological conditions (VMC) prevailed at the time of the accident. The positioning flight was being conducted under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91, and an instrument flight rules (IFR) flight plan had been filed. The airline transport certificated captain and commercial certificated first officer, the only occupants aboard, were not injured. The cross-country flight had just originated, and was destined for Cheyenne, Wyoming.

When the crew retracted the landing gear after takeoff, they heard a loud "bang." The crew circled the airport. When they lowered the landing gear, all three landing gear annunciator lights indicated SAFE, but the IN TRANSIT annunciator light also illuminated. After consulting with their maintenance department, the crew landed on runway 35R. During rollout, the left main gear collapsed. Post-accident examination revealed the drag leg assembly was fractured. When the gear collapsed, a portion of the wing spar bent.

On July 22, 2010, acting on behalf of the National Transportation Safety Board, representatives of the Federal Aviation Administration examined the drag leg assembly at Hawker Beechcraft's Metallurgical Engineering Laboratory in Wichita, Kansas. Also in attendance were representatives from Great Lakes Aviation.

The examination revealed that both lugs that attach to the landing gear actuator were fractured, as was the rig plate. The drag leg was bent. The right hand lug contained a fatigue crack that progressed to an overload failure. The other lug fractured completely through overload. Beach marks associated with the fatigue crack were clearly visible. The fracture surface was damaged by mating crack face abrasion. Striations and mechanical damage was also noted. The damage was pre-existent to the cracking, and served as a stress concentrator leading to the initiation of a fatigue crack.

The upper drag leg arm is made of aluminum alloy 7075 in the T6 temper. Spectrographic analysis showed that the material met the chemical composition requirements of that specification. Aerospace Material Specification (AMS) 2658 requires this material in the T6 temper to have a minimum Rockwell hardness of B scale 84 and a conductivity between 30.5 % IACS (International Annealed Copper Standard) and 36 % IACS. The drag leg had a Rockwell

hardness of B87.7 and displayed an electrical conductivity of 32% IACS.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	24,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):		**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	March 28, 2010
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 20, 2010
Flight Time:	3100 hours (Total, all aircraft), 2400 hours (Total, this make and model)		

Co-pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	29,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	September 4, 2009
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	January 20, 2010
Flight Time:	(Estimated) 1650 hours (Total, all aircraft), 1100 hours (Total, this make and model), 495 hours (Pilot In Command, all aircraft), 225 hours (Last 90 days, all aircraft), 75 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N195GL
Model/Series:	1900D	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	UE-195
Landing Gear Type:	Retractable - Tricycle	**Seats:**	21
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	17120 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo prop
Airframe Total Time:		**Engine Manufacturer:**	Pratt & Whitney
ELT:	Installed, not activated	**Engine Model/Series:**	PT6A-67D
Registered Owner:	Great Lakes Aviation, Ltd.	**Rated Power:**	1279 Horsepower
Operator:	Great Lakes Aviation, Ltd.	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:		**Operator Designator Code:**	GLBA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	DEN,5431 ft msl	**Distance from Accident Site:**	
Observation Time:	16:34 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 800 ft AGL	**Visibility**	2 miles
Lowest Ceiling:	Broken / 1000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	10°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.17 inches Hg	**Temperature/Dew Point:**	10°C / 8°C
Precipitation and Obscuration:			
Departure Point:	Denver, CO (DEN)	**Type of Flight Plan Filed:**	IFR
Destination:	Cheyenne, WY (CYS)	**Type of Clearance:**	IFR
Departure Time:	16:00 Local	**Type of Airspace:**	Air traffic control;Class B;Class C

Airport Information

Airport:	Denver International DEN	**Runway Surface Type:**	Concrete
Airport Elevation:	5431 ft msl	**Runway Surface Condition:**	Wet
Runway Used:	35R	**IFR Approach:**	ILS
Runway Length/Width:	12000 ft / 150 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

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:**	39.861667,-104.673057

Administrative Information

Investigator In Charge (IIC):	Scott, Arnold
Additional Participating Persons:	Michael J Hulett; FAA Flight Standards District Office; Denver, CO
Original Publish Date:	January 7, 2011
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=76305