Aviation Investigation Final Report

Location:	Longmont, Colorado	**Accident Number:**	CEN18LA059
Date & Time:	December 20, 2017, 08:50 Local	**Registration:**	N519MA
Aircraft:	AMERICAN CHAMPION AIRCRAFT 7GCAA	**Aircraft Damage:**	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The flight instructor and private pilot were conducting an instructional flight when the private pilot made a hard landing and the airplane bounced. The flight instructor heard a "snapping" sound during the landing and subsequently took over the flight controls. He increased engine power to compensate for the bounced landing then landed the airplane on the runway. Upon touchdown, the left landing gear collapsed up and aft. The airplane continued forward on its nose and left wing, then departed the left side of the runway. The left landing gear through bolt was found fractured.

A metallurgical examination of the landing gear through bolt fracture revealed two opposing regions of fatigue comprising 80-90% of the cross-sectional area of the bolt. These were separated by a narrow region of overstress, consistent with reverse bending fatigue crack propagation, which likely grew under low stress as evidenced by the length of the fatigue cracks.

The airplane was subject to a manufacturer service letter for inspection of the landing gear through bolts due to previous instances of cracking and failure. The service letter recommended that the inspections be performed on or before the next 100-hour inspection and at 100-hour intervals thereafter, and at more frequent intervals if the aircraft is used in soft or rough runway operations. The owner of the airplane was unaware of the service letter and stated that the airplane had not received the recommended inspection. Although not required, it is likely that had the service letter been complied with and the through bolt been regularly inspected, the fatigued bolt would have been replaced and the accident would have been prevented.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of the landing gear through bolt primarily due to fatigue during a hard landing, which resulted in a landing gear collapse and runway excursion. Contributing to the accident was noncompliance with the manufacturer service letter.

Findings

Aircraft	Main gear strut/axle/truck - Failure
Aircraft	Main gear strut/axle/truck - Fatigue/wear/corrosion
Aircraft	Main gear strut/axle/truck - Not serviced/maintained
Aircraft	Main gear strut/axle/truck - Not inspected
Aircraft	Scheduled maint checks - Not inspected
Personnel issues	Scheduled/routine inspection - Maintenance personnel

Factual Information

History of Flight

Landing	Hard landing
Landing	Dragged wing/rotor/float/other
Landing	Nose over/nose down
Landing	Landing gear collapse
Landing	Sys/Comp malf/fail (non-power) (Defining event)

On December 20, 2017, about 0850 mountain standard time, an American Champion Aircraft 7GCAA, N519MA, landed hard and departed the left side runway at Vance Brand Airport (LMO), Longmont, Colorado. The flight instructor and private pilot were not injured and the airplane sustained substantial damage during the runway excursion. The airplane was registered to CAG International Inc., and operated by Fly Elite Aviation, under the provisions of 14 *Code of Federal Regulations* Part 91 as an instructional flight. Visual meteorological conditions prevailed at the time of the accident and no flight pan had been filed. The local flight departed about 0845.

The flight instructor reported that private pilot made a hard landing during an instructional flight. The flight instructor heard a "snapping" sound during the landing so he took over the flight controls. He increased the throttle to compensate for the bounced landing and then landed the airplane on the runway. The left landing gear collapsed upward and aft damaging the left wing strut. The airplane continued forward on its nose and left wing as it departed the left side of the runway near taxiway A2 (figure 1).

Figure 1 – Accident airplane

The responding Federal Aviation Administration (FAA) inspector reported that the left landing gear thru-bolt was fractured. The left wing was bent upward, and the bottom and left side of the fuselage was damaged.

A metallurgical examination of the landing gear thru-bolt fracture revealed a primary fatigue fracture that initiated at the shank surface and propagated through about 60% of the bolt diameter (figure 2). A second fatigue crack initiated on the shank surface about 180° from the primary crack and propagated through 20% to 30% of the bolt diameter. The fracture surface exhibited a narrow region of overstress fracture between the two fatigue crack regions.

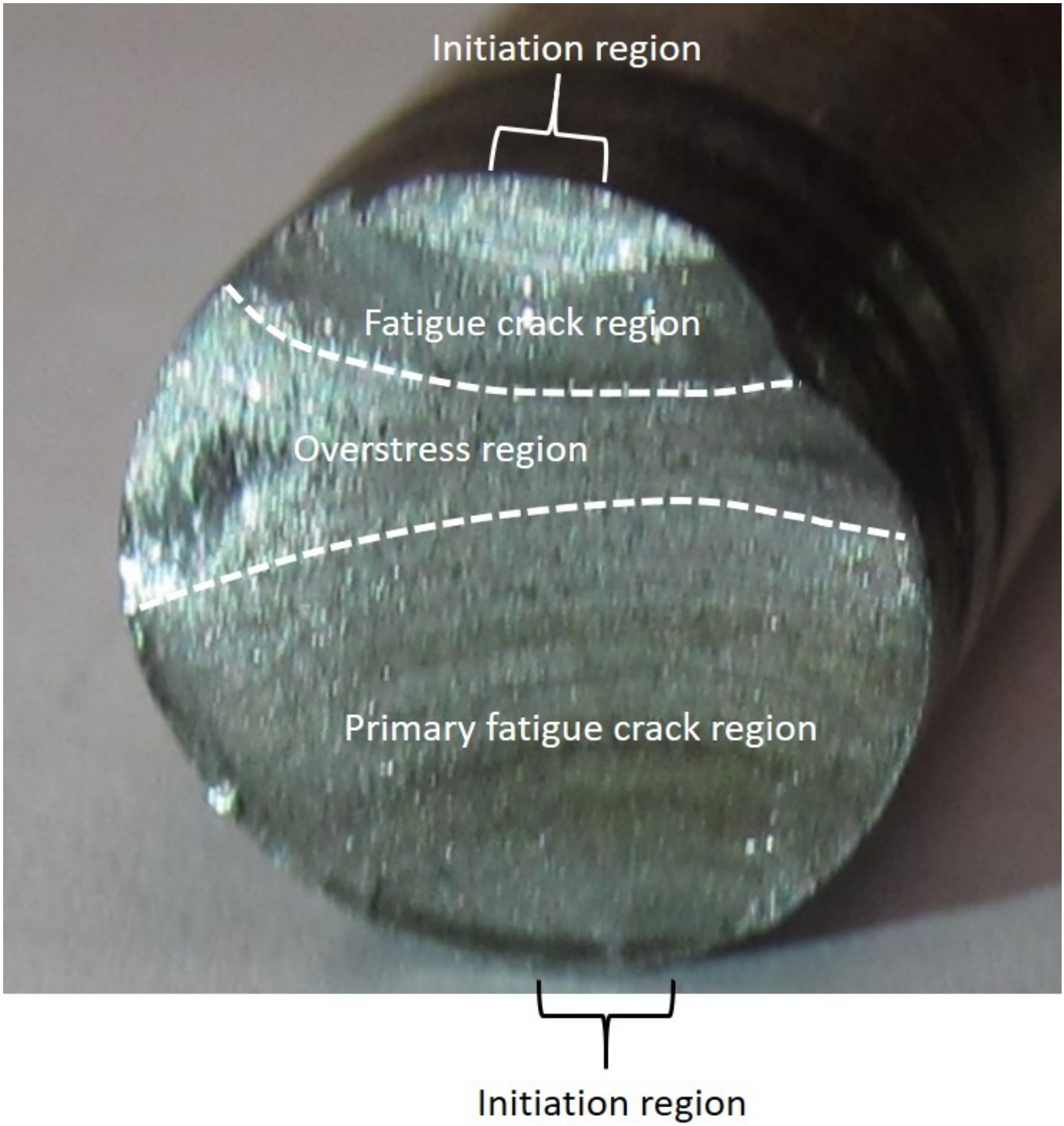

Figure 2 – Bolt fracture surface with notation

On December 13, 1978, Bellanca Aircraft Corporation issued FAA approved service letter C-135 for the purposes of inspecting landing gear thru-bolts and U-bolts. The service letter applied to the accident airplane and was issued due to reports of cracked and failed thru-bolts and U-bolts which were used to attach the landing gear to the fuselage frame. The service letter stated that these problems were due to

one or more of the following: (1) excessive loads during soft or rough runway operations; (2) improper torque; (3) corrosion. The service letter recommended the inspections be performed on or before the next 100-hour inspection and at 100-hour intervals thereafter, and at more frequent intervals if the aircraft is used in soft or rough runway operations.

The airplane owner stated that the Bellanca service letter C-135 had not been complied with, nor was it required under the FAA regulations. The owner provided documentation that on September 7, 2017, an airframe annual inspection and engine 100-hour inspection were completed at tachometer time 1,817.5 hours.

Flight instructor Information

Certificate:	Commercial; Flight instructor	**Age:**	56,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Rear
Other Aircraft Rating(s):	Glider	**Restraint Used:**	5-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	November 2, 2017
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	November 10, 2017
Flight Time:	3200 hours (Total, all aircraft), 118 hours (Total, this make and model), 45 hours (Last 90 days, all aircraft), 16 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Pilot Information

Certificate:	Private	**Age:**	38,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	October 13, 2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	May 20, 2017
Flight Time:	144 hours (Total, all aircraft), 8 hours (Total, this make and model), 8 hours (Last 90 days, all aircraft), 6 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	AMERICAN CHAMPION AIRCRAFT	**Registration:**	N519MA
Model/Series:	7GCAA NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:	2004	**Amateur Built:**	
Airworthiness Certificate:	Aerobatic; Normal	**Serial Number:**	489-2004
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	September 7, 2017 Annual	**Certified Max Gross Wt.:**	1750 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	1847 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	C91 installed, not activated	**Engine Model/Series:**	O-320-B2B
Registered Owner:	CAG INTERNATIONAL INC DBA	**Rated Power:**	160 Horsepower
Operator:	Fly Elite Aviation	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KLMO,5056 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	08:55 Local	**Direction from Accident Site:**	330°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	340°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.8 inches Hg	**Temperature/Dew Point:**	6°C / -4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Longmont, CO (LMO)	**Type of Flight Plan Filed:**	None
Destination:	Longmont, CO (LMO)	**Type of Clearance:**	None
Departure Time:	08:45 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	VANCE BRAND LMO	**Runway Surface Type:**	Concrete
Airport Elevation:	5055 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	29	**IFR Approach:**	None
Runway Length/Width:	4799 ft / 75 ft	**VFR Approach/Landing:**	Traffic pattern

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:**	40.165832,-105.166114(est)

Administrative Information

Investigator In Charge (IIC):	Lindberg, Joshua
Additional Participating Persons:	Mark Schmidt ; Federal Aviation Administration; Denver, CO
Original Publish Date:	July 5, 2018
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=96525