National Transportation Safety Board
Aviation Accident Final Report

Location:	Salinas, CA	**Accident Number:**	WPR16LA139
Date & Time:	07/08/2016, 1604 PDT	**Registration:**	N89965
Aircraft:	CESSNA 140	**Aircraft Damage:**	Substantial
Defining Event:	Landing gear collapse	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The private pilot made a normal landing in his 1946 tailwheel-equipped airplane. During the landing roll, the left wing began to dip. The pilot applied opposite aileron, but the airplane continued to roll to the left, and the cabin floor deformed upward. The left wing and propeller struck the runway surface, and the airplane came to a stop on the runway shortly thereafter. Postaccident examination revealed that the left main landing gear leg had rotated aft and up, and that the landing gear leg support structure formed by two transverse bulkheads and portions of the lower fuselage skin had failed. Comparisons of fasteners, skin, and fairing panels revealed some discrepancies between the existing configuration and the original design, but the exact pre-accident configuration and condition could not be determined. Detailed laboratory examination revealed that the joint between the aft landing gear bulkhead and the lower fuselage skin had failed in fatigue. The fatigue failure sites were in a region of the airplane's structure that was not readily accessible for cleaning or inspection, and some sludge-like deposits of unidentified substance were observed in the location of the fatigue failure.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The fatigue failure of a bulkhead-skin joint that supported the main landing gear leg, which resulted in the collapse of the left main landing gear. Contributing to the failure were the non-original structural configuration of the 60-year-old airplane and the relative inaccessibility for inspection or cleaning of the structure in the region of the fatigue failure.

Findings

Aircraft	Bulkheads (main fuselage) - Failure (Cause)

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Landing-landing roll	Landing gear collapse (Defining event)

On July 8, 2016, about 1604 Pacific daylight time, a Cessna 140, N89965, was substantially damaged when the left main landing gear collapsed during landing at Salinas Municipal airport (SNS), Salinas, California. The pilot/owner and his passenger were uninjured. The personal flight was conducted under the provisions of Title 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed.

The pilot stated that he was on a cross country flight from Charles M Schulz - Sonoma County airport (STS), Santa Rosa, California, to his home airport of Paso Robles Municipal airport (PRB), and that the landing at SNS was a planned intermediate stop. The flight from STS was uneventful, as was the approach to, and initial touchdown on, runway 26 at SNS. The pilot stated that he made a normal three-point landing, and during rollout, the left wing dipped. He applied opposite aileron, but the airplane continued to roll to the left, and then the cabin floor beneath his legs deformed upward. The left wing and propeller struck the runway surface, and the airplane came to a stop on the runway shortly thereafter.

Post accident examination of the airplane revealed that the left main landing gear had rotated aft and up, and that the landing gear leg support structure formed by two transverse bulkheads and lower fuselage skins had failed. The airplane was retained by the NTSB for additional examination.

Pilot Information

Certificate:	Private	**Age:**	54, Male
Airplane Rating(s):	Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap Only
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3	**Last FAA Medical Exam:**	07/01/2016
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	01/23/2016
Flight Time:	(Estimated) 177 hours (Total, all aircraft), 33 hours (Total, this make and model), 115 hours (Pilot In Command, all aircraft), 12 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft)		

According to the pilot, he had a total flight experience of about 177 hours, including about 33 hours in the accident airplane. He obtained his private pilot certificate in March 2015, and his tailwheel endorsement in January 2016. His most recent FAA third-class medical certificate was issued in July 2016.

Aircraft and Owner/Operator Information

Aircraft Make:	CESSNA	**Registration:**	N89965
Model/Series:	140 G	**Aircraft Category:**	Airplane
Year of Manufacture:	1946	**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	9017
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	01/01/2016, Annual	**Certified Max Gross Wt.:**	1601 lbs
Time Since Last Inspection:	27 Hours	**Engines:**	1 Reciprocating
Airframe Total Time:	4800 Hours at time of accident	**Engine Manufacturer:**	CONT MOTOR
ELT:	Installed, not activated	**Engine Model/Series:**	C85 SERIES
Registered Owner:	On file	**Rated Power:**	85 hp
Operator:	On file	**Operating Certificate(s) Held:**	None

FAA information indicated that the airplane, serial number 9017, was manufactured in 1946, and was equipped with a Continental C-85 series engine. The airplane was registered to the pilot in January 2016. The pilot reported that the airplane had an approximate total time in service of 4,800 hours.

Complete maintenance records were not available for the airplane. Examination of the airplane and the available maintenance records indicated that in June 1952, Cessna wheel extension kit # 53-3-115 was installed. These wheel extensions bolt to the bottom of each main landing gear leg and move the MLG axles about 4 inches forward. The purpose of these extensions is to reduce the likelihood of a propeller ground strike. An unintended effect of these extensions is to increase the loading moment on the MLG legs where they attach to the fuselage. The installation of the kits did not require any additional or different airworthiness or inspection requirements.

The most recent annual inspection noted in the airframe log was completed on September 2014, and listed a tachometer time of 340.5 hours. The most recent annual inspection noted in the engine log was incompletely dated "2016," and listed a tachometer time of 347.0 hours. A subsequent engine log entry was dated "1/1/2016" and cited the same tachometer time of 347.0 hours.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	SNS, 84 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	1553 PDT	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 Miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	13 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	280°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.02 inches Hg	**Temperature/Dew Point:**	18°C / 12°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Santa Rosa, CA (STS)	**Type of Flight Plan Filed:**	None
Destination:	Salinas, CA (SNS)	**Type of Clearance:**	None
Departure Time:	1445 PDT	**Type of Airspace:**	Class D

The 1553 SNS automated weather observation included winds from 280 degrees at 13 knots, visibility 10 miles, clear skies, temperature 18 degrees C, dew point 12 degrees C, and an altimeter setting of 30.02 inches of mercury.

The 1632 SNS special weather observation included winds from 280 degrees at 12 knots, visibility 10 miles, a broken cloud layer at 1,500 ft above ground level, with the same temperature, dew point, and altimeter setting as above.

Airport Information

Airport:	Salinas (SNS)	**Runway Surface Type:**	Asphalt
Airport Elevation:	84 ft	**Runway Surface Condition:**	Dry
Runway Used:	26	**IFR Approach:**	None
Runway Length/Width:	6004 ft / 150 ft	**VFR Approach/Landing:**	Traffic Pattern

SNS runway 26 was asphalt, and measured 6,004 by 150 feet. The airport elevation was listed in the FAA database as 84.3 feet. At the time of the accident, the air traffic control tower was staffed and operating.

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	36.662778, -121.606389 (est)

Examination of the airplane revealed that the left MLG leg had rotated aft and up; this deformation was accompanied by significant tearing and folding of the fuselage skin and underlying structure where the MLG leg attached to the fuselage. The cabin floor under the pilot's legs was also torn and deformed, generally in an upward direction. The pilot's cabin door and the left wing struts were also found to be deformed, and the propeller tips bore evidence of a ground strike while the engine was under power.

Detailed examination revealed that the two steel MLG legs were each attached to two steel fittings that were oriented fore-aft between two transverse aluminum D-shaped bulkheads. The flat edges of the D-bulkheads faced up, and attached to the cabin/cockpit floor, while the curved edges faced down, formed the lower fuselage outer mold line, and attached to the lower fuselage skins. The right side MLG leg and steel fittings remained relatively intact. Inspection of the fasteners in this region revealed that several of these fasteners, as well as some small skin or fairing panels, did not conform to the original Cessna drawings. No corresponding logbook entries were located, so the reasons and dates of these alterations were not able to be determined.

The left side MLG leg and steel fitting geometry remained in its original configuration, but the lower skins, cockpit floor, and two D-bulkheads were torn and deformed, which allowed the left MLG leg to pivot aft and up. The lower forward corner of the junction of the forward bulkhead and the lower skins exhibited tearing, generally along the fastener line. Several fasteners had failed and/or were absent. Similar to the right side, a variety of fastener types and some skin modifications which did not conform to the original design drawings were observed. Damage, missing fasteners, and lack of detailed maintenance records precluded an exact determination of the pre-accident configuration and condition of this section of the airplane structure.

Portions of the failed skin/bulkhead area were also heavily contaminated with unidentified, sludge-like debris. This debris was located in regions that would be difficult or impossible to access for inspection or cleaning without removing one or more riveted panels.

The damaged bulkhead and skin assembly was excised from the airplane and sent to the NTSB Materials Laboratory for failure analysis. The laboratory analysis revealed the presence of multiple fatigue cracks in the failed skin that was along the lower fastener line of the aft bulkhead. These fatigue cracks were in one of the regions of the bulkheads and skins contaminated by the sludge-like debris. The debris composition was not analyzed.

Although the landing gear extensions changed the loading of the MLG legs and support structure, their potential contribution to the failure was not evaluated.

Additional details are available in the NTSB public docket for this accident.

Administrative Information

Investigator In Charge (IIC):	Michael C Huhn	**Report Date:**	07/20/2017
Additional Participating Persons:	Michael Schaadt; FAA; San Jose, CA		
Publish Date:	07/20/2017		
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=93603		