



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	Acampo, CA	<b>Accident Number:</b>	WPR16LA107
<b>Date &amp; Time:</b>	05/12/2016, 1413 PDT	<b>Registration:</b>	N1114A
<b>Aircraft:</b>	CESSNA 208B	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of engine power (total)	<b>Injuries:</b>	1 Minor, 17 None
<b>Flight Conducted Under:</b>	Part 91: General Aviation - Skydiving		

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## Analysis

The commercial pilot reported that, after takeoff on the local skydiving flight, the engine experienced a total loss of power. He initiated a turn toward the airport, but realized the airplane would not reach the runway and chose to perform a forced landing to an open field. During the landing roll, the airplane exited the field, crossed a road, impacted a truck, and continued into a vineyard, where it nosed over.

Postaccident examination of the engine revealed that the fuel pressure line that connects the fuel control unit to the airframe fuel pressure transducer was fractured below the fuel control unit fitting's swaged seat. In addition, a supporting clamp for the fuel pressure fuel line was fractured and separated. The operator reported that the fractured fuel line had been replaced the night before the accident and had accumulated about 4 hours of operational time. The previously-installed line had also fractured.

Metallurgical examination of the two fractured fuel lines revealed that both fuel lines fractured due to reverse bending fatigue through the tube wall where a ferrule was brazed to the outside of the tube. There were no apparent anomalies or defects at the crack initiation sites. Examination of the supporting clamp determined that it fractured due to unidirectional bending fatigue where one of the clamp's tabs met the clamp loop, with the crack initiating along the inward-facing side of the clamp. The orientation of the reverse bending fatigue cracks and the spacing of the fatigue striations on the tube fracture surfaces were consistent with high-cycle bending fatigue due to a vibration of the tube. The cushioned support clamp is designed to prevent such vibrations from occurring. However, if the clamp tab is fractured, it cannot properly clamp the tube and will be unable to prevent the vibration. The presence of the fractured clamp combined with the fact that the two pressure tubes failed in similar modes in short succession indicated that the clamp most likely failed first, resulting in the subsequent failure of the tubes. Since the clamp was likely fractured when the first fractured fuel pressure line was replaced, the clamp was either not inspected or inadequately inspected at the time of the maintenance.

## Probable Cause and Findings

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

A total loss of engine power due to a fatigue fracture of the fuel pressure line that connected the fuel control unit and the fuel flow transducer due to vibration as the result of a fatigue fracture of an associated support clamp. Contributing to the accident was the mechanic's inadequate inspection of the fuel line support clamp during the previous replacement of the fuel line.

### Findings

Aircraft	Fuel distribution - Failure (Cause)
Personnel issues	Inspection - Maintenance personnel (Factor)

## Factual Information

On May 12, 2016, about 1413 Pacific daylight time, a Cessna 208B, N1114A, was substantially damaged during a forced landing near Acampo, California. The airplane was registered to Flanagan Enterprises (Nevada) INC., and operated by the Parachute Center under the provisions of 14 *Code of Federal Regulations* Part 91. The commercial pilot sustained minor injuries and his 17 passengers were not injured. Visual meteorological conditions prevailed and no flight plan was filed for the skydiving flight. The local flight originated about 1 minute prior to the accident.

The pilot reported that following takeoff from runway 26, he made a right turn and continued his climb for the skydive drop, however, as the airplane passed 1,000 ft above ground level (agl), the engine lost power. The pilot initiated a turn toward the airport, however, realized he was unable to make it, and landed in an open field. During the landing roll, the airplane exited the field, crossed a road, impacted a truck, continued into a vineyard, and nosed over.

Examination of the airplane by a Federal Aviation Administration inspector revealed that the fuselage and left wing were substantially damaged. The wreckage was recovered to a secure location for further examination.

Examination of the recovered wreckage was conducted on May 17 and 18, 2016. The engine remained partially attached to the fuselage. The fuel pressure line that connects the fuel control unit to the airframe fuel pressure transducer, Pratt & Whitney Canada (PWC) part number 3033981, was fractured below the fuel control unit fitting swaged seat. The supporting clamp, PWC part number 3006614, was fractured and was separated from its mating fuel pressure fuel line, PWC part number 3032010. In addition, the airframe P3 air line that provides air to the vacuum system exhibited a hole within the tube.

The operator reported that they had replaced the fuel line, PWC part number 3033981, the night before the accident due to the original fuel line being fractured. They stated that the new fuel line had about 4 hours of operational time since the installation. Review of the maintenance logbooks revealed that an entry regarding the replacement of the fuel line was dated April 11, 2016, with no airframe, engine, or HOBBS meter times listed. The operator was further questioned about what manual they used regarding engine maintenance and they replied they used the manufacturers manual for all engine related maintenance. When questioned about the supporting clamp, PWC part number 3006614, the operator stated that the clamp was attached at the time of the fuel line replacement.

Both the new and old fuel lines and separated clamp were sent to the National Transportation Safety Board Materials Laboratory for further examination. A Senior Materials Engineer examined the fuel lines and clamp and reported that the fuel line fracture surfaces were examined with the aid of a digital optical microscope and a scanning electron microscope and both fractured tubes were found to exhibit features consistent with crack initiation due to reverse bending fatigue.

The metal band of the clamp was fractured near the intersection of the tab and the loop portion of the clamp. The fracture surfaces were examined and exhibited features consistent with crack initiation at the inward-facing side of the tab due to bending fatigue. The fracture surface exhibited a comparatively flat appearance with curved crack progression marks on the fracture surface consistent with the crack initiating on the inward-facing side of the tab.

For further information, see the Materials Laboratory Factual Report within the public docket for this accident.

## History of Flight

<b>Enroute-climb to cruise</b>	Loss of engine power (total) (Defining event)
<b>Landing</b>	Off-field or emergency landing Collision with terr/obj (non-CFIT) Nose over/nose down

## Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	64, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land; Single-engine Sea	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	Glider	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 Without Waivers/Limitations	<b>Last FAA Medical Exam:</b>	07/04/2016
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	03/02/2015
<b>Flight Time:</b>	7050 hours (Total, all aircraft), 253 hours (Total, this make and model), 6680 hours (Pilot In Command, all aircraft), 80 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

Aircraft Manufacturer:	CESSNA	Registration:	N1114A
Model/Series:	208B B	Aircraft Category:	Airplane
Year of Manufacture:	1992	Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	208B0309
Landing Gear Type:	Tricycle	Seats:	
Date/Type of Last Inspection:	02/10/2016, 100 Hour	Certified Max Gross Wt.:	7449 lbs
Time Since Last Inspection:	69 Hours	Engines:	1 Turbo Prop
Airframe Total Time:	12848.9 Hours at time of accident	Engine Manufacturer:	P&W
ELT:	Installed, not activated	Engine Model/Series:	PT6A SER
Registered Owner:	FLANAGAN ENTERPRISES (NEVADA) INC	Rated Power:	0 hp
Operator:	Parachute Center	Operating Certificate(s) Held:	None

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	KSAC, 15 ft msl	Observation Time:	2053 UTC
Distance from Accident Site:	21 Nautical Miles	Direction from Accident Site:	328°
Lowest Cloud Condition:	Clear	Temperature/Dew Point:	31° C / 12° C
Lowest Ceiling:	None	Visibility	10 Miles
Wind Speed/Gusts, Direction:	Calm	Visibility (RVR):	
Altimeter Setting:	29.96 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Acampo, CA (103)	Type of Flight Plan Filed:	None
Destination:	Acampo, CA (103)	Type of Clearance:	None
Departure Time:	PDT	Type of Airspace:	Class G

## Airport Information

Airport:	LODI (103)	Runway Surface Type:	
Airport Elevation:	60 ft	Runway Surface Condition:	Dry
Runway Used:	N/A	IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	Forced Landing

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Minor	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	17 None	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Minor, 17 None	<b>Latitude, Longitude:</b>	38.203333, -121.255278

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Joshua Cawthra	<b>Adopted Date:</b>	03/19/2018
<b>Additional Participating Persons:</b>	David Jensen; Federal Aviation Administration; Oakland, CA Ernie Hall; Cessna Aircraft; Wichita, KS Thomas Berthe; P&W Canada; Montreal, Michael Moore; Blackhawk Modifications Inc; Waco, TX		
<b>Publish Date:</b>	03/19/2018		
<b>Note:</b>	The NTSB did not travel to the scene of this accident.		
<b>Investigation Docket:</b>	<a href="http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=93159">http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=93159</a>		

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