



# Aviation Investigation Final Report

<b>Location:</b>	Acampo, California	<b>Accident Number:</b>	WPR16LA107
<b>Date &amp; Time:</b>	May 12, 2016, 14:13 Local	<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		

## 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

<b>Aircraft</b>	Fuel distribution - Failure
<b>Personnel issues</b>	(general) - Maintenance personnel

## Factual Information

### History of Flight

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

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.

### Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	64, Male
<b>Airplane Rating(s):</b>	Single-engine land; Single-engine sea; Multi-engine land	<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>	July 4, 2016
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	March 2, 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

<b>Aircraft Make:</b>	Cessna	<b>Registration:</b>	N1114A
<b>Model/Series:</b>	208B B	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1992	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	208B0309
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	
<b>Date/Type of Last Inspection:</b>	February 10, 2016 100 hour	<b>Certified Max Gross Wt.:</b>	7449 lbs
<b>Time Since Last Inspection:</b>	69 Hrs	<b>Engines:</b>	1 Turbo prop
<b>Airframe Total Time:</b>	12848.9 Hrs at time of accident	<b>Engine Manufacturer:</b>	P&W
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	PT6A SER
<b>Registered Owner:</b>	FLANAGAN ENTERPRISES (NEVADA) INC	<b>Rated Power:</b>	0 Horsepower
<b>Operator:</b>	Parachute Center	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KSAC, 15 ft msl	<b>Distance from Accident Site:</b>	21 Nautical Miles
<b>Observation Time:</b>	20:53 Local	<b>Direction from Accident Site:</b>	328°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	/	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>		<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	29.95 inches Hg	<b>Temperature/Dew Point:</b>	31°C / 12°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Acampo, CA (103)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Acampo, CA (103)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>		<b>Type of Airspace:</b>	Class G

## Airport Information

<b>Airport:</b>	LODI 103	<b>Runway Surface Type:</b>	
<b>Airport Elevation:</b>	60 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>		<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>		<b>VFR Approach/Landing:</b>	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>	38.203334,-121.255279

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Cawthra, Joshua
<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>Original Publish Date:</b>	March 19, 2018
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=93159">https://data.nts.gov/Docket?ProjectID=93159</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).