



# Aviation Investigation Final Report

<b>Location:</b>	Sioux Falls, South Dakota	<b>Accident Number:</b>	CEN16LA201
<b>Date &amp; Time:</b>	May 27, 2016, 09:15 Local	<b>Registration:</b>	N76MD
<b>Aircraft:</b>	Cessna 402B	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Fire/smoke (non-impact)	<b>Injuries:</b>	2 None
<b>Flight Conducted Under:</b>	Part 91: General aviation - Instructional		

## Analysis

The commercial pilot in the left seat and the airline transport pilot in the right seat were conducting new-hire training for the left-seat pilot. While maneuvering for a practice approach, the pilots noticed the left engine was running rough. The left-seat pilot activated the auxiliary fuel pump, and the roughness resolved temporarily. Shortly thereafter, the left engine tachometer went to zero, and the left-seat pilot noticed flames emitting from the left engine cowling. The pilots declared an emergency, secured the left engine, and landed the airplane uneventfully; the wing structure was damaged by the fire. Examination of the left engine revealed thermal damage to the No. 4 cylinder, consistent with a preexisting crack condition that allowed exhaust gas to erode the cylinder head and resulted in an engine fire.

## Probable Cause and Findings

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

The failure of the No. 4 cylinder head, which resulted in an engine fire and subsequent damage to the wing structure.

## Findings

<b>Aircraft</b>	Recip eng cyl section - Failure
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## Factual Information

### History of Flight

Approach	Fire/smoke (non-impact) (Defining event)
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On May 27, 2016, at 0915 central daylight time, a Cessna 402B airplane, N76MD, experienced an in-flight left engine fire while maneuvering near the Joe Foss Field Airport (FSD), Sioux Falls, South Dakota. The airline transport pilot and commercial pilot were not injured, and the airplane sustained substantial damage to the left wing. The airplane was operated by Encore Air Cargo, Sioux Falls, South Dakota, as a 14 Code of Federal Regulations Part 91 instructional flight. Visual meteorological conditions prevailed at the time of the accident and a company flight plan was filed. The local flight departed FSD at 0840.

According to the airline transport pilot, while maneuvering for a practice approach, the flight crew noticed a rough running left engine. The commercial pilot activated the auxiliary fuel pump, and the engine then operated without issue. Shortly thereafter, the left engine tachometer went to zero and the commercial pilot, who was seated in the left seat, noticed flames emitting from the left engine cowling. The flight crew declared an emergency and secured the left engine. The airplane landed uneventfully and taxied to the company ramp.

Postaccident examination of the airplane by a Federal Aviation Administration inspector and company mechanics revealed substantial damage to the left wing structure and firewall. In addition, the number 4 cylinder was burned through at the exhaust port. The number 6 cylinder valve cover displayed thermal damage consistent with the observed damage to the number 4 cylinder. The number 4 cylinder was removed and sent to Continental Motors Group, Mobile, Alabama, for further examination.

On October 13, 2016, the number 4 cylinder was examined by the Continental Motors Group under the supervision of a National Transportation Safety Board investigator. Examination of the cylinder showed a burned through area at the cylinder head exhaust port, consistent with a preexisting crack that allowed exhaust gas to erode the cylinder head. A preexisting crack could not be determined due to the erosion of the burned through area. In addition to the burned through area, a crack was noted on the opposite side of the exhaust port.

According to the maintenance records, the number 4 cylinder was overhauled 178.3 hours prior to the accident.

## Pilot Information

<b>Certificate:</b>	Airline transport; Flight instructor	<b>Age:</b>	33,Female
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane multi-engine; Airplane single-engine; Instrument airplane	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 With waivers/limitations	<b>Last FAA Medical Exam:</b>	July 24, 2015
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	March 9, 2016
<b>Flight Time:</b>	3997 hours (Total, all aircraft), 1849 hours (Total, this make and model), 2945 hours (Pilot In Command, all aircraft), 54 hours (Last 90 days, all aircraft), 14 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

## Pilot Information

<b>Certificate:</b>	Commercial; Flight instructor	<b>Age:</b>	28,Female
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane single-engine	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	November 12, 2015
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	June 30, 2014
<b>Flight Time:</b>	1248 hours (Total, all aircraft), 10 hours (Total, this make and model), 975 hours (Pilot In Command, all aircraft), 90 hours (Last 90 days, all aircraft), 13 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Cessna	<b>Registration:</b>	N76MD
<b>Model/Series:</b>	402B B	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1977	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	402B1055
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	2
<b>Date/Type of Last Inspection:</b>	March 4, 2016 Annual	<b>Certified Max Gross Wt.:</b>	6300 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	2 Reciprocating
<b>Airframe Total Time:</b>	13479 Hrs at time of accident	<b>Engine Manufacturer:</b>	CONT MOTOR
<b>ELT:</b>	C91 installed, not activated	<b>Engine Model/Series:</b>	TSIO-520-E
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	300 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	On-demand air taxi (135)

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	FSD,1429 ft msl	<b>Distance from Accident Site:</b>	0 Nautical Miles
<b>Observation Time:</b>	08:56 Local	<b>Direction from Accident Site:</b>	0°
<b>Lowest Cloud Condition:</b>	10000 ft AGL	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	Overcast / 12000 ft AGL	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	8 knots /	<b>Turbulence Type Forecast/Actual:</b>	/ None
<b>Wind Direction:</b>	170°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	29.78 inches Hg	<b>Temperature/Dew Point:</b>	17°C / 13°C
<b>Precipitation and Obscuration:</b>	Light - None - Rain		
<b>Departure Point:</b>	Sioux Falls, SD (FSD)	<b>Type of Flight Plan Filed:</b>	Company VFR
<b>Destination:</b>	Sioux Falls, SD (FSD)	<b>Type of Clearance:</b>	Traffic advisory;VFR flight following
<b>Departure Time:</b>	08:40 Local	<b>Type of Airspace:</b>	Class D

## Airport Information

<b>Airport:</b>	Joe Foss Field Airport FSD	<b>Runway Surface Type:</b>	Concrete
<b>Airport Elevation:</b>	1429 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	15	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	8000 ft / 150 ft	<b>VFR Approach/Landing:</b>	Forced landing

## Wreckage and Impact Information

<b>Crew Injuries:</b>	2 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	In-flight
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 None	<b>Latitude, Longitude:</b>	43.582778,-96.742774(est)

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Sauer, Aaron
<b>Additional Participating Persons:</b>	Lori Thomasson; Federal Aviation Administration; Rapid City, SD
<b>Original Publish Date:</b>	January 18, 2017
<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.ntsb.gov/Docket?ProjectID=93282">https://data.ntsb.gov/Docket?ProjectID=93282</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](#).