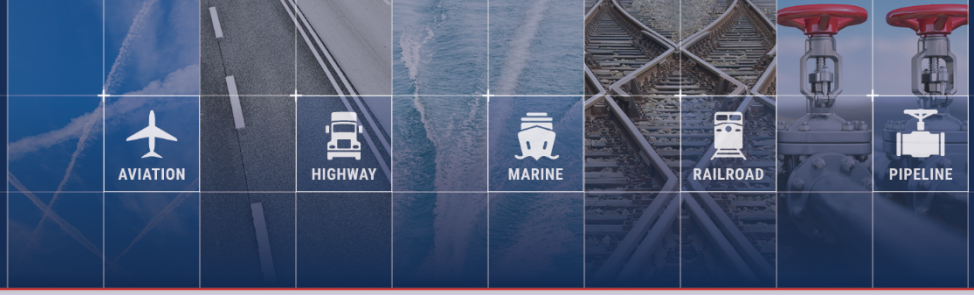

Aviation Investigation Factual Report

Location:	Homerville, Georgia	**Accident Number:**	ERA17LA176
Date & Time:	May 9, 2017, 15:25 Local	**Registration:**	N714DW
Aircraft:	Cessna 150M	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Factual Information

On May 9, 2017, about 1525 eastern daylight time, a Cessna 150M, N716DW, was substantially damaged when it was involved in an accident near Homerville, Georgia. The pilot was uninjured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot reported that he was in cruise flight at 3,000 ft mean sea level when he heard an unusual sound come from the engine and the engine power began to decrease to 1,500 rpm. The pilot turned the carburetor heat on, but power was not restored. He then checked the positions of the fuel selector and the engine primer. Light smoke began to enter the cockpit, and at the same time, a small piece of debris struck the windshield. The pilot declared an emergency with air traffic control, established the airplane at its best glide airspeed, and began looking for a suitable forced landing area.

As he descended the airplane toward the forced landing site, the pilot turned off electrical power. The main landing gear touched down first; however, the surface of the field was soft and rough, and the airplane nosed over and came to rest inverted.

Examination of the engine revealed that the barrel of the No. 4 cylinder separated at a point halfway along the length of the barrel and the No. 4 piston displayed heavy impact damage. The No. 4 connecting rod was bent, and the No. 4 piston pin was missing.

Examination of the components of the No. 4 cylinder by the NTSB Materials Laboratory revealed that the connecting rod, cap, and bolts were all intact, with no fractures; however, the connecting rod body was
deflected along the web near the piston pin bore. The sides of the rod exhibited scraping or gou ging damage, and the pin bore of the connecting rod was deformed, consistent with elongation along the length of the rod.

The crankshaft bearing surfaces were intact and exhibited minimal wear. Much of the piston exhibited severe deformation and material loss. The fracture surfaces on the underside of the piston were heavily damaged due to post-fracture impact and corrosion damage. The visible fracture features were consistent with overstress, with the fracture originating about the pin hole bore of the piston. The cylinder had fractured about the compression wall at the 10th cooling fin valley when counted from the larger main body cooling fins of the cylinder head. Several of the fin flange surfaces exhibited small circular features consistent with pitting.

The fracture located on the head side and the piston, or open, side of the cylinder halves were relatively flat and exhibited a reflective luster. Much of the fracture surface was damaged or entirely obliterated by post-fracture smearing or contact.

Closer examination of the head side fracture surface revealed that a portion exhibited crack arrest marks consistent with fatigue cracking. The crack arrest features were present along approximately 30% of the fracture surface circumference and propagated around the cylinder cross section from a singular point. The crack initiation site was located on the exterior surface of the cylinder fin valley. An initial thumbnail crack was present adjacent to the crack initiation site, with radial marks and crack arrest marks propagating outward.

The cylinder fracture surfaces were examined using a scanning electron microscope. An area of undamaged fracture surfaces near the end of the progressive cracking area displayed crack arrest marks and radial lines consistent with the crack propagation direction. Inside this region, fatigue striations were present, consistent with fatigue crack propagation. Outside the fatigue crack, dimple rupture was observed, consistent with subsequent overstress fracture.

Multiple corrosion pits were present at the fatigue crack initiation site. The pits contained non-conductive (non-metallic) compounds consistent with an iron oxide, containing detectable levels of sodium, magnesium, phosphorus, potassium, sulfur, and calcium. These elements were not present in the bulk of the materials. The chemical composition was consistent with an alloy steel.

A portion of the cylinder and fins near the fracture surface was sectioned, mounted, and polished for metallographic examination. Of note were features present along the adjacent cooling fin valleys where corrosion pits were present on the surface, with non-metallic compounds contained within. These corrosion pits were found on much of the surfaces examined in the cross-section. The composition of these compounds, as examined using energy dispersive x-ray spectroscopy, was consistent with that of the iron oxide compounds observed on the corrosion pits at the fatigue crack initiation site on the fracture surface.

Surface corrosion was present at all the examined fin valleys. The chemical composition of these compounds was consistent with that of the corrosion pit compounds, and further examination revealed that the surface corrosion compounds were cracked and discontinuous. The underlying interface with the base metal was also tortuous in morphology, consistent with widespread pitting corrosion.

Continental Motors Service Information Letter 98-9C stated that the time between overhaul (TBO) for the O-200-A engine was 2,000 hours of operation or 12-years (whichever occurred first), and that an engine's published TBO does not mean that every engine will operate the number of hours or years listed without requiring component replacements and/or unscheduled maintenance events. Noncompliance with instructions for continued airworthiness, operational and/or environmental factors may necessitate repair or replacement of the engine, engine components and accessories earlier than the published TBO.

According to FAA and maintenance records, the engine was manufactured on April 22, 1970. The engine received a complete overhaul on August 9, 1996. The engine was "top overhauled" with four new ECI cylinders on May 15, 2008.

The airplane's most recent annual inspection was completed on May 3, 2017. At the time of the accident, the airplane had accrued about 7,341.7 total hours of operation, and the engine had accrued about 2,249.3 total hours since the 1996 overhaul.

A nearly identical cylinder failure was documented in 2016 (NTSB Case No. CEN16LA306). Examination of that engine revealed that the No. 2 cylinder was completely separated between the flange and the head as the result of a fatigue crack that initiated at a cooling fin valley on the exterior surface. The fatigue crack grew around 40% of the circumference of the cylinder, and overstress led to the eventual cylinder fracture. A metallographic cross-section of the cylinder revealed corrosion pits under the paint and primer.

Pilot Information

Certificate:	Private	**Age:**	28,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	January 17, 2017
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	April 25, 2017
Flight Time:	198 hours (Total, all aircraft), 194 hours (Total, this make and model), 167 hours (Pilot In Command, all aircraft), 142 hours (Last 90 days, all aircraft), 57 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N714DW
Model/Series:	150M	**Aircraft Category:**	Airplane
Year of Manufacture:	1976	**Amateur Built:**	
Airworthiness Certificate:	Normal; Utility	**Serial Number:**	15079105
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	May 3, 2017 100 hour	**Certified Max Gross Wt.:**	1601 lbs
Time Since Last Inspection:	32 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	7309.6 Hrs as of last inspection	**Engine Manufacturer:**	CONT MOTOR
ELT:	Installed	**Engine Model/Series:**	O-200-A48
Registered Owner:	On file	**Rated Power:**	100 Horsepower
Operator:	Tailwheels Etc.	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KHOE,188 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	15:35 Local	**Direction from Accident Site:**	53°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	32°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	LAKE CITY, FL (LCQ)	**Type of Flight Plan Filed:**	None
Destination:	EASTMAN, GA (EZM)	**Type of Clearance:**	VFR flight following
Departure Time:	14:40 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	31.053333,-82.77111(est)

Administrative Information

Investigator In Charge (IIC):	Gunther, Todd
Additional Participating Persons:	Kenneth Reed; FAA/FSDO; College Park, GA John Kent; Continental Motors Inc.; Mobile, AL
Report Date:	
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=95145

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.