Aviation Investigation Final Report

Location:	Ider, Alabama	**Accident Number:**	ERA18LA195
Date & Time:	July 18, 2018, 14:00 Local	**Registration:**	N8805X
Aircraft:	Eagle DW1	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 None
Flight Conducted Under:	Part 137: Agricultural		

Analysis

The commercial pilot was conducting an aerial application flight. He stated that while maneuvering at 1,500 ft, he heard a "deep knock" in the engine; the entire windshield became covered with oil, and the engine lost power. The pilot made a forced landing to a service road, during which the airplane struck a barbed-wire fence with the right wings before coming to rest in a field. Postaccident examination of the engine revealed the No. 2 cylinder had separated from the cylinder mounting deck. Two fractured sections of the left crankcase that included part of the No. 2 cylinder bore were found in the engine cowling. All but one of the No. 2 cylinder base studs and through bolts remained in the cylinder bore and were fractured. The fractured surfaces exhibited signatures consistent with fatigue. The fatigue failure of the No. 2 cylinder studs and through bolts and the fracture of the crankcase led to the loss of engine power.

Probable Cause and Findings

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

Fatigue failure of the No. 2 cylinder studs/through bolts and the fracture of the crankcase, which resulted in a total loss of engine power.

Findings

Aircraft	Recip engine power section - Malfunction
Environmental issues	Fence/fence post - Contributed to outcome

Factual Information

History of Flight

Maneuvering	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing
Landing-flare/touchdown	Collision with terr/obj (non-CFIT)

On July 18, 2018, about 1400 central daylight time, an Eagle DW-1, N8805X, was substantially damaged when it made a forced landing following a total loss of engine power while maneuvering near Ider, Alabama. The pilot was not injured. The airplane was registered to and operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* as a Part 137 aerial application flight. Visual meteorological conditions prevailed, and no flight plan was filed.

The pilot stated that he was maneuvering at 1,500 ft when the engine stopped producing power after he heard a "deep knock" in the engine followed by the entire windshield getting covered with oil. The pilot made a forced landing to a service road and the airplane struck a barbed-wire fence with the right wings before coming to rest upright on the edge of a soybean field. The airplane sustained substantial damage to the upper and lower right wings, the outboard section of the left wings, and the fuselage. Two of the three propeller blades were displaced aft.

Postaccident examination of the airplane revealed a large hole in the left side of the engine cowling and a large amount of oil over the entire nose and windshield. The No. 2 cylinder had separated from the cylinder mounting deck. Two fractured sections of the left crankcase that included part of the No. 2 cylinder bore were found lying in the engine cowling. All but one of the No. 2 cylinder base studs and thru bolts remained in the cylinder/crankcase bore and were fractured. Photographs of the fractured studs/bolts were reviewed by the National Transportation Safety Board's Materials laboratory. The fractured surfaces exhibited signatures consistent with fatigue

A review of the engine maintenance logbook revealed that all six cylinders were replaced in September 2015 at a total engine time of 1,334.0 hours. At the time of the accident, the engine had accrued 1,582.43 hours and 248.43 hours since the No. 2 cylinder was installed.

In the June 2014 issue of Sport Aviation, the author of the "Savvy Aviator" column noted that, according to a veteran mechanic/expert witness, "who specializes in research on fastener torque and engine assembly practices,…the root cause of spun bearings, thrown rods, and separated cylinders is simply, 'a failure to achieve sufficient preload in the assembled fasteners.'"

The author further noted that, "preload is the technical term for the clamping force created by tightening a fastener (typically a threaded bolt or stud) that holds assembled parts together. Having sufficient preload is the key to a strong and reliable bolted joint that will not loosen, break, or shift under the load. In order for a bolted joint to be stable under cyclic repetitive stress, the preload on the fasteners must be greater than the maximum stress that is trying to pull the joint apart. If this condition is met, the joint

will not separate, and the fasteners won't 'feel' the repetitive stress cycles. But if it isn't, the joint will shift under load and the fasteners will ultimately fail from repetitive stress fatigue."

The pilot held a commercial pilot certificate with a rating for airplane single-engine land. His last Federal Aviation Administration second-class medical was issued on December 30, 2017. The pilot reported a total flight time of 2,214.4 hours.

Weather reported at Huntsville International Airport (HSV), Huntsville, Alabama, about 53 miles northwest of the accident site, at 1353, was: wind from 310° at 6 knots, visibility 10 miles, scattered clouds at 3,600 ft, scattered clouds at 25,000 ft, temperature 32° C, dew point 24°, and an altimeter setting of 29.97 inches Hg.

Pilot Information

Certificate:	Commercial	**Age:**	66,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Center
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	November 17, 2017
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 20, 2017
Flight Time:	2214.3 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Eagle	**Registration:**	N8805X
Model/Series:	DW1 NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	DW-1-0036-81
Landing Gear Type:	Tailwheel	**Seats:**	1
Date/Type of Last Inspection:	March 23, 2018 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	23 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	4432.93 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:		**Engine Model/Series:**	IO-540
Registered Owner:		**Rated Power:**	260 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	Agricultural aircraft (137)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	HSV,629 ft msl	**Distance from Accident Site:**	53 Nautical Miles
Observation Time:	13:53 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 3600 ft AGL	**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	310°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.96 inches Hg	**Temperature/Dew Point:**	32°C / 24°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Ider, AL	**Type of Flight Plan Filed:**	None
Destination:	Ider, AL	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	Unknown

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	34.714168,-85.680831(est)

Administrative Information

Investigator In Charge (IIC):	Read, Leah
Additional Participating Persons:	Kyle Cook; FAA/FSDO; Birmingham, AL
Original Publish Date:	April 20, 2020
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=97838