Aviation Investigation Final Report

Location:	Tomah, Wisconsin	**Accident Number:**	CEN14LA412
Date & Time:	August 7, 2014, 09:46 Local	**Registration:**	N213BL
Aircraft:	Enstrom F 28F	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 Serious
Flight Conducted Under:	Part 137: Agricultural		

Analysis

The pilot felt a vibration in the cyclic control and he stated that the engine was running irregularly as he neared the intended application field on the agricultural application flight. He immediately elected to execute a precautionary landing to a cornfield; the corn crop was about 10 feet tall at the time. During the landing, the landing skids collapsed, and the tailboom was severed by a main rotor blade. A postaccident examination of the engine revealed that the No. 4 cylinder did not exhibit compression during crankshaft rotation. Further examination of the No. 4 cylinder revealed that the intake valve did not seat properly; a gap of about 0.015 inch existed when the valve should have been fully seated. Linear scoring was observed on the valve stem, and debris consistent with valve guide material was also recovered upon removal of the valve. No other anomalies with respect to the engine were observed. The engine had accumulated about 831 hours since overhaul. The helicopter maintenance records did not contain a record of any unresolved maintenance issues.

Probable Cause and Findings

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

A loss of engine power due to the malfunction of the No. 4 cylinder intake valve.

Findings

Aircraft	Recip eng cyl section - Malfunction

Factual Information

History of Flight

Maneuvering-low-alt flying	Loss of engine power (partial) (Defining event)
Landing	Off-field or emergency landing

On August 7, 2014, about 0946 central daylight time, an Enstrom F-28F helicopter, N213BL, was substantially damaged when the pilot executed a precautionary landing in a cornfield after experiencing engine difficulties near Tomah, Wisconsin. The pilot was seriously injured. The helicopter was registered to and operated by Paul Peterson Aviation LLC under the provisions of 14 Code of Federal Regulations Part 137 as an aerial application flight. Visual meteorological conditions prevailed for the flight, which was not operated on a flight plan. The local flight originated from the loading site about one-half mile from the accident site.

The pilot's departure from the loading site on the third application flight of the morning proceeded without incident. However, about one-half mile from the planned application field, the pilot reportedly felt a vibration in the cyclic control and experienced an "irregular" running engine. He immediately elected to execute a precautionary landing to a corn field; the corn crop was approximately 10 feet tall at the time. During the landing, the landing skids collapsed and the tailboom was severed by a main rotor blade. A portion of the tail rotor drive shaft was separated from the airframe. Separation of the drive shaft was consistent with a main rotor strike. The tail rotor transmission separated into two sections; the appearance of the fracture surface was consistent with an overstress failure.

The postaccident examination did not reveal any preimpact anomalies with respect to the flight control system and rotor drive system. Examination of the engine revealed that the no. 4 cylinder did not exhibit compression during crankshaft rotation. Further examination of the No. 4 cylinder determined that the intake valve was not seating properly; a gap of approximately 0.015 inch existed when the valve should have been fully seated. Linear scoring were observed on the valve stem. Debris consistent with valve guide material was also recovered on removal of the valve. No other anomalies with respect to the engine were observed.

The accident helicopter was purchased by the operator on June 4, 2014. The aircraft was issued a restricted category, special airworthiness certificate for agriculture operations on July 25, 2014. The operator reported a total airframe time of 2,385.1 hours at the time of the accident. The most recent annual inspection was completed in December 2013 at 2,327.4 hours.

The helicopter was powered by a 225-horsepower Lycoming HIO-360-F1AD fuel-injected, reciprocating engine. Maintenance records indicated that the engine was overhauled in March 2006. At the time of the accident, the engine had accumulated about 831.2 hours since overhaul, with about 57.7 hours of that time since the annual inspection. The most recent engine maintenance entry was dated August 4, 2014, and consisted of replacement of the spark plugs. The helicopter maintenance records did not contain a record of any unresolved maintenance issues.

Pilot Information

Certificate:	Airline transport	**Age:**	70
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Helicopter; Instrument airplane; Instrument helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	March 7, 2014
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	18000 hours (Total, all aircraft), 250 hours (Total, this make and model), 12000 hours (Pilot In Command, all aircraft), 40 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft), 9 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Enstrom	**Registration:**	N213BL
Model/Series:	F 28F	**Aircraft Category:**	Helicopter
Year of Manufacture:	1995	**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	803
Landing Gear Type:	High skid	**Seats:**	2
Date/Type of Last Inspection:	December 2, 2013 Annual	**Certified Max Gross Wt.:**	2600 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	2385.1 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	HIO-360-F1AD
Registered Owner:	Paul Peterson Aviation LLC	**Rated Power:**	225 Horsepower
Operator:	Paul Peterson Aviation LLC	**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:	CMY,838 ft msl	**Distance from Accident Site:**	7 Nautical Miles
Observation Time:	10:35 Local	**Direction from Accident Site:**	270°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	110°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.12 inches Hg	**Temperature/Dew Point:**	25°C / 12°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Tomah, WI (PVT)	**Type of Flight Plan Filed:**	None
Destination:	Tomah, WI (PVT)	**Type of Clearance:**	None
Departure Time:	09:30 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	43.980323,-90.500907(est)

Administrative Information

Investigator In Charge (IIC):	Sorensen, Timothy
Additional Participating Persons:	Michael J Pieczynski; FAA Flight Standards; Milwaukee, WI
Original Publish Date:	January 14, 2015
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=89828