



Aviation Investigation Final Report

Location:	Stonewall, Mississippi	Accident Number:	ERA19LA008
Date & Time:	October 5, 2018, 14:45 Local	Registration:	N969TR
Aircraft:	North American NAVION A	Aircraft Damage:	Substantial
Defining Event:	Loss of engine power (total)	Injuries:	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot stated that, while en route to his destination, the airplane's engine sputtered and then lost total power. During the subsequent forced landing to a highway, the airplane landed hard, and the landing gear collapsed; the airplane sustained substantial damage to the fuselage. A postaccident examination of the engine revealed the No. 3 cylinder exhaust valve fractured where the stem transitioned to the valve head seat. The valve head impacted the No. 3 piston and became lodged between the crankcase and the camshaft, which resulted in the fracture of the camshaft. Fatigue cracking, which initiated at multiple sites, propagated through the valve stem. The presence of a tapered stem near the fracture surface, high temperature oxide deposits, and fatigue striations on the fracture surface suggested that the stem underwent spallation or erosion of the oxides formed during high temperature exposure, which would reduce the stem cross-section over time, increasing the likelihood of initiating fatigue cracking. Additionally, a localized area of wear on the top face of the valve stem was most likely due to the valve not rotating during operation, which could create hot spots or improper thermal dissipation in the hottest parts of the valve and lead to valve damage or failure.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The fatigue failure of the No. 3 cylinder exhaust valve, which resulted in a fractured camshaft and a total loss of engine power.

Findings

Aircraft	(general) - Failure
Aircraft	Recip eng cyl section - Failure
Aircraft	Recip eng cyl section - Fatigue/wear/corrosion

Factual Information

History of Flight

Enroute	Loss of engine power (total) (Defining event)
Landing	Hard landing

On October 5, 2018, about 1445 central daylight time, a North American Navion A, N969TR, was substantially damaged during a forced landing near Stonewall, Mississippi. The private pilot was not injured. The airplane was registered to the pilot and was being operated as Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed, and no flight plan was filed for the flight that departed Key Field Airport (MEI), Meridian, Mississippi, at 1438, and was destined for Jack Edwards National Airport (JKA), Gulf Shores, Alabama.

The pilot stated that he was flying at 3,500 ft when the engine sputtered. He informed air traffic control that he wanted to return to MEI and turned back toward the airport, but the engine stopped producing power. The pilot realized that he was not going to be able to reach MEI or any other airport and made a forced landing to a highway. The pilot said he bled off airspeed to avoid hitting cars and landed hard. The airplane's landing gear collapsed, and the airplane slid about 200 ft and came to rest upright on the road, which resulted in substantial damage to the fuselage.

A postaccident examination of the engine revealed the No. 3 cylinder exhaust valve fractured where the stem transitioned to the valve head. The valve head was found lodged between the crankcase and the camshaft, and the camshaft was fractured between the No. 3 intake and exhaust lobes. Metallurgical examination of the liberated valve head and the valve stem revealed that the valve head was damaged from repeated contact with the piston and the valve stem exhibited fracture surfaces consistent with fatigue. The fatigue cracking propagated through the valve stem, initiating at multiple crack initiation sites on the stem surface. The valve stem also exhibited tapering near the fracture surface, and surface oxidation and deposits of lead-based compounds which were also present on the exterior of the stem adjacent to the fracture surface. A small depressed area was also noted on the top face of the valve stem, which was consistent with repeated contact with the adjacent rocker.

The last annual inspection of the airplane and engine was on August 1, 2018. At the time of the accident, the engine had accrued a total of 1,705.0 hours and 641.5 hours since overhaul. Further review of the engine maintenance logbook revealed that on May 4, 2014, at an engine total time of 1,390.4 hours and 322.1 hours since overhaul, a mechanic "removed and reinstalled all six cylinders with new base seals, push rod tubes seals, intake tube seals, exhaust gaskets and rocker gaskets after resurfacing valves and seats."

Pilot Information

Certificate:	Private	Age:	48,Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Lap only
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 3 With waivers/limitations	Last FAA Medical Exam:	October 8, 2018
Occupational Pilot:	No	Last Flight Review or Equivalent:	April 30, 2017
Flight Time:	568 hours (Total, all aircraft), 264 hours (Total, this make and model), 439.2 hours (Pilot In Command, all aircraft), 11 hours (Last 90 days, all aircraft), 8.3 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	North American	Registration:	N969TR
Model/Series:	NAVION A No Series	Aircraft Category:	Airplane
Year of Manufacture:	1946	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	NAV-4-342
Landing Gear Type:	Retractable - Tricycle	Seats:	4
Date/Type of Last Inspection:	August 1, 2018 Annual	Certified Max Gross Wt.:	2769 lbs
Time Since Last Inspection:	11 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	3336 Hrs at time of accident	Engine Manufacturer:	Continental
ELT:	C91A installed, activated, did not aid in locating accident	Engine Model/Series:	E-225-4
Registered Owner:		Rated Power:	205 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	MEI, 298 ft msl	Distance from Accident Site:	15 Nautical Miles
Observation Time:	14:58 Local	Direction from Accident Site:	20°
Lowest Cloud Condition:	Scattered / 4800 ft AGL	Visibility	10 miles
Lowest Ceiling:	Broken / 8000 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	7 knots /	Turbulence Type Forecast/Actual:	None / None
Wind Direction:	180°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	30.02 inches Hg	Temperature/Dew Point:	33°C / 20°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Meridian, MS (MEI)	Type of Flight Plan Filed:	None
Destination:	Gulf Shores, AL (JKA)	Type of Clearance:	VFR flight following
Departure Time:	14:38 Local	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:	32.131668, -88.793334(est)

Administrative Information

Investigator In Charge (IIC):	Read, Leah
Additional Participating Persons:	Joseph Bozeman; FAA/FSDO; Jackson, MS Mike Council; Continental Motors; Mobile, AL
Original Publish Date:	August 10, 2020
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=98454

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).