Aviation Investigation Final Report

Location:	JOLIET, Illinois	**Accident Number:**	CHI95LA097
Date & Time:	March 1, 1995, 17:30 Local	**Registration:**	N1978J
Aircraft:	PIPER PA-32RT	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

ACCORDING TO THE PILOT, APPROXIMATELY TEN MINUTES INTO THE FLIGHT, THE ENGINE BEGAN TO RUN ROUGH. THE PILOT STATED HE BEGAN TO TROUBLESHOOT AND EVERYTHING APPEARED NORMAL EXCEPT THE FUEL FLOW WAS LOW. AT THIS TIME HE ADVANCED THE THROTTLE, SWITCHED FUEL TANKS, AND TURNED THE FUEL BOOST PUMP ON. THE PILOT STATED HE THEN HEARD A 'BANG' FROM THE ENGINE AND ALL ENGINE POWER WAS LOST. THE PILOT MADE A FORCED LANDING ON AN ACCESS ROAD ADJACENT TO A HIGHWAY. POSTACCIDENT EXAMINATION REVEALED THE NUMBER FOUR CYLINDER HAD SEPARATED FROM THE CRANKCASE. FRACTURES OF THE CYLINDER HOLD DOWN STUDS SHOWED NO CLEAR EVIDENCE OF FATIGUE CRACKING. FRACTURES ARE REPRESENTATIVE OF OVERSTRESS SEPARATIONS. FRETTING DAMAGE WAS OBSERVED ON THE MATING CYLINDER FLANGE, CRANKCASE BOSS, AND METAL FOLDS ON THE CYLINDER FLANGE/HOLE WALL CORNERS.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the failure of the number four cylinder due to a loose cylinder hold down stud. A factor in the accident was the embankment.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: CLIMB - TO CRUISE

Findings
1. (C) ENGINE ASSEMBLY,CYLINDER - FAILURE,TOTAL
2. (C) ENGINE ASSEMBLY,CYLINDER - LOOSE

Occurrence #2: FORCED LANDING
Phase of Operation: DESCENT - EMERGENCY

Occurrence #3: ON GROUND/WATER ENCOUNTER WITH TERRAIN/WATER
Phase of Operation: LANDING

Findings
3. (F) TERRAIN CONDITION - DROP-OFF/DESCENDING EMBANKMENT

Factual Information

On March 1, 1995, at 1730 central standard time, a Piper PA-R, N1978J, registered to Lowe Automotive, St. Louis, Missouri, was substantially damaged following a loss of engine power and subsequent off-airport forced landing near Joliet, Illinois. The private pilot and one passenger reported minor injuries. The 14 CFR Part 91 flight originated in West Chicago, Illinois, at 1710 with an intended destination of Bloomington, Illinois. An IFR flight plan was filed and visual meteorological conditions prevailed at the time.

According to the pilot, approximately ten minutes after departing DuPage County Airport, West Chicago, Illinois, the engine began to run rough. The pilot stated he began to troubleshoot and "everything appeared good except [the] fuel flow was low." At this time, he advanced the throttle, switched fuel tanks, and turned the fuel boost pump on. The pilot stated he then heard a "bang" from the engine and all engine power was lost. The pilot made a forced landing on an access road adjacent to a highway. While landing, the airplane hit an embankment before coming to rest.

Postaccident examination revealed the number four cylinder was separated from the crankcase but still attached to the exhaust stack and ignition wires. The base of the cylinder was substantially damaged but there was no obvious damage to the inside walls of the cylinder. The bottom skirt of the number four piston was also substantially damaged.

The lower left cylinder hold down stud was found completely out of the crankcase, but still in the hole of the cylinder base flange with the nut attached. Another stud, which was found at the accident site, was fractured nearly flush with the underside of the assembled nut. Both studs were sent to the NTSB Materials Laboratory, Washington, D.C., for further examination.

Examination revealed the threads of the intact stud were damaged between the underside of the nut to a position corresponding to the plane of the crankcase cylinder boss when the stud is assembled to the crankcase. The Metallurgist Factual Report stated "the thread damage was as if the thread crowns had been flattened by the cylinder flange moving against this area." Examination of the other stud disclosed features indicative of an overstress separation with no evidence of preexisting cracking.

A second postaccident examination of the cylinder and crankcase was done by an NTSB Metallurgist at DuPage Airport where the airplane was being stored. Examination showed no clear evidence of fatigue cracking. All fractures appeared to be representative of overstress separations. No welding repair to the crankcase was observed. Fretting damage was observed on the mating cylinder flange, crankcase boss, and metal folds on the cylinder flange/hole wall corners. (See attached Metallurgist Factual Report)

Pilot Information

Certificate:	Private	**Age:**	34,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	June 11, 1993
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	823 hours (Total, all aircraft), 415 hours (Total, this make and model), 724 hours (Pilot In Command, all aircraft), 38 hours (Last 90 days, all aircraft), 11 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	PIPER	**Registration:**	N1978J
Model/Series:	PA-32RT PA-32RT	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	32R-7885223
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	September 9, 1994 Annual	**Certified Max Gross Wt.:**	3600 lbs
Time Since Last Inspection:	72 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1450 Hrs	**Engine Manufacturer:**	LYCOMING
ELT:	Installed, not activated	**Engine Model/Series:**	IO-540-K1G5D
Registered Owner:	LOWE AUTOMOTIVE	**Rated Power:**	300 Horsepower
Operator:		**Operating Certificate(s) Held:**	
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	15 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	0°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	-4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	WEST CHICAGO , IL (DPA)	**Type of Flight Plan Filed:**	IFR
Destination:	BLOOMINGTON , IL (BMI)	**Type of Clearance:**	IFR
Departure Time:	17:10 Local	**Type of Airspace:**	Class E

Airport Information

Airport:		**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	41.52008,-88.120254(est)

Administrative Information

Investigator In Charge (IIC):	Corsones, Christine
Additional Participating Persons:	DONALD W BRIGHAM; WEST CHICAGO , IL
Original Publish Date:	June 29, 1995
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=9846