Aviation Investigation Final Report

Location:	ERIE, Colorado	**Incident Number:**	DEN00IA093
Date & Time:	May 22, 2000, 17:00 Local	**Registration:**	N424TP
Aircraft:	Piper PA-32R-300	**Aircraft Damage:**	Minor
Defining Event:		**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

During climb to cruise, on an IFR flight plan, in visual conditions, the engine lost all power approximately 10 minutes after takeoff. A forced landing was made in an open field and no damage was incurred during the landing. Examination of the engine provided evidence the number 2 cylinder had separated from the case and had lodged in the cowl. Detailed examination provided evidence that the cylinder hold down studs had failed and were 'necked-down' at the fracture points. The rod bolts then failed and the piston reversed itself and lodged in the case. No signatures of oil starvation or heat distress were found. Examination at an engine overhaul facility provided evidence that none of the hold down stud nuts on the remaining five cylinders had sufficient torque.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: Improper installation of cylinders by unknown maintenance personnel who failed to torque the cylinder stud nuts sufficiently.

Findings

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

Findings
1. ENGINE ASSEMBLY,CYLINDER - SEPARATION

2. (C) ENGINE ASSEMBLY,CYLINDER - LOOSE PART/BOLT/NUT/CLAMP/ETC
3. (C) MAINTENANCE,INSTALLATION - IMPROPER - OTHER MAINTENANCE PERSONNEL

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

Findings
4. TERRAIN CONDITION - OPEN FIELD

Factual Information

On May 22, 2000, at 1700 mountain daylight time, a Piper PA-32R-300, N424TP, sustained minor damage when the engine failed catastrophically during climb to cruise. The two private pilots were not injured. The flight was operating on an instrument flight rules flight plan, in visual conditions, under the provisions of Title 14 CFR Part 91. The landing site was about 10 miles north of Erie Tri-County Airport, Lafayette, Colorado, and the takeoff occurred from Jefferson County Airport, Broomfield, Colorado, about 20 miles south of the landing site.

As the flight was climbing through about 8,000 feet above mean sea level (msl), [3,000 feet above ground level] the engine lost all power and oil was observed by the pilot on the cowl and wind screen. The pilot made an emergency landing in a field. No damage was incurred as a result of the landing.

Initial examination of the engine revealed that the number 2 cylinder separated from the case and all the cylinder hold-down studs had sheared. The connecting rod contacted the skirt of the piston and fractured the skirt and jammed. The piston and connecting rod rotated nearly 180 degrees and the piston lodged in the case. The case revealed some piston impact damage. One connecting rod bolt and both connecting rod nuts with the bolt ends were recovered along with the connecting rod cap and both halves of the main rod bearings. One inner cylinder base nut with the stud end attached was also recovered. All fragments were found inside the engine cowling.

Visual examination of the portions of the connecting rod bolts and the cylinder hold down studs provided evidence of "necking" at the fracture points. The bearing surfaces of the connecting rod, the rod and cap had no signatures of oil starvation or heat distress. The sequence of events, as provided by the witness marks, provided evidence that the connecting rod bolt failure was secondary in nature and resulted from cylinder separation.

The cylinder was visually inspected and no paint or foreign material on the crankcase mounting surface or cylinder base surface was found. The other five cylinders had torque putty on all the cylinder hold down nuts.

Examination of the engine at an engine overhaul facility provided evidence that none of the hold down nuts on the remaining five cylinders had sufficient torque.

Pilot Information

Certificate:	Private	**Age:**	31,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	August 1, 1997
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	376 hours (Total, all aircraft), 80 hours (Total, this make and model), 345 hours (Pilot In Command, all aircraft), 48 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N424TP
Model/Series:	PA-32R-300 PA-32R-300	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	32R-7780332
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	April 18, 2000 100 hour	**Certified Max Gross Wt.:**	3600 lbs
Time Since Last Inspection:	70 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	4976 Hrs	**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	TO-540-KIG5D
Registered Owner:	DERRIAIRCRAFT	**Rated Power:**	300 Horsepower
Operator:	BRIAN J. INSKEEP	**Operating Certificate(s) Held:**	None
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:	BJC ,5671 ft msl	**Distance from Accident Site:**	20 Nautical Miles
Observation Time:	16:45 Local	**Direction from Accident Site:**	185°
Lowest Cloud Condition:	Scattered / 6000 ft AGL	**Visibility**	60 miles
Lowest Ceiling:	Broken / 16000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	12 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	290°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	29°C / 3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	BROOMFIELD , CO (BJC)	**Type of Flight Plan Filed:**	IFR
Destination:	SAINT JOSEPH , MO (STJ)	**Type of Clearance:**	IFR
Departure Time:	16:50 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:**	Minor
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	40.019958,-105.040924(est)

Administrative Information

Investigator In Charge (IIC):	Wiemeyer, Norman
Additional Participating Persons:	JIM FINN; DENVER , CO
Original Publish Date:	December 4, 2000
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=49271