



National Transportation Safety Board Aviation Accident Final Report

Location:	HOUSTON, TX	Accident Number:	FTW00LA058
Date & Time:	01/03/2000, 1225 CST	Registration:	N999SW
Aircraft:	Cessna A185F	Aircraft Damage:	Substantial
Defining Event:		Injuries:	4 None
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The airplane was climbing through 3,500 feet after departure when the pilot heard a sequence of loud bangs. The pilot stated that the airplane started to vibrate, therefore, he elected to pull the throttle to idle and returned to the departure airport. The pilot stated that he could not make it to the active runway and elected to land on a grass strip located on the airport. The pilot attempted to slow the airplane before impacting a ditch. The airplane nosed over at 40 knots, coming to rest inverted. Examination of the engine revealed that the #4 cylinder head separated from its cylinder barrel as a result of fatigue cracking originating in the cylinder head threads. The engine was overhauled 111.5 hours prior to the accident, at which time, 6 channel chromed overhauled cylinders were installed. It could not be determined how many hours the cylinders had accumulated or how many times they had been overhauled. There is no requirement to track cylinder hours or overhaul occurrences.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the loss of engine power during climb as a result of fatigue cracking of the #4 cylinder head and its subsequent separation from its barrel.

Findings

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

Findings

1. (C) ENGINE ASSEMBLY,CYLINDER - FATIGUE
 2. (C) ENGINE ASSEMBLY,CYLINDER - SEPARATION
 3. MAINTENANCE,RECORDKEEPING - NOT REQUIRED - FAA(OTHER/ORGANIZATION)
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Occurrence #2: FORCED LANDING
Phase of Operation: DESCENT - EMERGENCY

Occurrence #3: NOSE OVER
Phase of Operation: EMERGENCY LANDING

Factual Information

On January 3, 2000, at 1225 central standard time, a Cessna A185F single-engine airplane, N999SW, was substantially damaged during a forced landing following a loss of engine power after departing from the Clover Field Airport near Houston, Texas. The commercial pilot, who was the owner of the airplane, and his three passengers were not injured. Visual meteorological conditions prevailed and an instrument flight rules flight plan was filed for the 14 Code of Federal Regulations Part 91 personal flight. The cross-country flight departed the Clover Field Airport at 1215, and was destined for the Gregg County Airport near Longview, Texas.

During a telephone interview conducted by the NTSB investigator-in-charge, the pilot stated that he departed to the north from runway 32L, and was climbing through 3,200 feet while in instrument meteorological conditions when he heard a sequence of "loud bangs." The pilot stated that he looked at the digital engine monitor and noted that the cylinder head temperature for the "#3 cylinder" was indicating an "excessively high temperature." The pilot also noted that the oil pressure and oil temperature gauges were indicating "lower than normal." He added that the airplane was "vibrating violently," and therefore, he elected to pull the throttle to idle and initiate a descent.

The pilot declared an emergency to air traffic control (ATC) and they cleared him direct to the Clover Field Airport. The pilot stated that the airplane broke out of the clouds at 1,500 feet, and he reported to ATC that he had the airport in sight. The pilot determined that he would not be able to fly the airplane to runway 32L with the available power, and elected to land on runway 22 (a 2,400-foot long grass runway) instead. On final approach, the pilot fully extended the flaps while maintaining a 90-knot glide speed. He added that the airplane landed half way down the length of the runway at about 70 knots. The pilot applied heavy brake pressure in an attempt to stop the airplane before it contacted a ditch located at the end of the runway. When the airplane slowed to about 40 knots, it nosed over and came to rest inverted.

The FAA inspector, who responded to the accident site, stated that the wings, vertical stabilizer, and firewall were structurally damaged. The engine was separated from the engine mounts and the #4 cylinder head was found separated from its barrel.

On January 18, 2000, a representative from the engine manufacturer examined the Teledyne Continental IO-520-D engine (serial number 566923). According to the manufacturer's representative, the failed #4 cylinder was separated where the cylinder head attaches to the cylinder barrel. The fracture surface displayed discoloration and heat damage on 70% of the fracture surface circumference. According to the representative, the cylinders displayed a part number 646657CE. The #4 and #6 cylinders were sent to the NTSB Materials Laboratory in Washington, D.C., for further examination.

Examination of the fractured cylinder at the NTSB Materials Laboratory revealed that the head of the cylinder was separated approximately between the 4th and 5th cooling fins from the inboard end of the head. A portion of the fracture surface appeared relatively smooth with a curving boundary, which is a feature typical of fatigue. Crack arrest lines were also observed in the smooth regions, which are also indicative of fatigue. The fatigue features emanated from two broad origin areas, each containing multiple origin sites. The origin areas were located at the thread roots on the inner diameter of the cylinder head, where the head is screwed onto the barrel. The origin sites coincided with the 1st or 2nd outboard thread on the cylinder barrel.

Magnified examination revealed no apparent defects at the root of the threads in the cylinder head; however, the pressure flanks of the cast aluminum head had been worn by contact with the threads of the steel barrel.

Review of the aircraft's maintenance records revealed that the engine was overhauled on September 30, 1996, at an aircraft and engine total time of 1,980.1 hours. At that time, 6 channel chromed overhauled cylinders were installed. At the time of the accident, the engine had accumulated 111.5 hours since overhaul. The aircraft and engine underwent its last annual inspection on April 15, 1999, at which time the engine received its last compression check before the accident. The compression check did not reveal any anomalies in cylinder head compression. The engine manufacturer's representative reported finding 4 separate "chroming numbers" on the failed cylinder skirt. According to the facility that most recently overhauled the cylinders, the cylinder heads were not removed from the cylinder barrels during overhaul. Each cylinder was channel chromed and the head was then ultrasonically inspected for cracks. It could not be determined how many hours total time the cylinders had accumulated or how many times the cylinders had been overhauled, nor is it required to track cylinder total time or overhaul periods.

Pilot Information

Certificate:	Commercial	Age:	39, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim.	Last FAA Medical Exam:	12/20/1999
Occupational Pilot:	Last Flight Review or Equivalent:		
Flight Time:	1392 hours (Total, all aircraft), 62 hours (Total, this make and model), 1323 hours (Pilot In Command, all aircraft), 131 hours (Last 90 days, all aircraft), 27 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N999SW
Model/Series:	A185F A185F	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	18503720
Landing Gear Type:	Tailwheel	Seats:	4
Date/Type of Last Inspection:	04/15/1999, Annual	Certified Max Gross Wt.:	3350 lbs
Time Since Last Inspection:	51 Hours	Engines:	1 Reciprocating
Airframe Total Time:	2094 Hours	Engine Manufacturer:	Continental
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	IO-520-D
Registered Owner:	MARK J. ALLEN	Rated Power:	300 hp
Operator:	MARK J. ALLEN	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	LVJ, 44 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	1216 CST	Direction from Accident Site:	0°
Lowest Cloud Condition:	Scattered / 3200 ft agl	Visibility	10 Miles
Lowest Ceiling:	Broken / 4700 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	10 knots / 20 knots	Turbulence Type Forecast/Actual:	/
Wind Direction:	250°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29 inches Hg	Temperature/Dew Point:	24° C / 18° C
Precipitation and Obscuration:			
Departure Point:	(LVJ)	Type of Flight Plan Filed:	IFR
Destination:	LONGVIEW, TX (GGG)	Type of Clearance:	VFR
Departure Time:	1215 CST	Type of Airspace:	Class G

Airport Information

Airport:	CLOVER FIELD (T02)	Runway Surface Type:	Grass/turf
Airport Elevation:	44 ft	Runway Surface Condition:	Dry
Runway Used:	22	IFR Approach:	None
Runway Length/Width:	2400 ft / 100 ft	VFR Approach/Landing:	Forced Landing

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	3 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	4 None	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	NICOLE L CHARNON	Report Date:	07/02/2001
Additional Participating Persons:	GORDON MCMAHAN; HOUSTON, TX		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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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](#).