Aviation Investigation Final Report

Location:	FULTON, Missouri	**Accident Number:**	CHI96FA209
Date & Time:	June 21, 1996, 19:37 Local	**Registration:**	N2397J
Aircraft:	Beech 23	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Witnesses reported an abnormal amount of black smoke trailing from the aircraft after takeoff. The airplane subsequently descended through trees and power lines. Postaccident investigation revealed the engine's #1 cylinder did not have compression when checked. After the intake valve of the #1 cylinder was pried back, the cylinder had compression when the propeller was rotated. The #1 cylinder's intake and exhaust manifold areas were darker in color than those of the other cylinders. The #1 cylinder's valve springs were not within the tolerances as listed by the manufacturer.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the inadequate intake valve springs on the #1 cylinder.

Findings

Occurrence #1: LOSS OF ENGINE POWER
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. ENGINE ASSEMBLY,VALVE,INTAKE - OPEN
2. (C) ENGINE ASSEMBLY,OTHER - INADEQUATE

Occurrence #2: FORCED LANDING

Phase of Operation: EMERGENCY LANDING AFTER TAKEOFF

Occurrence #3: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: EMERGENCY LANDING AFTER TAKEOFF

Findings
3. OBJECT - TREE(S)
4. OBJECT - WIRE,TRANSMISSION

Factual Information

HISTORY OF FLIGHT

On June 21, 1996 at 1937 central daylight time (cdt), a Beech 23, N2397J, was destroyed by fire when the airplane collided with trees, and power lines approximately one quarter mile from the departure end of runway 23, at the Elton Hensley Memorial Airport, Fulton, Missouri. The private pilot and passenger were fatally injured in the accident. Visual meteorological conditions existed at the time of the 14 CFR Part 91 flight, and no flight plan had been filed.

AIRCRAFT INFORMATION

N2397J was normally parked outside on the ramp area of the Elton Hensley Memorial Airport.

WRECKAGE AND IMPACT INFORMATION

The airplane wreckage path followed a magnetic heading of approximately 185 degrees. At least three trees along the wreckage path had broken branches near their tops. One tree branch was found resting on top of a power line. Looking at the descent angle threw the trees, the investigator in charge (IIC) approximated the descent angle at 60 degrees. One electrical power line was found wrapped around the engines crankshaft. The first major airframe component along the wreckage path was a piece of the right wing leading edge. The main wreckage came to rest approximately 120 feet from the initial impact point, facing northerly. The left wing tip sustained crushing damage, at approximately 45 degrees to the wing leading edge.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot at the Fountain Mortuary, Columbia, Missouri. Toxicological testing performed on the pilot by the Columbia hospital was negative for all tests conducted.

FIRE

The right wing leading edge showed signs of damage similar to an explosion. The fuselage was destroyed by fire from the firewall to just in front of the vertical stabilizer. No instruments from the cockpit were documented. Numerous small ground fires occurred around the wreckage. Many pieces of plexiglass from the cabin area were found around the accident site with no fire damage.

TESTS AND RESEARCH

An on site review of the flight control system revealed no abnormalities. Some control cables showed signs similar to an overload failure. The elevator and rudder balance weights were attached, and no signs of flutter were noted. When the flap actuator handle bracket was opened, the fire damage was consistent with the flaps being in the up position at the time of the fire. The carburetor valve was found in the full open position, with the mixture in the full rich position at the accident site.

The engine from N2397J was disassembled on June 23, 1996. The magnetos on the engine were destroyed due to fire and could not be checked for operation. The needle seat of the carburetor was melted. The solder on the internal metal float of the carburetor had melted, and the float was not checked for bouncy. All the spark plugs were removed and photographed. Before rotating the propeller, the number two cylinder's exhaust valve was found open. Under normal conditions, the number one cylinder's intake valve should be open, when the number two cylinder's exhaust valve is open. Oil was poured into all the cylinders before a continuity and a compression check was performed. All intake and exhaust valves moved when the engine was rotated using the propeller. All cylinders had compression except for the number one cylinder.

After the intake valve of the number one cylinder was pried back using a screw driver, the cylinder had compression, when the propeller was rotated. The intake and exhaust manifolds were documented. The number one cylinder's intake and exhaust manifold areas contained more soot than the other cylinders.

A field comparison of the valve springs using a screw driver showed that the valve springs on the number one cylinder's intake valve were weaker than the others. The engine was found in areas which had sustained fire damage.

The number one cylinder was removed from the engine. The spark plugs were replaced in the cylinder, and the cylinder was set vertically. Diesel fuel was then poured into the cylinder. Diesel fuel leaked around the intake valve and past the intake seat. When the keepers which retain the intake valve were removed, the intake valve dropped out, without applying any external force to the valve. The springs which retained the intake valve were not broken. No corrosion was found on the intake valve shaft, and the shaft was straight. No cracks were found in the intake valve seat. The pushrods for the intake and exhaust valves did not show any signs of bending.

The number one cylinder's intake valve part number was different than the engine manufacturers intake valve part number. The engine logbook had an entry on January 8, 1987, which reported that the number one and number three cylinders had been replaced with remanufactured chrome cylinders. A November 10, 1993, work order listed cylinder compressions as high as 70/80, for the number one cylinder, and as low as 62/80 for the number three cylinder. On the annual inspection work order for February 27, 1996, all cylinders had compression of 76/80.

The IIC retained the valve springs from the intake valve of the number one cylinder for further analysis. The valve springs were tested for tolerances using a Transducer Techniques PHM-100 load cell indicator (serial number 84708), on July 22, 1996. The outer valve spring was completely compressed to 1.125 inches, and required 80 pounds. The manufactures service limit is 109 pounds at 1.3 inches of compression for the outer valve spring. The inner valve spring measured 1.0 inches when completely compressed, and required 40 pounds of force to compress. The manufactures service limit is 58 pounds at 1.17 inches of compression for the inner valve spring. Both valve springs had traces of oil residue present on them, when they were removed from the engine.

Both valve springs free lengths were approximately three quarters of an inch shorter, than the manufacturers specification. Both valve springs were tested by an independent laboratory for hardness. The valve springs were below the manufacturers specification for hardness.

An employee of Tig-AIr Aviation gave a written witness statement, and was interviewed in person by the IIC. The witness reported that before fueling the pilot drained between 5 and 10 fuel samples from the aircraft's fuel tanks which were clear in color. The witness then reported that he and the pilot moved the aircraft to the fuel pump where he filled the fuel tanks up to the fuel tabs. The witness reported that after fueling it then took an additional 7 to 10 fuel samples before the pilot saw a fuel sample with a blue color. The witness reported to the IIC that he could not recall if the pilot drained fuel from the gascalator area.

Another witness interviewed by the IIC reported an abnormal amount of black smoke trailing from the aircraft, after takeoff.

Pilot Information

Certificate:	Private	**Age:**	49,Female
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	January 11, 1994
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	
Flight Time:	220 hours (Total, all aircraft), 218 hours (Total, this make and model), 2 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N2397J
Model/Series:	23 23	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	M-364
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	February 27, 1996 Annual	**Certified Max Gross Wt.:**	2300 lbs
Time Since Last Inspection:	3 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	2563 Hrs	**Engine Manufacturer:**	Lycoming
ELT:	Installed	**Engine Model/Series:**	O-320-D2B
Registered Owner:	HARRI PALMER	**Rated Power:**	160 Horsepower
Operator:		**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:	COU ,889 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	20:13 Local	**Direction from Accident Site:**	280°
Lowest Cloud Condition:	Clear	**Visibility**	7 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	180°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	28°C / 24°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	(FTT)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	00:00 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	ELTON HENSLEY MEMORIAL FTT	**Runway Surface Type:**	
Airport Elevation:	886 ft msl	**Runway Surface Condition:**	
Runway Used:	23	**IFR Approach:**	None
Runway Length/Width:	3205 ft / 47 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	In-flight
Total Injuries:	2 Fatal	**Latitude, Longitude:**	38.850784,-91.950523(est)

Administrative Information

Investigator In Charge (IIC):	Boldenow, David
Additional Participating Persons:	
Original Publish Date:	February 18, 1997
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=10091