Aviation Investigation Final Report

Location:	KIRKSVILLE, Missouri	**Accident Number:**	CHI95LA139
Date & Time:	April 30, 1995, 13:55 Local	**Registration:**	N4145H
Aircraft:	MOONEY M20J	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	2 Minor, 2 None
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

SHORTLY AFTER TAKEOFF, AS THE AIRPLANE REACHED ITS ASSIGNED CRUISE ALTITUDE, THE AIRPLANE'S ENGINE LOST TOTAL POWER. THE PILOT MADE A FORCED LANDING IN A FIELD AND DURING THE ROLLOUT COLLIDED WITH A TREE AND DITCH. POSTACCIDENT EXAMINATION OF THE ENGINE REVEALED THAT FIVE OF SIX HYDRAULIC TAPPET BODY HEADS WERE SEPARATED FROM THE TAPPET BODY. THE TAPPET HEADS WERE FOUND THROUGHOUT THE ENGINE CASE. THE REASON FOR THE TAPPET BODY HEAD FAILURES WAS NOT DETERMINED.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the loss of engine power due to failure of the engine's hydraulic tappet body heads. Related factors in the accident were the restricted visual lookout, and the unsuitable terrain encountered during the forced landing.

Findings

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

Findings
1. (C) ENGINE ASSEMBLY,ROCKER ARM/TAPPET - FAILURE
2. REASON FOR OCCURRENCE UNDETERMINED

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

Findings
3. (F) VISUAL LOOKOUT - RESTRICTED - PILOT IN COMMAND
4. (F) UNSUITABLE TERRAIN OR TAKEOFF/LANDING/TAXI AREA - ENCOUNTERED - PILOT IN COMMAND

Occurrence #3: ON GROUND/WATER COLLISION WITH OBJECT
Phase of Operation: LANDING - ROLL

Findings
5. OBJECT - TREE(S)
6. TERRAIN CONDITION - DITCH

Factual Information

On April 30, 1995, at 1355 central daylight time, a Mooney M20J, N4145H, operated as a flying club airplane, experienced a total loss of engine power shortly after departure from Kirksville Regional Airport in Kirksville, Missouri. The airplane sustained substantial damage during the resultant forced landing. The certificated flight instructor and private pilot received minor injuries. The two passengers were not injured. Visual meteorological conditions prevailed for the flight, which operated on an IFR flight plan. The flight operated under 14 CFR Part 91, and originated from Kirksville, Missouri, approximately 1328.

According to the instructor and private pilot, the private pilot was seated in the front, left seat and conducted the flying duties throughout the flight. The private pilot reported, "Normal pre-flight run-up, take-off, and climb to assigned altitude. Just reached assigned altitude - 6,000 feet - loud bang, terrible engine vibration." The pilot stated that he declared an emergency and made a 180 degree turn to try to land at the departed airport. The pilot stated that the instructor pilot accomplished the emergency checklist but the engine did not restart. Due to oil on the windshield, the instructor pilot's view was totally obscured. The private pilot had some visibility and continued to fly the airplane.

The private pilot stated that he made an emergency landing in a field. During the rollout the airplane's left wing collided with a tree and separated from the fuselage. The pilot stated that railroad tracks were "...fast approaching. Did a 180 [degree] turn to right and slid across a drainage ditch backwards, stopping against the train track embankment...."

Postaccident examination of the internal engine case revealed metal contaminates (later identified as hydraulic tappet heads). The engine's rods, pistons, and cylinders were damaged. Five of the six hydraulic tappet body heads were entirely, or partially, separated from their respective tappet.

A metallurgical examination of the tappet bodies and heads were accomplished at the Safety Board's Materials Laboratory. The Metallurgist's Factual report denoted, "The head portion of tappet 1 appeared relatively intact. However, examination with the aid of a bench binocular microscope revealed regularly spaced slant indentations on the cam follower face...Visual examination reveled that the periphery of the head portions of tappets 2 and 3 were broken off. All fractures had a large-scale faceted appearance, as if sections of the tappet heads had broken off in segments. The cam follower faces [that] remained on the tappet bodies exhibited evidence of extensive wear. The fracture faces on tappets 2 and 3, and on all submitted separated pieces of tappets had a brittle appearance and their fracture features were typical of overstress separations...The head portions of tappets 4,5, and 6 were broken off and subsequently worn down to the cylinder portion. The wear between the contact surfaces of tappet 6 and the corresponding cam lobe developed a through-the- wall hole

extending into an oil supply chamber."

A hardness test was accomplished on tappet 1. Hardness values obtained were above the minimum hardness specified by the manufacturer.

According to the airplane's engine log books, the engine was overhauled on March 17, 1994, about 190 hours prior to the accident. On June 27, 1994, about 138 hours prior to the accident, the engine received a "propeller strike inspection" and a 100 hour inspection.

Pilot Information

Certificate:	Airline transport; Flight instructor	**Age:**	68,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	May 1, 1993
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	13020 hours (Total, all aircraft), 3300 hours (Total, this make and model), 12000 hours (Pilot In Command, all aircraft), 80 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	MOONEY	**Registration:**	N4145H
Model/Series:	M20J M20J	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	24-0646
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	March 17, 1994 Annual	**Certified Max Gross Wt.:**	2740 lbs
Time Since Last Inspection:	138 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	LYCOMING
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-360-A3B6D
Registered Owner:	MORRIS HANCOCK FLYING CLUB	**Rated Power:**	200 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:	IRK ,966 ft msl	**Distance from Accident Site:**	
Observation Time:	14:05 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Unknown	**Visibility**	15 miles
Lowest Ceiling:	Overcast / 2000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	80°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	13°C / 7°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:		**Type of Flight Plan Filed:**	IFR
Destination:	MORRIS , MN (MOX)	**Type of Clearance:**	IFR
Departure Time:	13:20 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:	2 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	2 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Minor, 2 None	**Latitude, Longitude:**	40.18917,-92.569129(est)

Administrative Information

Investigator In Charge (IIC):	Reeves, Jodi
Additional Participating Persons:	JERRY L GARRISON; KANSAS CITY , MO
Original Publish Date:	September 24, 1995
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=9879