Aviation Investigation Final Report

Location:	Hillsborough Township, New Jersey	**Accident Number:**	ERA23LA225
Date & Time:	May 6, 2023, 12:55 Local	**Registration:**	N262MK
Aircraft:	MOONEY AIRCRAFT CORP. M20K	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot reported that the first leg of the cross-country flight was uneventful and that the accident occurred during takeoff following an en route stop to add fuel. He reported the takeoff roll was normal; however, during the initial climb the engine began to lose power. Video of the accident showed that the pilot attempted to continue the initial climb in three separate pitch-up attempts. Subsequently, the airplane descended, rolled to the left, and impacted terrain, which resulted in substantial damage to the fuselage and wings. It is likely that the pilot's repeated attempts to increase the pitch of the airplane following the reported reduction in engine power likely resulted in the airplane likely exceeding its critical angle of attack and a subsequent aerodynamic stall.

Postaccident examination of engine found that the Nos. 1 and 5 cylinder top spark plug ignition harnesses were loose to their respective sparkplugs. The No. 3 top spark plug ignition harness was found completely unscrewed, detached, and lying next to the spark plug on top of the cylinder shroud. There were no other anomalies discovered with the engine. Based on this information, it is likely that the reduction in engine power the pilot reported during the takeoff was due to this ignition system anomaly.

The airplane had undergone maintenance and had been flown for 1.5 hours since the last inspection. The mechanic who performed that maintenance could not recall servicing any spark plugs, nor did he recall removing any ignition harnesses. Although the mechanic may not have loosened or removed the ignition harness, it is likely that he, or other maintenance personnel performing maintenance tasks at some other point, did not ensure the ignition harnesses were properly tightened before returning the airplane to service.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The partial loss of engine power due to maintenance personnel's failure to ensure that the ignition harnesses were properly secured and the pilot's inappropriate pitch control inputs, which resulted in the airplane exceeding its critical angle of attack and subsequently entering an aerodynamic stall.

Findings

Personnel issues	Post maintenance inspection - Maintenance personnel
Aircraft	Spark plugs/igniters - Inadequate inspection
Personnel issues	Aircraft control - Pilot
Aircraft	Pitch control - Incorrect use/operation
Aircraft	Angle of attack - Capability exceeded

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Initial climb	Loss of engine power (partial) (Defining event)
Initial climb	Aerodynamic stall/spin
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On May 6, 2023, about 1255 eastern daylight time, a Mooney M20K airplane, N262MK, was substantially damaged when it was involved in an accident at the Central Jersey Regional Airport (47N), Manville, New Jersey. The pilot sustained minor injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot reported that he departed Brookhaven Airport (HWV), Shirley, New York, about 1120 with a final destination of Hampton Roads Executive Airport (PVG), Chesapeake, Virginia. The first segment of the cross-country flight was uneventful and the trip required a fuel stop, which was the purpose for the landing at 47N.

The pilot reported that after adding about 70 gallons of 100-low lead fuel, he taxied for departure from runway 25. The pilot reported that on takeoff all engine gauges were in the green and he began the rotation after about 1,500 ft of ground roll; however, as the airplane entered the initial climb, “something just didn’t feel right.” Upon reaching about 300 ft above ground level, he stated the engine began “slowing down,” similar to the sensation of taking one’s foot off the gas pedal while driving on a highway. He ensured that the throttle, propeller, and mixture were full forward, but power was not restored. Shortly after the reduction in engine power, the left wing dropped and the airplane banked to the left and impacted an open field.

Airport surveillance video captured the entire takeoff roll, initial climb, and descent towards the accident site. The video showed the airplane begin its takeoff rotation about 1,200 ft down the runway. Once the airplane entered the initial climb, its wings rocked back and forth, and three distinct pitch up control applications could be observed as the airplane’s nose pitched up from a level attitude. Subsequently, the airplane entered a left bank with a pitch up attitude and descended towards the terrain south of runway 25 before exiting out of the camera view.

Examination of the airplane revealed substantial damage to the fuselage and wings. The engine remained attached to the firewall. Significant accumulation of dirt and sand was present on the bottom of the engine due to the impact with terrain, but the engine was largely free of any substantive impact damage. The propeller remained attached to its hub. It displayed leading edge gouging, blade polishing, and rearward bending.

The Nos. 1 and 5 cylinder top spark plug ignition harnesses were found loose to their respective sparkplugs when touched by hand. The No. 3 top spark plug ignition harness was found completely unscrewed, detached, and lying next to the spark plug on top of the cylinder shroud. Figure 1 provides an overview of how the ignition harnesses were found when the airplane was examined at the recovery facility.

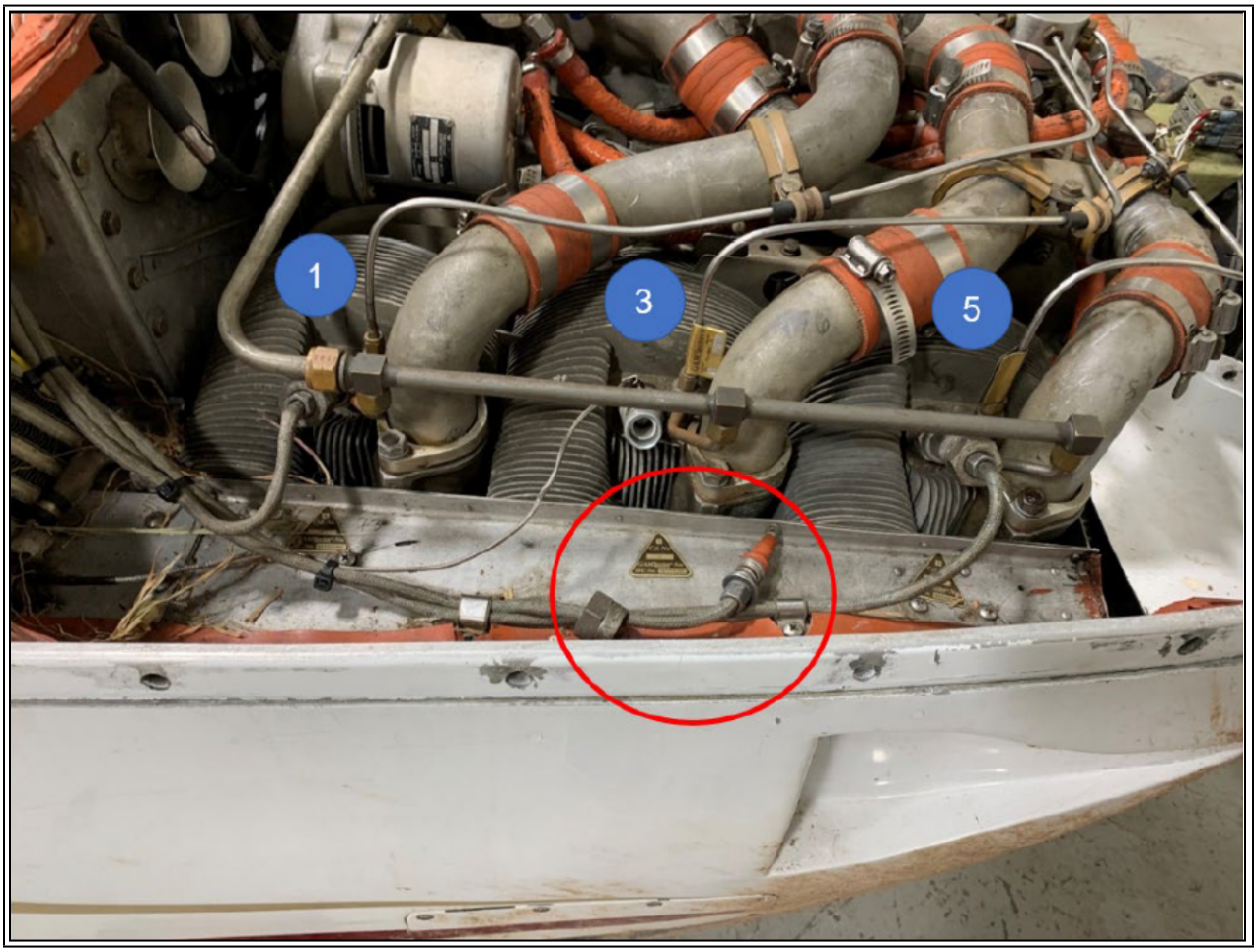

Figure 1: View of the Nos. 1, 3, and 5 cylinders and ignition harnesses as found at the recovery facility. The No. 3 ignition harness was found lying next to its attachment area. The No. 1 and 5 ignition harnesses were loose to the touch.

The Nos. 2, 4, and 6 cylinder ignition harnesses were all found secured and tight to their spark plugs. All top and bottom spark plugs were removed. Each were tight within the cylinders and each spark plug displayed normal combustion signatures.

The crankshaft was rotated by hand. Thumb compression was observed on all the cylinders. The accessory section components rotated normally. All ignition harnesses produced spark when the crankshaft was rotated by hand. The rocker covers were removed and each valve moved normally with crankshaft rotation. There was no evidence of oil leakage on the engine or cowling.

The fuel manifold valve was intact and installed to its installation area. It was removed and disassembled. The manifold contained fuel and the fuel filter screen was free of debris. The engine-driven mechanical fuel pump rotated by hand without anomalies and fuel was present in the pump.

On April 16, 2023, a maintenance endorsement noted that the crankshaft seal was replaced. The intake gaskets on the Nos. 2, 4, and 6 cylinders were replaced. The propeller was removed, overhauled, and re-installed.

The pilot reported that after the maintenance event, a 30-minute test flight was performed with no anomalies observed. The cross-country flight that he initiated on the day of the accident was the first flight since the maintenance test flight. Based upon the airplane's tachometer, a total of 1.5 hours had been flown since the maintenance was performed.

The mechanic who performed the maintenance in April of 2023 reported that the airplane owner (accident pilot) wanted him to troubleshoot a small amount of oil leakage coming from the engine, which the pilot had noticed accumulating on the forward windscreen during past flights. During the mechanic's troubleshooting, he observed evidence of oil leakage on the top of the engine and near the propeller hub. The propeller was removed, overhauled, and reinstalled. While the propeller was being overhauled, he removed the old crankshaft sealant and applied new sealant on the spine of the engine.

The mechanic reported that he did not recall servicing any spark plugs during this most recent maintenance in April 2023, nor did he recall removing any ignition harnesses while accomplishing work on other areas of the engine.

Pilot Information

Certificate:	Private	**Age:**	67,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	September 30, 2022
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	November 5, 2022
Flight Time:	747 hours (Total, all aircraft), 14 hours (Total, this make and model), 660 hours (Pilot In Command, all aircraft), 2 hours (Last 90 days, all aircraft), 2 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	MOONEY AIRCRAFT CORP.	**Registration:**	N262MK
Model/Series:	M20K NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:	1983	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	25-0773
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	July 14, 2022 Annual	**Certified Max Gross Wt.:**	2900 lbs
Time Since Last Inspection:	1.5 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	3569.3 Hrs at time of accident	**Engine Manufacturer:**	Continental
ELT:	Installed, not activated	**Engine Model/Series:**	TSIO-360-MB4B
Registered Owner:	On file	**Rated Power:**	200 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	SMQ,99 ft msl	**Distance from Accident Site:**	7 Nautical Miles
Observation Time:	12:53 Local	**Direction from Accident Site:**	333°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	290°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.2 inches Hg	**Temperature/Dew Point:**	21°C / 6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Hillsborough Township, NJ	**Type of Flight Plan Filed:**	VFR
Destination:	Chesapeake, VA (PVG)	**Type of Clearance:**	VFR flight following
Departure Time:		**Type of Airspace:**	Class G

Airport Information

Airport:	Central Jersey Regional Airport 47N	**Runway Surface Type:**	Asphalt
Airport Elevation:	85 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	25	**IFR Approach:**	None
Runway Length/Width:	3507 ft / 50 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor	**Latitude, Longitude:**	40.522658,-74.599896(est)

Administrative Information

Investigator In Charge (IIC):	Gerhardt, Adam
Additional Participating Persons:	Robert Harger; FAA/FSDO; Allentown, PA
Original Publish Date:	June 5, 2024
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=130453