



## **NATIONAL TRANSPORTATION SAFETY BOARD**

Office of Aviation Safety  
Western Pacific Region

July 21, 2015

### **SUMMARY OF AIRPLANE EXAMINATION**

**(WPR14FA320)**

This document contains 4 embedded photos.

#### **A. ACCIDENT**

Location:	San Diego, California
Date:	July 30, 2014
Aircraft:	Mooney M20L
NTSB Investigator-in-Charge	Thomas Little

## **B. EXAMINATION PARTICIPANTS**

Thomas Little  
Air Safety Investigator  
National Transportation Safety Board  
Federal Way, Washington

Scott Worthington  
Federal Aviation Administration  
Flight Standards District Office  
San Diego, California

Kurt Gibson  
Air Safety Investigator  
Continental Motors, Inc.  
Mobile, Alabama

Dan Ball  
Group Lead  
McCauley Propeller Systems  
Wichita, Kansas

Robert Collier  
Air Safety Investigator  
Mooney International

## **C. SUMMARY**

On July 30, 2014, about 1735 Pacific daylight time, N147MP, a Mooney M20L, was substantially damaged following an aborted landing and go-around at Montgomery Field (MYF), San Diego, California. The certified private pilot sustained serious injuries, and the sole passenger received fatal injuries. Visual meteorological conditions prevailed at the time of the accident and no flight plan was filed. The personal cross-country flight, which was being operated in accordance with 14 Code of Federal Regulations Part 91, departed the San Bernardino International Airport (SBD) about 1630, with MYF as its destination.

In a statement provided to the National Transportation Safety Board (NTSB) investigator-in-charge (IIC), the pilot reported that she departed SBD with one passenger en route to MYF, and was using VFR Flight Following. The pilot further reported that about 1735 while landing at MYF, the airplane bounced, at which time she attempted to go around for another landing, by adding full power, verifying rotation speed, and noting that the flaps were in the takeoff position. The pilot stated that soon after lifting off she realized that the airplane was not climbing as it normally should, and that the engine didn't seem to be making full power. The pilot opined that she reported her situation to the MYF control tower, after which she prepared for an emergency landing by verifying that she had full throttle in, airspeed. At this time she turned in the direction of her "bailout" emergency landing site, a shopping complex parking lot. However, the airplane impacted the top of an industrial warehouse building before falling to the ground and coming to rest in a delivery area on the west side of the building.

## **D. DETAILS OF THE EXAMINATION**

### **1.0 Accident Site Examination**

A survey of the accident site by the NTSB IIC and representatives from the Federal Aviation Administration (FAA) on the day following the accident, revealed that the airplane initially impacted a rooftop air-conditioning unit situated atop a retail building, about 28 feet above ground level with its right wing tip. It then proceeded across the rooftop on a measured magnetic heading of 200 degrees for about 40 ft, then impacted the cinder block perimeter barrier with the forward undercarriage structure. Blue paint transfer signatures were observed on top portion of the cinder block structure, which were consistent with the paint scheme on the lower forward section of the airplane. Additionally, the airplane's right main landing gear impacted the roof's perimeter barrier, which came to rest in a fenced in area about 25 feet of where the main wreckage to came to rest in the delivery parking area on the southwest side of the building. Subsequent to the right main landing gear being separated, the airplane's right wing impacted a 40-foot tall light standard, also located on the southwest side of the building. The airplane then fell the pavement and rotated about 150 degrees to the right prior to coming to rest upright on a heading of about 350 degrees. A subsequent fire ensued. All components necessary for flight were accounted for at the accident site.



Figure 1 - photo of accident site looking west

## 2.0 Follow-up examination

A follow-up examination of the airframe, engine was conducted at the facilities of Air Transport, Phoenix, Arizona, on August 21, 2014. The results of the examinations revealed the following:

## 2.0.1 Airframe examination notes

The airframe, which was examined both on site and post recovery, revealed the following:

The cabin and cockpit sections, although impact damaged, were primarily intact; the right side sustained thermal damage and light sooting. The throttle was observed retarded and the mixture was full rich. A survey of the cockpit instrumentation revealed the Horizontal Situation Indicator read 195 degrees, the Vertical Speed Indicator read plus 120 feet, the altimeter read 220 feet, the right and left fuel indicators read 33 gallons and undetermined respectively, the landing gear handle was positioned in the GEAR DOWN position, the flap switch was in the neutral position, the elevator trim was selected ON, High Boost and Boost Pump switches were off, both left and right control columns were remained connected, and all circuit breakers not tied off were in place. The airplane's Vision Microsystems VM1000 Display Assembly, serial number 94600, was removed from the airplane and shipped to the NTSB Vehicle Recorder division for examination and testing.

The right wing remained attached to the airplane's fuselage at the wing root attach points. The wing was destroyed as a result of severe impact forces with the light standard, as well as thermal activity. The right aileron remained attached to the trailing edge of the wing at each of the three attach point, with fire and impact damage observed. Control continuity from the aileron to the cabin flight control area was confirmed during the postaccident investigation. The right flap, which was observed partially extended, was destroyed by fire and impact damage, with remnants of the component having remained partially attached to the trailing edge of the wing. The right fuel tank was destroyed. The fuel tank's filler cap was observed tightly in place and not compromised.

The airplane's left wing remained attached to the airplane's fuselage at the wing root attach points. The wing had sustained a longitudinal tear from the leading edge of the wing aft to the inboard area of the aileron. Additionally, the upper surface of the wing just forward of the extreme inboard area of the left flap was deformed upward over an area of 18 inches in width and 30 inches in length. The left aileron remained attached to the wing's trailing edge at all attach points, and had sustained only minor damage. Control continuity was confirmed from the aileron to the cockpit control area during the postaccident investigation. The left flap was observed partially extended and attached at all attached points to the trailing edge of its respective wing, and had sustained only minor damage. The left fuel tank was not beached, and the fuel filler cap was found tightly in place and not compromised.

The empennage, with the exception of the outboard one-third of the right horizontal stabilizer and right elevator and the inboard top section of the rudder, was observed to have sustained only minor damage. The referenced horizontal stabilizer was impact damaged, and moderate sooting was observed. Sooting was also observed on both the upper and lower surfaces of the right elevator. The forward top piece of the rudder which overlays the top of the vertical stabilizer had failed down and aft to the left, and remained partially attached to the top of the rudder. Both horizontal stabilizers and vertical stabilizer remained attached to the fuselage and

were not compromised. The elevator remained attached the vertical stabilizer at all attach point, and both elevators remained attached to the trailing edge of their respective horizontal stabilizer at all attach points, with the exception of the right outboard elevators attach point. During the postaccident examination of the airplane, control continuity was observed from the elevator and rudder forward to the cockpit control area.

The airplane's left main landing gear was separated and came to rest about 8 ft aft of the main wreckage. The right main landing gear had separated from the airplane after impact with the roof top perimeter barrier, and came to rest in an enclosure at ground level, about 25 feet east of the main wreckage. The nose landing gear was observed to have separated due to impact forces, and was located wedged in a fence about 20 ft east of the main wreckage.

## **2.0.2 Engine examination notes**

The results of the initial engine examination, according to the Continental Motors air safety investigator, revealed that the engine sustained impact damage concentrated to the bottom portion of the engine. The exhaust was bent and crushed, the oil sump was partially crushed, and the right rear engine mount was broken. The oil filter sustained impact damage and had broken free from the oil filter adapter; the oil cooler also sustained impact damage and had a large dent.

All of the cylinders remained attached to the engine and sustained minor impact damage. All of the top spark plugs were removed and each cylinder was inspected using a borescope. The #2 cylinder displayed corrosion signatures consistent with water contamination typically observed after firefighting efforts. All of the other cylinders displayed normal operating signatures.

The crankshaft remained intact and there were no visible cracks noted. The crankshaft was rotated through the use of a hand tool attached to the propeller flange. There were no abnormalities noted with the crankshaft.

The fuel pump remained attached to its respective installation point and appeared to be undamaged. The fuel pump was removed and the fuel coupling was noted to be intact; the fuel pump was capable of being rotated by hand with no unusual resistance. The fuel pump mixture control arm remained attached and was capable of moving freely from stop to stop. The throttle body and fuel metering assembly remained attached to its respective installation point and sustained minor impact damage to the dataplate. The throttle control remained secured and was capable of moving the throttle valve from the idle stop to the full throttle stop. The fuel manifold valve remained attached to its respective installation point and appeared to be undamaged; there were no signs of leaks with the manifold valve. All of the fuel injectors remained installed in their respective installation points and the fuel lines were secure; there were no anomalies noted with the fuel injectors. There were no anomalies noted with the fuel system.

Both of the magnetos remained attached to their respective installation point and were undamaged. The ignition leads were removed and the crankshaft was rotated; all of the top ignition leads produced a blue spark when the impulse couplings engaged. All of the top spark plugs were inspected and displayed normal wear signatures when compared to Champion Aviation Service Manual AV6-R. All of the bottom spark plugs were inspected using a borescope and displayed normal operating signatures.



Figure 2 - photo of engine as received prior to initial examination

The engine was subsequently shipped to the Continental Motors, Inc. facility located in Mobile, Alabama, for further examination and testing, which included an engine performance test run. The engine performance run, performed on December 2, 2014, revealed the following:

Prior to the engine run the propeller governor was removed and disassembled for a visual inspection. The flyweights, spring, pump gears, valve, and associated components displayed normal operating signatures. The engine was not disassembled prior to the engine run.

The crankshaft end-play measured .007", the crankshaft flange run-out was .003" the deflection was .002".

It was noted during the oil sump removal that there was several large pieces of orange material consistent with the alternator drive coupling; it was noted that the installed alternator drive coupling was intact with no missing portions.

The #2 intake push rod was removed and visually inspected for possible damage resulting from the impact damage to the push rod housing; there was no damage noted. The push rod was installed in a serviceable push rod housing.

The engine was then prepared for operation by installing the appropriate thermocouples, pressure lines and test pads for monitoring purposes. The engine was then moved to CMI test cell number 43 and mounted for operation. The engine was fitted with a test club propeller for the IO-550-N engine model.

The engine experienced a normal start on the first attempt without hesitation or stumbling in observed RPM. The engine RPM was advanced in steps for warm-up in preparation for full power operation. The engine throttle was advanced to 1200 RPM and held for five (5) minutes to stabilize. The engine throttle was advanced to 1600 RPM and held for five (5) minutes to stabilize. The engine throttle was advanced to 2450 RPM and held for five (5) minutes to stabilize. The engine throttle was advanced to full open position and held for five (5) minutes to stabilize. The engine throttle was rapidly advanced from idle to full throttle six times where it performed normally without any hesitation, stumbling or interruption in power.

It was noted that there was an oil leak in the left rear of the engine; the oil leak was consistent with the impact damage to the oil filter adapter and the oil cooler.

Throughout the test phase, the engine accelerated normally without any hesitation, stumbling or interruption in power and demonstrated the ability to produce rated horsepower.

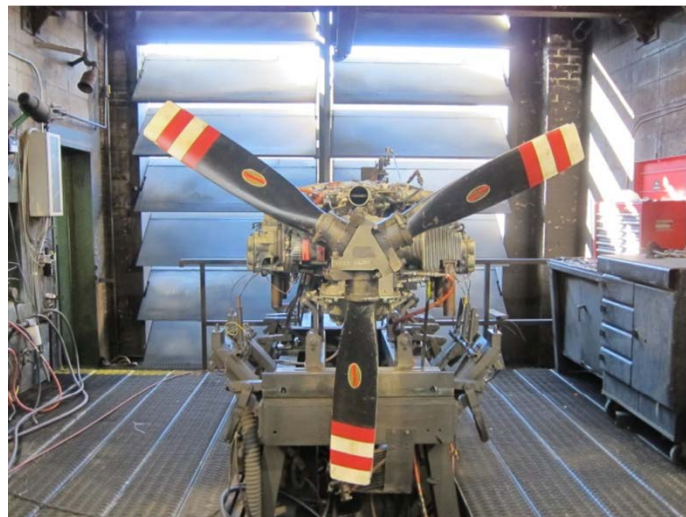


Figure 3 - photo of engine on test stand

### 2.0.3 Propeller examination notes

The airplane's propeller was shipped to the facilities of McCauley Propeller Systems, Wichita, Kansas, for a teardown inspection. On December 4, 2014, the propeller was inspected by a McCauley engineer, who reported the following:

- The propeller had damage as a result of impact. There were no indications of any type of propeller failure or malfunction prior to impact.
- The propeller had indications of some mid-level amount of rotational energy absorption (above windmilling and below full power) during the impact sequence. Exact engine power level was not determined.

- The propeller had no impact signature markings or component positions indicating angle disagreement between blades at impact. All 3 propeller blades had indications of operating in the normal angle range at impact (~16 to 40 degrees reference angle measured at the 30" blade spanwise station). Exact blade angles at impact were not determined. This approximate blade angle is consistent with a propeller being operated at the concluded power level.

The engineer also reported the following observations:

- The propeller had sudden-failure type damage that is typically associated with impact forces; and gross part deflections. The investigation found no evidence of any type of fatigue failure.
- The propeller blade butts had marks from contact with adjacent pitch change hardware during the accident sequence. The position of these marks indicates that all 3 blades were in the normal operating angle range at impact.
- All 3 actuating links were failed. The failure was tension overload type failure related to gross deflection of the blades and the pitch change mechanism during the impact sequence.
- All 3 actuating pins left similar indentations in the blade butts. The depth and direction of material displacement of the indentations corresponded to impact loading from gross deflection of the pitch change piston during the impact sequence.

The propeller blade bending, twisting, and overall propeller assembly damage was typical of that associated with some mid-level (above windmilling and less than full power) rotational energy absorption at impact.



Figure 4 - photo of propeller prior to teardown examination