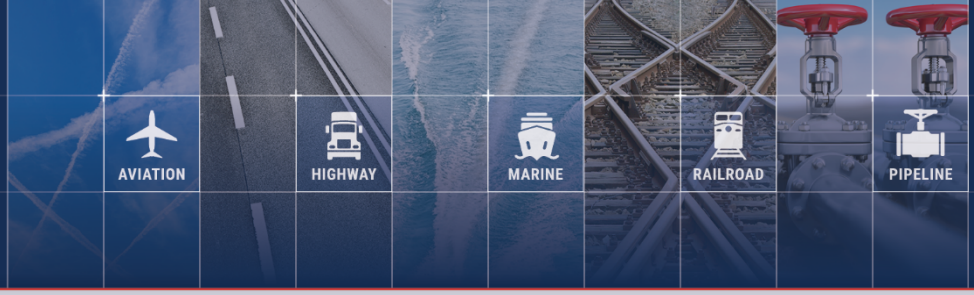

Aviation Investigation Final Report

Location:	Lewiston, California	**Accident Number:**	WPR12LA108
Date & Time:	February 17, 2012, 11:55 Local	**Registration:**	N367MR
Aircraft:	Mooney M20J	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

As the airplane climbed to an altitude of about 4,000 feet mean sea level after departure, the engine quit and would not restart. The pilot landed the airplane on a 3-lane section of highway; however, as the highway narrowed, the airplane's left wing struck two road signs and was substantially damaged. On-scene personnel observed oil streaks on the left side of the airplane's wing and fuselage that appeared to emanate from the engine cowl. Postaccident examination of the engine revealed that the No. 1 connecting rod bearing had seized and that internal engine damage was consistent with oil starvation. Additionally, examination revealed that a single propeller governor gasket was installed on the engine, whereas the proper gasket configuration was a governor pad plate sandwiched between two gaskets. Maintenance records showed that 10 hours before the accident, maintenance that required the removal and reinstallation of the propeller governor had been performed on the engine. The Mooney service manual does not specify that a 3-piece gasket stack be used when installing the propeller governor; however, the Mooney Illustrated Parts Manual shows a 3-piece gasket stack in place at the propeller governor. Additionally, a Lycoming Service Instruction and a Federal Aviation Administration Special Airworthiness Information Bulletin, both of which were issued in 2005, state that a propeller governor pad plate is necessary in this installation to eliminate the possibility of oil leakage between the propeller governor and the accessory housing.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A loss of engine power due to oil starvation as a result of improper maintenance.

Findings

Aircraft	Propeller controlling system - Incorrect service/maintenance
Aircraft	Oil - Fluid level
Personnel issues	Installation - Maintenance personnel

Factual Information

History of Flight

Initial climb	Loss of engine power (total) (Defining event)

HISTORY OF FLIGHT

On February 17, 2012, at 1155 Pacific standard time, a Mooney M20J, N367MR, experienced a loss of engine power about 5 minutes after takeoff near Lewiston, California. The pilot executed a forced landing on California Highway 299. The airplane was registered to and operated by the private pilot under the provisions of Title 14 Code of Federal Regulations, Part 91. The pilot was not injured, and the airplane was substantially damaged. Visual meteorological conditions prevailed, and no flight plan had been filed. The flight originated at Lonnie Pool Field/Weaverville Airport, Weaverville, California, at 1150.

The pilot stated that as the airplane climbed out of Weaverville Airport, and approached 4,000 feet mean sea level (msl), the engine quit, and would not restart. He was able to land the airplane on a section of Highway 299 that was three lanes wide. As the road narrowed, the left wing struck two road signs, substantially damaging the wing. On-scene personnel observed that the left side of the airplane's wing and fuselage had oil streaks emanating from the vicinity of the engine cowl.

AIRCRAFT INFORMATION

The four-seat, low-wing, retractable landing gear airplane, serial number 24-1437, was manufactured in 1984. It was powered by a Lycoming IO-360-A3B6D, 200-hp engine, equipped with a McCauley model B2D34C214-B constant speed propeller. Review of the maintenance logbooks showed that the last annual inspection was completed on October 12, 2011, at 2,063.5 hours total time, and 36.4 hours since major overhaul (SMOH). On February 7, 2012, at 45.0 hours SMOH, the engine accessories were removed and the accessory case housing was sent to a machine shop for repair. The housing was reinstalled along with all the accessories and components which had been removed for the maintenance action. Those items included the lower sump pan, exhaust system, oil cooler, magnetos, oil filter, vacuum pump, propeller governor, fuel and oil hoses, and electrical harness. The engine log book entry states, "All perishable seals and gaskets replaced as required." The engine was then serviced with 8 quarts of Aeroshell 15W50, and test run. The Hobbs time on February 7th was recorded as 1,776.3. The Hobbs time as recorded at the accident site was 1,786.3.

WRECKAGE & IMPACT INFORMATION

The airplane was recovered on Saturday, February 18, 2012, and trucked to a storage location

for further examination. On March 29, 2012, the airplane and engine were examined by the NTSB Investigator-in-Charge (IIC) and two Federal Aviation Administration (FAA) Inspectors. The engine had been removed from the airframe during the recovery of the wreckage.

In order to conduct the engine examination, the engine was suspended from a hoist. The propeller/crankshaft could not be rotated by hand and it was determined that the engine was seized. The propeller was removed from the propeller flange. The engine exhibited no evidence of impact damage. There were locations on horizontal surfaces external to the engine and the underside of some flanges where oil droplets were observed. Spark plugs were removed. The spark plugs exhibited normal operating signatures except for cylinder #4 which exhibited black dust-like residue on the top spark plug, and black deposits fouling the bottom spark plug. The fuel flow divider was disassembled. The gasket was pliable and intact. A petroleum odor was observed, and liquid was present on the plunger.

The oil filter was safety wired and had the date 1/31/2012 hand written on it. A wrench was used to loosen the filter and a filter cutter was used to cut open the case to examine the filter element. Portions of the filter element were black, and other sections were light brown/tan. Gold and black flakes were observed in the filter folds. Oil lines from the accessory case to the oil cooler, and from the oil cooler to the oil filter, were secure. Approximately 6 oz. of oil drained from the oil cooler when it was removed from the engine. The oil cooler was sealed, pressurized with compressed air, and submerged into a water tank. No air bubbles were observed leaking from the oil cooler. The oil plug finger screen was removed and examined. It had some black flakes and fibrous material on the screen but nothing that would restrict the flow of oil. The plug/screen did release a thin drizzle of oil after the plug had been removed.

The fuel lines leading to the throttle body were removed and released fuel. The fuel pump was removed and fuel drained from it. The propeller governor was removed, was able to be rotated freely by hand, and the filter screen was clear of debris. The governor drained out approximately 2 oz. of oil. The propeller gasket was a single black gasket, with MS9144-01 and AMS7283 imprinted on it in white lettering. The exhaust manifolds were removed. The exhaust manifolds were dark brown/black and dull in color. The muffler was brown/black, with dark vertical stained streaks.

The accessory case housing of the engine was removed; the gasket was pliable and no evidence of oil leakage. The oil pump was able to be rotated freely by hand. The oil pump cover was removed, and the pump gears exhibited no damage or scoring. The induction tubes and exhaust manifold were removed from the engine oil sump. The oil pan was removed from the bottom of the engine. A small amount of oil was observed coating the bottom of the sump. Gold colored and black colored flakes or sand-like material were observed on the bottom of the sump. There was no evidence of an oil leak from the oil sump gasket.

The valve covers were removed from all four cylinders, and all valve rockers were coated with a light coat of oil. The cylinders were removed from the engine case. All valves were seated, and no evidence of mechanical valve damage was observed. All pushrods were removed and

found lubricated with oil, with no discoloration observed. The piston wrist pins were removed. Piston heads exhibited brown-white combustion deposits on the faces. The no. 1 connecting rod was seized at the crankshaft bearing. The connecting rod exhibited red-brown discoloration around the base of the rod and connecting rod end cap. The no. 2 connecting rod moved freely and had no discoloration. The no. 3 connecting rod moved freely, and was discolored red-brown around the base and end cap. The no. 4 connecting rod moved freely, and had no discoloration. Crankshaft balance weights were present and moved freely. The engine case was not split. Total amount of engine oil recovered from the engine was measured as 1 quart. An estimated additional 1/8 to 1/4 quart was observed draining from the oil suction screen plug hole (but was not captured).

TESTS & RESEARCH

J.P. Instruments EDM-700

The airplane was equipped with a JPI EDM-700 engine monitor. The EDM-700 is a panel mounted gauge that the operator can monitor and record up to 24 parameters related to engine operations. The EDM-700 was sent to the NTSB Vehicle Recorder Laboratory for data download and review. The unit contained 11.2 hours of recorded data over 21 power cycles. The recorded data spanned dates of October 5, 2011 through the accident flight on February 17, 2012, as recorded by the unit internal clock. The parameters recorded were EGT, CHT, and battery voltage. Additionally, the calculated shock cooling rate was also recorded. No other parameters were recorded by the unit. The firmware revision number indicated on the configuration screens was 2.92. The recording session began at 11:47:16 on February 17, 2012 and continued for about 11 minutes 48 seconds until 11:59:04. The recording related to the accident flight shows a steady-state, CHT of about 386 deg F prior to a CHT rise at 11:54:09. The EGT also was in a steady-state, at about 1,303 deg F until an EGT rise at 11:54:04. The CHT began to decrease at 11:56:03, about 42 seconds after the EGT began to decrease.

The full Vehicle Recorder Laboratory Factual report is available in the official docket of this investigation.

Lycoming Service Instruction No. 1438A

Lycoming Service Instruction No. 1438A, dated December 9, 2005, is applicable to all four and six cylinder, dual magneto engines with rear mounting propeller governor drives, and is applicable any time the propeller governor is installed. The service instruction states, ”The use of a P/N LW-12347 propeller governor pad plate and two P/N 72053 gaskets on dual magneto engines with rear mounted propeller governor drives is necessary with some propeller governors to eliminate the possibility of oil leakage between the propeller governor and the accessory housing.” The service instruction includes an illustration that shows a gasket stack with the pad plate sandwiched between two gaskets.

Special Airworthiness Information bulletin (SAIB)

SAIB NE-06-08, dated November 9, 2005, alerts owners, operators, and certificated repair facilities of Lycoming four and six cylinder, dual magneto engines with rear mounted propeller governor drives, of a potential assembly problem that could result in loss of engine oil leading to engine failure. The oil loss results from the omission of a plate, Lycoming part number (P/N) LW-12347, which is required between the propeller governor drive pad and the propeller governor.

Mooney M20J Service and Maintenance Manual and Illustrated Parts Catalog

Section 61-20-10 of the M20J Service Manual, Propeller Controlling, Governor Installation, lists a 6 step procedure to install the propeller governor.

1. Clean mounting pad and bottom of governor.
2. Coat new gasket w/ DOW Corning 7 compound release agent or equivalent before installation.
3. Install new gasket on mounting studs. Insure gasket has raised surface of the gasket screen toward the governor.
4. Position governor on mounting studs, align the governor splines and the splines of the accessory dove.
5. Install all mounting hardware. Torque nuts.
6. Connect governor control to governor and rig.

These instructions do not indicate that there are multiple gaskets required for installation in steps 2 & 3. However, the illustrated parts catalog for the Mooney M20J does show 3 separate gasket items to be installed at the propeller governor interface.

ADDITIONAL INFORMATION

The Airframe & Powerplant (A&P) mechanic with Inspection Authorization (IA) who installed the accessories on to the engine provided a written statement to the FAA Inspector who was involved in this investigation. The mechanic stated that the engine sump and accessory case was already installed when he was given the task of installing the following accessories; oil filter housing, oil filter, thermostatic valve, vacuum pump, propeller governor, fuel injector throttle body, intake tubes, and exhaust system, all with new gaskets and seals. He stated that all work was done in accordance with the AVCO Lycoming Manual and the Mooney Service Manual. The Director of the maintenance facility that performed the work on the engine stated to the NTSB IIC that the mechanic who had done installation of the accessories was not aware, at the time, that the propeller governor shim & gasket needed to be retained for reuse after it had been removed from the engine.

Pilot Information

Certificate:	Private	**Age:**	65,Male
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:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	June 29, 2010
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	June 29, 2010
Flight Time:	1234 hours (Total, all aircraft), 284 hours (Total, this make and model), 1200 hours (Pilot In Command, all aircraft), 5 hours (Last 90 days, all aircraft), 1 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Mooney	**Registration:**	N367MR
Model/Series:	M20J	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	24-1437
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	October 12, 2011 Annual	**Certified Max Gross Wt.:**	2740 lbs
Time Since Last Inspection:	1 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	2064 Hrs as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:	Installed, not activated	**Engine Model/Series:**	IO360 SER
Registered Owner:	KROUSE DONALD E	**Rated Power:**	180 Horsepower
Operator:	KROUSE DONALD E	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KRDD,505 ft msl	**Distance from Accident Site:**	20 Nautical Miles
Observation Time:	11:53 Local	**Direction from Accident Site:**	120°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.27 inches Hg	**Temperature/Dew Point:**	12°C / 1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Weaverville, CA (KO54)	**Type of Flight Plan Filed:**	None
Destination:	Redding, CA (KO85)	**Type of Clearance:**	None
Departure Time:	11:50 Local	**Type of Airspace:**	

Airport Information

Airport:	Weaverville KO54	**Runway Surface Type:**	
Airport Elevation:	2350 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	40.674446,-122.826942(est)

Administrative Information

Investigator In Charge (IIC):	McKenny, Van
Additional Participating Persons:	Thomas Weeks; Federal Aviation Administration; Sacramento, CA Mark Platt; Lycoming; Van Nuys, CA Robert Collier; Mooney; Kerrville, TX
Original Publish Date:	August 13, 2013
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=82917

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The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties … and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available here.