Aviation Investigation Final Report

Location:	Marked Tree, Arkansas	**Accident Number:**	CEN12FA463
Date & Time:	July 21, 2012, 08:30 Local	**Registration:**	N1310W
Aircraft:	Mooney M20E	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 Minor, 1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot reported that about 5 minutes after reaching cruise altitude, the engine started to run rough with an accompanying partial loss of power. He noted that the engine exhaust temperatures had dropped but that other engine indications were normal. The pilot elected to divert to an intermediate airport; however, the engine continued to lose power, and the pilot was unable to maintain a proper glide path to the runway. The pilot was concerned about an inadvertent aerodynamic stall, so he made a forced landing to the bean field short of the runway.

Postaccident bench testing of the engine fuel injection servo revealed variations in fuel flow that were not consistent with normal servo operation. Further examination of the fuel servo revealed that the mixture control valve O-ring was damaged and that a fragment of the O-ring was located on the surface of the mixture control valve plate. This likely interfered with fuel flow through the servo and reduced the available engine power. The fuel servo was overhauled about 1 year before the accident and had accumulated about 113 hours in service since the overhaul.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The loss of engine power during cruise flight due to a malfunction of the fuel injection servo due to a damaged O-ring.

Findings

Aircraft	Fuel controlling system - Malfunction
Aircraft	(general) - Malfunction

Factual Information

History of Flight

Enroute-cruise	Loss of engine power (partial) (Defining event)
Emergency descent	Off-field or emergency landing

HISTORY OF FLIGHT
On July 21, 2012, about 0830 central daylight time, a Mooney M20E airplane, N1310W, was substantially damaged during a forced landing following a loss of engine power. The pilot was diverting to the Marked Tree Municipal Airport (6M8), Marked Tree, Arkansas, and was on approach to runway 36 at the time of the forced landing. The pilot sustained minor injuries. The passenger was uninjured. The airplane was registered to and operated by the pilot under the provisions of 14 Code of Federal Regulations Part 91 as personal flight. Visual meteorological conditions prevailed for the flight, which was operated on an instrument flight rules flight plan. The flight originated from West Memphis Airport (AWM), West Memphis, Arkansas, about 0804, with an intended destination of Sullivan Regional Airport (UUV), Sullivan, Missouri.

The pilot reported that about 5 minutes after reaching a cruise altitude of 6,000 feet mean sea level, the engine started to run rough with an accompanying partial loss of power. The engine exhaust temperatures on all four cylinders had dropped from about 1,350 degrees Fahrenheit (F) to below 1,000 degrees F. The remaining engine indications appeared normal. His attempts to resolve the issue were not successful and he elected to divert to 6M8. He stated that the engine continued to lose power as the flight approached the airport. He was unable to maintain a proper glide path to the runway and was concerned about an inadvertent aerodynamic stall. He subsequently executed a forced landing to the bean field short of the runway.

PERSONNEL INFORMATION
The pilot held a private pilot certificate with single-engine land and instrument airplane ratings. He was issued a third class airman medical certificate on June 25, 2012, with a restriction for corrective lenses. The pilot reported that at the time of the accident he had accumulated about 2,148 hours total flight time, with approximately 1,900 hours in Mooney M20E airplanes. His most recent flight review was completed on February 6, 2011.

AIRCRAFT INFORMATION
The accident airplane was a 1963 Mooney M20E, serial number 198. It was a four place, single engine design, configured with retractable, tricycle landing gear. The airplane was powered by a 200-horsepower Lycoming IO-360-A1A engine, serial number L-2994-51A.

Maintenance records indicated that the most recent annual inspection was completed on July

12, 2012, at a total airframe time of 5,137.19 hours. At the time of that inspection, the engine had accumulated 1,907.19 hours since overhaul. The maintenance records contained no entries subsequent to the annual inspection. The recording tachometer indicated 5,138.37 hours at the time of the accident.

Maintenance records indicated that repairs were made to the airplane fuel system in July 2010, which included an overhaul of the fuel injection servo. The tachometer indicated 5,024.9 hours at that time. The pilot reported that he did not recall any fuel system related repairs since the airplane was purchased in March 1989, with the exception of occasional fuel injector cleaning.

METEOROLOGICAL INFORMATION

Weather conditions recorded at AWM, located about 25 miles south of 6M8, at 0853, were: wind from 070 degrees at 6 knots, 10 miles visibility, clear sky, temperature 28 degrees Celsius, dew point 23 degrees Celsius, altimeter 29.98 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The airplane remained upright and came to rest about 325 feet from the arrival end of runway 36. The landing gear separated from the airframe and the right wing was substantially damaged. The cockpit/cabin remained intact.

A postaccident examination was conducted after recovery of the airplane. The engine was removed from the airframe to facilitate recovery. Engine control continuity was intact prior to removal of the engine. Fuel samples did not exhibit any visible sediment or contamination. The samples were consistent in appearance to 100 low lead aviation fuel. Fuel flow was confirmed from each wing fuel tank to the firewall fuel fitting. Electrical continuity from the cockpit ignition switch to firewall leads was confirmed.

The engine crankcase and cylinders appeared undamaged. Internal engine and accessory section continuity were confirmed via crankshaft rotation. The fuel flow divider appeared undamaged. The fuel injector lines were intact and the fuel injector nozzles were unobstructed. The spark plugs were unremarkable. The intake and exhaust systems appeared intact. No anomalies with respect to the engine driven fuel pump were observed, with the exception of minor internal corrosion deposits. Both magnetos produced spark across all leads when tested. No anomalies consistent with a loss of available engine intake air were observed.

TESTS AND RESEARCH

Bench testing of the engine fuel injection servo revealed that the unit performed as expected at each test point. Fuel flow rates stabilized at each test point and approximated the specifications for an in-service servo unit. However, variations in the fuel flow rate were observed during the course of the testing. The range of these variations was not consistent with normal servo function.

A teardown examination of the fuel servo revealed that a section of an O-ring installed on the

mixture control lever assembly was missing. Additionally, an O-ring fragment was located on the surface of the mixture control valve plate. The fragment measured approximately 7 mm by 2 mm, which appeared to correspond to the size of the missing O-ring section. No other anomalies were observed with respect to the fuel servo unit.

Pilot Information

Certificate:	Private	**Age:**	62,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	June 25, 2012
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	February 6, 2011
Flight Time:	2148 hours (Total, all aircraft), 1900 hours (Total, this make and model), 2040 hours (Pilot In Command, all aircraft), 2 hours (Last 90 days, all aircraft), 2 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Mooney	**Registration:**	N1310W
Model/Series:	M20E	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	198
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	July 12, 2012 Annual	**Certified Max Gross Wt.:**	2575 lbs
Time Since Last Inspection:	1 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	5138 Hrs at time of accident	**Engine Manufacturer:**	LYCOMING
ELT:	Installed, not activated	**Engine Model/Series:**	IO-360-A1A
Registered Owner:	On file	**Rated Power:**	180 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:	AWM,212 ft msl	**Distance from Accident Site:**	25 Nautical Miles
Observation Time:	08:53 Local	**Direction from Accident Site:**	180°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	70°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.97 inches Hg	**Temperature/Dew Point:**	28°C / 23°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	West Memphis, AR (AWM)	**Type of Flight Plan Filed:**	IFR
Destination:	Sullivan, MO (UUV)	**Type of Clearance:**	IFR
Departure Time:	08:04 Local	**Type of Airspace:**	

Airport Information

Airport:	Marked Tree Municipal 6M8	**Runway Surface Type:**	Asphalt
Airport Elevation:	219 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	36	**IFR Approach:**	None
Runway Length/Width:	3200 ft / 60 ft	**VFR Approach/Landing:**	Forced landing;Straight-in

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor, 1 None	**Latitude, Longitude:**	35.533054,-90.400276(est)

Administrative Information

Investigator In Charge (IIC):	Sorensen, Timothy
Additional Participating Persons:	John Gruber; FAA – Little Rock Flight Standards; Little Rock, AR
Original Publish Date:	February 14, 2013
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=84400