Aviation Investigation Final Report

Location:	North Branford, Connecticut	**Accident Number:**	ERA17FA327
Date & Time:	September 16, 2017, 13:00 Local	**Registration:**	N53CP
Aircraft:	Mooney M20C	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airline transport pilot, who was the owner of the airplane, and one passenger departed on a day visual flight rules cross-country flight. The airplane came to rest in a wooded area near an open field about 24 miles from the departure airport. The pilot was not in contact with air traffic control during the flight. Review of radar information revealed radar targets that were coincident with the accident flight on a south-southeast track at altitudes between 900 and 1,300 ft above ground level until radar contact was lost about 1 mile northwest of the accident site. Several individuals near the accident site reported that they heard the sound of the impact, but there were no witnesses to the accident. The propeller exhibited signatures consistent with a lack of engine power at the time of impact. The fuel selector was found in the left tank position and the landing gear was extended. There was evidence of fuel in both tanks at the accident site.

Examination of the fuel system revealed that air would not pass through the fuel selector valve with the valve selected to the left fuel tank position. The handle was operated by hand and could be moved normally between the settings. Air passed freely through the valve when selected to the right tank position. Disassembly of the fuel selector revealed a piece of red, fibrous material consistent with a shop towel that likely inhibited fuel flow to the engine and resulted in fuel starvation and a total loss of engine power. The airplane's maintenance logs were not found and when the shop towel debris may have been introduced to the fuel system could not be determined. Additionally, a homemade tool constructed of PVC pipe and connection fittings was found in the wreckage that appeared to be designed to manipulate the fuel selector; however, the reason for its fabrication and use during the accident flight could not be determined. The device was broken at its handle.

Following the loss of engine power, the pilot may have attempted to switch the fuel selector from the left tank to the right tank and was unable to do so, either due to a failure of his homemade tool or to the inadequate time afforded to troubleshoot the loss of engine power due to his selection of a low cruising altitude, or a combination of the two factors. The airplane's low cruising altitude also reduced the pilot's available forced landing site options after the engine lost power. It is likely that the pilot was attempting to reach an open field that was about 1,500 ft beyond the accident site and had lowered the landing gear

in preparation for landing, but due to the airplane's low altitude, it was unable to reach the field and impacted trees.

The pilot's medical certificate was denied nearly 10 years before the accident and never re-issued. Autopsy identified severe cardiac disease, which placed the pilot at risk for sudden symptoms such as chest pain, shortness of breath, palpitations, or fainting; however, it is not likely that this condition contributed to the accident.

Probable Cause and Findings

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

A total loss of engine power due to fuel starvation as the result of foreign object debris in the fuel selector valve. Contributing to the accident was the pilot's selection of a low cruising altitude, which reduced the available time to troubleshoot the loss of engine power and afforded fewer forced landing site options, and improper maintenance of the airplane, which allowed a portion of a shop towel into the fuel system.

Findings

Aircraft	Fuel selector/shutoff valve - Damaged/degraded
Aircraft	Fuel - Fluid management
Aircraft	Fuel selector/shutoff valve - Incorrect use/operation
Personnel issues	(general) - Other
Personnel issues	Post maintenance inspection - Other
Aircraft	Altitude - Not specified
Personnel issues	Decision making/judgment - Pilot

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Enroute	Fuel starvation
Enroute	Loss of engine power (total) (Defining event)
Landing	Collision with terr/obj (non-CFIT)

On September 16, 2017, about 1300 eastern daylight time, a Mooney M20C, N53CP, was substantially damaged when it impacted trees and terrain near North Branford, Connecticut. The airline transport pilot and the passenger were fatally injured. The airplane was owned by the pilot who was operating it as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed, and no flight plan was filed for the flight, which departed from Robertson Field Airport (4B8), Plainville, Connecticut, and was destined for Francis S. Gabreski Airport (FOK), Westhampton Beach, New York.

The pilot departed FOK about 1000 the morning of the accident and flew to 4B8 to pick up his passenger for the subsequent return flight to FOK where the passenger, a NASCAR driver, would be participating in a race at the Riverhead Raceway that afternoon. The pilot and passenger were friends and had been flying together for over 10 years; they and had flown this route many times according to friends.

The line service attendant at 4B8 reported that the pilot requested that the airplane's fuel tanks be topped off. The airplane was fueled with 15.8 gallons of 100LL aviation gasoline; 9 gallons in the right tank and 6.8 gallons in the left tank. After fueling, the line service attendant witnessed the pilot check the fuel through the fuselage fuel sump, then converse with several other pilots before departing with his passenger about 1230.

Review of radar data obtained from the United States Air Force 84th Radar Evaluation Squadron (RADES) revealed radar targets that were coincident with the accident flight. A radar target first appeared about 1242 about 10 miles south of 4B8 and about 1,200 ft mean sea level (msl). A radar track continued south-southeast for about 9 minutes. The airplane remained at altitudes between about 1,200 and 1,600 ft msl (about 900 to 1,300 feet above ground level) until radar contact was lost about 1 mile northwest of the accident site.

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	81,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	October 16, 2006
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 31000 hours (Total, all aircraft)		

Passenger Information

Certificate:		**Age:**	Male
Airplane Rating(s):		**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	Lap only
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

According to Federal Aviation Administration (FAA) airman records, the pilot, age 81, held an airline transport pilot certificate with a rating for airplane multi-engine land and commercial privileges for airplane single-engine land and sea. He also held a flight instructor certificate with ratings for airplane single-engine and instrument airplane, a flight engineer certificate with a rating for turbojet-powered airplanes, and a mechanic certificate with airframe and powerplant ratings.

The pilot's most recent application for an FAA second-class medical certificate was dated October 16, 2006. On that date, he reported 31,300 total hours of flight experience.

Aircraft and Owner/Operator Information

Aircraft Make:	Mooney	**Registration:**	N53CP
Model/Series:	M20C	**Aircraft Category:**	Airplane
Year of Manufacture:	1964	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	2663
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	Unknown	**Certified Max Gross Wt.:**	2575 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	at time of accident	**Engine Manufacturer:**	LYCOMING
ELT:	C91A installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-360-B1B
Registered Owner:	On file	**Rated Power:**	180 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The low-wing, four-seat monoplane was issued a standard airworthiness certificate on September 4, 1964. It was equipped with retractable landing gear and was powered by an air-cooled Lycoming IO-360, 180-horsepower engine, driving a Hartzell 3-bladed constant speed propeller. The airplane was equipped with two 26-gallon fuel tanks for a total fuel capacity of 52 gallons. No airplane maintenance records were located.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	HVN,13 ft msl	**Distance from Accident Site:**	9 Nautical Miles
Observation Time:	12:53 Local	**Direction from Accident Site:**	228°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	Broken / 1400 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/ None	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.15 inches Hg	**Temperature/Dew Point:**	24°C / 19°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	PLAINVILLE, CT (4B8)	**Type of Flight Plan Filed:**	None
Destination:	WESTHAMPTON BCH, NY (FOK)	**Type of Clearance:**	None
Departure Time:	12:40 Local	**Type of Airspace:**	Class G

At 1653, the weather conditions reported at Tweed-New Haven Airport (HVN), New Haven,

Connecticut, located 9 miles southwest of the accident site, included variable wind at 3 knots, 10 statute miles visibility, broken clouds at 1,400 ft above ground level, temperature 24°C, dew point 19°C, and an altimeter setting of 30.16 inches of mercury.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	41.361389,-72.744445(est)

Examination of the accident site revealed that the airplane's first point of impact was in 75-ft-tall pine trees in a nose-down attitude before coming to rest against trees in a nose-down position on its right side. The wreckage path was 175 ft long and was oriented on a heading of about 010° magnetic. There were an open field about 1,500 ft north of the accident site. The right wing separated from the fuselage at the wing root during impact and was the first piece of wreckage discovered at the start of the wreckage path. Three feet of the outboard left wing was found 75 ft north of the right wing and was wrapped around a tree. The fuselage, left wing, and tail assembly remained together at the main wreckage site, where they came to rest against a tree. The landing gear was extended, and the landing gear selector was in the "DOWN" position. The wing flaps were in the retracted position.

The primary flight instruments on the pilot's (left) side remained intact. The magneto switch was found in the "BOTH" position. The airplane was not equipped with any instruments that contained non-volatile memory.

The right wing fuel tank was breached during the impact sequence and evidence of fuel was found on the trees and vegetation near the initial impact point. The left wing fuel tank contained about 7.5 gallons of fuel. The fuel selector was inaccessible due to cockpit crushing and floor buckling, but a visual examination through the firewall indicated that it was in the left tank position.

The airframe and engine were removed from the site to facilitate further examination.

The propeller remained attached to the crankshaft flange. The spinner was partially crushed on one side. For the examination and visual reference, the three propeller blades were labeled A, B, and C. Blade A was bent aft about 30° about 6 inches outboard of the hub and could be rotated in the hub by hand. Blades B and C appeared straight and undamaged, with no rotational scoring, s-bending, or chordwise scratching. The propeller governor was impact-damaged and partially separated from the engine. The governor control cable remained attached to the governor control arm but was impact damaged. The governor oil screen was absent of debris.

Continuity of the crankshaft to the rear gears and to the valve train was confirmed and each cylinder produced suction and compression. The interiors of the cylinders were examined using a lighted borescope and no anomalies were noted. The No. 1 cylinder was removed to facilitate inspection of the

engine crankcase. No anomalies were noted to the crankcase interior components or to the No. 1 cylinder, piston or valves. Oil was present in the engine and the pistons, valves, and crankshaft appeared lubricated.

Both left and right magnetos were undamaged and no anomalies were noted. Both magnetos produced sparks at regular intervals when rotated by an electric drill.

The ignition harness remained attached to the magnetos, and the leads remained secured by their terminal ends to their respective spark plugs. The spark plugs remained secured to their respective cylinders. The top spark plugs were removed and examined. They all displayed little wear and no evidence of carbon or lead fouling in accordance with the Champion Check-A-Plug chart.

The vacuum pump remained attached to the engine and no damage was noted. The pump was removed and partially disassembled. The composite drive assembly, carbon rotor, and carbon vanes were intact.

The alternator remained attached to the engine and was undamaged. The alternator was rotated easily by hand and the drive belt was in place and unbroken.

The fuel injector servo was fractured across the throttle bore and separated from the engine oil sump. The throttle and mixture control cables remained attached to their respective servo control arms. The control cables and associated brackets were impact-damaged and the positions of the controls could not be determined.

The induction air box and air filter were present and impact-damaged but did not exhibit any preimpact anomalies.

The fuel injector servo was partially disassembled and no damage to the rubber diaphragms or other internal components was noted. The servo fuel inlet screen was absent of debris. The fuel flow divider remained attached to the engine and no damage was noted. The flow divider was partially disassembled, and no damage was noted to the rubber diaphragms or other internal components.

No debris was noted inside the flow divider. The fuel nozzle lines and the two-piece nozzles remained in place and were unobstructed. The engine-driven fuel pump remained attached to the engine. No damage was noted and it operated normally when actuated by hand. The pump was partially disassembled, and no damage was noted.

Liquid with an odor consistent with aviation fuel was observed in the engine-driven fuel pump, the hose from the pump to the servo, in the servo, and in the fuel selector. The fuel selector valve was removed from the airframe and air pressure applied to the valve fuel outlet port. Air did not pass through the selector valve when the handle was in the position marked "LEFT." The handle was moved to the "OFF" position, then back to the "LEFT" position, and it remained blocked. Air did not pass through the valve when the actuator handle was placed in the position marked "OFF" or in the rearward, unmarked position. Air passed freely when the handle was placed in the position marked "RIGHT." When the handle was returned to the position marked "LEFT," no air passed through the selector valve. The selector handle moved normally with no unusual resistance between the settings.

The valve was disassembled and a spongy mass of reddish fibers consistent in appearance with red cotton shop towel fibers were observed in the selector cavity (see figure 1). The rounded mass was about 5/8 inches in length and about 3/8 inches in width. Fibers also covered about 5% of the fuel drain screen.

Figure 1-Debris discovered in the fuel selector.

A section of PVC similar to plumbing or electrical conduit was discovered in the wreckage (see figure 2). It was made up of five individually-threaded, male-to-female connections which, when threaded together, measured about 9 inches long. On the top of the device was a PVC pipe in the shape of a handle. The entire device was in three separate pieces when discovered; the top of the t-handle was broken from the device and the bottom section was unscrewed. On each side of the handle was a label indicating "LEFT" and "RIGHT." The top of the handle was labeled "FUEL." On the bottom of the T-handle connection, the vertical pipe appeared to be hand carved/shaved so that it would fit into the top section of the devise There was a 3/4-inch notch cut out on the bottom of the device. When the device was reassembled during the examination, it fit into the airplane fuel selector handle, and appeared to be designed to switch the fuel tanks; however, the reason for its fabrication and use was unknown.

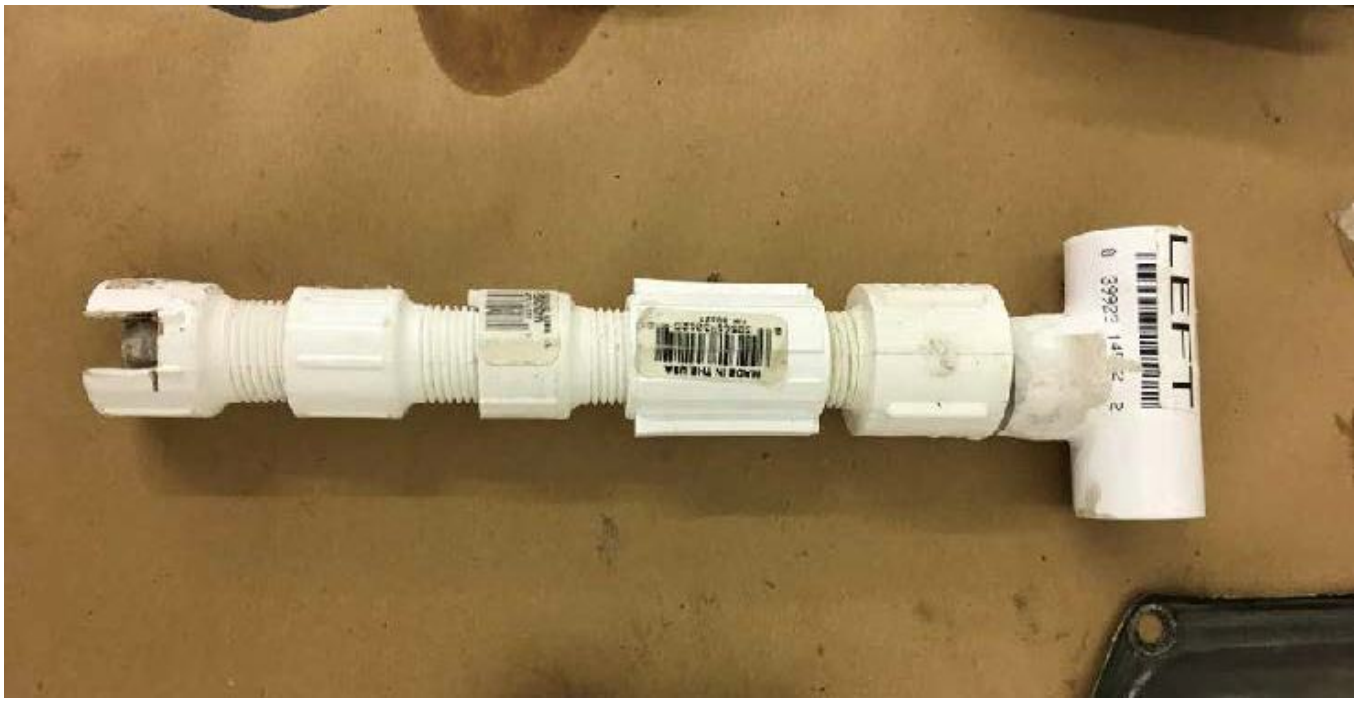

Figure 2-Homemade fuel selector tool after partial reassembly.

Medical and Pathological Information

The State of Connecticut, Office of the Chief Medical Examiner, performed the autopsy and determined

that the cause of death was blunt injuries of the head and chest.

According to the report, the pilot weighed 195 pounds. The autopsy identified previous cardiac surgery but did not describe the status of the grafts or the thickness of various walls. The heart weighed 500 grams and microscopy identified myocyte hypertrophy and described the myocardium as having extensive fibrosis. The average heart weight for a 195-pound man is 376 grams with an upper range of 484 grams. In addition, the pathologist noted a scar of the upper left chest with underlying suture material, but no defibrillator device or wires were described.

Toxicology testing by the state of Connecticut Department of Emergency Services and Public Protection, Division of Scientific Services, did not identify any tested-for alcohols.

Toxicology testing performed by the FAA Forensic Sciences Laboratory identified clopidogrel, losartan, and metoprolol in blood. All these substances, as well as ibuprofen and vardenafil, were identified in urine. Clopidogrel is an anti-platelet medication used to prevent recurrent heart attacks and is commonly marketed with the name Plavix. Losartan and metoprolol are blood pressure medications. Ibuprofen is an over-the-counter analgesic often marketed with the names Motrin and Advil. Vardenafil is a drug used to treat erectile dysfunction and is commonly sold with the name Levitra. None of these substances are considered impairing.

The pilot had previously reported hypertension and ischemic cardiomyopathy due to severe coronary artery disease that had been treated with three-vessel coronary artery bypass grafting in 2001. He had obtained a special issuance medical certificate beginning in 2002 and had reported using various medications over the years. No other abnormalities were identified on the physical exam and the pilot was initially issued a second-class medical certificate limited by a requirement to wear corrective lenses and specifying, "Limited second class/Full third class privileges; Not valid for carrying passengers or cargo for compensation except if serving as pilot of fully qualified 2-pilot crew; Not valid for any class after 10/31/2007." The pilot subsequently had an internal defibrillator placed and his medical certificate was denied in December 2007.

Administrative Information

Investigator In Charge (IIC):	Mccarter, Lawrence
Additional Participating Persons:	Robert McCauley; FAA-Bradley; Enfield, CT Mike Childers; Lycoming; Williamsport, PA
Original Publish Date:	December 17, 2019
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=96022

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