Aviation Investigation Final Report

Location:	Santa Rosa, New Mexico	**Accident Number:**	ANC19FA018
Date & Time:	May 5, 2019, 16:00 Local	**Registration:**	N102SN
Aircraft:	Beech A60	**Aircraft Damage:**	Substantial
Defining Event:	Aerodynamic stall/spin	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was performing a personal cross-country flight. While en route to the intended destination, the pilot contacted air traffic control to report that the airplane was having a fuel pump issue and requested to divert to the nearest airport. The pilot stated that the request was only precautionary and did not declare an emergency during the flight; he provided no further information about the fuel pump. As the airplane approached the diversion airport, witnesses observed the airplane flying low and rolling to the left just before impacting terrain, after which a postcrash fire ensued.

An examination of the airframe revealed no preimpact mechanical malfunctions or failures that would have precluded normal operation. A postaccident examination and review of recorded data indicated that the left engine was secured and in the feather position, and that the right engine was operating at a high RPM setting.

The left engine-driven fuel pump was found fractured. Further examination of the fuel pump revealed fatigue failure of the pressure relief valve. The fatigue failure initiated in upward bending on one side of the valve disk and progressed around both sides of the valve stem. As the cracks grew, the stem separated from the disk on one side and began to tilt in relation to the disk and the valve guide due to the non-symmetric support, which caused the lower end of the stem to rub against the valve guide, creating wear marks. The increasing stem tilt would have impinged against the valve guide, and the valve might have begun to stick in the closed position. If the valve were stuck in the closed position, it would not be able to open, and the outlet fuel pressure could rise above the set point pressure. Because the pump was driven by the engine, there would not be a way for the pilot to shut it off, disconnect it, or bypass it. Instead, the fuel pressure would continue to rise until the valve were to unstick. Thus, the pilot was likely experiencing variable fuel pressure as the valve became stuck and unstuck.

Examination of the spring seat and the diaphragm plate, which were in contact with each other in the fuel pump assembly, revealed wear marks on the surface of each component, with one mark on the diaphragm plate and two wear marks on the spring seat. The two wear marks on the spring seat were

distinct features separated by material with no wear indications in between. The only way that these wear marks could have occurred were if the spring seat was separated from the diaphragm plate and reinstalled in a different orientation. Thus, it is likely that the pilot had encountered a fuel pump problem before the accident flight and that someone tried to troubleshoot the problem.

The last radar data point indicated that the airplane was traveling at a groundspeed of about 98 knots, and had passed north of the airport, traveling to the southwest. The minimum control speed for the airplane with single-engine operation was 88 knots. However, it is likely that if the pilot initiated a left turn back toward the airport, that the right engine torque and the 14 knot wind with gusts to 24 knots would have necessitated a higher speed. Because appropriate control inputs and airspeed were not maintained, the airplane rolled in the direction of the feathered engine (due to the left fuel pump problem), resulting in a loss of control.

The pilot's toxicology report was positive for cetirizine, sumatriptan, gabapentin, topiramate, and duloxetine. All of these drugs act in the central nervous system and can be impairing alone or in combination. Although this investigation could not determine the reason(s) for the pilot's use of these drugs, they are commonly used to treat chronic pain syndromes or seizures. It is likely that the pilot was experiencing some impairment because of multiple impairing medications and was unable to successfully respond to the in-flight urgent situation and safely land the airplane.

Probable Cause and Findings

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

The pilot's loss of airplane control due to his failure to maintain appropriate control inputs and airspeed after shutting down an engine because of a progressive failure of the pressure relief valve in the fuel pump, which resulted in variable fuel pressure in the engine. Contributing to the loss of control was the pilot's use of multiple impairing medications.

Findings

Personnel issues	Aircraft control - Pilot
Aircraft	Engine out control - Not attained/maintained
Aircraft	Fuel pumps - Malfunction
Environmental issues	Tailwind - Response/compensation
Environmental issues	Crosswind - Response/compensation
Environmental issues	Gusts - Response/compensation
Personnel issues	Prescription medication - Pilot

Factual Information

History of Flight

Enroute	Loss of engine power (partial)
Enroute	Course deviation
Enroute	Engine shutdown
Maneuvering-low-alt flying	Aerodynamic stall/spin (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)
Post-impact	Fire/smoke (post-impact)

On May 5, 2019, about 1600 mountain daylight time, a Beech A60 airplane, N102SN, was substantially damaged when it was involved in an accident near Santa Rosa, New Mexico. The commercial pilot and one passenger sustained fatal injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The flight originated from Arlington Airport (GKY), Arlington, Texas, about 1431 central daylight time (1331 mountain daylight time) and was destined for Santa Fe Municipal Airport (SAF), Santa Fe, New Mexico. The airplane's Insight GEM-1200 engine monitor device recorded that, about 2.25 hours into the flight, the left engine exhaust gas temperature and cylinder head temperature began to decrease, the device had an internal clock that was not set prior to the accident flight and defaulted to midnight so the exact times were unknown. About that same time during the flight, the pilot contacted air traffic control (ATC) and asked to divert to the nearest airport because of a fuel pump issue. The pilot did not provide any details about the fuel pump issue to ATC but stated that the request was precautionary; he did not declare an emergency during the flight. The controller suggested Santa Rosa Route 66 Airport (SXU), Santa Rosa, New Mexico, and the airplane turned from a northwest heading to a southwest heading toward SXU. The controller asked the pilot to provide the remaining fuel quantity; the pilot responded that he did not have the time to provide that information and that he was switching to the airport's UNICOM frequency.

The airplane's Garmin Aera 510 GPS device recorded an inaccurate date for the accident session; however, the time was correct. The GPS was correlated with the GEM-1200 data by aligning concurrent engine data with GPS data from takeoff. The last data point recorded by the GPS was about 9.4 miles from the accident site. Radar data obtained, about that time, showed that the airplane was flying on a southwest heading and was passing north of the airport. The radar data also showed that the airplane's groundspeed was about 98 knots and altitude was about 5,000 ft mean sea level (msl), which was about 209 ft above ground level (agl).

Three witnesses reported seeing the airplane flying at an altitude of about 100 ft agl. Two of these witnesses also reported that the airplane rolled to the left and then impacted terrain, which was followed by a postcrash fire.

Pilot Information

Certificate:	Commercial	**Age:**	57,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	December 21, 2017
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 4100 hours (Total, all aircraft)		

Passenger Information

Certificate:		**Age:**	61,Male
Airplane Rating(s):		**Seat Occupied:**	Unknown
Other Aircraft Rating(s):		**Restraint Used:**	
Instrument Rating(s):		**Second Pilot Present:**	
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	
Flight Time:			

No logbooks for the pilot were provided by the family.

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N102SN
Model/Series:	A60	**Aircraft Category:**	Airplane
Year of Manufacture:	1973	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	P-217
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	Unknown	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	Lycoming
ELT:	C91A installed, activated, did not aid in locating accident	**Engine Model/Series:**	TIO-541-E1C4
Registered Owner:	On file	**Rated Power:**	380 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The logbooks for the airplane, engines, and propellers were not provided or located, so maintenance information could not be determined.

The airplane was equipped with two engine-driven fuel pumps, one for each engine, as well as two electric boost pumps, with one in each inboard wing leading edge fuel tank. The fuel system could also cross-feed fuel from either wing tank to the opposite engine when selected.

According to records from Harrison Aviation, Arlington, Texas, on the day of the accident, the airplane was fueled with about 55 gallons of Avgas per wing (about 110 gallons total). The fuel quantity of the airplane before fueling was unknown.

The Beechcraft Duke airplane flight manual stated, in the airspeed limitations section, that the minimum single-engine control speed was 88 knots.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KSXU	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	21:55 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	14 knots / 24 knots	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	230°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.79 inches Hg	**Temperature/Dew Point:**	29°C / -5°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Arlington, TX (GKY)	**Type of Flight Plan Filed:**	IFR
Destination:	Santa Fe, NM (SAF)	**Type of Clearance:**	IFR
Departure Time:		**Type of Airspace:**	Class G

Airport Information

Airport:	SANTA ROSA ROUTE 66 SXU	**Runway Surface Type:**	Asphalt
Airport Elevation:	4791 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Precautionary landing

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	Unknown
Total Injuries:	2 Fatal	**Latitude, Longitude:**	34.939998,-104.667778(est)

The airplane wreckage was located on a small tree-and-rock covered knoll about 1 mile west of SXU. The airplane came to rest on a heading of about 176° and at an elevation of about 4,645 ft msl. The inboard sections of the wings and the lower fuselage were damaged by the postimpact fire.

All major structural components of the airframe were located at the accident site. An examination of the airframe revealed no pre-impact mechanical malfunctions or failures that would have precluded normal

operation.

The left engine fuel selector was in the OFF position, and the right fuel selector was found between the ON and OFF positions. The left boost pump, after removal from the left wing leading edge fuel cell, functioned properly when power was applied. The right boost pump, after removal from the right wing leading edge fuel cell, was heavily damaged from impact and was not operational when power was applied.

The left engine fuel hose was found with a trace amount of fuel (estimated to be about 1 ounce) between the outlet from the fuel injector servo to the inlet of the flow diverter shutoff valve. The right engine fuel hose was damaged by fire and was found with no fuel between the outlet from the fuel injection servo to the inlet of the flow diverter shutoff valve.

The left engine-driven fuel pump was found displaced from the engine with the drive couple separated. The right engine-driven fuel pump was found displaced from the engine with the pump drive intact.

The left engine-driven fuel pump was sent to the National Transportation Safety Board's Materials Laboratory for examination. The examination revealed that the relief valve cover had fractured into multiple pieces due to impact and that, as part of the impact, the adjustment screw was displaced downward, leaving an impression on the spring seat. The lower side of the spring seat had two wear marks that were separated by about 120°. The diaphragm plate, which was in contact with the spring seat, had one wear mark. The diaphragm (below the diaphragm plate) was torn and exhibited regions in which the lower rubber layer had cracked, with chips of rubber separated from the diaphragm. The poppet valve, part of the pressure relief system, contained multiple fractures around the perimeter of the valve disk. Examination of the fracture surfaces found that the fractures had initiated along the lower surface of the disk due to high-cycle fatigue in upward bending. The valve seat and the beveled edge of the valve had no wear marks, impact marks, or other notable features. The valve guide exhibited opposing wear marks near the lower guide opening. The drive shaft to the pump rotor spline coupling exhibited wear of the external and internal spline teeth.

The left propeller hub remained attached to the engine. One blade exhibited face-side scoring that was oriented at an angle of about 45°; the scoring originated at the trailing edge of the blade, with no remarkable leading edge damage. Another blade was bent aft with no remarkable leading edge damage or scoring. A third blade exhibited localized chordwise scoring near the leading edge and was bent toward the camber side with the leading edge bent toward high pitch. The internal pitch change mechanism impact marks indicated the angle of the blade was higher than that for the normal operational range.

The right propeller made strike marks on rock near the main impact point and the hub had separated from the engine at the hub extension joint. All three blades exhibited chordwise/rotational scoring on the face side, bending in the forward/thrust direction, and twisting toward high pitch. One blade fractured from the propeller assembly at the shank, and about 8 inches of the tip had separated from the blade and was not recovered. The counterweight impact mark on the spinner dome indicated a counterweight angle of about 51°. Internal pitch change impact marks on the preload plates indicated that the propeller blade angle was in the normal range of operation.

Disassembly of the left and right turbochargers disclosed no anomalies. There was no rotational scoring that would indicate that the left turbocharger was operating at the time of impact with terrain. The right turbocharger indicated some rotational scoring within the turbine and compressor sections, and the pressure relief valve exhibited thermal damage. Both turbocharger pressure relief valves and controllers were sent to the manufacturer for further testing, with additional information located in the exam summary.

Medical and Pathological Information

The State of New Mexico Medical Examiner's Office, Albuquerque, New Mexico, conducted an autopsy of the pilot. His cause of death was blunt force trauma injuries.

Toxicology testing performed at the Federal Aviation Administration's Forensic Sciences Laboratory detected cetirizine (119 ng/mL), dextromethorphan and its metabolite dextrorphan, sumatriptan, gabapentin (843 ng/mL), topiramate (10721 ng/mL), and duloxetine (51 ng/mL) in the pilot's cavity blood specimens. Except for duloxetine, all of these drugs were also found in the pilot's urine specimens, as was acetaminophen. The testing detected no carbon monoxide or ethanol in the pilot's specimens.

Cetirizine is a sedating antihistamine available over the counter and frequently marketed as Zyrtec. It carries this warning, "When using this product, drowsiness may occur, alcohol, sedatives, and tranquilizers may increase drowsiness, avoid alcoholic drinks, and be careful when driving a motor vehicle or operating machinery."

Dextromethorphan is available over the counter in several medications for cough; at usual doses, it is not generally considered impairing.

Sumatriptan, often marketed as Imitrex, is indicated for the acute treatment of migraine headache. Because of its vasoactive effects, its use is associated with an increased risk of vascular and neurologic complications such as angina, stroke, and seizures.

Gabapentin is an anticonvulsant also used to treat neurologic pain symptoms and is often marketed with the name Neurontin. It acts in the central nervous system (CNS) and can cause a variety of psychiatric symptoms, which can be severe. It also has sedative effects, and carries this warning, "Patients should be advised that gabapentin may cause dizziness, somnolence, and other symptoms and signs of CNS depression. Accordingly, they should be advised neither to drive a car nor to operate other complex machinery until they have gained sufficient experience on gabapentin to gauge whether or not it affects their mental and/or motor performance adversely."

Topiramate is another anticonvulsant medication often used to treat chronic neurologic pain disorders; it is commonly prescribed with the name Topamax. It carries this warning," Topiramate can cause cognitive/neuropsychiatric adverse reactions. The most frequent of these can be classified into three general categories: 1) Cognitive-related dysfunction (e.g., confusion, psychomotor slowing, difficulty with concentration/attention, difficulty with memory, speech or language problems, particularly word-finding difficulties); 2) Psychiatric/behavioral disturbances (e.g., depression or mood problems); and 3)

Somnolence or fatigue."

Duloxetine is an antidepressant also indicated for use in the treatment of chronic pain syndromes and is commonly marketed with the name Cymbalta. In the medication guide, there is a warning for patients, "Duloxetine delayed-release capsules can cause sleepiness or may affect your ability to make decisions, think clearly, or react quickly. You should not drive, operate heavy machinery, or do other dangerous activities until you know how duloxetine delayed-release capsules affect you."

Finally, acetaminophen, an analgesic commonly marketed as Tylenol, was identified in urine. It is not considered impairing.

Administrative Information

Investigator In Charge (IIC):	Swenson, Eric
Additional Participating Persons:	Vernon Rocket; FAA; Albuquerque, NM Jennifer Barclay; Textron Aviation; Wichita, KS Mark Platt; Lycoming; Williamsport, PA Les Doud; Hartzell Propeller/Hartzell Engine Technologies; Piqua, OH Jennifer McDuffie; Honeywell Aerospace; Phoenix, AZ
Original Publish Date:	August 11, 2020
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=99372