



# Aviation Investigation Final Report

<b>Location:</b>	Logan, Utah	<b>Accident Number:</b>	WPR16FA144
<b>Date &amp; Time:</b>	July 18, 2016, 11:05 Local	<b>Registration:</b>	N419FP
<b>Aircraft:</b>	DIAMOND AIRCRAFT IND INC DA40 F	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>	Aerodynamic stall/spin	<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

## Analysis

The private pilot was practicing flight maneuvers required to obtain a commercial pilot certificate during daytime visual flight rules weather conditions. A witness saw the airplane flying in slow counterclockwise circles while descending with the engine power at idle. He reported strong gusting winds at the time. Radar data showed the airplane completing four counterclockwise orbits and then beginning a descending clockwise orbit. The last two data points indicate a rapid, vertical descent greater than 6,000 ft per minute. Wreckage and impact signatures revealed that the airplane impacted the ground in a nose-low, near-vertical attitude with little to no forward movement, consistent with an aerodynamic stall/spin. Examination of the airframe and engine found no abnormalities that would have precluded normal operation.

Weather conditions in the accident area included strong gusty winds, low-level wind shear, clear air turbulence near the terrain, and possible mountain wave activity at mountain top level. The weather information that the pilot obtained before departure indicated wind at 6 knots and no gusts. No records were located to indicate that the pilot had obtained an official weather briefing before departure, thus he may not have been aware of the gusting winds and the potential for low-level wind shear and turbulence which could have contributed to his failure to maintain aircraft control. The radar data, the witness's description, and the damage to the airplane are consistent with the pilot exceeding the airplane's critical angle of attack while maneuvering, resulting in the airplane entering an aerodynamic stall with a subsequent spin and descent to ground impact.

## Probable Cause and Findings

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

The pilot's exceedance of the airplane's critical angle of attack while maneuvering in turbulence and gusty wind conditions, which resulted in an aerodynamic stall/spin.

## Findings

<b>Aircraft</b>	Angle of attack - Not attained/maintained
<b>Personnel issues</b>	Aircraft control - Pilot
<b>Environmental issues</b>	(general) - Response/compensation
<b>Environmental issues</b>	Gusts - Response/compensation
<b>Environmental issues</b>	Windshear - Response/compensation

## Factual Information

### History of Flight

<b>Maneuvering</b>	Turbulence encounter
<b>Maneuvering</b>	Loss of control in flight
<b>Maneuvering</b>	Aerodynamic stall/spin (Defining event)
<b>Uncontrolled descent</b>	Collision with terr/obj (non-CFIT)

On July 18, 2016, about 1105 mountain daylight time, a Diamond DA40, N419FP, impacted terrain while maneuvering near Logan, Utah. The private pilot was fatally injured, and the airplane was destroyed. The airplane was registered to and operated by Utah State University as a 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed for the flight, and no flight plan was filed. The local flight originated from Logan-Cache Airport (LGU), Logan, Utah, about 1034.

According to the pilot's flight instructor, the purpose of the flight was for the pilot to practice maneuvers required to obtain a commercial pilot certificate. These maneuvers included lazy 8's, 8's on pylon, steep turns, chandelles, steep spirals, and stalls.

A witness located about 1/3 mile from the accident site observed the airplane flying in slow counterclockwise circles while descending with the engine power at idle. He assumed the pilot was practicing stalls. He reported "unusual" weather that day; the wind was gusting 30-40 mph; however, in between the gusts, it was "dead calm." As the airplane continued to execute counterclockwise turns, the witness noticed it "rocking quite a bit as it descended through the gusts until it disappeared" from his sight.

A review of radar data showed that the airplane departed from runway 35 at LGU, turned south, and proceeded toward the practice area. At 1043:36, the airplane started maneuvering in the practice area at 7,300 ft mean sea level (msl). During the next 5 minutes, the airplane's altitude varied between 7,300 ft msl and 7,500 ft msl while it executed 2 counterclockwise orbits. It then completed 2 more orbits at altitudes between 7,800 ft msl and 8,200 ft msl. At 1101:48, the airplane started a clockwise orbit about 0.8 mile west of the previous flight path at 7,900 ft msl. At 1104:12, the airplane completed 3/4 of a clockwise orbit at 8,100 feet msl. At 1104:48, the airplane descended to 7,700 ft msl, and, at 1105:00, the airplane descended to 7,600 ft msl. The last recorded data point at 1105:12 showed the airplane at 6,300 ft msl. The wreckage was located on the ground below the last recorded data point.

At 1121, the National Oceanic and Atmospheric Administration received signals from an emergency locator transmitter (ELT) near the accident site. About 2 hours later, a search and rescue team located the wreckage about 2 nautical miles east of the ELT signal's location.

## Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	21, Male
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 2 Unknown	<b>Last FAA Medical Exam:</b>	December 18, 2014
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	(Estimated) 109.9 hours (Total, all aircraft), 60 hours (Total, this make and model), 40 hours (Last 90 days, all aircraft), 12.6 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

The pilot, age 21, held a Dominican Republic private pilot certificate with an airplane single-engine land rating. He did not have a Federal Aviation Administration medical certificate; all limitations and restrictions on the Dominican Republic pilot license applied. A review of the pilot's logbook revealed that he had accumulated about 109.9 hours of total flight time as of July 15, 2016.

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	DIAMOND AIRCRAFT IND INC	<b>Registration:</b>	N419FP
<b>Model/Series:</b>	DA40 F NO SERIES	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	2006	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	40.FC019
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	
<b>Date/Type of Last Inspection:</b>	June 23, 2016 100 hour	<b>Certified Max Gross Wt.:</b>	2535 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	6201 Hrs at time of accident	<b>Engine Manufacturer:</b>	LYCOMING
<b>ELT:</b>	C91A installed, activated, aided in locating accident	<b>Engine Model/Series:</b>	O-360-A4M
<b>Registered Owner:</b>	UTAH STATE UNIVERSITY	<b>Rated Power:</b>	180 Horsepower
<b>Operator:</b>	UTAH STATE UNIVERSITY	<b>Operating Certificate(s) Held:</b>	Pilot school (141)

The four-seat, single-engine, low-wing, fixed-landing-gear airplane, serial number 40.FC019, was manufactured in 2006. It was powered by a Textron Lycoming O-360-A4M engine, serial number L-40653-36E, rated at 180 horsepower. The airplane was also equipped with a

Sensenich two-bladed fixed-pitch propeller, model 76EM8S10-0-63. A review of maintenance records showed that the most recent annual inspection was completed May 16, 2016, at a total aircraft time of 4,599.9 hours.

### Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KBMC,4226 ft msl	<b>Distance from Accident Site:</b>	10 Nautical Miles
<b>Observation Time:</b>	16:55 Local	<b>Direction from Accident Site:</b>	254°
<b>Lowest Cloud Condition:</b>		<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>		<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	17 knots / 25 knots	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	180°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.05 inches Hg	<b>Temperature/Dew Point:</b>	32°C / 0°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	LOGAN, UT (LGU)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	LOGAN, UT (LGU)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	10:34 Local	<b>Type of Airspace:</b>	Class G

The National Weather Surface (NWS) Analysis Chart for 1200 indicated a surface low pressure center southwest of the accident site near Salt Lake City, Utah, and a surface high pressure center in northwestern Colorado. At 0900, a warm front had just passed north of the accident site. With a warm frontal boundary moving northward past the accident site before the accident time and a surface low pressure and surface high pressure center areas relatively close together at the accident time, gusty low-level wind conditions would be expected over the mountainous terrain.

The NWS Storm Prediction Center Constant Pressure Charts depicted low-level troughs just southwest and northeast of the accident site. Troughs typically act as lifting mechanisms where enhanced lift, gusty winds, fronts, clouds, and precipitation can occur. Troughs and a frontal boundary close to the surface and near mountainous terrain also act to aid in the mixing of low-level air, allowing for the possibility of low-level wind shear (LLWS) and turbulence.

The closest weather station was an automated weather observing system (AWOS) located at Brigham City Airport (BMC), Brigham City, Utah, about 10 miles west-southwest of the accident site. At 1115, BMC reported wind from 180° at 17 knots with gusts to 24 knots. At 1135, BMC reported wind from 190° at 16 knots with gusts to 24 knots.

LGU, located 12 miles north of the accident site, had an automated surface observing system (ASOS). At 1051, LGU reported wind from 180° at 5 knots. At 1151, LGU reported wind from 230° at 14 knots with gusts to 31 knots.

Ogden-Hinckley Airport (OGD), Ogden, Utah, located 25 miles south-southwest of the accident site, had an ASOS with reports supplemented by air traffic control personnel. At 1053, OGD reported wind from 160° at 21 knots with gusts to 27 knots. At 1153, OGD reported wind from 160° at 23 knots with gusts to 30 knots.

The observations from BMC, LGU, and OGD surrounding the accident time indicated visual flight rules ceilings and visibilities. Each site had a south to southwest surface wind with wind gusts as high as 31 knots around the accident time. With the strong south to southwest wind over the terrain, low-level turbulence and LLWS conditions would be expected.

The closest official upper air sounding to the accident site was from Salt Lake City (SLC), Utah, located 50 miles south-southwest of the accident site. The sounding wind profile indicated a surface wind at SLC from 180° at 9 knots with an increase in wind speed to 28 knots by 4,900 ft. LLWS was identified between the surface and 5,000 ft, and several layers of clear air turbulence were indicated between the surface and 14,000 ft.

The area forecast issued at 0730, valid at the accident time, forecasted scattered clouds at 15,000 ft msl with a southwest wind gusting to 25 knots. The NWS Office in Salt Lake City issued an area forecast discussion at 0944 that discussed gusty southerly winds at the Salt Lake City Airport Terminal with possible wind gusts up to 35 mph.

According to the flight school's records, the pilot checked the weather observations for LGU. The observation recorded on the weight and balance sheet was made at 0951 and included the following weather information: wind from 330° at 6 knots, 10 miles visibility, clear skies, temperature of 25°C, dew point temperature of 6°C, and an altimeter setting of 30.08 inches of mercury. No records were located to indicate that the pilot obtained a weather briefing from an official weather briefing source.

For further weather information, refer to the weather study prepared by a National Transportation Safety Board staff meteorologist that is available in the public docket for this investigation.

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal	<b>Latitude, Longitude:</b>	41.597499,-111.847778(est)

The accident site was located on the side of a hill at an elevation of 4,714 ft msl. The damage to the airplane was consistent with terrain impact in a nose-low, vertical descent with little to no forward movement, and the airplane came to rest upright on a heading of about 093° magnetic. The first point of impact identified was a 1.5-ft-deep crater consistent with propeller impact. The main wreckage consisted of the engine, cockpit, fuselage, and empennage.

The upper skin of the left wing was separated and located about 24 ft from the main wreckage. The left wingtip was attached to the upper skin portion of the wing. The rest of the left wing was fragmented; the forward and aft spars exhibited multiple deformations; and the left flap and aileron were separated from the wing. The left fuel tank was resting lengthwise along the fuselage and exhibited hydraulic crushing. The left main landing gear was attached to the wing.

The right wing remained partially attached to the fuselage. The leading edge of the wing was deformed, and the wing exhibited aft accordion crushing. The bottom surface of the wing along the leading edge was separated and deformed downward. The fuel tank was pushed aft. The right flap and aileron remained attached to the wing. The right main landing gear was separated and crushed under the right wing.

The two-blade propeller remained attached to the engine. One blade was bent about 30° aft and slightly twisted, and the other blade remained straight. Both blades exhibited chordwise scratching and nicks. The propeller spinner exhibited significant crushing.

The engine remained attached to the firewall and was resting upwards on the ground. The instrument panel remained partially attached to the firewall and was mostly destroyed by impact forces.

The front seats were crushed rearward into the back seats. The forward windscreen was fragmented, and the frame structure surrounding the forward fuselage and the cockpit area was bent, broken, and fragmented.

The forward section of the empennage remained partially attached to the aft section. The horizontal stabilizer, vertical stabilizer, elevator, and rudder remained attached to the empennage. Flight control continuity was established from the cockpit controls to all moveable flight control surfaces.

The airplane wreckage was further examined at the facilities of Precision Air Power, Woods Cross, Utah, on July 20, 2016. The examination revealed no evidence of preimpact mechanical malfunction that would have precluded normal operations. For further information about the accident site and wreckage examinations, refer to the reports included in the public docket for this investigation.

## **Medical and Pathological Information**

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The Office of the Medical Examiner at Utah Department of Health, Salt Lake City, Utah, completed an autopsy on the pilot and concluded that the cause of death was blunt force injuries. The Federal Aviation Administration's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicology testing on specimens from the pilot. The results of the testing were negative for carbon monoxide, ethanol, and listed drugs.

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Smith, Maja
<b>Additional Participating Persons:</b>	Vahl Buchanan; FAA; Salt Lake City, UT Troy Helgeson; Lycoming Engines; CO Paul Arakawa; Diamon Aircraft Matt Bunnell; Utah State University; Logan, UT
<b>Original Publish Date:</b>	March 14, 2018
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	The NTSB traveled to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.ntsb.gov/Docket?ProjectID=93621">https://data.ntsb.gov/Docket?ProjectID=93621</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

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](#).