# Aviation Investigation Final Report

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| **Location:** | Hanapepe, Hawaii | **Accident Number:** | WPR16FA116 |
| **Date & Time:** | May 23, 2016, 09:22 Local | **Registration:** | N2007X |
| **Aircraft:** | Cessna 182 | **Aircraft Damage:** | Destroyed |
| **Defining Event:** | Loss of control in flight | **Injuries:** | 5 Fatal |
| **Flight Conducted Under:** | Part 91: General aviation - Skydiving | | |

## Analysis

The commercial pilot and four passenger-skydivers were departing in the airplane on a local area skydiving flight in visual meteorological conditions. Witnesses observed the airplane make a normal takeoff from the runway. Two witnesses reported that, shortly after takeoff, the engine seemed to stop producing power. Subsequently, the airplane rolled to the right while rapidly losing altitude. The airplane completed about a 360° rotation and impacted terrain in a nose-down attitude.

One of the four cameras recovered from the wreckage contained a 33-second video that captured the flight from the takeoff roll through the impact. The video showed the airplane after takeoff in a positive climb and a slight left roll. About 24 seconds into the recording, the video's audio track revealed a reduction in the volume of the engine sound. Two seconds later, the airplane started to roll to the right. The movement of the camera became increasingly erratic, consistent with the airplane entering an unusual flight attitude. The engine sound continued to decrease until the airplane impacted the ground. A sound spectrum study showed that the engine rpm decreased from 2,650 to 1,215 over the final 9 seconds of the flight, consistent with a partial loss of engine power.

Postaccident examination of the airplane revealed no evidence of any preimpact mechanical failures or anomalies that would have precluded normal operation. The airplane was estimated to be about 10 lbs above its maximum gross weight and within the center-of-gravity limits published for the maximum gross weight; therefore, weight and balance was likely not a factor in the accident.

The weather conditions at the time of takeoff were conductive to the formation of carburetor ice at glide power. Given that the airplane was operating at a high power setting at the time of takeoff, carburetor icing was unlikely.

Based on the witness observations and the onboard video recording, it is likely that the pilot failed to maintain airspeed following a partial loss of engine power, which resulted in the airplane exceeding its

critical angle of attack and experiencing an aerodynamic stall. The reason for the partial loss of engine power could not be determined.

## Probable Cause and Findings

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

The pilot's failure to maintain airspeed following a partial loss of engine power for reasons that could not be determined during postaccident examination, which resulted in the airplane exceeding its critical angle of attack and experiencing an aerodynamic stall.

### Findings

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| **Aircraft** | Airspeed - Not attained/maintained |
| **Personnel issues** | Aircraft control - Pilot |
| **Aircraft** | Angle of attack - Not attained/maintained |
| **Not determined** | (general) - Unknown/Not determined |

# Factual Information

## History of Flight

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| **Takeoff** | Loss of engine power (partial) |
| **Takeoff** | Loss of control in flight (Defining event) |
| **Uncontrolled descent** | Collision with terr/obj (non-CFIT) |

On May 23, 2016, about 0922 Hawaiian standard time, a Cessna 182H, N2007X, impacted terrain following a partial loss of engine power shortly after departure from Port Allen Airport (PAK), Hanapepe, Hawaii. The pilot and four passenger-skydivers were fatally injured. The airplane was registered to and operated by D & J Air Adventures, Inc., under the provisions of 14 *Code of Federal Regulations* Part 91 as a skydiving flight. Visual meteorological conditions prevailed, and no flight plan was filed.

Numerous witnesses reported that the airplane departed runway 9, it began to roll to the right while rapidly losing altitude. Two witnesses stated that it seemed the engine had stopped producing power. The airplane completed about a 360° rotation and impacted terrain in a nose-low attitude.

A video taken from a security camera located about 0.8 mile northeast of PAK showed the airplane in a climb, followed by a sudden right roll, and a rapid descent toward the terrain in a nose-down attitude. The airplane came to rest at the edge of a dirt road in a grassy area just outside the airport perimeter fence, and a postimpact fire ensued.

## Pilot Information

| | | | |
|---|---|---|---|
| **Certificate:** | Commercial; Private | **Age:** | 30,Male |
| **Airplane Rating(s):** | Single-engine land; Multi-engine land | **Seat Occupied:** | Front |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | Lap only |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | No |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | Yes |
| **Medical Certification:** | Class 1 Without waivers/limitations | **Last FAA Medical Exam:** | February 24, 2016 |
| **Occupational Pilot:** | Yes | **Last Flight Review or Equivalent:** | |
| **Flight Time:** | (Estimated) 321 hours (Total, all aircraft) | | |

## Passenger Information

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|---|---|---|---|
| **Certificate:** | | **Age:** | 43,Male |
| **Airplane Rating(s):** | | **Seat Occupied:** | None |
| **Other Aircraft Rating(s):** | | **Restraint Used:** | None |
| **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:** | | | |

## Passenger Information

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|---|---|---|---|
| **Certificate:** | | **Age:** | 26 |
| **Airplane Rating(s):** | | **Seat Occupied:** | None |
| **Other Aircraft Rating(s):** | | **Restraint Used:** | None |
| **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:** | | | |

## Passenger Information

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|---|---|---|---|
| **Certificate:** | | **Age:** | 25 |
| **Airplane Rating(s):** | | **Seat Occupied:** | None |
| **Other Aircraft Rating(s):** | | **Restraint Used:** | None |
| **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:** | | | |

## Passenger Information

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|---|---|---|---|
| **Certificate:** | | **Age:** | 27 |
| **Airplane Rating(s):** | | **Seat Occupied:** | None |
| **Other Aircraft Rating(s):** | | **Restraint Used:** | None |
| **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:** | | | |

The pilot held a commercial pilot certificate with airplane single-engine land and multi-engine land ratings and an Australian private pilot certificate with an airplane single-engine land rating. A first-class airman medical certificate was issued to the pilot on February 24, 2016, with no limitations. During his last medical exam, the pilot reported flight experience that included 321 total flight hours and 53.2 hours in last 6 months. A representative of the pilot's family provided a copy of the pilot's logbook, and the most recent entry in the logbook was for a flight of 1.1 hours on March 5, 2016.

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | Cessna | **Registration:** | N2007X |
| **Model/Series:** | 182 H | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | 1965 | **Amateur Built:** | |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | 18256107 |
| **Landing Gear Type:** | Tricycle | **Seats:** | 1 |
| **Date/Type of Last Inspection:** | March 22, 2016 100 hour | **Certified Max Gross Wt.:** | 2348 lbs |
| **Time Since Last Inspection:** | | **Engines:** | 1 Reciprocating |
| **Airframe Total Time:** | 8278.6 Hrs as of last inspection | **Engine Manufacturer:** | CONT MOTOR |
| **ELT:** | Installed | **Engine Model/Series:** | O-470 SERIES |
| **Registered Owner:** | D & J AIR ADVENTURES INC | **Rated Power:** | 230 Horsepower |
| **Operator:** | D & J AIR ADVENTURES INC | **Operating Certificate(s) Held:** | None |

The four-seat, single-engine, high-wing, fixed landing gear airplane, serial number 18256107, was manufactured in 1965. In September 1972, the airplane was configured for parachute operations, which included removal of the front right seat and the rear seat. The modifications also included the removal of

original cabin seats and installation of floor level seat belt brackets to accommodate four occupants in addition to the pilot. The airplane was powered by a Continental Motors O-470-R engine, serial number 203374-70R, rated at 230 horsepower. The airplane was also equipped with a McCauley two-bladed, constant-speed propeller. A review of maintenance records showed that the engine was installed on November 12, 2013, at a total airframe time of 10,043.7 hours. The most recent annual inspection was completed on October 13, 2015, at a total engine time of 8,121.3 hours and a total airframe time of 10,783.6 hours. The most recent maintenance activity recorded in the logbooks was a nose landing gear inspection completed on May 19, 2016, at a tachometer time of 8,353.5 hours (925 hours since engine overhaul).

Weight and balance values were calculated for the accident takeoff using the airplane's weight and balance documentation dated February 23, 2015. The input values included a presumed fuel quantity of 20 gallons (120 pounds) and an owner-provided total weight of pilot, passengers, and parachutes of 981 pounds. The takeoff gross weight was calculated to be 2,810.5 pounds with a center of gravity (CG) of 41.2 inches. Maximum allowable gross weight was 2,800 pounds, and the allowable CG range for that weight was 38.4 to 47.4 inches.

According to the owner, the airplane was refueled on May 23, 2016, with fuel from a nearby gas station. A supplemental type certificate (STC) issued for the airplane allowed for the use of automotive gasoline; the STC did not approve the use of fuel containing ethanol. Both ethanol and ethanol-free gasolines are sold in the state of Hawaii. Hawaii does not require a placard on pumps for gasolines that contain less than 1% ethanol. According to a European Aviation Safety Agency (EASA) report titled "Safety Implication of Biofuels in Aviation," a fuel system that uses ethanol-mixed gasolines has a higher probability to develop vapor lock, carburetor icing, or experience a water-induced phase separation; these conditions can potentially disrupt engine operation.

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | PHLI,100 ft msl | **Distance from Accident Site:** | 15 Nautical Miles |
| **Observation Time:** | 08:53 Local | **Direction from Accident Site:** | 70° |
| **Lowest Cloud Condition:** | Scattered / 2400 ft AGL | **Visibility** | 10 miles |
| **Lowest Ceiling:** | | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 10 knots / None | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | 60° | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 30.15 inches Hg | **Temperature/Dew Point:** | 27°C / 20°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Hanapepe, HI (PAK ) | **Type of Flight Plan Filed:** | None |
| **Destination:** | Hanapepe, HI (PAK ) | **Type of Clearance:** | None |
| **Departure Time:** | 09:21 Local | **Type of Airspace:** | Class G |

At 0853, the automated weather observation for Lihue Airport, Lihue, Hawaii, located about 17 miles northeast from PAK, reported wind from 060° at 10 knots, visibility 10 statute miles, scattered clouds at

2,400 ft, scattered clouds at 3,000 ft, temperature 27°C, dew point 20°C, and altimeter 30.16 inches of mercury.

According to Federal Aviation Administration Special Airworthiness Information Bulletin CE-09-35, entitled "Carburetor Icing Prevention," the LIH temperature and dew point were conductive to the formation of serious icing at glide power.

## Airport Information

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| **Airport:** | PORT ALLEN PAK | **Runway Surface Type:** | Dirt;Grass/turf |
| **Airport Elevation:** | 24 ft msl | **Runway Surface Condition:** | Dry;Vegetation |
| **Runway Used:** | | **IFR Approach:** | None |
| **Runway Length/Width:** | | **VFR Approach/Landing:** | None |

## Wreckage and Impact Information

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| **Crew Injuries:** | 1 Fatal | **Aircraft Damage:** | Destroyed |
| **Passenger Injuries:** | 4 Fatal | **Aircraft Fire:** | On-ground |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 5 Fatal | **Latitude, Longitude:** | 21.895833,-159.599716(est) |

The wreckage was located next to a dirt service road, about 250 ft from the departure end of runway 9, and at an elevation of about 90 ft mean sea level (msl).

The wreckage debris path was oriented on an approximate heading of 060° magnetic and was about 24 ft in length. The first identified point of impact was a crater in the dirt road that contained the propeller hub with both blades attached; small pieces of airframe and other debris surrounded the disrupted dirt. The rest of the airplane came to rest about 7.5 ft from the propeller. The engine was displaced aft into the firewall, and both the engine and firewall were crushed aft into the cabin area by impact forces.

The cockpit, fuselage, left wing, and forward portion of the empennage were consumed by the postcrash fire. The engine and the right wing exhibited impact and postimpact fire damage. The right wing separated from the fuselage and was displaced forward next to the cockpit area. The right horizontal stabilizer and the elevator remained attached to the empennage, and they exhibited impact and postcrash fire damage. The composite left- and right-wing tips were respectively located left and right of the main wreckage about 71 ft apart.

During the postaccident examination, about 12 gallons of fuel were drained from the right wing. The recovered fuel was clear and colorless, and a water paste test did not indicate any water contamination. No test was performed to determine whether there was ethanol in the fuel.

The wreckage was recovered to a secure location for further examination.

Airframe and Engine Examination

Postimpact fire consumed the cabin and rear fuselage, the instrument panel, and the left wing. The empennage was thermally damaged. Flight control cable continuity was confirmed from each cockpit control to the associated flight control. The rudder cables, aileron cables, pitch trim cables, and the "UP" elevator cable were cut in the cabin area to facilitate wreckage recovery. The position of the carburetor heat lever could not be determined.

Examination of the recovered engine revealed that it remained attached to the engine mount. All six cylinders remained attached to the engine and sustained damage consistent with impact damage and the postimpact fire.

Both magnetos were displaced from their mounts and exhibited damage to their mounting flanges. The ignition harness remained attached to both magnetos and a few of the leads were separated due to pinching damage. All the leads remained attached to their respective spark plugs, and their terminal ends were secured. The drive shafts on both magnetos were capable of normal rotation, and the impulse couplings operated normally. The drive shafts were rotated, and both magnetos produced a spark at each spark plug or at the end of the damaged leads.

All the spark plugs remained installed in their respective cylinders and were undamaged. The top spark plugs were removed, and it was noted that all top spark plug electrodes displayed normal operating and wear signatures. The internal portions of the cylinders were inspected using a lighted borescope. The cylinder barrels, piston faces, valves, and valve seats displayed normal operating and combustion signatures. The crankshaft was rotated manually using a hand tool that was inserted into the vacuum pump drive; thumb compression and suction were obtained on all six cylinders. In addition, engine and valve train continuity was established throughout.

The carburetor remained attached to the engine's induction system, but it was displaced from its normal mounting area. The carburetor sustained damage consistent with impact and the postimpact fire. The mixture and throttle control levers remained secured to their respective shafts, and the control cables remained secured to the throttle and mixture control levers. Both controls could move freely. The carburetor was disassembled, and both floats were melted on the bottom of the carburetor bowl. Movement of the float attachment bracket resulted in free movement of the fuel inlet valve. Movement of the throttle arm resulted in a coinciding movement of the throttle valve and accelerator pump. The fuel inlet screen was removed and no contaminates were observed.

The oil sump displayed deformation damage consistent with the impact forces and the postcrash fire. There were no signs of preimpact oil leaks around the oil sump. The oil pump remained attached to the rear of the engine. The oil pump housing was removed, and the gears were intact with no preaccident anomalies noted. The oil filter remained attached to the oil filter adapter and was secured with safety-wire.

The propeller spinner was crushed inward around the propeller hub; one side of the spinner was

conformed to the hub. One propeller blade exhibited leading edge damage, chordwise scratching on the camber side of the blade, and blade twist toward a lower pitch. The other blade exhibited leading edge damage but no chordwise scratching. Examination of the recovered airframe and engine did not reveal evidence of any preexisting mechanical malfunction that would have precluded normal operation. The complete examination reports are contained in the public docket for this accident.

## Medical and Pathological Information

Pan Pacific Pathologists, LLC, Lihue, Hawaii, completed an autopsy on the pilot and concluded that the cause of death was multiple blunt force injuries. The FAA's Bioaeronautical Sciences Research Laboratory in Oklahoma City, Oklahoma, performed toxicology testing on specimens from the pilot. The results of the testing were negative for ethanol and listed drugs.

## Tests and Research

Video Examination

Two GoPro HERO 3 and two GoPro HERO 3+ cameras were located at the accident site and subsequently sent to the National Transportation Safety Board Vehicle Recorders Laboratory for review. The cameras were enclosed in fabric-type wrist mount camera straps. Each strap contained one GoPro HERO 3 and one GoPro HERO 3+ camera. Examination of the cameras revealed two pertinent memory cards; one contained a video that captured the takeoff roll and the initial climb before the beginning of the accident sequence and the other contained a video that captured takeoff roll through the impact.

The GoPro videos revealed that the pilot sat in the left front seat and used a lap belt anchored to the floor. Instructor 1 sat on the floor to the right of the pilot with his back to the instrument panel; the right yoke had been removed. Student 1 sat on the floor between the legs of Instructor 1 facing aft. Student 2 sat on the floor between the legs of Student 1. Instructor 2 sat on the floor with his back to the pilot's seat facing aft. An external video taken by a family member of the passengers showed the floor of the airplane covered with a blue pad material. None of the videos showed the presence of restraint systems on the instructors or the students.

In a separate email correspondence, three individuals, who previously completed jumps as passenger-skydivers from the accident airplane, stated that they did not see or use seatbelts during their flights.

Throughout the first 13 seconds of the GoPro video recording that captured the impact, the airplane was observed rolling down the runway. Both flaps were retracted, and the left aileron trailing edge appeared above the left flap trailing edge. In addition, the video captured a fully extended windsock which was consistent with wind from the northeast. About 13 seconds after the airplane started to roll, it became

airborne. The airplane was observed in a positive climb and a slight roll to the left. Around 24 seconds into the recording, an audio portion revealed a reduction in the volume of the engine sound, which continued to decrease until the airplane impacted the ground. (A sound spectrum study was conducted and is discussed separately in this report.) About 26 seconds into the recording, the trailing edge of the left aileron was observed below the position of the left flap trailing edge, which is consistent with a right roll command. As time progressed, the right roll increased. The camera was then panned inside the airplane toward the rear cabin area. In the next few seconds, the camera movement became increasingly erratic. The airplane impacted the ground about 33 second after the recording started.

Sound Spectrum Study

The audio track of the video that captured the impact was evaluated to determine the engine operating speed from the takeoff roll to the impact. During the first 25 seconds of the video, the engine speed was about 2,650 rpm, and then it began to decrease. At 26 seconds, the engine rpm was about 2,250. At 27 seconds, the engine rpm dropped to about 1,700. At 30 seconds, the engine rpm dropped to about 1,400. By the time of impact, the engine rpm had decreased to about 1,215. A stall warning horn was not heard on the recording.

## Additional Information

According to the FAA's Airplane Flying Handbook (FAA-H-8083-3B), Chapter 17 "Emergency Procedures", if an engine failure occurs on takeoff, a pilot should establish a proper glide attitude and select a landing area straight ahead with only small changes in direction.

## Administrative Information

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| **Investigator In Charge (IIC):** | Smith, Maja |
| **Additional Participating Persons:** | Donald Andera; FAA; Honolulu, HI<br>Nicole Charnon; CMI; Mobile, AL<br>Paul Yoos; Textron Aviation; Wichita, KS<br>Randy Ottinger; United States Parachute Association; Fredericksburg, VA |
| **Original Publish Date:** | November 28, 2017 |
| **Last Revision Date:** | |
| **Investigation Class:** | Class |
| **Note:** | The NTSB traveled to the scene of this accident. |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=93228 |