



# Aviation Investigation Final Report

<b>Location:</b>	Afton, Wyoming	<b>Accident Number:</b>	WPR18LA241
<b>Date &amp; Time:</b>	August 13, 2018, 09:08 Local	<b>Registration:</b>	N5660J
<b>Aircraft:</b>	Cessna 172	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Controlled flight into terr/obj (CFIT)	<b>Injuries:</b>	3 Serious
<b>Flight Conducted Under:</b>	Part 91: General aviation - Aerial observation		

## Analysis

An airline transport pilot and two passengers departed on an aerial observation flight in mountainous terrain. While flying in a valley, the pilot reported that he experienced downdrafts, which made it unlikely that the airplane would clear the ridge lines in front of the airplane. The pilot performed a steep 180° left turn to exit from the high terrain. However, after completing the turn, the airplane was unable to climb over terrain and struck several trees before impacting the ground, which resulted in substantial damage to the wings and fuselage.

The pilot reported no preaccident mechanical failures or malfunctions with the airplane that would have precluded normal operation.

The airplane's weight and balance was calculated as about 256 pounds below the maximum gross weight limit, and the density altitude at the accident was calculated as about 8,765 ft mean sea level (msl). A weather study of the accident area identified no significant winds, turbulence, or low-level wind shear present or forecast. The study did identify a surface-based inversion that existed to about 500 ft above ground level (agl). Additionally, another pilot in a different airplane stated that moderate turbulence was present near the accident area about 18 minutes before the accident.

Due to a combination of the airplane's high gross weight, a high-density altitude, a temperature inversion, maneuvering at a steep bank in order to avoid high terrain, and with potential downdrafts, the pilot dissipated the airplane's airspeed and altitude, and approached a stall. With no altitude available to increase the airspeed after the left turn and already at full power, the airplane continued to descend until it struck trees and impacted terrain.

## 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 terrain clearance after an encounter with a downdraft while maneuvering in a valley with a high-density altitude, which resulted in impact with trees and terrain.

## Findings

<b>Personnel issues</b>	Decision making/judgment - Pilot
<b>Aircraft</b>	Altitude - Not attained/maintained
<b>Environmental issues</b>	High density altitude - Effect on equipment
<b>Environmental issues</b>	Downdraft - Effect on equipment

# Factual Information

## History of Flight

Maneuvering	Other weather encounter
Maneuvering	Controlled flight into terr/obj (CFIT) (Defining event)

On August 13, 2018, about 0908 mountain daylight time, a Cessna 172N airplane, N5660J, was substantially damaged when it was involved in an accident near Afton, Wyoming. The airline transport pilot and two passengers sustained serious injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 local aerial observation flight.

According to the pilot, while conducting aerial observation of markers for a local mine in a valley next to mountainous terrain, he experienced downdrafts and the airplane lost altitude. In an attempt to exit from the high terrain, the pilot performed a 180° left turn with about 45° of bank. However, after completing the turn, the airplane's stall horn began to sound. The airplane was unable to climb over terrain and struck several trees and subsequently impacted terrain, which resulted in substantial damage to the wings and fuselage.

The pilot reported no preaccident anomalies with the airplane that would have precluded normal operation.

The airplane wreckage was recovered at an elevation of about 6,750 ft msl in heavily forested terrain. Using the environmental factors at the accident site, the density altitude was calculated to be about 8,765 ft msl. Additionally, aircraft performance charts indicated the airplane would have had a climb rate of about 300 ft per minute under the conditions at the accident site.

Review of the weight and balance form provided by the pilot revealed that the airplane was operated at a gross weight of 2,294 pounds at takeoff, under the maximum gross takeoff weight of 2,550 pounds. The center of gravity calculation was within the specified limits.

A weather study of the station models surrounding the accident area identified only light winds with variable winds of 10 knots or less and clear to scattered clouds. A National Oceanic and Atmospheric Administration numerical model indicated that the temperature was 18.2°C and the dew point was 1.8°C. According to the model, a surface-based inversion existed to about 500 ft agl. No low-level wind shear or significant turbulence was indicated, and the winds from 500 ft agl to the surface were calm. A search of pilot reports over the region indicated that there were no reports 3 hours before or after the accident. No SIGMETS or AIRMETS were current at the time of the accident for any turbulence, low-level wind shear, or high winds. The National Weather Service had a current AIRMET Sierra for mountain obscuration conditions.

According to a commercial pilot who was flying about 15 miles north of the accident area, there was moderate turbulence over the mountain ridge lines. The pilot had landed about the time that the accident airplane had taken off.

The Federal Aviation Administration's Aviation Safety Program publication "Tips on Mountain Flying," section on ridge and pass crossing, stated that "experienced pilots recommend crossing a ridge line or pass, at the ridge elevation plus at least 1,000 ft." The publication also stated, "plan to be at that altitude at least three miles before reaching the ridge ... This clearance zone will give you a reasonable safety zone to avoid the most severe turbulence and down drafts in windy conditions." The publication further stated "when you actually cross a ridge, you should do so at a 45° angle to the ridge. This allows you to turn away from the ridge quicker is you encounter a severe downdraft or turbulence."

## Pilot Information

<b>Certificate:</b>	Airline transport; Commercial; Flight instructor; Private	<b>Age:</b>	66, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	Glider; Helicopter	<b>Restraint Used:</b>	Lap only
<b>Instrument Rating(s):</b>	Airplane; Helicopter	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Airplane multi-engine; Airplane single-engine; Glider; Helicopter; Instrument airplane; Instrument helicopter	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 With waivers/limitations	<b>Last FAA Medical Exam:</b>	March 12, 2018
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	May 2, 2016
<b>Flight Time:</b>	(Estimated) 17383 hours (Total, all aircraft), 2600 hours (Total, this make and model), 15346 hours (Pilot In Command, all aircraft), 179 hours (Last 90 days, all aircraft), 67 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

## Passenger Information

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

## Passenger Information

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

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Cessna	<b>Registration:</b>	N5660J
<b>Model/Series:</b>	172 N	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1980	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	17273825
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	May 22, 2018 100 hour	<b>Certified Max Gross Wt.:</b>	2299 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	4418.7 Hrs at time of accident	<b>Engine Manufacturer:</b>	Lycoming
<b>ELT:</b>	C91 installed, activated, aided in locating accident	<b>Engine Model/Series:</b>	O-360-A4M
<b>Registered Owner:</b>		<b>Rated Power:</b>	180 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	AFO, 6220 ft msl	<b>Distance from Accident Site:</b>	16 Nautical Miles
<b>Observation Time:</b>	09:15 Local	<b>Direction from Accident Site:</b>	100°
<b>Lowest Cloud Condition:</b>		<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	Broken / 11000 ft AGL	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	5 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	50°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.22 inches Hg	<b>Temperature/Dew Point:</b>	13°C / 6°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Afton, WY (AFO )	<b>Type of Flight Plan Filed:</b>	Company VFR
<b>Destination:</b>	Afton, WY (AFO )	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	08:50 Local	<b>Type of Airspace:</b>	Class G

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Serious	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	2 Serious	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	3 Serious	<b>Latitude, Longitude:</b>	43.283332, -111.51667(est)

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Nixon, Albert		
<b>Additional Participating Persons:</b>	Luke Waters; Federal Aviation Administration; Salt Lake City, UT Andrew Hall; Textron Aviation; Wichita, KS		
<b>Original Publish Date:</b>	September 16, 2021	<b>Investigation Class:</b>	3
<b>Note:</b>	The NTSB did not travel to the scene of this accident.		
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=98164">https://data.nts.gov/Docket?ProjectID=98164</a>		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).