



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

# Aviation Investigation Final Report

<b>Location:</b>	Shipshewana, Indiana	<b>Accident Number:</b>	CEN15LA106
<b>Date &amp; Time:</b>	January 19, 2015, 17:00 Local	<b>Registration:</b>	N979DC
<b>Aircraft:</b>	DIAMOND AIRCRAFT IND INC DA 20 C1	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of engine power (total)	<b>Injuries:</b>	1 None
<b>Flight Conducted Under:</b>	Part 91: General aviation - Instructional		

## Analysis

The student pilot reported that he was practicing solo ground reference maneuvers about 1,600 ft above ground level when the engine began operating erratically. He further stated that the airplane might have entered an aerodynamic stall. He advanced the throttle to full forward, but the engine did not respond and subsequently experienced a total loss of power. He attempted to restart the engine by completing the emergency procedures that he remembered. The engine "turned over" but did not restart. He then prepared for a forced landing to a nearby field. During the base-to-final turn, he lost control of the airplane, and it descended to the ground. The airplane impacted the field and continued into a propane tank and then a house where it came to rest.

A postaccident examination of the airplane revealed that most of the induction air filter was obstructed by ice; no other anomalies were noted. The engine was test run with and without the ice in the air filter, and the engine produced full power under both conditions. The alternate air lever, which selects a second induction air intake in case the primary air intake (air filter) becomes restricted, was found in the "off" position. The aircraft flight manual states that, in the event of an in-flight engine failure, the alternate air control should be opened (or "on"). A Federal Aviation Administration advisory circular warns pilots of induction system icing known as "impact ice," which can build up on components like the air filter when moisture-laden air is near freezing. Based on the near-freezing outside air temperature and clouds in the area in which the flight was operating and the lack of any apparent engine malfunctions, it is likely that the primary air induction system became obstructed with impact ice during the flight.

When asked about the airplane's alternate air lever, the student pilot indicated that he was unfamiliar with the lever and did not know its intended use. If the student pilot had opened the alternate air control during the initial power loss, it is likely that engine power would have been restored.

# Probable Cause and Findings

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

The total loss of engine power due to impact ice obstructing the primary air induction system, which resulted from the student pilot's failure to operate the alternate air control. Contributing to the accident was the student pilot's lack of knowledge about using the alternate air control during an engine power loss.

## Findings

Aircraft	Air intake - Incorrect use/operation
Environmental issues	(general) - Effect on equipment
Personnel issues	Knowledge of equipment - Student/instructed pilot
Personnel issues	Training with equipment - Student/instructed pilot
Personnel issues	Lack of action - Student/instructed pilot
Personnel issues	Use of equip/system - Student/instructed pilot

# Factual Information

## History of Flight

<b>Maneuvering-low-alt flying</b>	Loss of engine power (total) (Defining event)
<b>Maneuvering-low-alt flying</b>	Other weather encounter

On January 19, 2015, about 1700 eastern standard time, a Diamond Aircraft Inc. DA 20 C1 airplane, N979DC, made a forced landing into a field near Shipshewana, Indiana. The solo student pilot was not injured and the airplane sustained substantial damage. The airplane was registered to and operated by New Horizons Aviation Inc. under the provisions of 14 Code of Federal Regulations Part 91 as a solo instructional flight. Visual meteorological conditions prevailed and no flight plan was filed. The local flight departed from the Goshen Municipal Airport (GSH), Goshen, Indiana about 1645.

According to the student pilot, he was about 1,600 feet above ground level practicing ground reference maneuvers. He reported that the engine operation became erratic and the airplane might have entered an aerodynamic stall. He advanced the throttle to full forward, but the engine did not respond and experienced a total loss of power. He attempted to restart the engine by completing the emergency procedures that he remembered. The engine "turned over" but did not restart. He then prepared for a forced landing into a nearby field. During the base to final turn, he lost control of the airplane and descended to the ground. The airplane impacted the field and continued into a propane tank and then a house where it came to rest.

The student pilot reported having accumulated 12 total flight hours, all of which were logged in the preceding 30 days, and in the same make and model airplane.

The airplane was a two seat, low wing, tricycle landing gear, training airplane which was manufactured in 2005. It was powered by a 125-horsepower Continental Motors Inc. IO-240 engine, which drove a Sensenich two-bladed, fixed pitched, wooden propeller.

On January 22, 2015, the airplane was examined after the accident by a Federal Aviation Administration (FAA) Inspector and a representative from Continental Motors Inc. The examination revealed that the majority of the induction air filter was covered with ice. The alternate air lever in the airplane was OFF. The engine cylinders each displayed normal operating signatures. The spark plugs displayed normal wear signatures when compared to a Champion Aviation Service Manual No. AV6-R. Internal crankshaft continuity was established by rotating the propeller. Additionally, all four cylinders displayed thumb suction and compression. The top spark plugs and ignition leads were reinstalled for an engine operational test run. The air filter remained impacted with ice during the first engine run; the engine was capable of running with the throttle full forward and produced about 2,200 RPM which is normal for a fixed pitch propeller. The alternate air lever was moved to ON and the engine was still capable of producing about 2,200 RPM. The engine was then shut down and the ice removed from the air filter. The engine was subjected to a second test run; the engine produced 2,200 RPM with the throttle advanced to full forward. The ignition switch was actuated to test both magnetos and the decreases in

RPM were normal and the engine indications displayed normal operating parameters. Other than the ice in the air induction filter there were no anomalies noted that would have precluded normal operation. The airplane sustained substantial damage to the fuselage and empennage.

During the postaccident investigation, the pilot was asked about the airplane's alternate air lever. He reported that he was unfamiliar with the lever and did not know its intended use. He also stated that he flew through some low clouds during the flight, but they did not obstruct his view of the ground and he was able to maintain visual flight rules (VFR) the entire time.

At 1653 the weather observation station at GSH, which was located 13 miles southwest, reported the following conditions: wind from 200 degrees at 3 knots, visibility 10 miles, few clouds at 12,000 feet, temperature 36° Fahrenheit (F), dew point 30° F, altimeter setting 29.94 inches of mercury.

Using the average temperature lapse rate, 3.5° F per 1,000 feet, the temperature at 1,600 feet would have been about 30° F.

The Diamond Aircraft Airplane Flight Manual (AFM) stated in Chapter 7.9.2 Engine Controls: The alternate air control selects a second induction air intake in case of restriction of the primary air intake (air filter).

AFM Chapter 3.3.1 (c) Engine Failure during Flight – ENGINE RUNNING ROUGHLY – the pilot should perform the following checklist:

1. Mixture – FULL RICH
2. Alternate Air – OPEN
3. Fuel Shut-off – OPEN
4. Fuel Pump – ON
5. Ignition Switch – cycle L – BOTH – R – BOTH
6. Throttle – at present position
7. No Improvement – reduce throttle to minimum required power, land as soon as possible.

FAA Advisory Circular 20-113. The Advisory Circular states that one form of induction system icing is impact ice and states in part:

"Impact ice is formed by moisture-laden air at temperatures below freezing, striking and freezing on elements of the induction system which are at temperatures of 32° F or below. Under these conditions, ice may build up on such components as the air scoops, heat or alternate air valves, intake screens, and protrusions in the carburetor. Pilots should be particularly alert for such icing when flying in snow, sleet, rain, or clouds, especially when they see ice forming on the windshield or leading edge of the wings. The ambient temperature at which impact ice can be expected to build most rapidly is about 25° F, when the super cooled moisture in the air is still in a semi liquid state. This type of icing affects an engine with

fuel injection, as well as carbureted engines. It is usually preferable to use carburetor heat or alternate air as an ice prevention means..."

### Student pilot Information

<b>Certificate:</b>	Student	<b>Age:</b>	18
<b>Airplane Rating(s):</b>	None	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	January 13, 2015
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	12 hours (Total, all aircraft), 12 hours (Total, this make and model), 2 hours (Pilot In Command, all aircraft), 12 hours (Last 90 days, all aircraft), 12 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

### Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	DIAMOND AIRCRAFT IND INC	<b>Registration:</b>	N979DC
<b>Model/Series:</b>	DA 20 C1	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	2005	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Utility	<b>Serial Number:</b>	C0314
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	2
<b>Date/Type of Last Inspection:</b>	100 hour	<b>Certified Max Gross Wt.:</b>	
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	3195 Hrs at time of accident	<b>Engine Manufacturer:</b>	Continental Motors Inc
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	IO-240
<b>Registered Owner:</b>	NEW HORIZONS AVIATION INC	<b>Rated Power:</b>	125 Horsepower
<b>Operator:</b>	NEW HORIZONS AVIATION INC	<b>Operating Certificate(s) Held:</b>	Pilot school (141)

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KGSH, 827 ft msl	<b>Distance from Accident Site:</b>	13 Nautical Miles
<b>Observation Time:</b>	16:53 Local	<b>Direction from Accident Site:</b>	216°
<b>Lowest Cloud Condition:</b>	Few / 12000 ft AGL	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	Unknown	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	3 knots / None	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	200°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	29.94 inches Hg	<b>Temperature/Dew Point:</b>	2°C / -1°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	GOSHEN, IN (GSH )	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	GOSHEN, IN (GSH )	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	16:45 Local	<b>Type of Airspace:</b>	

## Airport Information

<b>Airport:</b>	GOSHEN MUNI GSH	<b>Runway Surface Type:</b>	Grass/turf
<b>Airport Elevation:</b>	827 ft msl	<b>Runway Surface Condition:</b>	Vegetation
<b>Runway Used:</b>		<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>		<b>VFR Approach/Landing:</b>	Forced landing

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 None	<b>Aircraft Damage:</b>	Substantial
<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 None	<b>Latitude, Longitude:</b>	41.705833,-85.613052(est)

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Lindberg, Joshua
<b>Additional Participating Persons:</b>	Dan Sedberry; FAA; South Bend, IN Kurt Gibson; Continental Motors Inc; Mobile, AL
<b>Original Publish Date:</b>	March 17, 2015
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<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=90617">https://data.nts.gov/Docket?ProjectID=90617</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](#).