Aviation Investigation Final Report

Location:	Springfield, Ohio	**Accident Number:**	CEN16LA281
Date & Time:	July 22, 2016, 10:40 Local	**Registration:**	N807LK
Aircraft:	Vans RV9	**Aircraft Damage:**	Destroyed
Defining Event:	Inflight upset	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Before takeoff on a personal cross-country flight, the private pilot received two official weather briefings of all the forecast and observed weather conditions along the flight route, which included thunderstorms and convective SIGMETs. A review of air traffic control (ATC) information revealed that, while en route to the destination airport, the pilot was in contact with ATC and attempting to circumnavigate oncoming weather and precipitation. The pilot requested ATC assistance and stated that he could avoid the clouds if ATC could help him avoid the precipitation, indicating that he was aware of the weather conditions but that he likely did not have onboard weather information. The Middletown sector approach controller provided two route options: one of the options would have allowed the pilot to completely avoid the precipitation and taken him farther away from his destination, and the other option would have allowed the pilot to proceed between two areas of precipitation and stay closer to his intended route. The controller obtained PIREPs from two pilots who had previously transitioned through the two areas of precipitation, and they reported that they "didn't really have any problems" flying through the area. The controller also provided the pilot the intensity of the two cells and the estimated distance between the two areas of precipitation. After the controller relayed this information to the pilot, he chose to fly between the two areas of heavy precipitation. The controller then transferred communication to the Urbana sector approach controller.

After the pilot checked in with the Urbana approach controller, the controller issued the pilot several heading suggestions to the northwest to avoid the precipitation, but the pilot responded that he wanted to continue on his present heading and then continued flying east toward the severe weather. Despite several subsequent suggestions by the controller to the pilot to change course to avoid the weather, according to radar data, the airplane continued flying east toward the severe weather. In the final 3.5 minutes of the flight, while flying east, the airplane made a left 360° turn while descending about 2,900 ft per minute (fpm), then resumed a climb while heading east. Less than 1 minute later, the airplane made a right 310° turn while descending about 1,200 fpm. The airplane then flew northeast and descended about 4,600 fpm to 3,440 ft above ground level. Subsequently, the descent rate increased to about 6,450 fpm, at which point radar contact was lost. The airplane entered an area of an outflow

boundary and thunderstorms and likely encountered heavy precipitation, severe-to-extreme turbulence, updrafts and downdrafts, and wind shear.

A witness saw the airplane in a steep descent and heard the engine operating; the airplane then disappeared behind a tree line, at which point she heard the sound of an impact. The airplane impacted a corn field heading north. The vertical stabilizer and rudder were found 0.61 to 0.63 nautical miles southwest of the main wreckage, respectively, and exhibited overload signatures consistent with an in-flight breakup. A postaccident examination of the airframe and engine did not reveal any anomalies, other than the separated components, that would have precluded normal operation.

Although the Middletown sector controller provided general information about the observed weather, she did not provide specific information, such as the direction relative to the airplane and distance to the bands of weather and the widths of the weather bands, as required by Federal Aviation Administration Order 7110.65. The controller's workload did not prevent her from providing general weather information and suggesting headings to the pilot, which indicates that the controller could have provided more specific adverse weather information without detriment to other duties, as required. However, it is unlikely that this affected the pilot's decision about the route he flew. The pilot's continued flight into known thunderstorms resulted in the in-flight breakup of the airplane.

Although toxicology testing detected ethanol in the pilot's muscle and liver, the ratio of the detected ethanol suggested that some or all the ethanol was from sources other than ingestion.

Probable Cause and Findings

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

The pilot's decision to fly into known thunderstorms, which resulted in an in-flight breakup.

Findings

Environmental issues	Thunderstorm - Effect on equipment
Environmental issues	Thunderstorm - Decision related to condition
Personnel issues	Decision making/judgment - Pilot
Personnel issues	Aircraft control - Pilot
Aircraft	Vertical stabilizer - Capability exceeded
Aircraft	Rudder - Capability exceeded
Aircraft	(general) - Capability exceeded

Factual Information

History of Flight

Enroute-cruise	Loss of control in flight
Enroute-cruise	Inflight upset (Defining event)
Enroute-cruise	Other weather encounter
Enroute-cruise	Windshear or thunderstorm

HISTORY OF FLIGHT

****This report was modified on August 16, 2017. Please see the docket for this accident to view the original report.****

On July 22, 2016, about 1040 eastern daylight time, a Levon G King Vans RV9A airplane, N807LK, impacted terrain near Springfield, Ohio. The pilot and one passenger were fatally injured and the airplane was destroyed. The airplane was registered to and operated by the pilot under the provisions of 14 *Code of Federal Regulations* Part 91 as a personal flight. Marginal visual meteorological conditions prevailed near the accident site and the airplane was receiving visual flight rules flight following. The flight departed Tri-Cities Regional Airport (TRI), Bristol/Johnson/Kingsport, Tennessee, about 0850 and was en route to Grosse Ile Municipal Airport (ONZ), Detroit/Grosse Ile, Michigan.

A review of the air traffic control (ATC) and radar data revealed that while en route to ONZ, the pilot was in contact with ATC and attempted to navigate around the oncoming weather and precipitation. From 0957 to 1038 the pilot communicated with the controllers about avoiding the precipitation and requested assistance in doing so. The pilot stated that he could avoid the clouds if ATC could keep him out of the precipitation. The controllers gave the pilot several heading suggestions to the northwest to avoid the precipitation that they observed on their radar scopes. The pilot continued flying east toward the severe weather (figure 1).

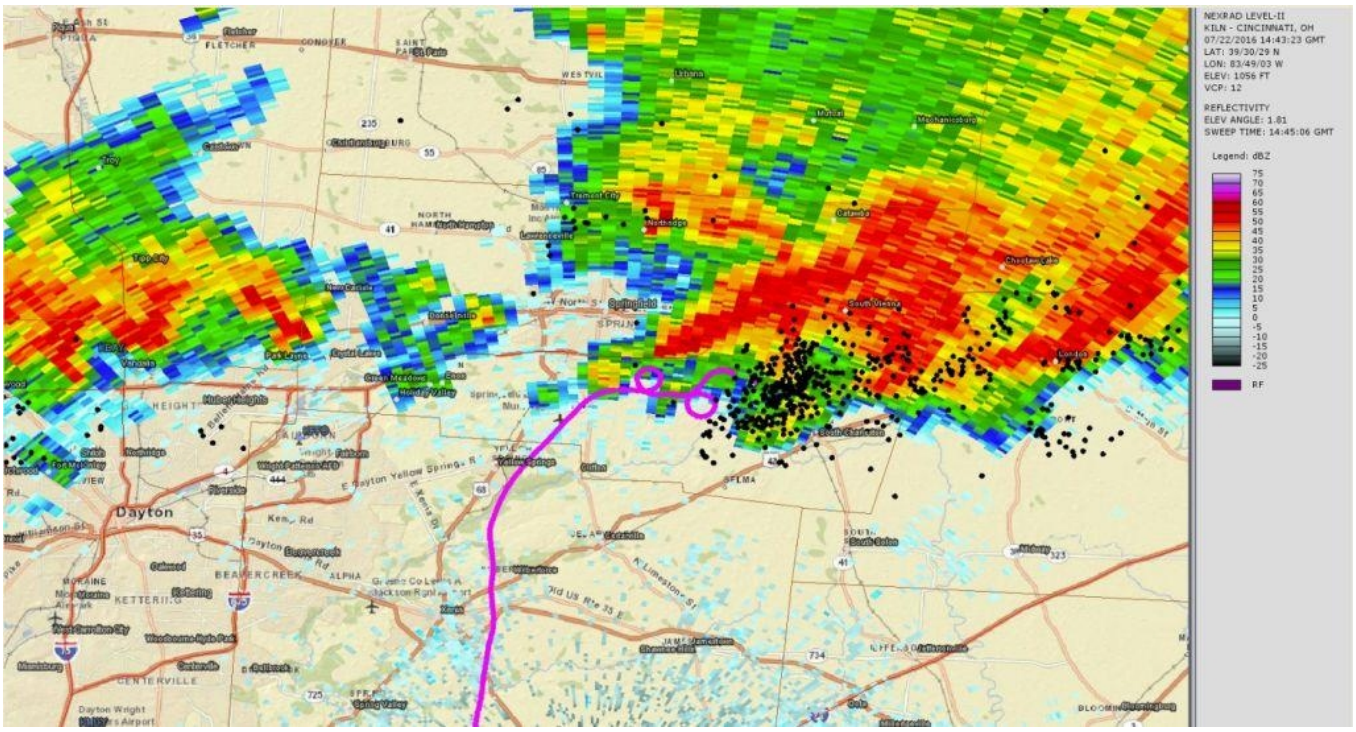

Figure 1 – Weather radar with flight track

In the final 3.5 minutes of the flight while flying east, the airplane made a left 360° turn while descending about 2,900 ft per minute (fpm), then resumed a climb while heading east. Less than one minute later, the airplane made a right 310° turn, descending about 1,200 fpm. The airplane then flew northeast and descended about 4,600 fpm to an elevation of 3,440 ft above ground level (agl). The descent rate increased to about 6,450 fpm until radar contact was lost (figure 2).

A witness observed the accident airplane above her house as it flew east-northeast (figure 2). She stated that the airplane was in a steep descent and disappeared behind a tree line when she heard the sound of an impact. She heard the engine operating before the airplane disappeared behind the trees.

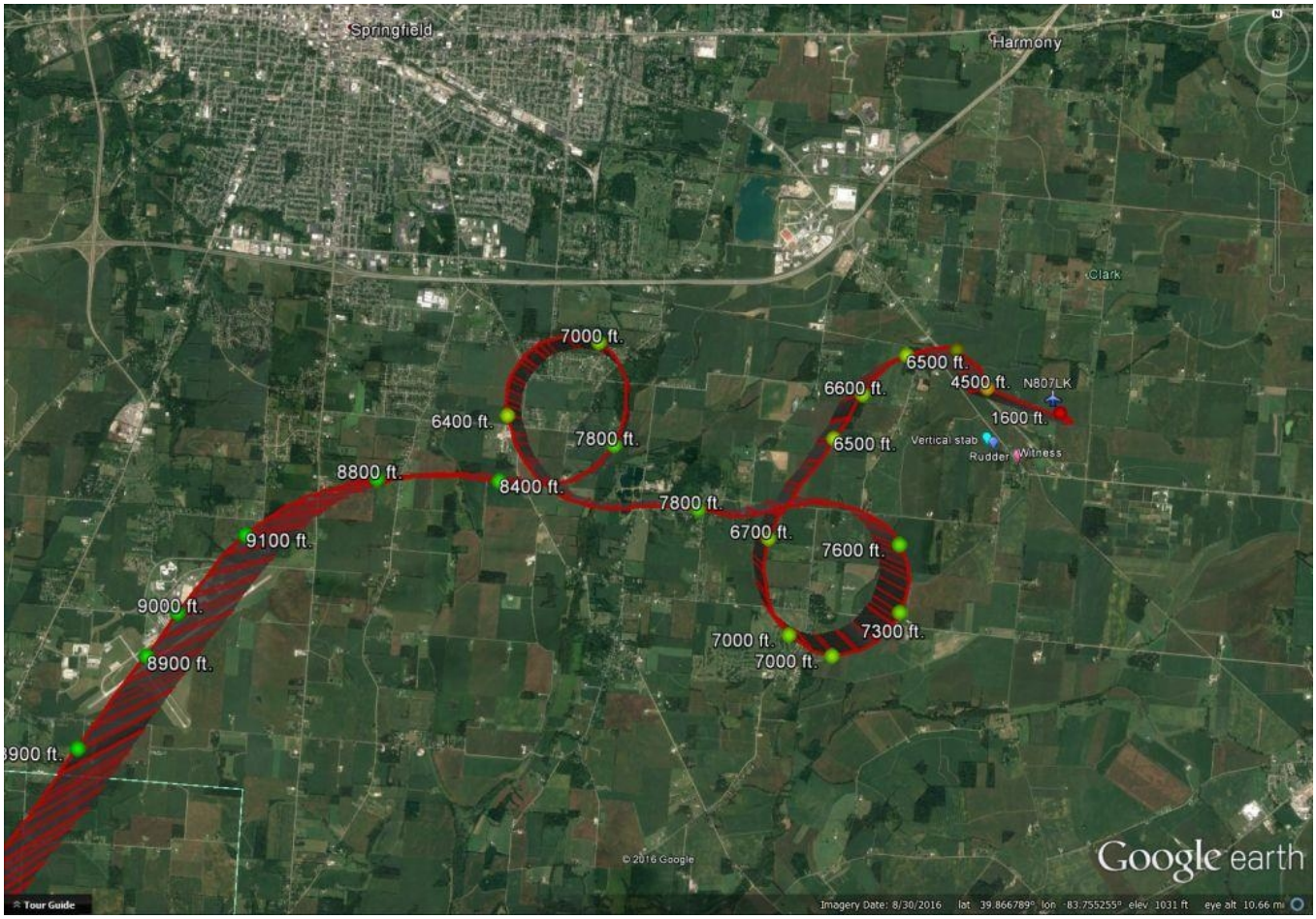

Figure 2 – Google Earth view of final flight path and witness location. Altitude in mean sea level (msl)

PERSONNEL INFORMATION

AIRCRAFT INFORMATION

The pilot built the airplane from a kit, which was configured for 2 occupants with side-by-side seating. The airplane received a special airworthiness certificate with an experimental designation on April 27, 2015. The pilot logged the airplane's first flight on July 30, 2015.

The airplane was equipped with a TruTrak electronic flight instrument system, a Garmin GTX 327 transponder, and Free Flight automatic dependent surveillance-broadcast (ADS-B). A Garmin 795 handheld GPS was found onboard and was damaged to the extent that a download of non-volatile memory was not possible. An external Garmin GPS antenna was found by the FAA inside the pilot's hangar at ONZ.

The investigation did not find any evidence of a satellite weather subscription and could not determine if the pilot was receiving weather information to the cockpit instruments.

METEOROLOGICAL INFORMATION

While en route, air traffic controller advised the pilot that two other airplanes had flown over Dayton, Ohio, but that route was located between two cells with heavy precipitation, and there was only 5 to 8 miles clearance on either side. The controller informed the pilot that she would request pilot reports (PIREPs) from the pilots. The air traffic controller informed the accident pilot that the pilots who had transitioned over Dayton indicated that they "didn't really have any problems" flying through that area.

A search of weather briefing sources revealed that the accident pilot contacted Lockheed Martin Flight Service at 0619 and 0804 and received weather briefings. During the first weather briefing, the briefer explained a Convective SIGMET (a weather advisory concerning convective weather significant to the safety of all aircraft) outlook which bordered the area along the western edge of the intended flight track and was valid through 1150. An Airmen's Meteorological Information (AIRMET) for moderate turbulence was current to the west of ONZ. It was anticipated that thunderstorms would continue to develop due to a frontal boundary in the area and turbulence was likely near ONZ.

During the second weather briefing at 0804, the briefer explained that rain had developed through northern portions of Ohio and was slowly moving east-southeast. A Convective SIGMET had been issued for the route of flight and an AIRMET for higher level turbulence had been issued for the northern portion of the route of flight. Additional Convective SIGMETs could be issued for Ohio northward during the accident flight and deviations to the west would likely avoid the SIGMET. Thunderstorms were moving southeast toward Columbus, Ohio. The briefer further explained that due to the weather conditions, the pilot would likely go direct Ohio State University Airport (OSU), Columbus, Ohio, then direct to ONZ in order to avoid the thunderstorms.

There is no record of the accident pilot receiving or retrieving any other weather information other than the information provided by ATC.

FAA Advisory Circular AC 00-24C, "Thunderstorms," defines the echo intensity levels and weather radar echo intensity terminology associated with those levels. For decibel (dBZ) values less than 30 the weather radar echo intensity terminology should be "light," 30 to 40 dBZ should be "moderate," and 40 to 50 dBZ should be "heavy." Any values above 50 dBZ shall be described as "extreme." From the National Weather Service, precipitation conditions at the surface can be inferred from VIP Levels described as:

• VIP 1 (Level 1, 18-30 dBZ) - Light precipitation

• VIP 2 (Level 2, 30-38 dBZ) - Light to moderate rain.

• VIP 3 (Level 3, 38-44 dBZ) - Moderate to heavy rain.

• VIP 4 (Level 4, 44-50 dBZ) - Heavy rain

• VIP 5 (Level 5, 50-57 dBZ) - Very heavy rain; hail possible.

• VIP 6 (Level 6, >57 dBZ) - Very heavy rain and hail; large hail possible.

The GPS flight track indicated that the airplane flew through an area of 10 to 40 dBZ reflectivity values located along the route of flight before the accident time. Reflectivity values of 25 to 40 dBZ were located north of the flight path. The accident flight flew into an area of defined thunderstorms while an

outflow boundary north of the accident site was moving south. As the outflow boundary moved south across the accident site there was a corresponding increase in the dBZ values in the base reflectivity data. There were lightning flashes and strikes surrounding the accident area with more than 900 lightning flashes associated with the thunderstorms between 1030 and 1040 EDT. The flight path was within 2 miles of the lightning flashes after 1037:02 EDT through the accident time (figure 1).

COMMUNICATIONS

ATC Transcripts – Partial Summary

10:34:15 – (pilot) good morning Columbus, experimental November eight zero seven lima kilo we 're level (unintelligible) at nine point four

10:34:22 – (ATC) experimental eight zero seven lima kilo Columbus approach altimeter is three zero seven seven

10:34:28 – (pilot) three zero seven seven, seven lima kilo

10:34:35 – (pilot) and seven lima kilo we'd like all the help you can give us around this precip[itation]

10:34:40 – (ATC) experimental seven lima kilo say again

10:34:43 – (pilot) any help you can give us to avoid the precip[itation] we'd appreciate

10:34:47 – (ATC) seven lima kilo roger my radar scope you need to turn straight to the northwest about a three twenty to three thirty heading uh if you want to try and go through the least amount of precip[itation] on your present heading then your current heading looks good you might you might need to turn a little bit to the right but if you want to stay out of it completely then you need to turn to the northwest

10:35:09 – (pilot) seven lima kilo I think I'll maintain present heading

10:35:13 – (ATC) Roger

10:36:07 – (pilot) Columbus approach seven lima kilo [what do you show] as my present heading?

10:36:13 – (ATC) experimental seven lima kilo your present heading takes you through the uh worst of the precipitation heavy to extreme precipitation I suggest you turn to the south southwest

10:36:23 – (pilot) seven lima kilo

10:37:38 – (ATC) experimental seven lima kilo Columbus

10:37:40 – (pilot) seven lima kilo go ahead

10:37:43 – (ATC) I was just, are you turning back to the northeast?

10:37:46 – (pilot) I intended to turn to the southeast

10:37:50 – (ATC) okay your present heading is taking you straight eastbound again right into, at least on my scope, the worst of the precip[itation] so you need to turn the right, if you want to turn to the right to the southwest or southeast if you want to go through the least of it

10:38:04 – (pilot) okay we'll go to the right

10:39:50 – (ATC) experimental seven lima kilo I can see you continuing to the northeast at least on my scope if you turn a little bit to the left go northbound that you be a through the precipitation here in about twenty miles

10:40:10 – (ATC) experimental seven lima kilo Columbus

10:40:17 – (ATC) experimental seven lima kilo if you can hear me Springfield airport is off to your right or the Lisbon airport is just off to your left it's runway five two three one thousand eight hundred by seventy-five feet

10:41:10 – (ATC) experimental seven lima kilo if you can hear radar contact is lost, if you can hear me uh just uh respond

End of Transcript.

WRECKAGE AND IMPACT INFORMATION

The responding Federal Aviation Administration (FAA) inspector reported that the airplane was found in a corn field (figure 3) about 7 statute miles east of Springfield-Beckley Municipal Airport (SGH), Springfield, Ohio.

Figure 3 – Main wreckage in a mature corn field with first responders nearby

The main wreckage debris path was generally oriented north and contained the engine, propeller, left and right wings, fuselage, and most of the empennage. The debris path was about 25 yards in length beginning with pieces of a wing and ended with the main wreckage. The instrument panel and forward cockpit area separated from the airplane and were found near the middle of the debris path. The throttle, mixture, and propeller knobs were found near the full forward position. The engine separated from its mounts and sustained impact damage. The propeller was separated from the engine and sustained leading edge damage, S-bending, and rearward bending.

The vertical stabilizer, rudder, and several small pieces separated from the empennage and came to rest in separate locations 0.61 to 0.63 nautical miles southwest of the main wreckage. The vertical stabilizer and rudder (figure 5) and were found with overload signatures at all separation points. The vertical stabilizer separated near the bottom of the rear spar. The rudder was found separated in two large pieces with several small pieces also identified. The counterweight was laterally separated from the top of the rudder. The rudder hinge brackets remained attached to the control rod ends. Most of the hinge bracket rivets were pulled through the vertical stabilizer.

Figure 4 – Right side view of the main wreckage in a mature corn field. The vertical stabilizer and rudder are missing from the empennage.

Figure 5 – Vertical stabilizer and rudder

MEDICAL AND PATHOLOGICAL INFORMATION

Clark County Coroner's Office, Dayton, Ohio, completed an autopsy on the pilot and the cause of death was blunt force injuries. The Bioaeronautical Research Laboratory at the FAA's Civil Aerospace Medical Institute conducted toxicology testing, which revealed 48 milligrams per deciliter (mg/dL) of ethanol in the muscle and 23 mg/dL in the liver. No putrefaction was reported.

Ethanol is primarily a social drug with a powerful central nervous system depressant. After absorption, ethanol is uniformly distributed throughout all tissues and body fluids. The distribution pattern parallels the water content and blood supply of each organ. Postmortem production of ethanol also takes place due to putrefaction processes, but vitreous humor and urine do not suffer from such production to any significant extent in relation to blood. Vitreous humor would normally have about 12% more ethanol than blood if the system is in the post absorptive state, and urine would normally have about 25% more ethanol than blood. The average rate of elimination of ethanol from blood is 18 mg/dL (15-20 mg/dL) per hour.

ADDITIONAL INFORMATION

Air Traffic Control Information

Controllers are required to provide weather and precipitation information to pilots as stated in FAA Order 7110.65, Paragraph 2-6-4, "Weather and Chaff Services":

a. Issue pertinent information on observed/reported weather and chaff areas by defining the area of coverage in terms of azimuth (by referring to the 12-hour clock) and distance from the aircraft or by indicating the general width of the area and the area of coverage in terms of fixes or distance and direction from fixes.

NOTE − Weather significant to the safety of aircraft includes such conditions as funnel cloud activity, lines of thunderstorms, embedded thunderstorms, large hail, wind shear, microbursts, moderate to extreme turbulence (including CAT), and light to severe icing.

PHRASEOLOGY− WEATHER/CHAFF AREA BETWEEN (number) O'CLOCK AND (number) O'CLOCK (number) MILES, or (number) MILE BAND OF WEATHER/CHAFF FROM (fix or number of miles and direction from fix) TO (fix or number of miles and direction from fix).

b. Inform any tower for which you provide approach control services of observed precipitation on radar which is likely to affect their operations.

c. Use the term "precipitation" when describing radar−derived weather. Issue the precipitation intensity from the lowest descriptor (LIGHT) to the highest descriptor (EXTREME) when that information is available. Do not use the word "turbulence" in describing radar−derived weather.

1. LIGHT. 2. MODERATE. 3. HEAVY. 4. EXTREME.

PHRASEOLOGY − AREA OF (Intensity) PRECIPITATION BETWEEN (number) O'CLOCK AND (number) O'CLOCK, (number) MILES, MOVING (direction) AT (number) KNOTS, TOPS (altitude). AREA IS (number) MILES IN DIAMETER.

EXAMPLES

1. "Area of extreme precipitation between eleven o'clock and one o'clock, one zero miles moving

east at two zero knots, tops flight level three niner zero."

2. "Area of heavy precipitation between ten o'clock and two o'clock, one five miles. Area is two

five miles in diameter."

3. "Area of heavy to extreme precipitation between ten o'clock and two o'clock, one five miles.

Area is two five miles in diameter."

Weather Information

FAA Pilot Handbook of Aeronautical Knowledge, Chapter 11, "Weather Theory," states the following:

"…if an aircraft enters a thunderstorm, the aircraft could experience updraft and downdraft that exceed 3,000 ft per minute…a good rule of thumb is to circumnavigate thunderstorms by at least 5 nautical miles…if flying around a thunderstorm is not an option, stay on the ground until it passes."FAA Pilot Handbook of Aeronautical Knowledge - Chapter 11, "Weather Theory"

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FAA Safety Team FAA–P–8740–12 - AFS–8 (2008) "Thunderstorms – Don't Flirt…Skirt 'Em"

Pilots should observe the following rules for any flight routed even potentially near actual or possible thunderstorm activity:

• Avoid all thunderstorms.

• Never get closer than 5 miles to any visible storm cloud with overhanging areas, and strongly consider increasing that distance to 20 miles or more. You can encounter hail and violent turbulence anywhere within 20 miles of very strong thunderstorms.

• Do not attempt flight beneath thunderstorms, even when visibility is good, because of the destructive potential of shear turbulence in these areas.

• At the first sign of turbulence, reduce airspeed immediately to the manufacturer's recommended airspeed for turbulent air penetration for a specific gross weight (design maneuvering speed).

• If the aircraft inadvertently penetrates the thunderstorm, maintain a straight and level altitude on a heading that will take you through the storm area in the minimum time.

Pilot Information

Certificate:	Private	**Age:**	80,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	November 15, 2015
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	1375 hours (Total, all aircraft), 63.7 hours (Total, this make and model), 15.1 hours (Last 90 days, all aircraft), 13.5 hours (Last 30 days, all aircraft)		

Passenger Information

Certificate:		**Age:**	84,Female
Airplane Rating(s):		**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	Unknown
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:			

Aircraft and Owner/Operator Information

Aircraft Make:	Vans	**Registration:**	N807LK
Model/Series:	RV9 A	**Aircraft Category:**	Airplane
Year of Manufacture:	2015	**Amateur Built:**	Yes
Airworthiness Certificate:	Certificate of authorization or waiver (COA)	**Serial Number:**	91528
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	June 16, 2016 Condition	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	53.2 Hrs as of last inspection	**Engine Manufacturer:**	Superior
ELT:		**Engine Model/Series:**	XP-320
Registered Owner:	On file	**Rated Power:**	160 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KSGH,1050 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	10:56 Local	**Direction from Accident Site:**	178°
Lowest Cloud Condition:		**Visibility**	7 miles
Lowest Ceiling:	Broken / 1500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	40°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.06 inches Hg	**Temperature/Dew Point:**	25°C / 22°C
Precipitation and Obscuration:	Moderate - Thunderstorm - Rain		
Departure Point:	BRISTOL/JOHNSON/KINGSPORT, TN (TRI)	**Type of Flight Plan Filed:**	VFR
Destination:	DETROIT/GROSSE ILE, MI (ONZ)	**Type of Clearance:**	VFR;VFR flight following
Departure Time:	08:50 Local	**Type of Airspace:**	Class E

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	39.873889,-83.687225(est)

Administrative Information

Investigator In Charge (IIC):	Lindberg, Joshua
Additional Participating Persons:	Andrew Porter; Federal Aviation Administration; Cincinnati, OH
Original Publish Date:	September 6, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=93660