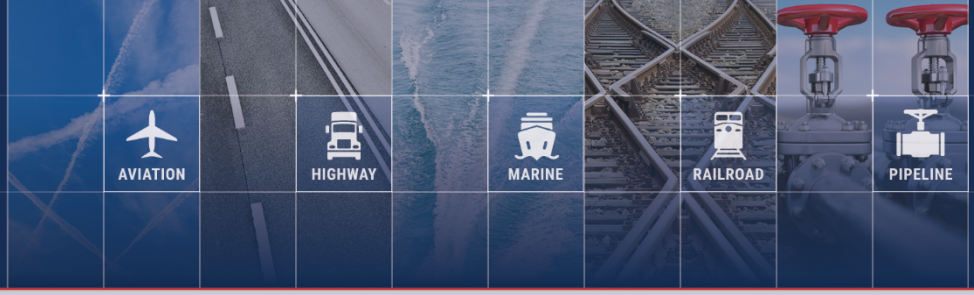

Aviation Investigation Final Report

Location:	Tryon, Nebraska	**Accident Number:**	WPR22FA266
Date & Time:	July 25, 2022, 08:39 Local	**Registration:**	N192MH
Aircraft:	HOLLAND MIKE RV9A	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The non-instrument-rated pilot and student-pilot rated passenger were en route during a cross-country flight when they encountered instrument meteorological conditions. Air traffic control (ATC) communications and flight track data were consistent with the pilots being aware of deteriorating weather conditions along their desired route of travel and attempting to navigate around clouds before the pilot reported to ATC that they were in the clouds. The pilot's final radio call to ATC was that they were "still in the soup" and the airplane subsequently descended rapidly and exceeded the airplane's do not exceed airspeed (Vne) by 70-80 knots true airspeed (TAS) before the radar data ended. Witnesses heard a loud noise and then saw the airplane spiraling over their home along with separated pieces of the airplane falling from the sky before they impacted terrain.

The debris field was about 1 mile long, and the first pieces of wreckage in the debris field were portions of the vertical stabilizer, indicating portions of the empennage separated from the airplane first. The observed damage was consistent with structural failure initiated by flutter of the rudder and no pre-existing anomalies were found during examinations of the wreckage.

The accident is consistent with the non-instrument-rated pilot continuing to fly toward deteriorating weather conditions despite his knowledge of those conditions and his lack of qualification to fly in them. The pilot likely became spatially disoriented and lost control of the airplane after entering instrument meteorological conditions and losing the ability to see visual references. The airplane then entered a descent and exceeded its airspeed design limits to a point where rudder flutter occurred, which resulted in structural failure of the airplane.

Probable Cause and Findings

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

The non-instrument-rated pilot's decision to continue visual flight into instrument meteorological conditions, which resulted in spatial disorientation, a loss of control, exceedance of the airplane's design limitations, and in-flight breakup of the airplane due to rudder flutter.

Findings

Personnel issues	Total instrument experience - Pilot
Personnel issues	Understanding/comprehension - Pilot
Personnel issues	Decision making/judgment - Pilot
Aircraft	Descent rate - Not attained/maintained
Aircraft	Airspeed - Capability exceeded
Environmental issues	Clouds - Decision related to condition
Environmental issues	Clouds - Response/compensation

Factual Information

History of Flight

Enroute-cruise	VFR encounter with IMC
Enroute-cruise	Loss of visual reference
Enroute-cruise	Loss of control in flight (Defining event)

On July 25, 2022, at 0839 central daylight time, an experimental amateur-built Vans RV-9A, N192MH, was destroyed when it was involved in an accident near Tryon, Nebraska. The pilot and student pilot-rated passenger were fatally injured. The airplane was being operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

Radar data and air traffic control communications indicate the airplane departed Greeley-Weld County Airport (GXY), Greely, Colorado about 0715 and flew northeast towards its intended destination of Cherokee County Regional Airport (CKP), Cherokee, Iowa, at an altitude of 9,500 ft mean sea level (msl). The non-instrument-rated pilot requested visual flight rules (VFR) flight following with ATC during the flight.

At 0809, ATC informed the pilot of moderate precipitation at 65 miles and his 12 o'clock position. The pilot commented that it "looked pretty open from here." Five minutes later, the pilot told ATC he needed to deviate to the north to avoid flying into overcast conditions.

At 0831, the ATC controller asked the pilot if they were changing their destination due to a sudden change in their direction of flight. The pilot advised they were trying to remain clear of clouds and requested to be pointed into a direction that was clear. The controller advised there were no pilot reports (PIREPs) in the area and reissued the depicted precipitation. The pilot advised they were going to climb and attempt to get on top of a cloud layer. The controller instructed the pilot to maintain VFR. There were several subsequent communications between the pilot and ATC where the pilot indicated he was maneuvering and attempting to remain clear of clouds and ATC provided updated weather reports and directions to nearby airports.

At 0837, the pilot reported they were at 12,300 ft and "still in the soup." The airplane remained at that altitude about 90 seconds before the airplane started a descending left-hand turn. The following 20 seconds of radar data indicated that the airplane descended about 4,800 ft and accelerated past its maximum airspeed of 182 knots TAS to about 249-264 knots TAS before the radar data ended (see figures 1 and 2).

Figure 1 – Flight Track

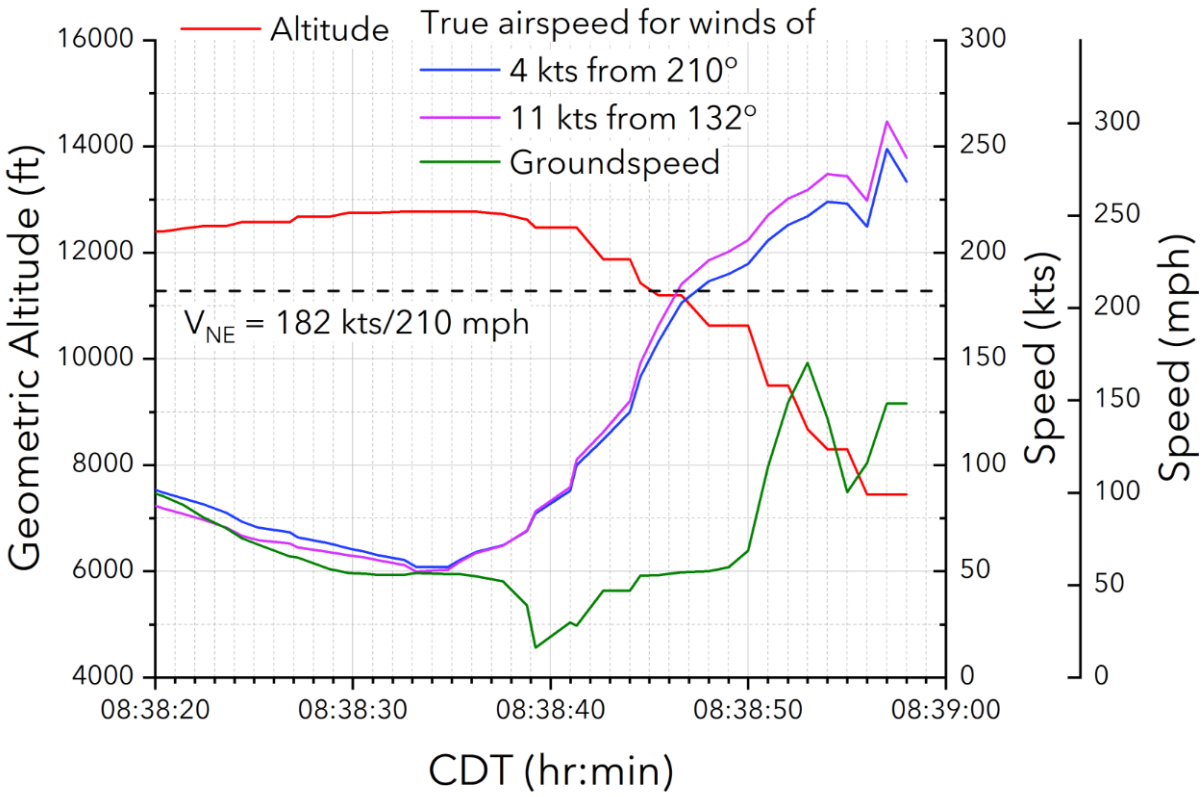

Figure 2 – Airspeed and Altitude Graph

Two witnesses reported they were in their home when they heard a loud “boom” that “shook their

house." One witness ran outside and observed the airplane overfly the house "in a spiral" before it impacted the ground. He also observed pieces of the airplane falling to the ground near the home.

Pilot Information

Certificate:	Private	**Age:**	80,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	BasicMed	**Last FAA Medical Exam:**	February 1, 2019
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	1050 hours (Total, all aircraft)		

Pilot-rated passenger Information

Certificate:	Student	**Age:**	58,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	July 22, 2019
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

No current pilot logbooks were located during the investigation for either occupant. The pilot reported 1,050 total flight hours as of his last medical examination dated February 23, 2017.

Aircraft and Owner/Operator Information

Aircraft Make:	HOLLAND MIKE	**Registration:**	N192MH
Model/Series:	RV9A	**Aircraft Category:**	Airplane
Year of Manufacture:	2005	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	90556
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	LYCOMING
ELT:	Installed, not activated	**Engine Model/Series:**	O-320-D2A
Registered Owner:	On file	**Rated Power:**	160 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

No airplane maintenance logbooks were located during the investigation.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KTIF,2925 ft msl	**Distance from Accident Site:**	20 Nautical Miles
Observation Time:	08:35 Local	**Direction from Accident Site:**	20°
Lowest Cloud Condition:	9000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 1200 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots / 15 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	160°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.1 inches Hg	**Temperature/Dew Point:**	19°C / 16°C
Precipitation and Obscuration:			
Departure Point:	Greeley, CO (GXY)	**Type of Flight Plan Filed:**	
Destination:	Cherokee, IA	**Type of Clearance:**	VFR flight following
Departure Time:	06:15 Local	**Type of Airspace:**	Class G

The accident pilot did not request weather information from Leidos Flight Service or ForeFlight for the flight. A search of archived ForeFlight information indicated that five days before the

accident, the student pilot-rated passenger did review ForeFlight information for a potential flight through the accident region.

The closest official weather station to the accident site was at Thomas County Airport (KTIF), Thedford, Nebraska, located 20 miles northeast of the accident site. KTIF weather at 0835 CDT showed wind from 160° at 9 knots with gusts to 15 knots, visibility 10 miles or greater, broken ceiling at 1,200 ft above ground level (agl), overcast skies at 9,000 ft agl, temperature of 19° Celsius (C), dew point temperature 16°C, and an altimeter setting of 30.10 inches of mercury (inHg).

The next closest weather reporting station was at North Platte Regional Airport/Lee Bird Field (KLBF), North Platte, Nebraska, at an elevation of 2,777 ft and located 33 miles south of the accident site. KLBF weather at 0853 CDT showed wind from 110° at 9 knots, visibility 2 ½ miles, light rain, mist, broken ceiling at 500 ft agl, broken clouds at 1,500 ft agl, overcast skies at 2,300 ft agl, temperature of 18°C, dew point temperature 17°C, and an altimeter setting of 30.08 inHg.

Geostationary Operational Environmental Satellite number 16 (GOES-16) visible and infrared data from 0840 indicated there was layered cloud cover over the accident site and that cloud tops were near 14,000 ft. National Weather Service radar imagery depicted no precipitation echoes above the accident site at 0840. Precipitation was depicted east of the accident site along the anticipated route of flight.

There were no non-convective or convective Significant Meteorological Information (SIGMET) advisories or Airmen's Meteorological Information (AIRMET) advisories valid for the accident site at the accident time. The Denver (ZDV) Air Route Traffic Control Center (ARTCC) Center Weather Service Unit (CWSU) was responsible for the accident region. There was no Center Weather Advisory (CWA) valid from ZDV CWSU at the accident time.

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	41.668643,-100.79525(est)

The airplane debris was spread along a line beginning about 1 mile northwest of the main wreckage and was about 900 ft wide, consistent with an inflight breakup. The first pieces of wreckage in the debris field were portions of the vertical stabilizer. The left wing, right horizontal stabilizer, and portions of the rudder were located about the midpoint of the debris field, and the left horizontal stabilizer with attached empennage was located about .2 miles northwest of the main wreckage. The main wreckage consisted of most the fuselage, cockpit, engine and propeller, and most of the right wing.

The left wing separated from the airplane about 2-3 ft outboard of the fuselage. The upper spar cap was fractured through the wing attach bolt hole and pulled out of the inboard wing. The rear spar had twisting deformation in a leading edge down direction. The left aileron separated from the wing and both aileron fittings were pulled from the aileron. There was spanwise buckling noted on the upper left wing skin. The flap was fractured near the wing separation point. The inboard half remained attached to the inboard wing and the outboard section separated. The wingtip was separated and fractured into multiple pieces.

The right wing was partially separated about 2 ft outboard of the fuselage and bent down as found. The upper spar cap was cut during recovery to remove the wing. The right flap and aileron remained attached to the wing. The right wingtip was separated and fractured into multiple pieces.

The wing center section that remained attached to the fuselage had obvious downward deformation consistent with negative wing overload.

The vertical stabilizer separated mostly intact from the empennage. The front spar was fractured and deformed aft at the fracture location. The rear spar was pulled from the vertical stabilizer and the vertical stabilizer skins were splayed open. The rudder was separated and fractured into 5 pieces. The rudder counterweight was separated from the top of the rudder. The upper half of the rudder was mostly intact, but the riveted trailing edge was splayed open. A section of the left center rudder skin was recovered separately, and a section of the right center rudder skin was not recovered. The lower section of rudder remained attached to the vertical stabilizer rear spar at the center hinge. The vertical stabilizer rear spar had diagonal buckling damage along most of its length. The upper rudder hinge plates were pulled from the spar and the upper half of the spar was deformed and twisted to the right. The lower rudder cap was separated.

Figure 3 - Separated vertical stabilizer and rudder.

The right horizontal stabilizer was separated and had signatures consistent with downward separation. About ¾ of the right elevator remained attached to the right horizontal stabilizer and the trailing edge was splayed open. The inboard portion of right elevator was separated. The right elevator counterweight was separated and not recovered. The left horizontal stabilizer and elevator remained attached to the empennage. The left elevator counterweight was separated and not recovered. The empennage was fractured from the fuselage consistent with twisting counterclockwise as viewed looking forward.

The observed damage was consistent with structural failure initiated by flutter of the rudder and no anomalies were found during examinations of the wreckage.

Additional Information

Flutter

Flutter is an aeroelastic phenomenon that can occur when an airplane's natural mode of structural vibration couples with the aerodynamic forces to produce a rapid periodic motion, oscillation, or vibration. Flutter can be somewhat stable if the natural damping of the structure prevents an increase in the forces and motions. Flutter can become dynamically unstable if the damping is not adequate or speed is increased, resulting in increasing self-excited destructive forces being applied to the structure. Flutter can range from an annoying buzz of a flight control or aerodynamic surface to a violent destructive failure of the structure in a very short period of time. Due to the high frequency of oscillation, even when flutter is on the verge of becoming catastrophic, it can still be very hard to detect. Aircraft speed, structural stiffness, and mass distribution are three inputs that govern flutter. An increase in airspeed, a reduction in structural stiffness, or a change in mass distribution can increase the susceptibility to flutter.

Spatial Disorientation

The Federal Aviation Administration Civil Aeromedical Institute's publication, "Introduction to Aviation Physiology," defines spatial disorientation as a "loss of proper bearings; state of mental confusion as to position, location, or movement relative to the position of the earth." Factors contributing to spatial disorientation include changes in acceleration, flight in IFR conditions, frequent transfer between visual flight rules and IFR conditions, and unperceived changes in aircraft attitude.? ?

The FAA's?*Airplane Flying Handbook*?(FAA-H-8083-3B) describes some hazards associated with flying when the ground or horizon are obscured. The handbook states, in part, the following:??

The vestibular sense (motion sensing by the inner ear) in particular can and will confuse the pilot. Because of inertia, the sensory areas of the inner ear cannot detect slight changes in airplane attitude, nor can they accurately sense attitude changes that occur at a uniform rate over?a period of time. On the other hand, false sensations are often generated, leading the pilot to believe the attitude of the airplane has changed when, in fact, it has not. These false sensations result in the pilot experiencing spatial disorientation.

Preventing Similar Accidents

Reduced Visual References Require Vigilance (SA-020)

The Problem

About two-thirds of general aviation accidents that occur in reduced visibility weather conditions are fatal. The accidents can involve pilot spatial disorientation or controlled flight into terrain. Even in visual weather conditions, flights at night over areas with limited ground lighting (which provides few visual ground references) can be challenging.

What can you do?

- Obtain an official preflight weather briefing, and use all appropriate sources of weather information to make timely in-flight decisions. Other weather sources and in-cockpit weather equipment can supplement official information.
- Refuse to allow external pressures, such as the desire to save time or money or the fear of disappointing passengers, to influence you to attempt or continue a flight in conditions in which you are not comfortable.
- Be honest with yourself about your skill limitations. Plan ahead with cancellation or diversion alternatives. Brief passengers about the alternatives before the flight.
- Seek training to ensure that you are proficient and fully understand the features and limitations of the equipment in your aircraft, particularly how to use all features of the avionics, autopilot systems, and weather information resources.
- Don’t allow a situation to become dangerous before deciding to act. Be honest with air traffic controllers about your situation, and explain it to them if you need help.
- Remember that, when flying at night, even visual weather conditions can be challenging. Remote areas with limited ground lighting provide limited visual references cues for pilots, which can be disorienting or render rising terrain visually imperceptible. When planning a night VFR flight, use topographic references to familiarize yourself with surrounding terrain. Consider following instrument procedures if you are instrument rated or avoiding areas with limited ground lighting (such as remote or mountainous areas) if you are not.
- Manage distractions: Many accidents result when a pilot is distracted momentarily from the primary task of flying.

See https://www.ntsb.gov/Advocacy/safety-alerts/Documents/SA-020.pdf for additional resources.

The NTSB presents this information to prevent recurrence of similar accidents. Note that this should not be considered guidance from the regulator, nor does this supersede existing FAA Regulations (FARs).

Administrative Information

Investigator In Charge (IIC):	Baker, Daniel
Additional Participating Persons:	Rian Johnson; Van's Aircraft; Aurora, OR Phil Huntley; FAA; Lincoln, NE
Original Publish Date:	April 25, 2024
Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=105567