



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

Location:	Culpeper, Virginia	Accident Number:	ERA19FA010
Date & Time:	October 11, 2018, 20:00 Local	Registration:	N804RL
Aircraft:	Vans RV8	Aircraft Damage:	Destroyed
Defining Event:	Loss of visual reference	Injuries:	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Air race/show		

Analysis

The accident pilot was performing as part of a two-airplane demonstration team that was conducting a night aerobatic display about 55 minutes after the end of civil twilight. Both airplanes were equipped with streamer- and flare-type fireworks that were discharged throughout the 5-minute routine. The pilot of the lead airplane stated that the night of the accident was "a little bit on the darker side" and that they had chosen to perform their display around 700 ft above ground level (agl) rather than their typical 500 ft agl altitude. They were in the middle of the routine when the accident occurred; the accident airplane was in trail behind the lead airplane as they each performed two aileron rolls. Video footage showed that, after completing the second aileron roll, the lead airplane began to climb. The accident airplane completed its second aileron roll to an inverted attitude, but rather than continuing the roll to an upright position, entered an inverted descent that continued until ground contact.

At the time of the accident, the moon was more than 14° below the horizon. The dark night conditions, combined with a lack of cultural lighting on the ground in the vicinity of the airport, would have increased the difficulty associated with the task of maintaining awareness of the airplane's attitude in relation to the horizon and its height above the ground. In addition, the multiple point-source glare from the pyrotechnics off the lead airplane during the final moments of the flight may have impeded the pilot's vision and affected his ability to maintain his orientation during maneuver, particularly without a discernable contrast between earth and sky under the dark night conditions. With this loss of attitude orientation, it is likely that the pilot did not recognize that he had not come out of the roll and the airplane continued to ground impact.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's loss of attitude orientation while maneuvering at low altitude in dark night visual meteorological conditions, which resulted in impact with terrain.

Findings

Personnel issues	Aircraft control - Pilot
Personnel issues	Perception - Pilot
Environmental issues	Dark - Effect on operation
Environmental issues	Dark - Effect on personnel
Environmental issues	Dark - Contributed to outcome
Aircraft	(general) - Not attained/maintained

Factual Information

History of Flight

Maneuvering-aerobatics	Loss of visual reference (Defining event)
Maneuvering-aerobatics	Collision with terr/obj (non-CFIT)

On October 12, 2018, about 2000 eastern daylight time, an experimental, amateur-built Vans RV-8, N804RL, was destroyed when it was involved in an accident in Culpeper, Virginia. The pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 airshow flight.

The accident airplane was part of aerobatic team of two RV-8 airplanes that were participating in the Culpeper Air Fest airshow. The accident airplane was the trailing airplane. The airplanes were fitted with streamer-type fireworks that trailed from each airplane throughout the demonstration, as well as 12 pairs of flare-type fireworks, which were discharged periodically during the routine.

According to the pilot in the lead airplane, they departed Cincinnati, Ohio, around 1000 on the morning of the accident and arrived at Culpeper Regional Airport (CJR) at 1150. They rigged the fireworks and prepared the airplanes for the airshow. They finished about 1600 and waited in the fixed base operator until the night portion of the airshow began. The lead pilot stated that they had flown the night show routine on three occasions during the previous 30 days. He added that the team had performed in darkness previously but, "this one was a little bit on the darker side," so they elected to fly at 700 ft above ground level (agl) instead of their usual 500 ft agl. The lead pilot further reported that he was always in front, and as the maneuvers progressed, the airplanes would get farther apart. The flight sequence was planned to last about 5 minutes, and the airplanes were performing a double aileron roll maneuver in the middle of the routine when the accident occurred.

Video footage of the accident showed both airplanes performing the double aileron roll maneuver with the accident airplane in trail behind the lead airplane. After completing the maneuver, the lead airplane began to climb. The accident airplane completed its second aileron roll to the inverted position but did not continue the roll to an upright position and instead entered an inverted dive, which continued until the airplane impacted terrain.

Pilot Information

Certificate:	Airline transport; Commercial	Age:	60,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Center
Other Aircraft Rating(s):	None	Restraint Used:	5-point
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	February 27, 2018
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	February 1, 2018
Flight Time:	(Estimated) 13000 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Vans	Registration:	N804RL
Model/Series:	RV8 UNDESIGNAT	Aircraft Category:	Airplane
Year of Manufacture:	2017	Amateur Built:	Yes
Airworthiness Certificate:	Experimental (Special)	Serial Number:	83272
Landing Gear Type:	Tailwheel	Seats:	1
Date/Type of Last Inspection:	November 21, 2017 Condition	Certified Max Gross Wt.:	
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	120 Hrs at time of accident	Engine Manufacturer:	Superior
ELT:	Not installed	Engine Model/Series:	IO-360
Registered Owner:		Rated Power:	180 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Night/dark
Observation Facility, Elevation:	KCJR,315 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	00:15 Local	Direction from Accident Site:	22°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	/	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.85 inches Hg	Temperature/Dew Point:	11°C / 7°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Culpeper, VA (CJR)	Type of Flight Plan Filed:	None
Destination:	Culpeper, VA (CJR)	Type of Clearance:	VFR;Special VFR
Departure Time:	19:50 Local	Type of Airspace:	Class G

Astronomical data from the United States Naval Observatory indicated that sunset was at 1838, and the end of civil twilight was at 1905. At the time of the accident, both the sun and moon were more than 14° below the horizon.

Airport Information

Airport:	Culpeper Rgnl CJR	Runway Surface Type:	Asphalt
Airport Elevation:	315 ft msl	Runway Surface Condition:	Dry
Runway Used:	22	IFR Approach:	None
Runway Length/Width:	5000 ft / 100 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:		Aircraft Fire:	On-ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	38.518611,-77.863334

The airplane came to rest inverted about 300 ft from the end of runway 22. The wreckage was in a 5-ft-

deep crater on a 22° magnetic heading; the wreckage was severely fragmented and deformed. All flight control surfaces were found at the accident site. The fuselage was crushed and the main wing spar remained attached to the fuselage. The cockpit and instrument panel were destroyed by impact forces. Flight control continuity was established throughout the flight control systems.

An examination of the airframe and engine did not reveal any anomalies that would have precluded normal operation.

Additional Information

According to excerpts of the FAA Airplane Flying Handbook, FAA-H-8083-3, Chapter 10:

Night flying requires that pilots be aware of, and operate within, their abilities and limitations. Although careful planning of any flight is essential, night flying demands more attention to the details of preflight preparation and planning. Night flying is very different from day flying and demands more attention of the pilot. The most noticeable difference is the limited availability of outside visual references. Therefore, flight instruments should be used to a greater degree in controlling the airplane. Even on clear nights, the stars may be reflected on the water surface, which could appear as a continuous array of lights, thus making the horizon difficult to identify.

Medical and Pathological Information

The Department of Health, Office of the Chief Medical Examiner, Northern Virginia District, performed an autopsy on the pilot. His cause of death was multiple blunt force injuries.

Toxicology testing performed at the FAA Forensic Sciences Laboratory was negative for carbon monoxide and drugs. Testing identified ethanol at 0.017 gm/dl in liver and 0.021 gm/dl muscle. Ethanol may also be produced in body tissues by microbial activity after death.

Administrative Information

Investigator In Charge (IIC):	Alleyne, Eric		
Additional Participating Persons:	Perry Benshoof; FAA/FSDO; Herndon, VA		
Original Publish Date:	December 3, 2020	Investigation Class:	2
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=98465		

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](#).