



National Transportation Safety Board Aviation Accident Final Report

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| Location: | Fishers, IN | Accident Number: | CEN17FA334 |
| Date & Time: | 08/31/2017, 1125 EDT | Registration: | N212ZF |
| Aircraft: | VANS AIRCRAFT INC RV-12 | Aircraft Damage: | Destroyed |
| Defining Event: | Loss of control in flight | Injuries: | 1 Fatal |
| Flight Conducted Under: | Part 91: General Aviation - Personal | | |

Analysis

A private pilot departed on a local flight in his experimental, amateur-built airplane equipped with a tip-up (forward-opening) canopy. A witness saw the airplane during its initial climb after takeoff and stated that it descended "straight down and burst into a ball of flames" upon impact. Examination of the accident site revealed that items from the cabin were found on the ground near the runway threshold and before the impact site. There were no preimpact anomalies of the airframe or engine and kit manufacturer fuel tank Service Bulletins were compiled with.

The airplane's before takeoff checklist stated, "Canopy – CHECK Latched." However, the metal canopy latching mechanisms on the roll bar frame exhibited soot-colored discoloration and its polyethylene latch block was not present, and the latch handle on the canopy was intact, not deformed, and not discolored, consistent with the latch being unsecured at the time of impact. Additionally, the presence of items from the cockpit before the impact site is consistent with the canopy opening in flight.

About 9 months before the accident, the kit manufacturer published a service letter regarding the in-flight opening of tip-up canopies. The letter stated that, based on previous events, the aircraft will most likely pitch nose down abruptly if the canopy opens in flight. The severity of the pitching moment can depend on speed, attitude, and weight and balance. The letter further stated that most instances of in-flight canopy openings were the result of the pilot forgetting to latch the canopy properly before takeoff, and cautioned pilots to ensure that the latching mechanism fully engaged as designed. Based on the available evidence, it is likely that the accident pilot failed to properly latch the canopy before takeoff, did not maintain airplane control following the canopy opening, and the airplane subsequently impacted terrain to the extent that the incorporated service bulletins remedies did not keep the fuel tank from breaching, causing the ground fire.

Probable Cause and Findings

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

The pilot's failure to latch the canopy before takeoff, and his failure to maintain pitch control following the in-flight opening of the canopy during the initial climb resulting in a subsequent impact with terrain and ground fire.

Findings

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| Aircraft | Passenger/crew doors - Incorrect use/operation (Cause) Pitch control - Not attained/maintained (Cause) |
| Personnel issues | Aircraft control - Pilot (Cause) Incomplete action - Pilot (Cause) |

Factual Information

History of Flight

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| Initial climb | Loss of control in flight (Defining event) |
| Uncontrolled descent | Collision with terr/obj (non-CFIT) |
| Post-impact | Fire/smoke (post-impact) |

On August 31, 2017, about 1130 eastern daylight time, an experimental amateur-built Vans Aircraft Inc. RV-12 airplane, N212ZF, impacted terrain after takeoff from runway 15 at the Indianapolis Metropolitan Airport (UMP), near Fishers, Indiana. The private pilot, who was the sole occupant, was fatally injured. The airplane was destroyed during the impact and a post impact ground fire. The airplane was registered to and was operated by the pilot as a Title 14 Code of Federal Regulations Part 91 personal flight. Day visual meteorological conditions prevailed in the area about the time of the accident, and the flight was not operated on a flight plan. The local flight was originating from UMP at the time of the accident.

A flight instructor giving dual instruction in a helicopter stated that he was preparing to conduct an autorotation to land on runway 15 at UMP. About 4 miles from UMP, his student announced over the airport's common traffic advisory frequency their intentions to make a straight-in landing on runway 15. As the helicopter descended through short final, an airplane began to cross the runway 15 hold short line while simultaneously announcing his departure over the radio. As soon as the radio call ended the airplane had reached the runway 15 threshold markings. The instructor immediately made a radio call announcing that the helicopter was on short final. The airplane pilot did not respond and continued to take the runway. The instructor indicated, "At this point it was clear we would have to initiate a go around in order to avoid a collision. Instead of proceeding upwind and risking a collision while he was taking off, I opted to do a right 360 off of the southwest side of the approach end of 15 to ensure we would remain clear of his departure path. As we began the right 360 I made a calmly mannered radio call directed toward the aircraft explaining that it was bad practice to cut off approaching aircraft on short final." The airplane pilot never responded. The instructor further stated, "As we came back around on final after executing the right 360 I noticed a fire in the grass off of the departure end of the runway. I began to look for the departing airplane and also noted that he had not made any other radio calls announcing his departure from the pattern. At this point I realized it was pretty clear that the fire was likely the departing airplane. I immediately initiated a go around and radioed the Metro unicom instructing them to call 911 for the wrecked airplane. I then executed the rest of the go around and flew over the wreckage to try and assess the damage. I immediately landed the helicopter direct to the ramp and then called 911 again from my phone." The instructor said that he never had two-way radio communication with the pilot of the airplane and that he did not see the airplane takeoff or impact terrain.

According to information given to the airport police, another witness saw the airplane during its climb. The airplane descended "straight down", impacted grassy terrain southeast of the runway, and "burst into a ball of flames" upon impact.

Pilot Information

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| Certificate: | Private | Age: | 78, Male |
| Airplane Rating(s): | Single-engine Land | Seat Occupied: | Left |
| Other Aircraft Rating(s): | None | Restraint Used: | |
| Instrument Rating(s): | None | Second Pilot Present: | No |
| Instructor Rating(s): | None | Toxicology Performed: | Yes |
| Medical Certification: | Class 3 With Waivers/Limitations | Last FAA Medical Exam: | 06/28/2012 |
| Occupational Pilot: | No | Last Flight Review or Equivalent: | |
| Flight Time: | (Estimated) 1200 hours (Total, all aircraft) | | |

The 78-year-old pilot held a Federal Aviation Administration (FAA) private pilot certificate with an airplane single engine land rating. His most recent application for a FAA third-class medical certificate was dated June 28, 2012. As of this medical exam, the pilot reported that he had accrued 1,200 total hours of flight time and 23 hours of flight time in the 6 months before the medical certificate. That medical certificate had a limitation: Must wear corrective lenses.

Aircraft and Owner/Operator Information

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| Aircraft Make: | VANS AIRCRAFT INC | Registration: | N212ZF |
| Model/Series: | RV-12 NO SERIES | Aircraft Category: | Airplane |
| Year of Manufacture: | 2011 | Amateur Built: | No |
| Airworthiness Certificate: | Experimental Light Sport | Serial Number: | 120136 |
| Landing Gear Type: | Tricycle | Seats: | 2 |
| Date/Type of Last Inspection: | 11/20/2016, Condition | Certified Max Gross Wt.: | 1320 lbs |
| Time Since Last Inspection: | | Engines: | 1 Reciprocating |
| Airframe Total Time: | 153.4 Hours as of last inspection | Engine Manufacturer: | Rotax |
| ELT: | | Engine Model/Series: | 912ULS |
| Registered Owner: | On file | Rated Power: | 100 hp |
| Operator: | On file | Operating Certificate(s) Held: | None |

N212ZF was an experimental operating light-sport kit-built Van's Aircraft Inc. RV-12 airplane with serial number 120136. The airplane was a single engine, low-wing monoplane, configured to seat two occupants in a side-by-side seating arrangement. It had a fixed tricycle landing gear arrangement and was constructed primarily from aluminum alloy materials. The airplane was powered by a 100-horsepower Rotax 912 ULS engine, serial number 6775819. The engine drove a two-bladed, Sensenich composite, ground adjustable, propeller. An endorsement in the airplane's logbooks indicated that a condition inspection was completed on November 20, 2016, and that the airplane had accumulated 153.4 hours of total time at that date. Logbook endorsements indicated that Service Bulletin (SB) 11-12-14, which was released to make the fuel system more breach resistant by the addition of clips and installation of frangible bolts, was complied with on June 30, 2013, and SB 13-12-19, which was released to add more robust hardware in conjunction with doublers inside the fuel tank in order to make the fuel tank more resistant to a breach, was complied with on July 15, 2013.

The airplane was equipped with a forward-hinged tip-up canopy with a locking mechanism. The mechanism was a handle attached near the center and at the rear of the canopy frame. Once closed, the handle was turned 90° so that a tang on the end of the handle extended under the adjacent fuselage roll bar frame where the tang is retained under an ultra-high-molecular-weight polyethylene (UHMW) latch block.

The kit manufacturer supplied an excerpt from the pilot operating handbook from the closest available revision to the one sent with the kit to the builder. The handbook's before takeoff checklist, in part, stated, "Canopy – CHECK Latched."

A canopy open warning system was developed by the kit manufacturer. The warning system is applicable to SkyView or Garmin display equipped RV-12 airplanes and are not designed for Dynon FlightDEK-D180 display equipped RV-12 airplanes.

The accident airplane was equipped with a Dynon FlightDEK-D180 seven-inch wide screen display unit. The unit's primary functions include attitude, airspeed, altitude, vertical speed, gyro-stabilized magnetic compass, slip/skid ball, turn rate, clock, timers, g-meter, and horizontal situation indicator. This instrument features ADAHRS (Air Data, Attitude and Heading Reference System) to provide air data, attitude and heading information to the display. The unit integrates up to 16 engine related instruments including manifold pressure, temperatures, RPM and fuel system information, and annunciate any abnormality immediately upon detection. The Dynon's internal memory is capable of logging data depending on the firmware version installed in the unit. The data logging must be configured by the operator to enable logging and set the data log interval.

Meteorological Information and Flight Plan

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| Conditions at Accident Site: | Visual Conditions | Condition of Light: | Day |
| Observation Facility, Elevation: | KMQJ, 862 ft msl | Distance from Accident Site: | 9 Nautical Miles |
| Observation Time: | 1129 EDT | Direction from Accident Site: | 129° |
| Lowest Cloud Condition: | Clear | Visibility | 10 Miles |
| Lowest Ceiling: | None | Visibility (RVR): | |
| Wind Speed/Gusts: | 5 knots / | Turbulence Type Forecast/Actual: | / |
| Wind Direction: | 70° | Turbulence Severity Forecast/Actual: | / |
| Altimeter Setting: | 30.11 inches Hg | Temperature/Dew Point: | 21° C / 17° C |
| Precipitation and Obscuration: | No Obscuration; No Precipitation | | |
| Departure Point: | INDIANAPOLIS, IN (UMP) | Type of Flight Plan Filed: | None |
| Destination: | INDIANAPOLIS, IN (UMP) | Type of Clearance: | None |
| Departure Time: | 1130 EDT | Type of Airspace: | |

At 1129, the recorded weather at the Indianapolis Regional Airport (MQJ), near Indianapolis, Indiana, included wind 070° at 5 kts, visibility 10 statute miles, sky condition clear, temperature 21° C, dew point 17° C, and altimeter 30.11 inches of mercury.

Airport Information

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| Airport: | INDIANAPOLIS METROPOLITAN (UMP) | Runway Surface Type: | N/A |
| Airport Elevation: | 811 ft | Runway Surface Condition: | Dry |
| Runway Used: | N/A | IFR Approach: | None |
| Runway Length/Width: | | VFR Approach/Landing: | None |

UMP was a public, non-towered airport, which was owned by the Indianapolis Airport Authority. It was located near Fishers, Indiana, about 8 miles northeast of Indianapolis, Indiana. The airport had one runway and a surveyed elevation of 811.3 ft above mean sea level. Runway 15/33 was a 4,004 ft by 100 ft runway with a grooved asphalt surface. The airport listed 123.0 megahertz as its common traffic advisory frequency.

Wreckage and Impact Information

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| Crew Injuries: | 1 Fatal | Aircraft Damage: | Destroyed |
| Passenger Injuries: | N/A | Aircraft Fire: | On-Ground |
| Ground Injuries: | N/A | Aircraft Explosion: | None |
| Total Injuries: | 1 Fatal | Latitude, Longitude: | 39.930000, -86.040278 (est) |

An on-scene examination of the wreckage was conducted. A page from the airplane's checklist, a section of foam, and a pair of glasses were found in the grass near the departure threshold of the runway. Airport operations personnel examined the runway after the accident and no liberated airplane parts were found. A linear impact mark was found about 225 ft southeast of the departure end of runway 15; it had a depression at its center, consistent with the size of the airplane's wings, engine cowling, and nose landing gear, indicative of an initial impact point. That linear mark revealed an impact heading of 140°. The airplane came to rest upright on a heading of about 100° about 104 ft after that initial impact point. The grass along a linear path between the initial impact point and where the airplane came to rest was chafed. That linear path heading was about 150°. The nose landing gear was separated from the airplane and was found near the depression at the initial impact point. Sections of the airplane were liberated along the path. One side of a headset was found about 13 ft from the impact point. A composite propeller blade was found about 20 ft from the impact point. A section of cowling was found about 80 ft from the impact point. The fuselage by the cabin area and inboard sections of the wings exhibited discoloration, deformation, and consumption damage consistent with a postimpact ground fire.

Rudder and elevator control cables were traced from their respective flight control surfaces to the cabin area near their controls. Aileron control continuity could not be traced due to fire damage. The throttle, choke, and cabin heat were found in their forward positions. Engine control cables were traced from the cabin to the engine. Electrical power was applied to the trim motor and it was operational. The metal canopy latching mechanisms on the roll bar frame exhibited a soot-colored discoloration and its UHMW latch block was not present. However, the latch handle on the canopy was intact, not deformed, and not discolored.

Medical And Pathological Information

An autopsy was performed on the pilot by the Central Indiana Forensic Associates, LLC, Fishers, Indiana, at the request of the Hamilton County Coroner's Office. The cause of death was listed as multiple blunt force injuries and manner of death was accident.

Toxicology testing performed at the FAA Forensic Sciences Laboratory revealed:

Irbesartan detected in Blood (Cavity)
Irbesartan detected in Liver

Rosuvastatin detected in Blood (Cavity)
Rosuvastatin detected in Liver

The FAA Forensic Toxicology's WebDrugs website description of Irbesartan, in part, indicated that it was an angiotensin II receptor antagonist used mainly for the treatment of hypertension.

The FAA Forensic Toxicology's WebDrugs website description of Rosuvastatin, in part, indicated that it was a member of the drug class of statins, used to treat high cholesterol and related conditions, and to prevent cardiovascular disease.

Fire

The observed unsooted, non-discolored, liberated parts and the discolored, deformed, and consumed wreckage along with a localized charring of vegetation in the area of the wreckage were consistent with a ground fire.

Tests And Research

An engine disassembly investigation was conducted. The carburetors were found liberated from their respective manifolds. The fuel pump pumped a liquid that smelled like gas when the pump was manipulated by hand. All sparkplugs were NGK DCPBR8E model sparkplugs and they were all gapped at .026 inches. All sparkplugs exhibited normal combustion coloration compared to a Champion Check-A-Plug chart. The No. 3 top sparkplug had a media on its electrodes (ground and center) consistent with the appearance of ash. The fuel return line had two metering jets on its return side.

The 2/4 carburetor's float bowl was removed and both of its floats exhibited thermal damage. The float's needle valve was operational when pressurized air was applied to the fuel line inlet and the valve arm manipulated by hand. The carburetor inlet was unobstructed and the main jet was also unobstructed.

The 1/3 carburetor's float bowl was removed and both of its floats exhibited thermal damage. The float's needle valve was operational when pressurized air was applied to the fuel line inlet and the valve arm manipulated by hand. The carburetor inlet was unobstructed and the main jet was also unobstructed. The float bowl exhibited coloration consistent with corrosion. The 1/3 carburetor piston slide discolored consistent with sooting.

Threads on the bottom return fitting hole were stripped out and the oil level was not checked. However, the crankshaft rotated and oil was present within the oil system.

All exhaust ports were capped off and a thumb compression was present at sparkplug ports for all cylinders.

Examination of the exhaust did not reveal any preimpact anomalies.

Both accident engine ignition modules were run on an exemplar engine and no anomalies were noted during an engine run

The accident airplane's Dynon FlightDEK D180 was removed from the airplane and shipped to the National Transportation Safety Board (NTSB) Vehicle Recorder Division where a senior recorder specialist examined the unit, downloaded and documented data from it, and produced a specialist's factual report. The specialist's recorder factual report is appended to the docket material associated with this investigation.

According to the recorder specialist's report, an exterior examination revealed the Dynon unit had sustained impact damage. It was found that the accident Dynon device's data log function was enabled and was found to be setup to record data every second. The accident flight recording was approximately nine minutes long. The data from the unit ended prematurely. This condition could have been a result of data buffering prior to being written to the unit's memory.

The data showed the aircraft reached nearly full power around 1125:30. The aircraft began a climb around 1125:40. Just prior to data loss at 1125:54, values for pitch and roll indicated that the aircraft became pitched down greater than -10° and was rolling to the left. Engine parameters prior to this point were nominal. In the seconds prior to data loss, values for manifold pressure and engine RPM were trending downward. A review of available EFIS and engine monitoring alerting parameters revealed that no alerts or warnings were displayed or triggered just prior to the time of the accident.

Additional Information

Video files from local parking lot cameras were reviewed. The airplane did not exhibit any trailing smoke or fire in flight. Smoke can be seen rising from the accident site after impact. No other useful information was able to be gleaned from the videos due to the low resolution of the video data.

The NTSB database was queried. The CEN14FA306, CEN13LA340, and CEN11LA601 investigations listed occurrences of canopies opening during flight.

The NTSB issued the cause of CEN13LA340 as the pilot's failure to properly secure the latch to the tip-up canopy before flight, which resulted in the canopy opening on takeoff and a subsequent loss of airplane control while attempting to land the airplane.

The NTSB issued the cause of CEN14FA306 as the pilot's loss of pitch control due to the in-flight opening of the canopy during cruise flight for reasons that could not be determined because fire damage precluded examination of the airplane's canopy and systems. A witness in this case reported that the airplane was in a "nose-dive." The witness said that the airplane had about a 70° nose down attitude while in the descent.

The NTSB issued the cause of CEN11LA601 as the pilot's loss of airplane control after liftoff due to his distraction with the unsecured canopy, which he did not lock before takeoff. The pilot

reported that he inadvertently did not secure the canopy latch after entering the cabin and that the accident could have been prevented had he focused on flying the airplane instead of attempting to secure the unlatched canopy.

The kit manufacturer, Van's Aircraft, issued Service Letter 16-11-04 in November 2016 regarding the operation of tip-up canopies. The letter, in part, stated:

While rare, in-flight canopy and door openings have been reported in all models of RVs. Field reports of aircraft flight characteristics both during and after an in-flight opening vary significantly. The most pronounced changes in flight characteristics reported have been related to canopy openings on RVs with tip-up (forward-opening) type canopies, as used on the RV-6/7/9/12/and 14 models. In most cases these incidents have been minor, but some have had serious consequences.

Field reports indicate that if the canopy does become unlatched in flight, the aircraft will most likely pitch nose down abruptly. The severity of the pitching moment can depend on speed, attitude and weight and balance...Most in-flight openings occur due to the pilot simply forgetting to latch the canopy properly prior to take-off. Latch component wear and maladjustment may also contribute to the likelihood of an in-flight opening.

Builders and operators of RVs with tip-up canopies should pay particular attention to the latching mechanism, and ensure that it operates as designed to secure the canopy. Preflight checks should be made to ensure that the latching mechanism fully engages the canopy frame and that the operating handle is securely retained when closed.

Administrative Information

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| Investigator In Charge (IIC): | Edward F Malinowski | Report Date: | 11/06/2019 |
| Additional Participating Persons: | Dale Hoff; Federal Aviation Administration; Indianapolis, IN Jordan Paskevich; Rotax Aircraft Engines; Vernon B.C, FN Mitch Lock; Van's Aircraft, Inc.; Aurora, OR Christoph Ringl; Ministry for Transport, Innovation and Technology; Trauzlgasse, FN | | |
| Publish Date: | 11/06/2019 | | |
| Note: | The NTSB traveled to the scene of this accident. | | |
| Investigation Docket: | http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=95929 | | |

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](#).