Aviation Investigation Final Report

Location:	Chadron, Nebraska	**Accident Number:**	CEN13LA340
Date & Time:	June 11, 2013, 06:33 Local	**Registration:**	N666BE
Aircraft:	Vans RV12	**Aircraft Damage:**	Substantial
Defining Event:	Hard landing	**Injuries:**	1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot stated that, just as the airplane became airborne after takeoff, the tip-up canopy popped open about 3 inches. The pilot grabbed the canopy with his hand and simultaneously lowered the airplane's nose and partially reduced power in an attempt to land on the remaining runway. The airplane nosed over, and the pilot lost grip of the canopy when it "opened to the full vertical position," which caused the airplane's nose to further pitch over. He applied back pressure on the control stick; however, the elevator and rudder did not respond. He was able to level the wings before the airplane landed hard on all three landing gear.

A postaccident examination of the airplane revealed that the canopy latch operated normally except for some slight resistance when locking the latch into the detent position. The pilot stated that the canopy latch was hard to latch and that he most likely did not secure it properly. The airplane's kit manufacturer reported that it had not conducted any testing on the aerodynamic effects of the airplane's canopy opening in flight; therefore, it could not contest the pilot's claims that the canopy opened to the fully open/vertical position. However, the kit manufacturer did report that it has had a "reasonable amount" of field experience with tip-up canopies opening in flight on similar model airplanes in which no loss of control was reported and that, "While the extent that a canopy tends to open will vary with airspeed, it is our experience that a tip-up canopy will open to a point where the aerodynamic equilibrium is reached...at which point the canopy's position will stabilize." However, because the airplane was in the process of landing, it is likely that the canopy position did not have a chance to stabilize before touchdown. This accident was the first reported instance where pitch authority was affected from a canopy opening in flight on any model equipped with a tip-up canopy, and a lack of flight test data precluded a determination of the aerodynamic effects on the airplane's elevator and rudder if the canopy fully opens during landing.

Probable Cause and Findings

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

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.

Findings

Aircraft	(general) - Incorrect use/operation
Aircraft	Pitch control - Not attained/maintained

Factual Information

History of Flight

Takeoff	Sys/Comp malf/fail (non-power)
Landing-flare/touchdown	Hard landing (Defining event)

On June 11, 2013, about 0633 central daylight time, N666BE, an experimental-amateur built Vans RV-12 airplane, sustained substantial damage during a hard landing at the Chadron Municipal Airport (CDR), Chadron, Nebraska, after the canopy opened on takeoff. The certified airline transport pilot/owner/builder was seriously injured. Visual meteorological conditions prevailed and no flight plan was filed for the local flight conducted under 14 Code of Federal Regulations Part 91.

The pilot stated that the takeoff roll was normal and he rotated at 70 miles per hour (mph). Just as the airplane became airborne, the tip-up canopy popped open about 3-inches. The pilot grabbed the canopy with his hand and simultaneously lowered the nose and partially reduced power in an attempt to land on the remaining runway. At this point, the airplane had accelerated to 80 mph and was about 50-feet-above the runway. As the airplane pitched, the pilot lost grip of the canopy when it "opened to the full vertical position." He said this caused the nose of the airplane to pitch over further and when he applied back pressure on the control stick, there was no response from the elevator. There was also no response from the rudder. The pilot could not get a hold of the canopy to close it and perform a normal landing. He was able to level the wings before the airplane landed hard resulting in substantial damage to both wings and the fuselage. An inspector with the Federal Aviation Administration (FAA) performed a postaccident examination of the airplane and was able to operate the canopy latch with the exception of some slight resistance when locking the latch into the detent position. The pilot said the canopy latch was hard to latch and he most likely did not secure it properly.

Data extracted from the pilot's handheld GPSMAP 496 revealed the airplane departed runway 2 about 0633:21 and achieve a maximum average groundspeed of 64 knots. The airplane's track started on the runway centerline and moved progressively left of the centerline when the data ended at 0633:57. Data from the onboard Dynon FlightDEK D 180 display was also downloaded, but due to the 60-second sampling rate and short duration of the flight, none of the information for the accident flight was useful to the investigation.

The canopy on the RV-12 is hinged in the front and is latched in the back behind the pilot. When the canopy is opened, it moves up and forward (toward the front of the airplane) about 90 degrees vertical. According to Van's Aircraft Inc., a pilot seated in the airplane would not be able to reach the canopy handle on the RV-12 if the canopy was open more than a third open and would be completely out of reach (for even the tallest pilots) when the canopy was more than halfway open.

In a written statement Van's Aircraft, Inc., stated that they have not done any testing in regard to the aerodynamic effects of the RV-12 canopy opening in flight. As such, they could not contest the pilot's claims that the canopy opened to the fully open/vertical position since "There may be aerodynamic

conditions that we are not aware of that could cause this." However, Van's Aircraft Inc., did report that they have had a "reasonable amount" of field experience with tip-up canopies opening in flight on the RV-6/6A, RV-7/7A and RV-9/9A model airplanes along with other incidents of the RV-12 canopy opening in flight, where no loss of control was reported. They said, "While the extent that a canopy tends to open will vary with airspeed, it is our experience that a tip-up canopy will open to a point where the aerodynamic equilibrium is reached...at which point the canopy's position will stabilize." This accident was the first reported instance where pitch authority was affected from a canopy opening in flight on any of the Van's Aircraft Inc. models equipped with a tip-up canopy.

In response to this accident, Van's Aircraft Inc. will issue Notification 14-05-22 recommending owners of all RV-12 aircraft equipped with SkyView or a Garmin G3X Touch to add a canopy latch warning system. This warning system consists of a switch that is tied into the SkyView or Garmin G3X Touch systems and would alert a pilot if the canopy is unlatched or latched improperly when the engine rpm exceeded 3,700 rpm. This modification is not available for RV-12 aircraft equipped with the Dynon 180 EFIS units.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	66
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine	**Toxicology Performed:**	No
Medical Certification:	None None	**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	May 30, 2012
Flight Time:	5667 hours (Total, all aircraft), 54 hours (Total, this make and model), 5237 hours (Pilot In Command, all aircraft), 56 hours (Last 90 days, all aircraft), 54 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Vans	**Registration:**	N666BE
Model/Series:	RV12	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental light sport (Special)	**Serial Number:**	120226
Landing Gear Type:	Tricycle	**Seats:**	
Date/Type of Last Inspection:	June 3, 2013 Annual	**Certified Max Gross Wt.:**	1320 lbs
Time Since Last Inspection:	54 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	54 Hrs at time of accident	**Engine Manufacturer:**	Viking
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	11D
Registered Owner:	William Earl	**Rated Power:**	110 Horsepower
Operator:	William Earl	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/ None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	18°C
Precipitation and Obscuration:			
Departure Point:	Chadron, NE (CDR)	**Type of Flight Plan Filed:**	None
Destination:	Chadron, NE (CDR)	**Type of Clearance:**	None
Departure Time:	06:33 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	Chadron Municipal CDR	**Runway Surface Type:**	Concrete
Airport Elevation:	3297 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	02	**IFR Approach:**	None
Runway Length/Width:	5998 ft / 100 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	42.835834,-103.090553(est)

Administrative Information

Investigator In Charge (IIC):	Yeager, Leah
Additional Participating Persons:	Brent Elliot; FAA/FSDO; Lincoln, NE
Original Publish Date:	July 30, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=87156