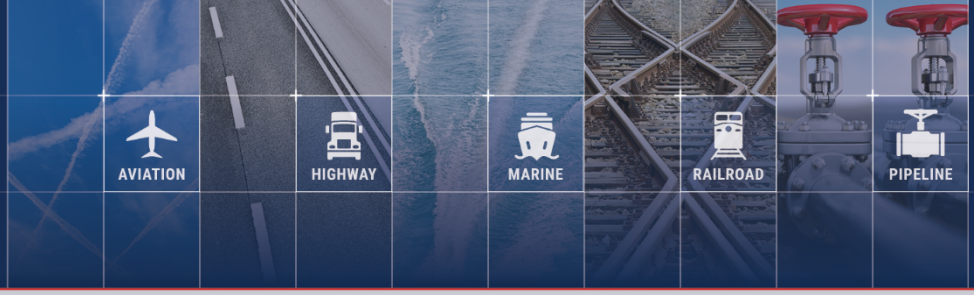

Aviation Investigation Factual Report

Location:	Advance, North Carolina	**Accident Number:**	ERA15FA335
Date & Time:	September 2, 2015, 14:03 Local	**Registration:**	N393MC
Aircraft:	COOPER MICHAEL C RV 8A	**Aircraft Damage:**	Destroyed
Defining Event:	Low altitude operation/event	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

On September 2, 2015, about 1403 eastern daylight time, a privately owned and operated, experimental amateur-built RV-8A airplane, N393MC, crashed into a pond adjacent to the Twin Lakes Airport (8A7), Advance, North Carolina, shortly after takeoff. Visual meteorological conditions prevailed at the time and no flight plan was filed for the 14 Code of Federal Regulations Part 91 personal flight. The airplane was destroyed by impact forces and the two occupants (both pilot rated) were fatally injured. The flight originated about 3 minutes earlier from 8A7.

Before departure, there was no comment made by either occupant about what maneuver (if any) they would perform on takeoff. Witnesses on the airport reported observing a thorough preflight inspection performed by either one or both occupants. After boarding the airplane, the front seat occupant passed a handheld tablet computer to the rear seat occupant and was heard to say, "you navigate", before the canopy was closed and the engine was started. The airplane was taxied to runway 27 where an engine run-up was performed, which included a check of the magnetos and propeller; no discrepancies were reported.

The airplane became airborne in the normal/typical location for that type of airplane, then climbed in a normal attitude to between 700 and 800 feet. The flight remained in the traffic pattern for runway 27, and flew over runway 27 between 200 and 300 feet above ground level at an estimated speed between 190 and 200 knots. Three witnesses, who were located on the ramp south of the runway near the approach end of runway 27, reported that when the airplane was at about ½ way along the runway, it briefly pitched slightly nose down. At that time one of the witnesses thought they were going to do a roll or some other maneuver and said words to the effect, "oh my god he is going to roll it" though he thought the flight was too low at the start of the maneuver. The airplane then pitched slightly nose up and began to roll to the left, which began about 1 to 1.5 seconds after the slight pitch-up and turned into a barrel roll. As the airplane became inverted the nose came down to about a 30-degree nose low attitude but the roll continued.

While south of the runway, the tail appeared to lower and the airplane was in a nose-up attitude The airplane impacted the water and smoke was observed. No smoke was noted trailing the airplane during the flight, and nothing separated from the aircraft during the flight. The engine was heard to operate normally throughout the flight with no discrepancies and no power settings change from the flyover until the engine stopped at impact. One of the witnesses indicated he was not in any position to see the flight control surfaces during the final portion of the flight, but he did not see the canopy open during the flight. The maneuver was described by one of the witnesses as it, "…did not look like a deliberate maneuver. I've seen snap rolls, barrel rolls, aileron rolls. I know what those maneuvers look like, and it was not one of those maneuvers."

Another witness who observed the airplane descend below the tops of nearby buildings just west of his location, then heard the impact drove to the site and extinguished a small postcrash fire by stomping it out.

Pilot Information

Certificate:	Commercial	**Age:**	71,Male
Airplane Rating(s):	None	**Seat Occupied:**	Rear
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	May 1, 2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	2526 hours (Total, all aircraft)		

Pilot Information

Certificate:	Private	**Age:**	68,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	July 8, 2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	March 29, 2015
Flight Time:	78.6 hours (Total, all aircraft)		

The front seat occupant, age 68, held a private pilot certificate with an airplane single engine land rating originally issued March 29, 2015. On the application for that certificate, he listed 78.7 hours of total flight experience; the checkride was performed in a Cessna 150L. There were no records of enforcement actions. He held a Federal Aviation Administration (FAA)-issued third class medical certificate, with a limitation to wear corrective lenses for near and distant vision issued July 8, 2014.

The rear seat occupant, age 71, held a commercial pilot certificate with airplane single engine land, airplane multi-engine land, and instrument airplane ratings. A review of his FAA airman records revealed no records of enforcement actions. He held an FAA-issued third class medical certificate with a limitation to wear corrective lenses issued May 1, 2014. On the application for the medical certificate he listed a total civilian flight hours as 2,526. Friends reported he was formerly a pilot for the U.S. Air Force, was an instructor pilot in T-38's, and was familiar with aerobatic flight.

Aircraft and Owner/Operator Information

Aircraft Make:	COOPER MICHAEL C	**Registration:**	N393MC
Model/Series:	RV 8A	**Aircraft Category:**	Airplane
Year of Manufacture:	2001	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	81143
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	September 25, 2014 Condition	**Certified Max Gross Wt.:**	1800 lbs
Time Since Last Inspection:	80 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	152.32 Hrs as of last inspection	**Engine Manufacturer:**	Lycoming
ELT:	C91A installed	**Engine Model/Series:**	IO-360-A1B6
Registered Owner:	On file	**Rated Power:**	200 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The tandem-seat RV-8A airplane was built in 2001. It was powered by a Lycoming IO-360-A1B6 engine and equipped with a constant speed Hartzell HC-C2YK-7766A2 propeller. Both seats were equipped with flight controls for roll, pitch, and yaw; however, the rear seat was not equipped with any engine control. The airplane was co-owned by both occupants, and was purchased on September 8, 2014.

Review of the maintenance records revealed the airplane's last condition inspection was completed on September 25, 2014. The airplane total time on that date was recorded to be 152.32 hours.

On the day of the accident while at 8A7, maintenance was performed to the airplane's brakes. The maintenance log entry associated with that work indicated that the airplane had accumulated 232 flight hours.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	EXX,733 ft msl	**Distance from Accident Site:**	11 Nautical Miles
Observation Time:	13:55 Local	**Direction from Accident Site:**	136°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/ Unknown
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/ Unknown
Altimeter Setting:	30.05 inches Hg	**Temperature/Dew Point:**	32°C / 19°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Advance, NC (8A7)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	14:00 Local	**Type of Airspace:**	

A surface observation weather report taken at Davidson County Airport (EXX), Lexington, North Carolina, at 1355, indicated the wind was calm, the visibility was 10 statute miles, and clear skies existed. The temperature and dew point were 32 and 19 degrees Celsius, respectively, and the altimeter setting was 30.06 inches of mercury. The accident site was located about 10.9 nautical miles and 316 degrees from EXX.

Airport Information

Airport:	Twin Lakes Airport 8A7	**Runway Surface Type:**	
Airport Elevation:	818 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Traffic pattern

The 8A7 airport is privately owned, available to the public, and has a single asphalt runway designated 9/27. The published common traffic advisory frequency was 122.7 MHz, which was not recorded. There was no airport security video that captured the initial takeoff, low pass, or accident sequence.

The airport manager reported there was no record that fuel was purchased on the day of the accident at 8A7.

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	35.914443,-80.462219

The airplane impacted a pond adjacent to the airport. The main portion of wreckage consisted of the fuselage, empennage, and portion of main spar, and was about 206 feet and 214 degrees from the departure end of runway 27.

Components of the airplane were located in the pond, on land, and in close proximity to the main wreckage. Debris from the airplane was oriented on a magnetic heading of 320 degrees. A fuel sheen was noted on the water, and trees/bushes adjacent to the pond immediately adjacent to the accident site exhibited browning consistent with fuel spill. All components necessary to sustain flight remained attached or were in close proximity to the accident site.

The left wing which exhibited extensive impact damage, the full span was accounted for, and the lower wing skin exhibited fire damage. The flap remained attached at the hinge, but the aileron with attached balance weight separated and was found in close proximity to the wreckage. The aileron bellcrank to aileron pushrod remained connected to the bellcrank attached to the aft side of the main spar; however, the rod end near the aileron control surface exhibited bending overload. The aileron bellcrank to stick pushrod exhibited bending overload about 7 inches outboard from the wing root. Closer examination of the bellcrank attached to the aft side of the main spar revealed the lower portion of the bellcrank adjacent to the aileron bellcrank to stick pushrod was slightly deformed down consistent with contact by the end of the pushrod. The main spar just inboard of the aileron bellcrank was buckled aft.

Examination of the right wing revealed it was fragmented in multiple pieces, but the full span including the wingtip was accounted for. The flap and aileron were separated but both were recovered. Examination of the aileron revealed the leading edge was crushed down and aft, and the aileron balance weight was separated but not recovered. The aileron bellcrank to aileron pushrod was bent about midspan and also near the control surface. The pushrod remained connected to the bellcrank on the aft side of the main spar, but was separated from the rod end near the control surface; the threaded portion of the rod end near the aileron control surface was bent and fractured. The aileron bellcrank to stick pushrod remained attached to the bellcrank on the aft side of the main spar but was fractured due to bending overload just outboard of the attach point at the bellcrank and also at the wing root. Distortion of the aileron bellcrank attached to the aft side of the main spar was noted at the attach points for both pushrods. The exterior surface of the aileron bellcrank to aileron pushrod near the bellcrank attach point revealed multiple marks oriented about 50 degrees to the span on the rod adjacent to 2 rivets. One rivet exhibited a flat spot immediately adjacent to the 50-degree marks, while another rivet exhibited a wear/chafing spot. Personnel from the recovery crew reported that the threaded portion of the rod end near the bellcrank attached to the aft side of the main spar fractured while unloading the wreckage from the trailer. The flap was deformed and pulled from hinge.

Examination of the empennage revealed all primary and secondary structure and flight control surfaces remained attached. The right horizontal stabilizer was bent up in form of an inverted "V". The elevator pushrod was bent but remained attached at the rear and intermediate bellcranks, but was fractured near the aft control stick attach point due to bending overload. Both rudder control cables remained connected at the rear bellcrank while the left and right rudder control cables were fractured in tension overload 12 feet 4 inches and 10 feet 10 inches, respectively, forward of the rear bellcrank. The remaining sections of the fractured rudder cables remained connected to the respective idler arm in the cockpit. Separate rudder cables remained connected to each idler arm, and were continuous through a guide on the side of each rudder pedal, to their respective attach points on the firewall. The rear seat left rudder pushrod assembly remained attached to the idler arm, but the threaded portion of the rod end was bent near the idler arm. The threaded portion of the rod end for the rear seat right rudder pushrod assembly was bent and fractured at the attach point at the idler arm. The elevator trim tab was in the neutral position with the elevator positioned to neutral.

The cockpit was fragmented, and the front and rear seat aileron and elevator flight control assemblies were separated from the aircraft. The left and right aileron rod ends remained attached to their respective attach points on the control column; however, both aileron pushrods were fractured just outboard of the attach point. The elevator rod end remained attached to the rear seat control stick base; however, the threaded portion of the rod end was bent and fractured. The control column and pushrod assembly within the control column were deformed and fractured about midspan. The forward control stick and rear seat control stick base remained attached to the fractured control column; however, the rear seat control stick part number (P/N) WD-812 was separated from the rear control stick base P/N WD-412A. No securing hardware was found. Closer examination of the rear seat control stick base (stick base) revealed a single hole through the wall on the left side. The hole was deformed on the upper portion, which was located about .125 inch below the upper surface of the socket. The inside portion of the stick base from the upper portion of the hole to the upper surface of the socket exhibited scrape marks. Close examination of the rear seat control stick revealed it contained two holes each of which were about 90 degrees apart and only thru one wall. One hole was located about 0.43 inch up from the bottom, and the second was located about 1.5 inches up from the bottom. Full insertion of the stick into the base resulted in the matching of the upper hole in the stick and the base. In that orientation, bulging was noted on the forward side of the stick at the base and the stick was bent forward beginning about the location of the base.

Further examination of the fragmented cockpit revealed the flap actuator was extended 2.25 inches as measured from the housing to the center of the attach bolt, which likely corresponded to flaps retracted. The airspeed indicator was indicating 154 knots; no needle slap mark was noted and the needle was not trapped. The throttle, mixture, and propeller controls were full forward, and the magneto switch was in the both position. The tachometer was indicating 0 rpm and the oil pressure and temperature gauges were off scale low.

Examination of the engine following recovery from the pond revealed that the two-blade propeller remained attached to the engine. The engine remained attached to the firewall, but the firewall was separated from the fuselage.

Further examination of the engine revealed separation of the No. 1 cylinder exhaust and No. 2 cylinder intake pushrods and pushrod tubes. The No. 1 cylinder intake pushrod tube and pushrod were impact

damaged but remained in place. Crankshaft, camshaft, and valve train continuity was confirmed at all cylinders that had the pushrods in place. Compression and suction were confirmed in cylinders Nos. 2, 3, and 4. The No. 1 cylinder had compression escaping the exhaust valve consistent with a visually impact-bent exhaust valve not seating on the exhaust seat. All cylinders were inspected using a digital video borescope and were found to be unremarkable. Examination of the engine's fuel system, ignition system, and lubrication system components revealed no evidence or preimpact failure or malfunction.

Examination of the propeller revealed one blade exhibited 40 to 45 degree aft bending about 24 inches from the hub, while the opposite blade exhibited up and aft bending. The first bend (up) was located about 10 inches from the hub and the second bend (aft) was located about 10 inches from the tip. This blade also exhibited leading edge impact damage consistent with a threaded object and other leading edge gouges. The spinner was impact-separated and the back plate remained attached to the propeller.

Communications

A witness who had a portable VHF transceiver with him, and was monitoring the airport's common traffic advisory frequency, reported he did not hear any distress call from either occupant during any portion of the accident flight, but he also did not hear their departure announced.

Medical and Pathological Information

Postmortem examinations of the occupants were performed by the Wake Forest Baptist Medical Center, Winston-Salem, North Carolina. Major findings at autopsy for both indicated multiple blunt force injuries. No natural disease was noted of either occupant. Both occupants exhibited fractures of their right ulna and radius.

Forensic toxicology was performed on specimens of both occupants by the FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma. The toxicology reports for both occupants indicated testing for carbon monoxide and cyanide was not performed. No volatiles were detected in specimens for either occupant, and no tested drugs were detected in the specimens of the front seat occupant, while unquantified amounts of Irbesartan was detected in the liver specimen, and Rosuvastatin was detected in the liver and muscle specimens of the rear seat occupant.

Tests and Research

Review of the airplane's maintenance records revealed that Van's Aircraft, Inc., Service Bulletin (SB) 07-2-6, a procedure to secure the rear control stick with a bolt and nut, was signed off as completed on September 25, 2014. Examination of the wreckage revealed that the work was not properly performed due to the lack of a hole thru both sides of the rear control stick base.

Pictures of the scrape damage and damage to a rivet on the right aileron bellcrank to aileron pushrod and a picture of the left aileron bellcrank and attached pushrods were submitted to a representative of the airframe designer. According to the representative, the as-found position of the left aileron bellcrank and pushrods were beyond normal travel for right aileron input. The representative also indicated that in normal full left or right aileron deflection, the rivets on the aileron bellcrank to aileron pushrod will never be close to the aileron bellcrank or any portion of the aircraft, and the damage to the rivet likely was caused by overtravel during the impact sequence.

Administrative Information

Investigator In Charge (IIC):	Monville, Timothy
Additional Participating Persons:	Cecil Land; FAA/FSDO; Greensboro, NC Timothy L Haley; FAA/FSDO; Greensboro, NC Judson Rupert; Lycoming Engines; Williamsport, PA
Report Date:	January 18, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=91907