



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

# Aviation Investigation Final Report

<b>Location:</b>	Jonesboro, Arkansas	<b>Accident Number:</b>	CEN16FA215
<b>Date &amp; Time:</b>	June 12, 2016, 15:30 Local	<b>Registration:</b>	N789MR
<b>Aircraft:</b>	ROBINSON HELICOPTER COMPANY R44 II	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>	Low altitude operation/event	<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

## Analysis

During the 2 to 3 hours before the accident, a witness saw the commercial pilot drinking from a cup that smelled like alcohol and noticed that he refilled the cup two or three times. He then heard the pilot say that he was going to put on an airshow. The helicopter lifted off at a 45° angle backward and upward, reach an altitude of about 125 ft, and then descend out of sight behind hangars. A postaccident examination revealed that the helicopter's tail contacted the ground behind the hangars resulting in separation of both tail rotor blades. The helicopter then rose above the hangars and began to spin. The helicopter descended again, impacted terrain, and burst into flames. The examination of the wreckage did not reveal evidence of any preimpact anomalies that would have precluded normal operation of the helicopter. Toxicology testing detected diphenhydramine, a sedating antihistamine, and elevated levels of ethanol in the pilot's blood and tissues. The pilot was most likely impaired by the combination of ingested alcohol and the use of diphenhydramine, both of which are central nervous system depressants. The impairing effects of the combination of these substances most likely contributed to his decision to fly after drinking alcohol as well as his inability to maintain control of the helicopter.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain helicopter control during takeoff. Contributing to the accident was the pilot's impairment due to his combined use of alcohol and diphenhydramine, which led to his improper decision to fly after drinking alcohol and degraded his ability to maintain control of the helicopter.

## Findings

<b>Personnel issues</b>	Aircraft control - Pilot
<b>Aircraft</b>	(general) - Not attained/maintained
<b>Personnel issues</b>	Alcohol - Pilot
<b>Personnel issues</b>	OTC medication - Pilot
<b>Personnel issues</b>	Decision making/judgment - Pilot

# Factual Information

## History of Flight

<b>Prior to flight</b>	Miscellaneous/other
<b>Takeoff</b>	Collision during takeoff/land
<b>Maneuvering-low-alt flying</b>	Abrupt maneuver
<b>Maneuvering-low-alt flying</b>	Low altitude operation/event (Defining event)

On June 12, 2016, about 1530 central daylight time, a Robinson Helicopter Company, R44 II, Raven, helicopter, N789MR, impacted terrain during takeoff from the Classic Airstrip (23AR), near Jonesboro, Arkansas. The commercial pilot, who was the sole occupant, was fatally injured. The helicopter was destroyed during the impact and subsequent ground fire. The helicopter was registered to Floyd Vuncannon Aviation Inc. and was operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Day visual meteorological conditions prevailed at the airport about the time of the accident, and the flight was not operated on a flight plan. The local flight was originating from 23AR at the time of the accident.

A witness, who was visiting a friend at an airstrip located just west of 23AR, reported that before noon, he saw the accident pilot drinking from a red cup that smelled like alcohol. The pilot refilled the cup 2 or 3 times during the next 2 or 3 hours. During the day, he saw the pilot going between hangars. When the witness finished working on a task, he heard the pilot say that he was going to put on an airshow. The witness saw the accident pilot getting into his helicopter, which was located east of him on 23AR. The witness observed the helicopter lift off at a 45° angle backward and upward. The helicopter rose to about 125 ft and then descended out of sight behind hangars that were located between 23AR's runway and the west airstrip. The witness reported that he thought he "heard it hit" but the engine never shutdown. The helicopter began to rise upwards above the hangars and it began to spin around. It appeared that the tail rotor was not working and the skids were bent as if it had hit the ground. The helicopter continued to rise to about the same height as when it lifted off. The helicopter then descended again, impacted terrain, and burst into flames in the middle of the west airstrip. The witness stated that another witness nearby called 911 and they waited for first responders to arrive.

## Pilot Information

<b>Certificate:</b>	Commercial; Flight instructor	<b>Age:</b>	73, Male
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	Gyroplane; Helicopter	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Airplane single-engine; Gyroplane; Helicopter	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 2 With waivers/limitations	<b>Last FAA Medical Exam:</b>	May 1, 2014
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	(Estimated) 6000 hours (Total, all aircraft)		

The 73-year-old pilot held a Federal Aviation Administration (FAA) commercial pilot certificate with airplane single-engine land, rotorcraft helicopter, rotorcraft gyroplane, and instrument airplane ratings. He also held a flight instructor certificate, expiring October 31, 2017, with airplane single engine, rotorcraft helicopter, and rotorcraft gyroplane ratings. He held a FAA second-class medical certificate issued on May 1, 2014, with the limitations that he "must wear corrective lenses and possess glasses for near and intermediate vision." At the time of that medical examination, he reported 6,000 hours total flight time and 110 hours in the 6 months before that examination. A review of excerpts from the pilot's logbook did not reveal an entry for a flight review. The logbook pages were not totaled, and the last entry was dated August 2, 2015.

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	ROBINSON HELICOPTER COMPANY	<b>Registration:</b>	N789MR
<b>Model/Series:</b>	R44 II II	<b>Aircraft Category:</b>	Helicopter
<b>Year of Manufacture:</b>	2004	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	10561
<b>Landing Gear Type:</b>	N/A; Skid	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	July 2, 2015 Annual	<b>Certified Max Gross Wt.:</b>	2500 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	1242.1 Hrs as of last inspection	<b>Engine Manufacturer:</b>	LYCOMING
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	IO-540-AE1A5
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	245 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

N789MR, serial number 10561, was a Robinson R44 II, Raven, four-place, two-bladed, single main rotor, single-engine helicopter, with a spring and yield skid type landing gear. The primary structure of its fuselage was welded steel tubing and riveted aluminum sheet. The tailcone was a monocoque structure consisting of an aluminum skin. A Lycoming IO-540- AE1A5, serial number L-29728-48A, engine rated at 260 horsepower, powered the helicopter. However, according to the helicopter's type certificate, the engine had a 5-minute takeoff rating of 245 horsepower and a maximum continuous rating of 205 horsepower.

A review of helicopter logbook excerpts that were provided by a FAA inspector, showed that the helicopter's last annual inspection was completed on July 2, 2015. At the time of that inspection, the helicopter had accumulated a total time of 1,242.1 hours.

The helicopter manufacturer issued, R44 Service Bulletin (SB)-78B, on December 20, 2010, and issued a revised SB on September 28, 2012. The SB, in part, stated:

TO: R44 and R44 II owners, operators, and maintenance personnel  
SUBJECT: Bladder Fuel Tank Retrofit  
ROTORCRAFT AFFECTED: R44 helicopters S/N 0001 thru 2064, and R44 II helicopters S/N 10001 thru 12890, unless previously accomplished.  
TIME OF COMPLIANCE: As soon as practical, but no later than 30 April 2013.  
BACKGROUND: This bulletin requires R44 helicopters with all-aluminum fuel tanks to be retrofitted with bladder-type tanks. In addition to a factory retrofit program, a field kit is now available. To improve the R44 fuel system's resistance to a post-accident fuel leak, this retrofit must be performed as soon as possible.

The review of the helicopter logbook excerpts did not reveal an entry for the installation of the bladder fuel tanks as called for by the SB.

### Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KJBR, 262 ft msl	<b>Distance from Accident Site:</b>	5 Nautical Miles
<b>Observation Time:</b>	15:38 Local	<b>Direction from Accident Site:</b>	273°
<b>Lowest Cloud Condition:</b>		<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>		<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	4 knots / None	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	90°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.02 inches Hg	<b>Temperature/Dew Point:</b>	34°C / 21°C
<b>Precipitation and Obscuration:</b>	In the vicinity - Thunderstorm -		
<b>Departure Point:</b>	Jonesboro, AR (23AR)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Jonesboro, AR (23AR)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	15:30 Local	<b>Type of Airspace:</b>	

At 1538, the recorded weather at the Jonesboro Municipal Airport, near Jonesboro, Arkansas, located about 5 miles west of 23AR, included wind 090°; at 4 knots, visibility 10 statute miles, present weather thunderstorms in the vicinity, temperature 34°; C, dew point 21°; C, and altimeter 30.02 inches of mercury.

### Airport Information

<b>Airport:</b>	CLASSIC AIRSTRIP 23AR	<b>Runway Surface Type:</b>	Grass/turf
<b>Airport Elevation:</b>	260 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>		<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>		<b>VFR Approach/Landing:</b>	None

23AR was a private, non-towered airport, which was owned by an individual. It was located about 7 miles east of Jonesboro, Arkansas. The airport had an estimated elevation of 260 ft above mean sea level. The airport's published runway 17/35 was 2,600 ft by 80 ft with a turf surface.

Another, privately-owned, north/south-oriented turf runway was located about 350 ft west of 23R's published runway.

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	On-ground
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal	<b>Latitude, Longitude:</b>	35.826389,-90.549163

The main helicopter wreckage was located about 1,800 ft on a magnetic heading of 35° from the intersection of Highway 18 and Barnhill Road. The turf, in a circular shaped area around the helicopter was found charred. Portions of the helicopter wreckage were discolored, deformed, and consumed by fire consistent with a ground fire.

The helicopter's resting heading was about 270° magnetic. The tailcone was folded to the left and separated near its forward end. Most of the aluminum and fiberglass components of the fuselage were discolored, deformed, and consumed by fire. The separated aft section of the tailcone was located about 20 ft south of the airframe. The tail rotor gearbox remained attached to the aft bulkhead of the separated section of the tailcone. The empennage separated from the aft bulkhead and was located about 40 ft south of the airframe. The main rotor gearbox and main rotor were separated from the airframe and found about 3 ft north of the airframe. Ground scars north of the airframe were consistent with main rotor blade strikes. Main rotor blade tip pieces were recovered in and near the ground scars and yellow paint that matched the paint on the main rotor blade tips was transferred to the dirt inside the scars.

Both tail rotor blades were separated near their roots and were found east of the airframe on the other side of the hangar located between 23R and the west airstrip. A series of ground scars consistent with the shape, size, and spacing of tail rotor blade strikes were located east of the location that the tail rotor blades were found.

An on-scene examination of the wreckage revealed that all flight control rod ends remained attached to their attachment points. Sections of push pull tubes were not continuous, separated from their original location, and/or consumed by fire. All flight control discontinuities exhibited either thermal damage or separations consistent with overload. No preimpact anomalies were detected in the flight control system.

The fuel mixture control knob was found in the full rich position. The mixture control wire was found disconnected near its fuel mixture arm on the engine fuel control servo unit. The throttle linkage sustained thermal damage and its position could not be determined. The governor switch sustained thermal damage and its position could not be determined.

The right skid tube was located under the main wreckage and it sustained thermal damage. The four struts that attached the left and right skid tubes were separated from the airframe and were thermally damaged. The aft cross tube appeared to be thermally deformed. A portion of the front cross tube was consumed by fire and the remaining end was not bent near its elbow.

Observed damage to the cabin structure included deformation, discoloration, and consumption by fire. The removable cyclic and collective were recovered from under seat debris, and the removable pedals

were installed. The pedals were found in a neutral position. The vertical tube of the cyclic control was bent aft. The cyclic grip was consumed by fire. The aft left and right doors were found in the main wreckage and they sustained thermal damage. The two front doors were not identified or found in the wreckage.

The upper and lower frames were bent and had some separations in their tubes. The surface of the separations exhibited angular and jagged features consistent with overload. The lower edge of the vertical firewall was deformed. The tailcone was bent to the left and thermally damaged at its forward end.

The separated aft section of the tailcone exhibited deformation damage consistent with several tail rotor blade strikes. The empennage was separated from the aft bulkhead. The surface of the separation was rough and jagged. The lower vertical stabilizer was bent to the right as viewed from its aft looking forward. A segment of the tail rotor guard that included the guard's curved section was separated below its forward mount and forward of its aft mount. The surfaces of the guard's separations were angular and jagged. The aft section of the tail rotor guard remained attached to its mount and the tip of the tail rotor guard exhibited witness marks consistent with scuffing on its lower left surface. The tailskid had some witness marks on its lowest bottom surface consistent with scuffing.

Sections of the V-belts were consumed by fire with charred sections remaining in the grooves of the upper sheave and on the ground below the lower sheave. The alignment strut's outer rod end for the upper sheave exhibited a separation consistent with overload. No scoring was visible on the sheave face. Scoring was visible on the rod end jam nut adjacent to the aft sheave face. The overrunning clutch operated properly. The actuator was extended about 1 inch.

The main rotor gearbox was separated at the upper housing. The main rotor driveshaft was bent about 15° at the swashplate. The mast tube was bent and exhibited thermal discoloration and damage. Both elastomeric teeter stops were consumed by fire and their brackets were bent across the center. One droop stop tusk was bent downward and the spindle was found cracked with an angular and jagged separation surface. The other spindle coning bolthole was deformed. Both main rotor blades exhibited thermal damage and deformation consistent with impact damage.

The lower frame tube adjacent to the intermediate flex coupling exhibited rotational scoring. The tail rotor driveshaft was bent near its forward end and was disconnected just aft of the bend. The tail rotor drive shaft damper bearing bracket was separated from the bulkhead. The damper bearing exhibited thermal damage and would not rotate. The tail rotor gearbox rotated with no anomalies. Oil was visible in its sight gage. The blades were separated near their roots. The surface of the tail rotor blades' separations exhibited angular and jagged features consistent with overload. Both blades were bent to the right and they exhibited leading edge damage at their tips. One blade exhibited deformation damage that was consistent with contact with rivet locations on the tailcone. Witness marks running chordwise near the blade tips were present on both blades, which appeared to be consistent with terrain contact.

Observed damage to the cooling fan included discoloration and it was deformed around its forward edge. The cooling scroll was consumed by fire. The alternator and its cooling fan exhibited thermal damage.



The engine was found lying upright and it remained attached to its tubular engine mounts. The exterior surfaces of the engine were discolored consistent with exposure to a post-impact fire. Sections of the oil sump were consumed in the fire. The fuel servo was found separated and partially thermally consumed. The remaining rear mounted accessories exhibited features consistent with fire damaged.

The engine was partially disassembled. The engine's crankshaft was rotated by turning the cooling fan, and continuity of the crankshaft to the rear gears and to the valve train were confirmed. Thumb compression and suction were observed from all six cylinders as the engine was rotated. The interiors of the cylinders were examined using a lighted borescope and no anomalies were noted. The two-piece fuel injector nozzles were disassembled and found to be unobstructed. Disassembly of both magnetos revealed that their internal components sustained thermal damage. The removed sparkplug electrodes exhibited light brown coloration and worn out normal condition when compared to the Champion Check-A-Plug chart.

## Medical and Pathological Information

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The Arkansas State Crime Lab Medical Examiner's Office conducted an autopsy on the pilot and took toxicological samples. The autopsy indicated that the pilot's cause of death was multiple blunt force injuries and the manner of death was an accident. No significant natural disease was identified during the autopsy.

The FAA Bioaeronautical Sciences Research Laboratory performed toxicological testing on the samples taken during the autopsy. The toxicology report indicated that the samples sustained putrefaction and listed the following findings:

418 (mg/dL, mg/hg) Ethanol detected in Blood  
336 (mg/dL, mg/hg) Ethanol detected in Heart  
309 (mg/dL, mg/hg) Ethanol detected in Lung  
182 (mg/dL, mg/hg) Ethanol detected in Kidney  
152 (mg/dL, mg/hg) Ethanol detected in Urine

...

Diphenhydramine detected in Urine  
0.049 (ug/ml, ug/g) Diphenhydramine detected in Blood  
Pioglitazone detected in Urine  
Valsartan detected in Urine  
Valsartan detected in Blood

Ethanol is the intoxicant commonly found in beer, wine, and liquor. It acts as a central nervous system (CNS) depressant. After ingestion, at low doses, it impairs judgment, psychomotor functioning, and vigilance; at higher doses it can cause coma and death. The effects of ethanol on aviators are generally well understood; it significantly impairs pilots' performance, even at very low levels. Federal Aviation Regulations prohibit any person from acting or attempting to act as a crewmember of a civil aircraft

while having 0.040 gm/dl (40 mg/dl) or more ethanol in the blood. Ethanol may also be produced in the body after death by microbial activity.

Diphenhydramine is a sedating antihistamine used to treat allergy symptoms and as a sleep aid. It is available over the counter under many names including Benadryl and Unisom. Diphenhydramine carries the following FDA warning: "may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery)." The therapeutic range of diphenhydramine is 0.0250 to 0.1120 ug/ml; this is the range of blood levels where psychoactive effects are expected. Diphenhydramine undergoes postmortem redistribution where, after death, the drug can leech from storage sites back into blood. Central postmortem levels may be about two to three times higher than peripheral levels. Compared to other antihistamines, diphenhydramine causes marked sedation; it is also classed as a CNS depressant, and this is the rationale for its use as a sleep aid. Altered mood and impaired cognitive and psychomotor performance may also be observed. In a driving simulator study, a single dose of diphenhydramine impaired driving ability more than a blood alcohol concentration of 0.100%.

Valsartan is a prescription blood pressure medication often marketed with the name Diovan. It is not generally considered impairing. Pioglitazone is a prescription medication for diabetes; it is often marketed with the name Actos. It is not generally considered impairing and does not lead to the development of hypoglycemia.

Review of the pilot's FAA medical records indicated that he had reported no chronic medical conditions and no medication use to the FAA.

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Malinowski, Edward
<b>Additional Participating Persons:</b>	Bill Aldrich; Federal Aviation Administration; Little Rock, AR Thom Webster; Robinson Helicopter Company; Torrance, CA J M Childers; Lycoming Engines; White, GA
<b>Original Publish Date:</b>	April 9, 2018
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	The NTSB traveled to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=93363">https://data.nts.gov/Docket?ProjectID=93363</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).