Aviation Investigation Final Report

Location:	Wikieup, Arizona	**Accident Number:**	WPR16FA130
Date & Time:	June 23, 2016, 14:25 Local	**Registration:**	N117TW
Aircraft:	ROBINSON HELICOPTER CO R66	**Aircraft Damage:**	Destroyed
Defining Event:	Mast bumping	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

The commercial pilot and the pilot-rated passenger departed on a cross-country positioning flight. The helicopter was reported overdue when it did not arrive at the destination, and the wreckage was located the following morning. There were no witnesses to the accident, no recorded radar data, and no recorded radio transmissions from the pilot.

Examination of the wreckage revealed no evidence of any preexisting anomalies that would have precluded normal operation of the helicopter. There was evidence that a mast bumping event had occurred and that the main rotor blades had contacted the airframe, which resulted in an in-flight break-up. There was no recorded information available that could be used to determine the helicopter's airspeed, altitude, or the pilot's control inputs.

A weather study indicated that conditions were conducive to the development of significant updrafts or thermals of rising air and dust devils, and people near the accident site reported that there were numerous dust devils in the area.

It is likely that the helicopter encountered turbulence due to updrafts and/or dust devils, and the pilot lost control of the helicopter, which resulted in mast bumping.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: An encounter with turbulence due to updrafts and/or dust devils that resulted in mast bumping and an in-flight break-up.

Findings

Aircraft	Main rotor mast/swashplate - Related operating info
Environmental issues	Convective turbulence - Effect on operation
Environmental issues	Terrain induced turbulence - Effect on operation

Factual Information

History of Flight

Enroute-cruise	Turbulence encounter
Enroute-cruise	Mast bumping (Defining event)

On June 23, 2016, about 1425 mountain standard time, a Robinson Helicopter Company R66, N117TW, broke up in flight near Wikieup, Arizona. The commercial pilot and the pilot-rated passenger sustained fatal injuries; the helicopter was destroyed. Guidance Air Service LLC was operating the helicopter under the provisions of 14 Code of Federal Regulations Part 91. The cross-country positioning flight departed Prescott, Arizona, about 1338 with a planned destination of Riverside, California. Visual meteorological conditions prevailed, and no flight plan had been filed.

According to the operator, the pilot, who was seated in the right seat, was going to Riverside to take a Part 135.293 check ride with an inspector from the Federal Aviation Administration (FAA) Flight Standards District Office located there. The pilot-rated passenger, who was seated in the left seat, was the operator's Part 141 chief pilot.

The helicopter was reported overdue when it did not arrive at the destination, and the wreckage was located about 0430 on June 24. There were no witnesses to the accident, no recorded radar data, and no recorded radio transmissions from the pilot.

A SPOT device, which is a handheld GPS tracking device that uses a satellite network enabling text messaging and GPS tracking services, was present on the helicopter. Records provided by the operator listed 19 location fixes beginning at Prescott at 1338 and proceeding on a southwesterly heading. The last data point at 1425 was in the vicinity of the accident site.

Pilot Information

Certificate:	Airline transport; Flight instructor	**Age:**	52,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Helicopter; Instrument airplane; Instrument helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	July 9, 2015
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 10, 2015
Flight Time:	8000 hours (Total, all aircraft), 10 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft)		

Pilot-rated passenger Information

Certificate:	Commercial; Flight instructor; Private	**Age:**	55,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	3-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Helicopter; Instrument helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	May 2, 2016
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 22, 2016
Flight Time:	5220 hours (Total, all aircraft), 101 hours (Total, this make and model), 3769 hours (Pilot In Command, all aircraft), 89 hours (Last 90 days, all aircraft), 42 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	ROBINSON HELICOPTER CO	**Registration:**	N117TW
Model/Series:	R66	**Aircraft Category:**	Helicopter
Year of Manufacture:	2011	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	0042
Landing Gear Type:	Skid	**Seats:**	5
Date/Type of Last Inspection:	February 16, 2016 100 hour	**Certified Max Gross Wt.:**	2700 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:	662 Hrs as of last inspection	**Engine Manufacturer:**	Rolls Royce
ELT:	Not installed	**Engine Model/Series:**	250-C300A1
Registered Owner:	On file	**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	Rotorcraft external load (133), On-demand air taxi (135)
Operator Does Business As:	On file	**Operator Designator Code:**	2G7A

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KHII,783 ft msl	**Distance from Accident Site:**	43 Nautical Miles
Observation Time:	14:35 Local	**Direction from Accident Site:**	270°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	17 knots / 22 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	190°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.79 inches Hg	**Temperature/Dew Point:**	43°C / -3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Prescott, AZ (PRC)	**Type of Flight Plan Filed:**	None
Destination:	Riverside, CA (RAL)	**Type of Clearance:**	None
Departure Time:	13:38 Local	**Type of Airspace:**	

The southwest section of the National Weather Service surface analysis chart depicted a thermal low pressure system west of the accident site. The closest upper air sounding from Yuma, Arizona, about 90 miles south of the accident site, depicted thermal profiles that supported strong thermals through 8,500 ft. The lifted index (a common measure of atmospheric instability) and the K-index (a measure of thunderstorm potential) indicated conditions conducive to development of significant updrafts or

thermals of rising air and dust devils. Other weather products supported strong thermals to 11,000 ft.

Two people near the accident site reported seeing numerous large dust devils. One person was an airframe and powerplant mechanic driving on a highway, and he saw as many as five dust devils simultaneously. The other person was the pilot of an R44 who was performing aerial survey work immediately north of the accident site. He stated that beginning at 1130 the winds became stronger and gustier. Over the next couple of hours, he observed numerous dust devils, and experienced a significant updraft in excess of 1,000 ft per minute. About 1515, he decided to discontinue operations and encountered a significant wind shift while returning to his base.

A dust devil is a strong, well-formed whirlwind that can range from a few feet to hundreds of feet wide, and can reach heights of several hundred feet. In the United States, dust devils have been reported in every state with Arizona reporting the highest frequencies of occurrence, and they are most frequent between June and August. They have been implicated as a cause or contributing factor in about 50 aircraft accidents between 2000 and 2015 according to the NTSB database.

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:**	34.461112,-113.683334

The helicopter came to rest in hilly desert terrain. The debris field was about 750 yards long and 150 yards wide. One of the first pieces identified was the outboard 5 ft of a main rotor blade afterbody that had separated from the leading edge spar and displayed black paint transfer marks near the tip. It was located on the top of a small ridgeline. The inboard section of this main rotor blade was about 600 yards into the debris field and 85 yards left of the debris path centerline.

The left side of the helicopter was more fragmented than the right; left side cabin pieces and instruments were distributed throughout the early part of the debris field. The tail boom was about midway into the debris field. The left side/nose cabin, which was located near the tail boom had a straight separation line or slice across one side, and some floor panels at the aft end of the slice were crushed in an accordion pattern. The cabin came to rest inverted about 600 yards into the debris field, and was destroyed by a postcrash fire. The engine remained attached to the cabin.

The transmission, mast, and second main rotor blade separated as a unit, and were about 100 yards past the cabin area in the direction of the centerline of the debris field. The coning bolt of the separated blade was bent, and the teeter stops for both blades had impact marks across their centers. The attached blade was bent midspan about 10° to 20° opposite the direction of rotation. The main rotor driveshaft was bent about 15° at the swashplate.

Medical and Pathological Information

Pilot

The Mohave County Medical Examiner's Office completed an external exam autopsy of the pilot. The cause of death was determined to be multiple injuries due to a helicopter crash.

Toxicology testing of the specimens from the pilot by the FAA's Bioaeronautical Science's Research Laboratory, Oklahoma, City, Oklahoma, were negative for ethanol and tested drugs in the muscle.

Pilot-Rated Passenger

The Mohave County Medical Examiner's Office completed an autopsy of the pilot-rated passenger. The cause of death was determined to be multiple injuries due to a helicopter crash.

Toxicology testing of the specimens from the pilot-rated passenger by the FAA's Bioaeronautical Science's Research Laboratory were negative for tested drugs in the liver.

The testing detected 80 (mg/dL, mg/hg) ethanol in muscle, and Propanol (N-) was detected in muscle; no ethanol was detected in the brain. The report noted that putrefaction of the specimens had occurred.

Additional Information

Robinson Safety Notice SN-32 discusses flight in high winds and turbulence and explains how improper application of control inputs in response to turbulence can increase the likelihood of a mast bumping accident. It recommends that pilots reduce airspeed below normal cruise speed to 60 to 70 knots for flight in significant turbulence. It suggests techniques to avoid overcontrol of the helicopter, and says to avoid flying on the downwind side of hills and ridges.

Administrative Information

Investigator In Charge (IIC):	Plagens, Howard
Additional Participating Persons:	Mark Pritchett; FAA-FSDO; Scottsdale, AZ Thom Webster; Robinson Helicopter Company; Torrance, CA Jack Johnson; Rolls-Royce; Indianapolis, IN Eddie Ochoa; Guidance Aviation; Prescott, AZ
Original Publish Date:	November 28, 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=93446