Aviation Investigation Final Report

Location:	Newport Beach, California	**Accident Number:**	WPR18FA077
Date & Time:	January 30, 2018, 13:50 Local	**Registration:**	N7530R
Aircraft:	ROBINSON HELICOPTER R44	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	3 Fatal, 1 Serious, 1 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The private pilot of the helicopter departed with three passengers on a cross-country flight in day visual meteorological conditions. Surveillance video of the takeoff showed that the helicopter assumed a nose-low attitude upon lifting off the ground and mostly maintained that attitude throughout the takeoff and initial climb. Radar data indicated that the helicopter reached a maximum altitude of 500 ft mean sea level before it entered a rapid descent and impacted homes and the ground less than 1 mile from the departure airport. The surviving passenger described the descent as "straight down."

An examination of the airframe, engine, and related systems revealed no evidence of preimpact mechanical malfunctions or failures that would have precluded normal operation. Weight and balance calculations revealed that the helicopter was operating 76 lbs over its published maximum gross weight and near the published forward center of gravity (CG) limits. The helicopter's observed nose-low attitude throughout the flight is consistent with a forward CG, which would have required additional aft cyclic control inputs to maintain level flight and may have resulted in reduced cyclic control travel. The passenger stated that the pilot did not ask any of the passengers for their weights, nor did he instruct them where to sit, suggesting that the pilot did not perform weight and balance calculations before the flight. Given the lack of mechanical anomalies, it is likely that the pilot experienced a loss of helicopter control due to his decision to operate the helicopter outside of its published weight and balance limitations.

Probable Cause and Findings

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

The pilot's failure to perform weight and balance calculations before departing on the flight, which resulted in his operation of the helicopter outside of its published weight and balance limitations and a subsequent loss of control shortly after takeoff.

Findings

Personnel issues	Decision making/judgment - Pilot
Aircraft	Maximum weight - Capability exceeded
Aircraft	CG/weight distribution - Capability exceeded
Personnel issues	Weight/balance calculations - Pilot
Personnel issues	Aircraft control - Pilot

Factual Information

History of Flight

Prior to flight	Aircraft loading event
Enroute-climb to cruise	Loss of control in flight (Defining event)
Enroute-climb to cruise	Collision with terr/obj (non-CFIT)

On January 30, 2018, about 1350 Pacific standard time, a Robinson Helicopter R44, N7530R, was destroyed when it impacted houses near Newport Beach, California shortly after takeoff. The private pilot and two of the three passengers sustained fatal injuries, one passenger sustained serious injuries, and one person on the ground sustained minor injuries. The helicopter was registered to Spitzer Helicopter and was operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed, and no flight plan was filed for the flight, which originated from John Wayne-Orange County Airport (SNA), Santa Ana, California, about 1 minute before the accident, with an intended destination of Catalina Island, California.

The surviving passenger reported that the pilot and all of the passengers met at the pilot's office and planned to fly to Catalina Island for lunch. Following a brief conversation, the pilot drove the passengers to the airport. The passenger stated that, during the drive, the pilot received a phone call during which he appeared to be frustrated. The passenger asked if everything was ok, and the pilot responded everything was fine and he just wanted a different helicopter. Upon arriving at the airport, they all walked to the helicopter and the pilot appeared to conduct a preflight inspection.

The passenger recalled that the pilot never asked any of the passengers about their weights, nor did he assign them seats. After all the passengers boarded the helicopter, they put on the headsets and the pilot started the engine. The passenger stated that the helicopter started to lift up, shimmied a little, and seemed to hover momentarily before it began a gradual climb. As the helicopter continued to climb steadily, in more of a level attitude than the initial lift off, the helicopter suddenly descended straight down nose first and impacted the ground. Following transport to the hospital, the passenger reported to law enforcement that the pilot said "something's wrong" and apologized to the passengers before stating that he could probably "save it."

Surveillance video footage of the takeoff showed the helicopter slightly move forward in a nose low attitude, lift off, rotate left, increase in a nose-low attitude, and yaw to the right. As the helicopter briefly transitioned into a level attitude, it moved momentarily out of view behind a parked airplane. The tailboom of the helicopter became visible shortly after, in an elevated attitude consistent with a nose-low pitch attitude. As the rest of the helicopter became visible, it appeared to be in a slight climbing left turn, remaining in a nose-low attitude. The helicopter briefly descended and appeared to transition into a level attitude before it began a climb. The helicopter continued the climb while transitioning to a nose-low pitch attitude as it traveled out of frame.

A witness adjacent to the accident site reported observing the helicopter "going down quickly diagonally" before it "pulled [the] nose up and appeared to try an auto rotation while it continued to go

down." A second witness reported that they observed the helicopter flying on an easterly heading and descending until it impacted two residential houses. The witness reported that they did not see any parts come off of the helicopter prior to the impact.

A review of archived Federal Aviation Administration (FAA) radar data revealed that the helicopter departed SNA on a southerly heading followed by a slight left turn to a southeasterly heading. The data showed that the helicopter climbed to a maximum altitude of 500 ft mean sea level (msl) and traveled along a southeasterly heading for about 13 seconds. The data showed that the helicopter then descended from 500 ft msl to the last recorded target, at 200 ft msl, in 11 seconds. The last recorded radar return was almost directly above the initial impact area. Review of recorded radio transmissions revealed that the pilot did not make any distress calls.

Pilot Information

Certificate:	Private	**Age:**	60,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	July 11, 2016
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	195 hours (Total, all aircraft)		

The pilot held a private pilot certificate with a rotorcraft-helicopter rating and a third-class FAA medical certificate issued on July 11, 2016, with no limitations. The pilot reported on the application for the medical certificate 195 total hours of flight experience, of which 25 hours were in the previous 6 months. The pilot's logbooks were not located.

Aircraft and Owner/Operator Information

Aircraft Make:	ROBINSON HELICOPTER	**Registration:**	N7530R
Model/Series:	R44 UNDESIGNAT	**Aircraft Category:**	Helicopter
Year of Manufacture:	2003	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	1295
Landing Gear Type:	N/A; Emergency float; Skid	**Seats:**	
Date/Type of Last Inspection:	December 7, 2017 100 hour	**Certified Max Gross Wt.:**	2400 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	6966.3 Hrs as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:	Installed	**Engine Model/Series:**	O-540-F1B5
Registered Owner:	On file	**Rated Power:**	260 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The accident helicopter was a Robinson Helicopter R44, serial number 1295, and was powered by a 235-horsepower Lycoming O-540-F1B5 engine, serial number L-25375-40A. The most recent 100-hour inspection was completed on December 7, 2017, at a Hobbs time of 568.6 hours and an airframe total time of 6,966.3 hours. The most recent annual inspection was completed on June 1, 2017, at a Hobbs time of 383.9 hours, airframe total time of 6,781.6 hours, and engine time since major overhaul of 383.9 hours.

According to representatives from a fixed-base operator located at SNA, the helicopter was refueled with 15.8 gallons of 100 low-lead aviation fuel based on a request to top off the main fuel tank only.

Using the basic empty weight of the helicopter, fuel load, and weights of the occupants and baggage, the helicopter weighed about 2,476 lbs at the time of takeoff with a longitudinal center of gravity (CG) of 93.42 inches. The calculated weight exceeded the published maximum gross weight of 2,400 lbs and the CG was near the forward range noted in the R44 Pilot Operating Handbook.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KSNA,55 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	21:53 Local	**Direction from Accident Site:**	10°
Lowest Cloud Condition:	Few / 13000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 18000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	210°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.97 inches Hg	**Temperature/Dew Point:**	26°C / -2°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Santa Ana, CA (SNA)	**Type of Flight Plan Filed:**	None
Destination:	Catalina Island, CA	**Type of Clearance:**	VFR
Departure Time:	13:49 Local	**Type of Airspace:**	Class C

A review of recorded data from the SNA automated weather observation station, located about 2 miles north of the accident site, revealed that the conditions at 1353 included wind from 210° at 5 knots, visibility 10 statute miles, few clouds at 13,000 ft above ground level (agl), broken cloud layer at 18,000 ft agl, temperature 26°C, dew point -2°C, and an altimeter setting of 29.98 inches of mercury.

Airport Information

Airport:	JOHN WAYNE AIRPORT-ORANGE COUN SNA	**Runway Surface Type:**	
Airport Elevation:	56 ft msl	**Runway Surface Condition:**	Dry
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	2 Fatal, 1 Serious	**Aircraft Fire:**	None
Ground Injuries:	1 Minor	**Aircraft Explosion:**	None
Total Injuries:	3 Fatal, 1 Serious, 1 Minor	**Latitude, Longitude:**	33.654167,-117.871391

The helicopter impacted multiple residential structures and a residential street about 0.95 nm miles south-southeast of the departure end of runway 20R at SNA. The initial impact point was identified by damage to the roof of a single-story home. The tail rotor gearbox and one tail rotor blade were located on top of the roof of a single-story home, partially lodged within a hole in the roof. The empennage and opposing tail rotor blade were located between the two homes, surrounded by thick vegetation. Additional impact damage was observed to a palm tree located between the homes.

Numerous impact gouges and paint transfer marks were located on the street in front of both homes, consistent with fuselage and main rotor blade impact. The helicopter came to rest on its left side against a single-story home on a heading of about 189° magnetic, about 86 ft from the first identified point of impact. Throughout the wreckage debris path, plexiglass fragments, clay roofing material, palm tree fragments, and portions of both main rotor blades were observed.

The empennage and the aft section of the tailcone were separated from the airframe. The empennage was separated from the tailcone. The tail rotor gearbox was separated from the empennage and tailcone. The skids were detached and folded underneath the wreckage. The forward section of the tailcone was bent forward almost 180°.

The forward tail rotor drive shaft flex coupling was intact. The intermediate flex coupling was distorted and detached at one arm. The tail rotor drive shaft was separated into multiple sections. The tail rotor drive shaft damper assembly was detached from the tailcone and the tail rotor drive shaft bearing. The bearing rotated freely. The friction at the damper linkage was normal. The aft flex coupling was detached at the tail rotor gearbox yoke input arms. The tail rotor gearbox rotated freely and contained oil. The slider bearing rotated freely. One of the tail rotor blades was separated and distorted. The opposing blade remained attached and exhibited leading edge damage.

The drive belts remained intact and in place within their respective grooves. The sprag clutch operated normally. The belt tension actuator was intact and when operated, the belt tension actuator extended and contracted. Both the upper and lower actuator bearings rotated freely.

The main rotor blades remained attached to the hub. Both main rotor blades were intact. One of the rotor blades was bent upward about mid-span and exhibited slight bending opposite of the direction of rotation near the blade tip. A portion of the blade honeycomb skin structure was torn away from the spar at the blade tip. The opposing main rotor blade exhibited dents and scuffs about 10 inches outboard of the hub. The blade was bent downward about 135° about 2 ft outboard of the hub. The blade was also bent upward mid-span and bent aft opposite of the direction of rotation along the outboard third of the blade. A portion of the blade honeycomb skin structure was torn away from the blade tip.

Dents observed in the oil cooler were consistent with impact from the starter ring gear. At the upper belt sheave, score marks consistent with rotational contact from adjacent components were observed.

Flight control continuity was established throughout the helicopter from the cockpit controls to the main rotor and tail rotor controls through various overload fractures.

The engine remained attached to the airframe. The upper spark plugs were removed. The electrodes were undamaged and exhibited color consistent with normal operation with the exception of the No. 3

spark plug, which was oil-soaked. The engine crankshaft was rotated using the cooling fan. Compression and suction were obtained on all six cylinders.

The oil sump screen was removed and contained two small plastic fragments consistent with the magneto drive bushings. The oil filter was removed and cut open. The internal filter element exhibited no debris.

The engine was installed on a test stand. In order to facilitate an engine run, a slave starter and propeller were installed. The engine was started and ran uneventfully. During the engine run, the No. 3 cylinder was not producing any exhaust gas temperature (EGT) readings on the engine monitoring unit installed on the test stand. The engine was shut down and further inspected. The bottom spark plug lead of the No. 3 cylinder was found impact damaged, and the upper spark plug lead was pulled away from the ignition cap. A serviceable ignition harness was installed for both the left and right magnetos. The engine was started a second time and operated throughout various power settings. At maximum power, the engine produced 2,600 rpm at 29 inches of manifold pressure. Engine rpm drops during magneto tests were within specification. The engine ran uneventfully until it was shut down using the mixture cut-off.

No evidence of any preexisting mechanical malfunction was observed with the airframe or engine.

For further information, see the Accident Site, Airframe, and Engine Examination Summary report and Robinson Helicopter's report within the public docket for this accident.

Medical and Pathological Information

The Orange County Coroner, Santa Ana, California, performed an autopsy on the pilot. The autopsy report indicated that the cause of death was multiple blunt force traumatic injuries.

Toxicology testing on specimens recovered from the pilot performed at the FAA Forensic Sciences Laboratory identified unspecified amounts of Irbesartan in the blood and urine.

Irbesartan is a prescription medication used alone or in combination with other medications to treat high blood pressure. It is not considered to be impairing.

Additional Information

According to the FAA's Helicopter Flying Handbook (FAA-H-8083-21B), Chapter 6, Weight and Balance:

Weight limits are necessary to guarantee the structural integrity of the helicopter, enable pilots to predict helicopter performance and insure aircraft controllability.

Helicopter performance is not only affected by gross weight, but also by the position of that weight. It is essential to load the aircraft within the allowable CG range specified in the rotorcraft flight manual's (RFM) weight and balance limitations. Loading outside approved limits can result in insufficient control travel for safe operation.

The pilot should ensure that the helicopter is properly balanced within its center of gravity limitations, so that minimal cyclic input is required during hovering flight, except for any wind corrections. Since the fuselage acts as a pendulum suspended from the rotor, changing the CG changes the angle at which the aircraft hangs from the rotor…if the CG is too far forward of the mast, the helicopter hangs with its nose tilted down…

Administrative Information

Investigator In Charge (IIC):	Cawthra, Joshua
Additional Participating Persons:	Dave Keenan; Federal Aviation Administration; Washington, DC Mark Platt; Lycoming Engines; Williamsport, PA Thom Webster; Robinson Helicopter Company; Torrance, CA Ken Martin; Robinson Helicopter Company; Torrance, CA
Original Publish Date:	April 8, 2020
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=96678

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