



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	Truckee, California	<b>Accident Number:</b>	WPR18LA041
<b>Date &amp; Time:</b>	November 30, 2017, 15:35 Local	<b>Registration:</b>	N47WH
<b>Aircraft:</b>	ROBINSON HELICOPTER COMPANY R22	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Hard landing	<b>Injuries:</b>	2 Serious
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

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## Analysis

The flight instructor was demonstrating an autorotation with a 180° left turn at a density altitude of about 6,470 ft. He entered the maneuver from 700 ft above ground level (agl) and about 80 kts indicated airspeed, established engine rpm, and started the 180° turn. About 1/3 of the way through the turn, he felt he needed a “desirable” speed through the turn and moved the cyclic forward and adjusted the collectively accordingly. The flight instructor stated that when he should have been 2/3 through the turn, he felt that he did not have the cyclic and collective control of the helicopter and he knew they were going to crash. He further stated that he continued “teaching,” and called out “rpm, airspeed, and outside,” while pointing to the tachometer, airspeed indicator, and intended landing spot; he also made control inputs and continued to fly what “had become an unresponsive aircraft.” He also stated that there was no flare at the end of the autorotation and no time for an engine rpm recovery.

Postaccident examination of the airframe and engine revealed no mechanical anomalies that would have precluded normal operation.

The helicopter manufacturer’s Safety Notice SN-38 stated that if any of the parameters for rotor rpm, a stabilized airspeed, a stabilized rate of descent or turns (if any) completed are not correct, an immediate power recovery should be initiated; salvaging the situation by coaching the student or trying to correct below 100 ft agl (200 ft when operating at or above 4000 ft density altitude) should not be attempted. Had the flight instructor aborted the autorotation early on, it is likely he would have regained helicopter control.

## Probable Cause and Findings

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

The flight instructor's failure to execute a power recovery from a non-stabilized autorotative descent, which resulted in a hard landing.

## Findings

<b>Aircraft</b>	Prop/rotor parameters - Not attained/maintained
<b>Personnel issues</b>	Aircraft control - Instructor/check pilot
<b>Aircraft</b>	Descent rate - Not attained/maintained
<b>Aircraft</b>	Landing flare - Attain/maintain not possible
<b>Personnel issues</b>	Decision making/judgment - Instructor/check pilot

## Factual Information

On November 30, 2017, at 1540 Pacific standard time, a Robinson Helicopter Company (RHC) R22, N47WH, was substantially damaged when it was involved in an accident near Truckee, California. The two pilots were seriously injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 instructional flight.

The flight instructor reported that the pilot/owner had just purchased the helicopter and it was delivered the morning of the accident. The flight instructor had flown the helicopter earlier in the day to comply with his recent flight experience requirements. The accident occurred in the afternoon, with the owner of the helicopter also onboard. The purpose of the afternoon flight was to check out the flight characteristics with two full size adults on board to determine if it could serve as a viable training helicopter for the operator. If the helicopter performed well, then he and the owner would practice some procedures and maneuvers required for a biennial flight review for the owner. According to the flight instructor they practiced several different maneuvers, normal takeoffs, pattern work, normal approaches, steep approaches, landings, hover work, governor off work, hovering autorotations, and low rpm recovery in a hover.

The flight instructor stated that the flight went well, and they decided to do straight-in autorotations as well as 180° autorotations. After completion of the straight-in autorotations, they moved on to 180° autorotations.

The flight instructor set up for a 180° autorotation; while on downwind they commented that the helicopter was not flying smoothly and thought the main rotor was unbalanced and had a “little hop.” He had not noticed the vibration on the earlier flights. They continued with the flight and the maneuver. After they passed the intended landing point, he entered from 700 ft above ground level (agl) and about 80 kts indicated airspeed, he established his rpm, and started the 180° turn. About 1/3 of the way through the turn, he felt he needed a “desirable” speed through the turn and moved the cyclic forward and adjusted the collectively accordingly.

The flight instructor stated that when he should have been 2/3 through the turn, he felt that he did not have the cyclic and collective control of the helicopter and he knew they were going to crash. He further stated that he continued “teaching,” and called out “rpm, airspeed, and outside,” while pointing to the tachometer, airspeed indicator, and intended landing spot; he also made control inputs and continued to fly what “had become an unresponsive aircraft.” The flight instructor stated that there was no flare at the end of the autorotation and no time for an engine rpm recovery.

A witness at the airport watched the helicopter practicing pattern work east of runway 29. He saw the helicopter turn onto its base leg at a normal attitude and then it entered a rapid descent toward the runway. The witness reported that the helicopter flared about 30 yards from the runway, impacted the ground, tail rotor first, followed by the main body of the helicopter. The main rotor blades sheared off the tail boom and the helicopter came to rest on its side.

Postaccident examination of the airframe established flight control continuity. The tail cone separated after contact by a main rotor blade. The throttle linkage was intact and in the closed position. The mixture was full rich, and the carburetor heat was in the OFF position. Both V-belts were out of the sheave grooves. One V-belt was fractured across the vees. The fuel tanks were half-full as verified visually and by the fuel gauges.

The engine sustained minimal impact damage. The crankshaft rotated by hand using the cooling fan with no anomalies noted. Thumb compression was established in all cylinders, and spark was produced at the lower ignition leads during rotation of the crankshaft.

The automated weather observation station at the Truckee-Tahoe Airport (TRK), Truckee, California, reported at 1545 wind from 290° at 5 knots, temperature 50°, dewpoint 23°, and altimeter setting of 30.17 inches of mercury. TRK was located at an elevation of 5,904.3 ft mean sea level (msl); density altitude was calculated to be 6,469 ft.

The maximum gross takeoff weight for the R22 Beta II is 1,370 lbs. The estimated gross weight at the time of the accident was calculated to be about 1,356 lbs.

Information pertaining to the execution of autorotations can be found in the Helicopter Flying Handbook, as well as the FAA Practical Test Standard, Private Pilot Rotorcraft, along with additional information from RHC Safety Notice SN-38, Practice Autorotations Cause Many Training Accidents. SN-38, in part, indicated a 100 ft decision check that identified rotor rpm, stabilized airspeed, stabilized rate of descent, and turns. An immediate power recovery should be made if any of the parameters are not correct. It also stated that there should be no attempt to salvage the situation by coaching the student or trying to correct below 100 ft above ground level (agl). At density altitudes above 4,000 ft, the decision height should be increased to 200 ft above the ground or higher. The safety notice also indicated that practice should be limited to no more than three or four consecutive autorotations to maintain instructor focus and minimize student fatigue.

## History of Flight

Autorotation	Hard landing (Defining event)
Autorotation	Attempted remediation/recovery

## Flight instructor Information

<b>Certificate:</b>	Commercial; Flight instructor	<b>Age:</b>	52, Male
<b>Airplane Rating(s):</b>	None	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Helicopter	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Helicopter; Instrument helicopter	<b>Toxicology Performed:</b>	
<b>Medical Certification:</b>	Class 2 With waivers/limitations	<b>Last FAA Medical Exam:</b>	May 5, 2017
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	May 15, 2017
<b>Flight Time:</b>	(Estimated) 5889 hours (Total, all aircraft), 1142 hours (Total, this make and model), 54 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

## Student pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	38, Male
<b>Airplane Rating(s):</b>	None	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Helicopter	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	
<b>Medical Certification:</b>	Class 2 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	October 27, 2017
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	October 10, 2017
<b>Flight Time:</b>	(Estimated) 2200 hours (Total, all aircraft), 180 hours (Total, this make and model)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	ROBINSON HELICOPTER COMPANY	<b>Registration:</b>	N47WH
<b>Model/Series:</b>	R22 MARINER	<b>Aircraft Category:</b>	Helicopter
<b>Year of Manufacture:</b>	2003	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	3525
<b>Landing Gear Type:</b>	N/A; Ski	<b>Seats:</b>	2
<b>Date/Type of Last Inspection:</b>	Unknown	<b>Certified Max Gross Wt.:</b>	1370 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	219 Hrs at time of accident	<b>Engine Manufacturer:</b>	LYCOMING
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	O-360-J2A
<b>Registered Owner:</b>		<b>Rated Power:</b>	145 Horsepower
<b>Operator:</b>		<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KTRK, 5900 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	15:45 Local	Direction from Accident Site:	90°
Lowest Cloud Condition:	Scattered / 17000 ft AGL	Visibility	10 miles
Lowest Ceiling:	Broken / 24000 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	5 knots /	Turbulence Type Forecast/Actual:	None / None
Wind Direction:	290°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	30.17 inches Hg	Temperature/Dew Point:	10° C / -5° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Truckee, CA	Type of Flight Plan Filed:	None
Destination:	Truckee, CA	Type of Clearance:	VFR; Traffic advisory
Departure Time:		Type of Airspace:	Class D

## Airport Information

Airport:	TRUCKEE-TAHOE TRK	Runway Surface Type:	
Airport Elevation:	5904 ft msl	Runway Surface Condition:	Dry
Runway Used:		IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	Simulated forced landing

## Wreckage and Impact Information

Crew Injuries:	2 Serious	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	2 Serious	Latitude, Longitude:	39.319999, -120.13944(est)

## Administrative Information

Investigator In Charge (IIC):	Cornejo, Tealeye		
Additional Participating Persons:	Thom Webster; Robinson Helicopter Company; Torrance, CA Gerald Rose; Federal Aviation Administration; Reno, NV		
Original Publish Date:	April 6, 2022	Investigation Class:	3
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	<a href="https://data.nts.gov/Docket?ProjectID=96411">https://data.nts.gov/Docket?ProjectID=96411</a>		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).