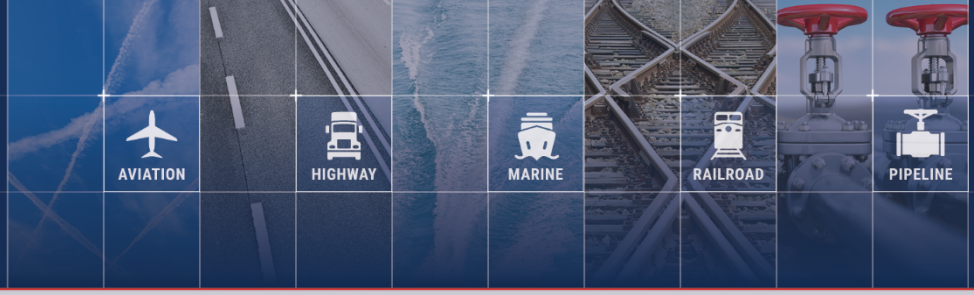

Aviation Investigation Factual Report

Location:	Farmington, Connecticut	**Accident Number:**	ERA12LA282
Date & Time:	April 14, 2012, 18:40 Local	**Registration:**	N1152W
Aircraft:	ROBINSON HELICOPTER R22 BETA	**Aircraft Damage:**	Substantial
Defining Event:	Loss of tail rotor effectiveness	**Injuries:**	2 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Factual Information

HISTORY OF FLIGHT

On April 14, 2012, about 1840 eastern daylight time, a Robinson R22 helicopter, N1152W, was substantially damaged following a loss of control and subsequent uncontrolled descent while approaching South Meadows Heliport (CT73), Farmington, Connecticut. The certificated private pilot and a passenger were seriously injured. Visual meteorological conditions prevailed, and no flight plan was filed for the flight, which originated from Chester Airport (SNC), Chester, Connecticut, around 1740, with the intended destination of CT73. The personal flight was conducted under the provisions of 14 Code of Federal Regulations Part 91.

According to the pilot, the helicopter departed SNC after it was serviced with 17 gallons of fuel. He completed a scenic flight lasting approximately one hour, before returning for landing at CT73. The heliport was a small paved pad on the east side of a large open field, surrounded by tall trees.

The approach was from the southeast on a northwesterly heading, and according to the pilot, the windsock "indicated a wind direction opposite" to the helicopter's flight path. He then initiated a turn to "enter the landing area" when he felt a bump in the tail rotor control [pedals]. The pilot added that he applied left pedal to compensate for a right yaw, and the helicopter immediately "started to rotate" at an increasing yaw rate with full left pedal applied. The pilot stated that the rotation stopped when he pushed the collective control "full down" and applied aft cyclic. The helicopter then descended through the trees and collided with terrain.

A witness at the heliport heard the helicopter approach and described the sound as "all fine." She said the sound changed, and then she heard a loud bang.

In a written statement, the pilot stated that the initial approach to CT73 was from the east to the west along an east-west road that was south of the field. He then turned the helicopter to the northwest "into the wind." However, examination of radar data revealed that the helicopter approached from the southwest, orbited an airport 2 miles south of CT73, and approached the helipad from the south. The helicopter was in a shallow, descending left turn to the northwest at 90 knots groundspeed, about 1 mile south of CT73 when the radar track terminated. From the point where the radar track terminated, a right turn to the north was required to align with the landing zone. The helicopter descended vertically through trees to ground contact about one-half mile directly south of the helipad.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with a rating for lighter-than-air balloon, and a

private pilot certificate with a rating for rotorcraft-helicopter. His most recent Federal Aviation Administration (FAA) third class medical certificate was issued March 30, 2011. The pilot reported 850 total hours of flight experience on that date. A review of the pilot's logbook revealed several incomplete entries, but suggested 798 total hours of rotorcraft experience.

AIRCRAFT INFORMATION

According to FAA and maintenance records, the helicopter was manufactured in 2006 and had accrued 1,825 total aircraft hours. Its most recent annual inspection was completed August 24, 2011 at 1,801 total aircraft hours.

METEOROLOGICAL INFORMATION

At 1853, the weather observation at Hartford-Brainard Airport (HFD), 9 miles east of the accident site included clear skies, temperature 19C, dewpoint -3 C, and winds from 190 at 8 knots. At 1753, the winds were from 190 at 7 knots, and at 1653, the winds were from 170 at 7 knots gusting to 15 knots.

At 1853, the weather observation at Meriden Markham Municipal airport, 13 miles south of the accident site included clear skies, temperature 18 C, dewpoint -2 C, and winds from 190 at 8 knots gusting to 16 knots. At 1753, the winds were from 180 at 10 knots gusting to 17 knots.

WRECKAGE AND IMPACT INFORMATION

FAA inspectors performed a preliminary examination of the helicopter at the accident site on the day of the accident. The examination revealed no pre-impact mechanical anomalies. The helicopter was removed from the site, and a detailed examination of the wreckage was scheduled.

On May 2, 2012, an NTSB investigator performed a detailed examination of the wreckage. The tail rotor output shaft was separated at the gear box, but remained attached by the control arm. The fracture surfaces at the gearbox separation were consistent with overload fracture. Control continuity was established from the cockpit to the main and tail rotors. One main rotor pitch-change link was fractured due to overload. The tail rotor push/pull tube was separated at the tailcone separation point.

The engine was rotated by hand at the cooling fan, and continuity was confirmed through the powertrain and valvetrain to the accessory section. Compression was confirmed using the thumb method.

The main fuel tank was compromised by impact, but continuity of the fuel system was confirmed throughout.

ADDITIONAL INFORMATION

Unanticipated Right Yaw (Loss of Tail Rotor Effectiveness)

The FAA issued Advisory Circular (AC) 90-95, Unanticipated Right Yaw in Helicopters, in February 1995. The AC stated that the loss of tail rotor effectiveness (LTE) was a critical, low-speed aerodynamic flight characteristic which could result in an uncommanded rapid yaw rate which does not subside of its own accord and, if not corrected, could result in the loss of aircraft control. It also stated, "LTE is not related to a maintenance malfunction and may occur in varying degrees in all single main rotor helicopters at airspeeds less than 30 knots."

Paragraph 6 of the AC covered conditions under which LTE may occur. It stated:

"Any maneuver which requires the pilot to operate in a high-power, low-airspeed environment with a left crosswind or tailwind creates an environment where unanticipated right yaw may occur."

Paragraph 8 of the AC stated:

"OTHER FACTORS...Low Indicated Airspeed. At airspeeds below translational lift, the tail rotor is required to produce nearly 100 percent of the directional control. If the required amount of tail rotor thrust is not available for any reason, the aircraft will yaw to the right."

Paragraph 9 of the AC stated:

"When maneuvering between hover and 30 knots: (1) Avoid tailwinds. If loss of translational lift occurs, it will result in an increased high power demand and an additional anti-torque requirement. (2) Avoid out of ground effect (OGE) hover and high power demand situations, such as low-speed downwind turns. (3) Be especially aware of wind direction and velocity when hovering in winds of about 8-12 knots (especially OGE). There are no strong indicators to the pilot of a reduction of translation lift... (6) Stay vigilant to power and wind conditions."

Vortex Ring State (Settling With Power)

According to the FAA Rotorcraft Flying Handbook, "Vortex ring state describes an aerodynamic condition where a helicopter may be in a vertical descent with up to maximum power applied, and little or no cyclic authority. The term 'settling with power' comes from the fact that the helicopter keeps settling even though full engine power is applied."

U.S Army Field Manual 1-203 defined Settling with Power as:

A condition in powered flight in which the [helicopter] settles in its own downwash.

Three things needed to get into settling with power:

1) Low airspeed
2) 20 to 100% of available engine power applied
3) A 300 foot per minute or greater rate of descent, with insufficient power remaining to retard the sink rate

Contributing factors for a loss of tail rotor effectiveness include:

1) High gross weight/[Density Altitude]
2) Low indicated airspeed
3) Power droop
4) Right downwind turns

Robinson Helicopter Safety Notice SN-34 AERIAL SURVEY AND PHOTO FLIGHTS -VERY HIGH RISK discussed the risks associated with low speed, out-of-ground-effect maneuvering in adverse wind conditions at less than 30 knots. An excerpt of the Safety Notice cited the following:

"While maneuvering, the pilot may lose track of airspeed and wind conditions. The helicopter can rapidly lose translational lift and begin to settle. An inexperienced pilot may raise the collective to stop the descent. This can reduce RPM thereby reducing power available and causing an even greater descent rate and further loss of RPM. Rolling on throttle will increase rotor torque but not power available due to the low RPM. Because tail rotor thrust is proportional to the square of RPM, if the RPM drops below 80% nearly one-half of the tail rotor thrust is lost and the helicopter will rotate nose right. Suddenly the decreasing RPM also causes the main rotor to stall and the helicopter falls rapidly while continuing to rotate. The resulting impact is usually fatal."

Pilot Information

Certificate:	Commercial; Private	**Age:**	59,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Balloon; Helicopter	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	March 30, 2011
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	1603 hours (Total, all aircraft), 5 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	ROBINSON HELICOPTER	**Registration:**	N1152W
Model/Series:	R22 BETA	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	2835
Landing Gear Type:	Skid	**Seats:**	2
Date/Type of Last Inspection:	August 24, 2011 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	24 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1825 Hrs at time of accident	**Engine Manufacturer:**	LYCOMING
ELT:	Installed, not activated	**Engine Model/Series:**	O-360-J2A
Registered Owner:	HELIKAT LLC	**Rated Power:**	145 Horsepower
Operator:	HELIKAT LLC	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	HFD,18 ft msl	**Distance from Accident Site:**	9 Nautical Miles
Observation Time:	18:53 Local	**Direction from Accident Site:**	86°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	190°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	19°C / -3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Chester, CT (SNC)	**Type of Flight Plan Filed:**	Unknown
Destination:	Farmington, CT (CT73)	**Type of Clearance:**	VFR
Departure Time:		**Type of Airspace:**	

Airport Information

Airport:	South Meadows Heliport CT73	**Runway Surface Type:**	
Airport Elevation:	200 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing;Straight-in

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Serious	**Latitude, Longitude:**	41.720001,-72.855552

Administrative Information

Investigator In Charge (IIC):	Rayner, Brian
Additional Participating Persons:	William DeKine; FAA/FSDO; Windsor Locks, CT Thom Webster; Robinson Helicopter Company; Torrance, CA
Report Date:	March 22, 2013
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=83388