



Aviation Investigation Final Report

Location:	Hemet, California	Accident Number:	WPR14TA357
Date & Time:	August 28, 2014, 10:55 Local	Registration:	N991SD
Aircraft:	Airbus Helicopters AS 350 B3	Aircraft Damage:	Substantial
Defining Event:	Hard landing	Injuries:	2 Minor
Flight Conducted Under:	Public aircraft		

Analysis

The flight instructor and pilot receiving instruction toward his commercial certificate worked for the Riverside County Sheriff's Department (RCSD) and were conducting a local instructional flight in the helicopter. However, the helicopter remained on alert status in the event of a need for response. The instructor reported that they started a maneuver to simulate a governor failure at 500 ft above ground level (agl) by switching the auto/manual switch to manual. With the switch in manual, the full authority digital engine control governor was disengaged, which required the pilot to use the twist grip throttle control on the collective to increase and decrease power. They then proceeded on an extended left downwind for 2.5 miles, and the pilot practiced manipulating the twist grip. The pilot then turned onto the base leg, turned from the base to final leg, started descending, and reduced the throttle input (rolled off the throttle). As the helicopter approached the runway threshold about 50 to 100 ft agl, the instructor noticed that the rotor rpm was decreasing a little more than he expected. He rolled the throttle on but noticed that the rotor rpm was not increasing. While the helicopter was about 50 ft agl and over the runway threshold, the flight instructor noticed that it was quickly descending and that the rotor rpm was continuing to decrease. His attempts to increase the rotor rpm by pulling aft cyclic and lowering the collective were unsuccessful. The helicopter then impacted the runway surface hard, rotated left 180 degrees, rolled over, and came to rest on its left side facing northeast. A postaccident examination of the airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.

The pilot was the first RCSD pilot to obtain only a private certificate from an outside vendor and then work on getting a commercial certificate with an RCSD flight instructor. There was no formal training syllabus, and the pilot did not know before the flight what maneuvers were to be performed. After completing in-flight simulated instrument work and with the helicopter still running on the ground, the instructor briefed the private pilot on the simulated governor failure maneuver; however, he did not demonstrate the maneuver in flight before he had the pilot perform it. Further, the instructor did not provide the pilot with an opportunity to adequately practice coordinating movements of the collective

and the twist grip throttle before attempting a landing, likely because he had been talking to dispatch since the beginning of the maneuver.

It is likely that the instructor's failure to demonstrate the maneuver and to provide the pilot with adequate opportunity to practice manipulating the twist grip throttle before attempting a landing resulted in the pilot mismanaging the twist grip throttle during the final approach, which led to a decay in rotor rpm. Further, it is likely that the instructor's inadequate supervision and delayed remedial action during the final approach resulted in the unsuccessful performance of the maneuver.

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 adequately brief and demonstrate the simulated emergency procedure to the pilot under instruction and his delayed remedial action and inadequate supervision during the maneuver, which resulted in an excessive sink rate and a hard landing.

Findings

Personnel issues	Monitoring other person - Instructor/check pilot
Aircraft	Prop/rotor parameters - Not attained/maintained
Personnel issues	Use of equip/system - Instructor/check pilot
Personnel issues	Delayed action - Instructor/check pilot
Personnel issues	(general) - Instructor/check pilot
Organizational issues	(general) - Operator

Factual Information

History of Flight

Approach-VFR pattern downwind	Simulated/training event
Landing-flare/touchdown	Hard landing (Defining event)
Post-impact	Roll over

HISTORY OF FLIGHT

On August 28, 2014, about 1055 Pacific daylight time, an Airbus Helicopters AS 350 B3, N991SD, landed hard and rolled onto its side at Hemet-Ryan Airport, Hemet, California. The Riverside County Sheriff's Department (RCSD) was operating the helicopter under the provisions of 14 Code of Federal Regulations (CFR) Part 91. The deputy flight instructor (FI) and the deputy private pilot under instruction (PUI) sustained minor injuries. The helicopter sustained substantial damage to the airframe. The local instructional flight departed Hemet about 1040. Visual meteorological conditions (VMC) prevailed, and no flight plan had been filed.

The FI reported that he and the PUI started a maneuver to simulate a governor failure at 500 feet above ground level (agl) by switching the auto/manual switch to manual. They proceeded on an extended left downwind to runway 23 for 2.5 miles before turning base. They turned base to final, started descending, and reduced the throttle input (rolled off the throttle).

As the helicopter approached the runway threshold at 50 to 100 feet agl, the FI noticed that the rotor revolution per minute (rpm) was decreasing a little more than he expected. He attempted to roll the throttle past the limit switch, but noticed that he was not gaining any additional rpm. About 50 feet agl over the runway threshold, he noticed that the helicopter was descending at a faster rate of descent, and that the rotor rpm continued to decay. He attempted to regain rotor rpm by pulling aft cyclic and lowering the collective, but was unsuccessful in increasing rotor rpm. He noticed that as he moved the cyclic forward to a level attitude, he felt a "resistance" in the movement, and had trouble getting the cyclic to move forward.

The helicopter then impacted the surface of the runway very hard, spun to the left, and came to rest on its left side facing northeast, the same direction from which it approached; it had rotated to the left 180 degrees.

The FI stated that there had been other instances with the cyclic being restricted in this make/model helicopter.

PERSONNEL INFORMATION

FI

The operator reported that the 44-year-old FI held a commercial pilot certificate with ratings for airplane single-engine land, single-engine helicopter, and instrument airplane. The pilot held a FI certificate with ratings for airplane single-engine land and helicopter.

The FI held a second-class medical certificate issued on August 12, 2014. It had the limitations that the pilot must have glasses available for near vision.

The operator reported that the FI had a total flight time of 2,542 hours. He logged 95 hours in the previous 90 days, and 18 in the previous 30 days. He had 1,973 hours in this make and model. He completed a biennial flight review on December 12, 2013.

PUI

The operator reported that the PUI held a private pilot certificate with a rating for single-engine helicopter. The PUI held a second-class medical certificate issued on May 16, 2014. It had the limitations that the pilot must wear corrective lenses.

The operator reported that the PUI had a total flight time of 259 hours. He logged 121 hours in the previous 90 days, and 49 in the previous 30 days. He had 77 hours in this make and model. He completed a biennial flight review on July 30, 2014.

AIRCRAFT INFORMATION

The helicopter was a Eurocopter AS350B3, serial number 3325. The operator reported that the helicopter had a total airframe time of 6,312 hours at the time of the accident. It was maintained on a continuous airworthiness program, and the last inspection was on July 25, 2014.

The engine was a Turbomeca Arriel 2B, serial number 22151. Total time recorded on the engine at the time of the accident was 6,026 hours, and time since overhaul was 2,526 hours.

TESTS AND RESEARCH

Investigators from the NTSB, FAA, Eurocopter, and Turbomeca examined the wreckage at the Riverside County Sheriff's hangar in Hemet, California, on September 19, 2014. A full report is contained within the public docket for this accident.

The airframe and engine were examined with no mechanical anomalies identified.

During the airframe examination, there was continuity of the main rotor to the free turbine. Continuity was established from the main rotor system to the tail rotor drive system.

Cyclic control continuity was established, but stiff due to binding near the rotor mast; the fore/aft push/pull rod under the cabin floor had a small upward dent. The cyclic friction was set to midrange.

The collective was also stiff from binding of the push-pull rods near the rotor mast area, however, continuity was established. The right side collective head was damaged from impact forces.

With power off, the throttle was rolled with no binding, ratcheting, or kinking. No binding was felt in the manual emergency throttle when moved from minimum to maximum.

All electrical connections were good.

The engine examination revealed that the gas generator turned freely when manually rotated; there was no binding. The free turbine turned freely by hand; continuity was confirmed to the main rotor transmission.

The transmission shaft between the engine and main transmission was intact with no visible damage. Continuity through the reduction gearbox, as well as the accessory gearbox, was confirmed.

The pilot's helmets were scratched and abraded during the accident. It was noted that the issued RCSD flight helmets were MSA Gallet model LH250, which had been selected for use by the department without a documented selection process. The damaged helmets were taken out of service. After completing the unit evaluation of available replacement helicopter helmets, RCSD decided to issue to a different model.

There are no FAA standards for helicopter helmet protection so it is up to the individual pilot or organization to determine what safety standards are best for them. The US military, through the US Army Aeromedical Research Laboratories (USAARL), has studied numerous crash scenarios and the biodynamics involved in rotary wing accidents. They determined the best combination of mission effectiveness, impact protection, user comfort, and weight to develop helmet specifications. The current US military standard is referred to as Military Specification (MilSpec) FNS/PD 96-18. At this time, there is only one military helmet manufactured to these safety standards. There is one commercial version that is manufactured that allows slightly higher impact forces.

There are no commercial equivalent specifications to these military specifications. This is in contrast to the ANSI 290.1 specification for motor vehicular use, or the Snell standards for race car helmets. No known agencies exist that have accumulated the body of biodynamics and physiological data that USAARL used in development of the current military specifications.

ADDITIONAL INFORMATION

Prior to the accident, all RCSD pilots obtained their private and commercial pilot certificates from outside vendors. The PUI was the first to obtain only the private pilot from the outside vendor, and then work on the commercial certificate with an RCSD instructor. The outside vendor had a syllabus, so the student could prepare for the next flight. The FI had a lesson plan, but the student would not know what the next flight was to include until the preflight briefing. There was no standard operating procedures (SOP) manual, training manual, or Safety Management System (SMS) in place. The RCSD did have a policy and procedures manual that stated that all training should be done with an FI on board.

The first part of the flight was to complete 0.5 hours of simulated instrument time. The crew did that, and flew back to the home base airport. While on the ground without shutting down, the FI briefed the simulated governor failure maneuver. The brief noted that once in the manual mode, the PUI would need to slide a red button to the forward position to be able to control the twist grip, which would be stiff. The FI would be on the controls since it would be the PUI's first attempt. The FI had done about 20 governor failure simulations previously with no issues, and they were doing the procedure from memory. The PUI

acknowledged an understanding of the procedure and that the FI would be on the controls to assist if needed. The FI went to manual mode just as the helicopter entered downwind.

The helicopter was configured for training mode with a training pilot flying. The helicopter was also set up for patrol, as they were going to use the helicopter for patrol after the training. Even on training missions, the helicopter had to be available for high priority calls. Immediately after liftoff, the FI was in contact with dispatch regarding a photo mission. He continued to talk to dispatch through the downwind leg, and stopped when they turned the helicopter onto final approach.

Post-Accident Changes

Following the accident, the RCSD sent the PUI back to the vendor for commercial pilot certificate completion.

RCSD implemented a computer-based SMS system for their operations.

Pilots were to attend yearly factory simulator training.

RCSD sent two pilots to the Airbus Maintenance Test Pilot course, and will continue to send one per year.

RCSD purchased helicopter rated helmets.

The RCSD Safety Officer organized a yearly safety stand-down.

Flight instructor Information

Certificate:	Commercial; Flight instructor; Private	Age:	44, Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	Helicopter	Restraint Used:	5-point
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane single-engine; Helicopter	Toxicology Performed:	No
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	August 12, 2014
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	December 2, 2013
Flight Time:	2542 hours (Total, all aircraft), 1973 hours (Total, this make and model), 2440 hours (Pilot In Command, all aircraft), 95 hours (Last 90 days, all aircraft), 18 hours (Last 30 days, all aircraft)		

Student pilot Information

Certificate:	Private	Age:	42, Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	5-point
Instrument Rating(s):	None	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	May 16, 2014
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	July 30, 2014
Flight Time:	259 hours (Total, all aircraft), 77 hours (Total, this make and model), 141 hours (Pilot In Command, all aircraft), 121 hours (Last 90 days, all aircraft), 49 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Airbus Helicopters	Registration:	N991SD
Model/Series:	AS 350 B3	Aircraft Category:	Helicopter
Year of Manufacture:	2000	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	3325
Landing Gear Type:	Skid	Seats:	6
Date/Type of Last Inspection:	July 25, 2014 Continuous airworthiness	Certified Max Gross Wt.:	4960 lbs
Time Since Last Inspection:		Engines:	1 Turbo shaft
Airframe Total Time:	6312 Hrs at time of accident	Engine Manufacturer:	Turbomeca
ELT:	C126 installed, not activated	Engine Model/Series:	Ariel 2B
Registered Owner:	County of Riverside	Rated Power:	843 Horsepower
Operator:	County of Riverside	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KF70,1512 ft msl	Distance from Accident Site:	
Observation Time:	10:55 Local	Direction from Accident Site:	
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	3 knots /	Turbulence Type Forecast/Actual:	/ Unknown
Wind Direction:	200°	Turbulence Severity Forecast/Actual:	/ Unknown
Altimeter Setting:	30.02 inches Hg	Temperature/Dew Point:	32°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Hemet, CA (HMT)	Type of Flight Plan Filed:	None
Destination:	Hemet, CA (HMT)	Type of Clearance:	None
Departure Time:	10:40 Local	Type of Airspace:	

Airport Information

Airport:	Hemet-Ryan Airport HMT	Runway Surface Type:	Asphalt
Airport Elevation:	1512 ft msl	Runway Surface Condition:	Dry
Runway Used:	23	IFR Approach:	None
Runway Length/Width:	4314 ft / 100 ft	VFR Approach/Landing:	Simulated forced landing

Wreckage and Impact Information

Crew Injuries:	2 Minor	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Minor	Latitude, Longitude:	33.734165,-117.022499(est)

Administrative Information

Investigator In Charge (IIC):	Plagens, Howard
Additional Participating Persons:	Roy Peters; FAA FSDO; Riverside, CA
Original Publish Date:	April 20, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=89975

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