National Transportation Safety Board
Aviation Accident Final Report

Location:	San Diego, California	**Accident Number:**	WPR10TA016
Date & Time:	October 12, 2009, 11:00 Local	**Registration:**	N613BP
Aircraft:	MD Helicopter 600	**Aircraft Damage:**	Substantial
Defining Event:	Hard landing	**Injuries:**	1 Minor, 1 None
Flight Conducted Under:	Public aircraft		

Analysis

According to the pilot-in-command (PIC), he was performing autorotations at the lower part of the main rotor rpm green arc in part due to weight considerations. Upon entering the accident autorotation, he maintained an airspeed between 85-90 knots in the hope that extra speed would allow a more aggressive deceleration flare prior to touchdown, which should in turn further slow the rate of descent and forward speed. The helicopter's rate of descent was high, and as the PIC turned the helicopter onto the runway heading it was apparent to him that the rate of descent was excessive and that he was too low to execute either a proper deceleration flare or perform a power recovery. He attempted to level the helicopter as much as possible prior to impact to minimize the damage to the helicopter and prevent injury. The helicopter landed hard with the left skid contacting the runway first. The left skid collapsed, damaging the outboard landing gear damper attachment structure. The helicopter slid about 100 yards before coming to a stop. According to the manufacturer, the main rotor rpm range is 90 percent to 106.4 percent. At the helicopter's weight and the density altitude on the day of the accident, the main rotor rpm during the autorotation should have been above the 106.4 percent limit (red line), requiring the pilot to increase collective pitch to maintain the rotor rpm within limits. Performing autorotations at the lower part of the green arc provides less availability of rotor energy to perform an autorotation landing. The pilot should have recognized that he was not achieving the required main rotor rpm for the autorotations and terminated the maneuvers. The helicopter was within weight and balance limits.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain adequate main rotor rpm during an autorotation, which resulted in a hard landing.

Findings

Personnel issues	Aircraft control - Pilot
Aircraft	Airspeed - Not attained/maintained
Aircraft	Prop/rotor parameters - Not attained/maintained

Factual Information

HISTORY OF FLIGHT

On October 12, 2009, at 1100 Pacific daylight time, a MD Helicopter, Inc. (MDHI) 600N, N613BP, landed hard following a practice 180-degree autorotation at Gillespie Field Airport (SEE), San Diego, California. The Department of Homeland Security - Customs and Border Protection (CBP) operated the helicopter under the provisions of Title 14 Code of Federal Regulations Part 91 as a public-use training flight. The MDHI factory training pilot (FTP) was not injured and the CBP standardization instructor pilot received minor injuries. The helicopter sustained substantial damage during the hard landing as the skids spread and the aft portion of the skids penetrated the fuselage. The flight had departed Brown Field Municipal Airport (SDM), San Diego, California, at 1000, and no flight plan had been filed.

According to the MDHI factory training pilot's written statement to the National Transportation Safety Board (NTSB), he was acting as the pilot-in-command (PIC) for the training flight with the CBP standardization instructor pilot (IP). The purpose of the flight was to evaluate the FTP's suitability to conduct autorotation training for the other nine CBP pilots. They departed from Brown Field with a helicopter gross weight of 3,570 pounds to do autorotation training. The PIC stated that he had not flown in a CBP 600N and the IP had not flown in the 600N for over 6 months. While en route to SEE, the PIC noted visual flight rule (VFR) conditions with light winds and 10+ miles of visibility. They each flew one normal traffic pattern to familiarize themselves with the helicopter's characteristics before commencing with the training.

After performing several hovering autorotations, they felt comfortable enough to perform full touchdown autorotations. The PIC performed the first full touchdown autorotation with no issues. He indicated that the fuel at that point was between 600 to 650 pounds and the helicopter weight as now about 3,450 pounds; the main rotor rpm was remaining at the lower part of the green arc, even going below the green arc occasionally if the collective was increased during the descent. He stated that his first approach was deliberately fast. The helicopter slid about 50 yards after touchdown.

The PIC reported that they each performed two touchdown autorotations, which resulted in the helicopter sliding about 50 yards. He indicated that going slower prior to touchdown would have likely increased the risk of damaging the helicopter. He told the IP that he would perform the first 180-degree autorotation at an entry altitude of 500 feet above ground level (agl). The PIC's previous experience doing autorotations in the 600N led him to believe that an entry altitude of 500 feet agl was a safe altitude, even with the extra weight and higher touchdown speeds that they were experiencing on this flight.

Upon entering the accident autorotation, the PIC maintained an airspeed between 85-90 knots, in the hope that it would allow a more aggressive deceleration flare prior to touchdown, which should in turn further slow the rate of descent and forward speed. The helicopter's rate of descent was high, and as the PIC rolled the helicopter out onto runway heading, it was apparent to him that the rate of descent was excessive and that they were too low to execute a

proper deceleration flare or perform a power recovery. He attempted to level the helicopter as much as possible prior to impact to minimize the damage to the helicopter and prevent injury. The helicopter landed hard with the left side skid contacting the runway first. The left skid collapsed and the helicopter slid about 100 yards before coming to a stop.

Witnesses on the ground were videotaping the accident flight (video is attached to the docket).

AIRCRAFT INFORMATION

The 1999 MD Helicopter, Inc., model 600N, N613BP, serial number RN045, was equipped with a Rolls-Royce 250-C47M turbo shaft engine, serial number CAE-847825. The helicopter total time at the time of the accident was recorded as 3,192.5 hours; the last maintenance performed, including weighing the helicopter was October 7, 2009, with the last 100-hour inspection performed on April 5, 2009.

METEOROLOGICAL INFORMATION

Gillespie Field, field elevation 388 feet, recorded terminal aviation routine weather report (METAR) at the time of the accident as overcast sky conditions, a temperature of 68 degrees Fahrenheit, and calm winds.

Nearby Montgomery Field Airport (MYF), San Diego, 9 nautical miles west of Gillespie, at a field elevation of 427 feet, reported METAR at 0953 as few clouds at 3,400 feet and overcast sky conditions of 4,400 feet; winds from 140 degrees at 6 knots; temperature 17 degrees Celsius; dew point 09 degrees Celsius; and altimeter setting of 29.89 inches of Mercury.

TESTS AND RESEARCH INFORMATION

Examination of the helicopter did not identify any pre impact malfunction; investigators were able to establish flight control continuity. The helicopter is a NOTAR (no tail rotor) design; when rotated, the main rotor transmission, NOTAR transmission, and NOTAR fan assembly rotated freely. No visible damage was observed to the tail boom, NOTAR empennage, or NOTAR fan blades. The helicopter sustained damage to the left side of the airframe in the area of the outboard landing gear damper attachment structure. While the left landing gear struts were not broken, it had spread with the landing gear damper attachment structure torn and the structure deformed.

According to CSP-HMI-2, chapter 18-10-60, table 502, titled Autorotation Percentage Chart, ensures the sufficient autorotation rpm is available at minimum gross weight. According to the manufacturer's representative, the main rotor rpm range is 90 percent to 106.4 percent. At the helicopter's weight and the density altitude, the main rotor rpm should have been above the 106.4 percent limit (red line), requiring the pilot to increase collective pitch to maintain the rpm within limits. The manufacturer's representative indicated that with the main rotor rpm not fully available to the pilot, the autorotation capability is diminished.

Weight and balance information for the helicopter on the day of the accident had an operational weight of 3,406 pounds with a longitudinal center of gravity (CG) of 92.7 inches.

The certificated maximum gross weight of the helicopter was 4,100 pounds and the longitudinal CG limits are 91 to 96 inches.

History of Flight

Landing-flare/touchdown	Hard landing (Defining event)

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	56,Male
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	February 1, 2009
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	October 8, 2009
Flight Time:	11100 hours (Total, all aircraft), 180 hours (Total, this make and model), 9600 hours (Pilot In Command, all aircraft), 100 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Other flight crew Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	62,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
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:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	April 29, 2009
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	October 5, 2009
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	MD Helicopter	**Registration:**	N613BP
Model/Series:	600 N	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	RN045
Landing Gear Type:	Skid	**Seats:**	7
Date/Type of Last Inspection:	April 5, 2009 AAIP	**Certified Max Gross Wt.:**	4100 lbs
Time Since Last Inspection:	40 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	3193 Hrs at time of accident	**Engine Manufacturer:**	ALLISON
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	250-C47
Registered Owner:		**Rated Power:**	650 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	SEE,388 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	10:55 Local	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Scattered / 4000 ft AGL	**Visibility**	7 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.87 inches Hg	**Temperature/Dew Point:**	18°C / 8°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	San Diego, CA (SDM)	**Type of Flight Plan Filed:**	Company VFR
Destination:	San Diego, CA (SEE)	**Type of Clearance:**	VFR
Departure Time:	10:00 Local	**Type of Airspace:**	

Airport Information

Airport:	Gillespie Field Airport SEE	**Runway Surface Type:**	Asphalt
Airport Elevation:	388 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	17	**IFR Approach:**	None
Runway Length/Width:	4147 ft / 100 ft	**VFR Approach/Landing:**	Simulated forced landing;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 Minor, 1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor, 1 None	**Latitude, Longitude:**	32.82611,-116.972221

Administrative Information

Investigator In Charge (IIC):	Cornejo, Tealeye
Additional Participating Persons:	John McCarthy; Department of Homeland Security; Washington, DC John Hobby; McDonnell Douglas Helicopter; Mesa, AZ
Original Publish Date:	July 18, 2011
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=74890

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