National Transportation Safety Board
Aviation Accident Final Report

Location:	Aurora, CO	**Accident Number:**	DEN02LA019
Date & Time:	01/11/2002, 0840 MST	**Registration:**	N902AM
Aircraft:	McDonnell Douglas MD 902	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	3 None
Flight Conducted Under:	Part 91: General Aviation - Instructional		

Analysis

An instructor pilot was conducting transition training and was demonstrating emergency procedures on anti-torque malfunctions and loss of thrust/fixed pedal settings. After reaching a final approach position at approximately 100 feet agl, he began to demonstrate how to complete an approach with an "Anti-Torque Failure - Fixed Thruster Setting." He established the helicopter on a "shallow" approach angle with a deceleration attitude of approximately 15 to 20 degrees nose up and approximately 300 feet per minute rate of descent. The flight profile "appeared normal" until about 50 to 60 feet above ground level when the helicopter started to descend at a higher than desired rate for demonstration. The pilot applied collective lever control and a shudder was felt in the rotor system, followed by an increase in descent rate. Collective lever application could not arrest the descent. The helicopter struck the ground hard in a nose high attitude, ballooned into the air approximately 3 to 5 feet and slowly rotated approximately 360 degrees. The "thruster" was jammed in the neutral position, but he had no problem landing the helicopter from a hover with power. The helicopter sustained substantial damage to the Notar Anti-Torque rotating thruster cone, the aft cross tube, and both landing gear skids.

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 aircraft control due to inadvertent settling with power resulting in a hard landing. Contributing factors include the improperly planned approach, the high density altitude, and the encounter with vortex ring state.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: DESCENT

Findings
1. (F) WEATHER CONDITION - HIGH DENSITY ALTITUDE
2. (F) PLANNED APPROACH - IMPROPER - PILOT IN COMMAND(CFI)
3. (F) VORTEX RING STATE - ENCOUNTERED - PILOT IN COMMAND(CFI)
4. (C) SETTLING WITH POWER - INADVERTENT - PILOT IN COMMAND(CFI)

Occurrence #2: HARD LANDING
Phase of Operation: DESCENT - UNCONTROLLED

Findings
5. TERRAIN CONDITION - OPEN FIELD

Factual Information

On January 11, 2002, at approximately 0840 mountain standard time, a McDonnell Douglas MD 902 helicopter, N902AM, operated by MD Helicopters, was substantially damaged during a hard landing in a field near Aurora, Colorado. The flight instructor, a pilot receiving instruction, and one passenger were not injured. Visual meteorological conditions prevailed, and no flight plan was filed for this local training flight being conducted under Title 14, CFR Part 91. The flight originated from Centennial Airport, Englewood, Colorado, at approximately 0750.

According to the instructor, he was conducting transition training and was demonstrating emergency procedures on anti-torque malfunctions and loss of thrust/fixed pedal settings. After reaching final approach at approximately 80 knots forward airspeed, and at approximately 100 feet above ground level, he began to demonstrate how to complete an approach with a loss of directional control or "Anti-Torque Failure- Fixed Thruster Setting." He identified an intended termination area, and established the helicopter on a "shallow" approach angle with a deceleration attitude of approximately 15 to 20 degrees nose up and approximately 300 feet per minute rate of descent. The flight profile "appeared normal" until about 50 to 60 feet above ground level when the helicopter started to descend at a higher than desired rate for demonstration. The pilot applied collective lever control and a shudder was felt in the rotor system, followed by an increase in descent rate. Collective lever application could not arrest the descent. The helicopter struck the ground hard in a nose high attitude, ballooned into the air approximately 3 to 5 feet and slowly rotated approximately 360 degrees. The "thruster" was jammed in the neutral position and the "fan would stall making popping sounds," but he had no problem landing the helicopter from a hover with power. The helicopter sustained substantial damage to the Notar (No Tail Rotor) Anti-Torque rotating thruster cone, the aft cross tube, and both landing gear skids.

The pilot stated that he encountered "vortex-ring-state" while trying to slow the helicopter, and that it "put me on the ground at a very high rate of descent." The initial higher rate of descent may have been due to the higher density altitude at the training site than is normally encountered at his home station in Mesa, Arizona.

At 0853, the reported weather at Centennial Airport (APA), Englewood, Colorado (approximately 12 nautical miles west of the accident site, and at an elevation of 5,883 feel msl) was, wind, 220 degrees at 8 knots; visibility, 10 statute miles; sky condition, few at 12,000 feet; temperature, 7 degrees C. (44.6 degrees F.); dew point, minus 12 degrees C. (10.4 degrees F.); altimeter setting, 30.24. The calculated density altitude was 6,022 feet msl.

Flight Instructor Information

Certificate:	Flight Instructor; Commercial	**Age:**	41, Male
Airplane Rating(s):	Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last Medical Exam:**	08/16/2001
Occupational Pilot:		**Last Flight Review or Equivalent:**	02/18/2000
Flight Time:	9436 hours (Total, all aircraft), 229 hours (Total, this make and model), 9200 hours (Pilot In Command, all aircraft), 146 hours (Last 90 days, all aircraft), 37 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Co-Pilot Information

Certificate:	Airline Transport	**Age:**	46, Male
Airplane Rating(s):	Single-engine Land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last Medical Exam:**	08/08/2001
Occupational Pilot:		**Last Flight Review or Equivalent:**	08/30/2001
Flight Time:	3933 hours (Total, all aircraft), 4 hours (Total, this make and model), 2856 hours (Pilot In Command, all aircraft), 4 hours (Last 90 days, all aircraft), 4 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	McDonnell Douglas	**Registration:**	N902AM
Model/Series:	MD 902	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	900-00092
Landing Gear Type:	Skid	**Seats:**	5
Date/Type of Last Inspection:	01/03/2002, 100 Hour	**Certified Max Gross Wt.:**	6250 lbs
Time Since Last Inspection:	38.01 Hours	**Engines:**	2 Turbo Shaft
Airframe Total Time:	38.01 Hours	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Not installed	**Engine Model/Series:**	PCE-BG0027
Registered Owner:	Zion Credit Corporation	**Rated Power:**	800 hp
Operator:	MD Helicopters	**Air Carrier Operating Certificate:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	APA, 5883 ft msl	**Observation Time:**	0853 MST
Distance from Accident Site:	12 Nautical Miles	**Direction from Accident Site:**	80°
Lowest Cloud Condition:	Scattered / 150 ft agl	**Temperature/Dew Point:**	3°C / -12°C
Lowest Ceiling:	Broken / 250 ft agl	**Visibility**	10 Miles
Wind Speed/Gusts, Direction:	8 knots, 220°	**Visibility (RVR):**	
Altimeter Setting:	30.24 inches Hg	**Visibility (RVV):**	
Precipitation and Obscuration:			
Departure Point:	Englewood, CO (APA)	**Type of Flight Plan Filed:**	None
Destination:	(APA)	**Type of Clearance:**	None
Departure Time:	0750 MST	**Type of Airspace:**	Class E

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 None	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	James F Struhsaker	**Adopted Date:**	12/06/2002
Additional Participating Persons:	Bruce Hanson; FAA FSDO; Denver, CO		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		