Aviation Investigation Final Report

Location:	Danville, West Virginia	**Accident Number:**	NYC06LA175
Date & Time:	July 15, 2006, 09:15 Local	**Registration:**	N5691B
Aircraft:	Enstrom 280C	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Minor
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

Approximately 7 minutes after takeoff, the pilot of the helicopter heard a "loud snap," and experienced a 5 to 10 degree right yaw. This occurred a second time, 5 to 8 seconds later. The pilot declared an emergency and elected to make a precautionary landing. During the approach, he experienced a third snap sound and yaw movement. The helicopter was at an airspeed below 20 knots, and about 8 to 10 feet above the ground, when the pilot heard a bang, and felt ground contact. The helicopter rolled to the left, and the main rotor blades contacted the ground. Examination of the helicopter confirmed drive train continuity to the main and tail rotor drive shafts. A ground scar, consistent with tail rotor ground contact, was observed about 60 feet from the main wreckage. The tail rotor gear box, drive shaft and blade assembly were located about 250 feet from the main wreckage. Examination of the tail rotor gearbox and adjacent components did not reveal any preexisting damage; however, it also did not reveal any indications of rotational damage. Examination of the override clutch assembly, which drove both the main transmission and the tail rotor system, revealed preexisting damage that occurred at an undeterminable time prior to the accident. The accident helicopter was involved in a previous hard landing accident about 13 months, and 87 hours of operation prior, during which, it had a tail rotor strike, and a fractured tail rotor drive shaft. The override clutch assembly was not removed for inspection after that accident; nor was it specifically required to be removed and inspected per the manufacturer's maintenance guidelines for "Special Inspection for Sudden Stoppage, Main and/or Tail Rotor Blade Strikes."

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A partial failure of the override clutch assembly. A contributing factor to the accident was the manufacturer's inadequate inspection procedures of the override clutch assembly following a

tail rotor strike.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CRUISE - NORMAL

Findings
1. (C) ROTOR DRIVE SYSTEM,CLUTCH ASSEMBLY - FAILURE,PARTIAL
2. (F) MAINTENANCE,SERVICE BULLETIN/LETTER - INADEQUATE - MANUFACTURER

Occurrence #2: HARD LANDING
Phase of Operation: EMERGENCY LANDING

Findings
3. TERRAIN CONDITION - GROUND

Factual Information

On July 15, 2006, about 0915 eastern daylight time, an Enstrom 280C, N5691B, was substantially damaged during a precautionary landing in Danville, West Virginia. The certificated commercial pilot sustained minor injuries. Visual meteorological conditions prevailed and no flight plan was filed for the flight that departed the Logan County Airport (6L4), Logan, West Virginia, destined for the Greater Portsmouth Regional Airport, Portsmouth (PMH), Ohio. The solo cross-country instructional flight was conducted under 14 Code of Federal Regulations Part 91.

According to his written statement, the pilot said he heard a "loud snap" and experienced a 5 to 10 degree right yaw, approximately 7 minutes after takeoff. Approximately 5 to 8 seconds later, he heard a second snapping sound, and again experienced a 5 to 10 degree right yaw. The pilot declared an emergency and elected to perform a precautionary landing at a strip mine. During the approach, he experienced a third snap sound and yaw movement. The helicopter was at an airspeed below 20 knots, and about 8 to 10 feet above the ground, when the pilot heard a bang, and felt ground contact. The helicopter rolled to the left, and the main rotor blades contacted the ground.

Examination of the helicopter was conducted by a Federal Aviation Administration (FAA) inspector and representatives from Enstrom Helicopter. Drive train continuity was confirmed to the main and tail rotor drive shafts. A ground scar, consistent with tail rotor ground contact, was observed about 60 feet from the main wreckage. The tail rotor gear box, drive shaft and blade assembly were located about 250 feet from the main wreckage. The tail rotor assembly, 90-degree gearbox and the override clutch assembly were retained for further examination.

Examination of the tail rotor gearbox and adjacent components at the National Transportation Safety Board Materials Laboratory, Washington DC, did not reveal any preexisting damage or failures. In addition, the examination did not reveal any indications of rotational damage.

The override clutch assembly, which drove both the main transmission and the tail rotor system, was removed and examined at its manufacturer, under the supervision of an FAA inspector. According to the manufacturer's teardown report, damage was found in the clutch assembly that was consistent with impact damage sustained during the accident; however, damage was also found that was consistent with preexisting damage that occurred at an undeterminable time prior to the accident. The override clutch assembly had accumulated approximately 1,804.6 hours since new, and had a time between overhaul (TBO) interval of 2,400 hours.

The accident helicopter was involved in a previous hard landing accident on August 12, 2005, during which, it experienced a tail rotor strike, and a fractured tail rotor drive shaft. According

to maintenance records, the override clutch assembly was not removed for inspection after that accident. Review of the helicopter's maintenance manual did not reveal any information calling for an inspection of the override clutch assembly after a tail rotor blade strike. Enstrom service information letter (SIL) No. 0088, "Special Inspection for Sudden Stoppage, Main and/or Tail Rotor Blade Strikes" was in effect at the time of the accident; however, the SIL required that the override clutch assembly be inspected only during main rotor strikes and or sudden stoppage. According to the maintenance manual, SIL's were to be considered part of the maintenance manual, and were used to transmit information, recommendations, and general service instructions to the customer. The clutch assembly would not have been disassembled and inspected during routine 100-hour and annual inspection maintenance intervals.

The helicopter had been operated approximately 87 hours since the previous accident. The override clutch assembly teardown report further stated that because the clutch assembly was not disassembled and inspected after the tail strike in August 2005, it was not possible to determine the amount of internal damage that the clutch assembly sustained at the time of that event, and may have accumulated during the subsequent hours of operation.

The pilot held a commercial pilot certificate, with ratings for single and multiengine land airplanes, and was training for a rotorcraft rating with private pilot privileges. He reported 1,060 hours of total flight experience, which included about 30 hours in helicopters.

Student pilot Information

Certificate:	Commercial	**Age:**	52,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	June 1, 2005
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	1060 hours (Total, all aircraft), 27 hours (Total, this make and model), 25 hours (Last 90 days, all aircraft), 8 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Enstrom	**Registration:**	N5691B
Model/Series:	280C	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	1180
Landing Gear Type:	Skid	**Seats:**	3
Date/Type of Last Inspection:	June 1, 2006 100 hour	**Certified Max Gross Wt.:**	2350 lbs
Time Since Last Inspection:	11 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1804 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Not installed	**Engine Model/Series:**	HIO-360-EIAD
Registered Owner:	Marpat Aviation LLC	**Rated Power:**	205 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:	CRW,981 ft msl	**Distance from Accident Site:**	24 Nautical Miles
Observation Time:	09:54 Local	**Direction from Accident Site:**	30°
Lowest Cloud Condition:	Scattered / 800 ft AGL	**Visibility**	7 miles
Lowest Ceiling:	Overcast / 1500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	250°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.06 inches Hg	**Temperature/Dew Point:**	24°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Logan, WV (6L4)	**Type of Flight Plan Filed:**	None
Destination:	Portsmouth, OH (PMH)	**Type of Clearance:**	None
Departure Time:	09:05 Local	**Type of Airspace:**	

Airport Information

Airport:	NONE	**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing;Precautionary landing

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor	**Latitude, Longitude:**	38.083332,-80.83889

Administrative Information

Investigator In Charge (IIC):	Schiada, Luke
Additional Participating Persons:	John Riggs; FAA/FSDO; Charleston , WV Todd Tetzlaff; Enstrom Helicopter; Menominee, MI
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Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=64117