## National Transportation Safety Board Washington, DC 20594

## **Brief of Accident**

## Adopted 12/06/2002

MIA00FA030						
File No. 12473	11/27/1999	PHILADELPHIA, MS	Aircraft Reg No. N8144M		Time (Local): 14:45 CST	
Make/Model Engine Make/Model Aircraft Damage Number of Engines Operating Certificate(s) Type of Flight Operation Reg. Flight Conducted Under	<ul> <li>Bell / 212</li> <li>Pratt &amp; Whitney / PT6T-3</li> <li>Destroyed</li> <li>1</li> <li>On-demand Air Taxi; Aircra</li> <li>Positioning</li> <li>Part 91: General Aviation</li> </ul>	ift External Load	Crew Pass	Fatal 1 1	Serious 0 0	Minor/None 0 0
Last Depart. Point: TUSCALOOSA, AL Destination: JACKSON, MS Airport Proximity: Off Airport/Airstrip		Condition of Light: Day Weather Info Src: Weather Observation Facility Basic Weather: Visual Conditions Lowest Ceiling: None Visibility: 10.00 SM Wind Dir/Speed: 240 / 003 Kts Temperature (°C): 19 Precip/Obscuration:				
Pilot-in-Command Age Certificate(s)/Rating(s)	e: 54		Flight Time (Hours) Total All Aircraft: 11140			
Airline Transport; Helicopter Instrument Ratings Helicopter			Total Make/Model: 2469 Total Instrument Time: 55			

At the last refueling stop the pilot and passenger stated to the lineman that the greenhouse window above the pilot had cracked during the previous leg of the flight. The transcript of communications recorded on the cockpit voice recorder showed that about 29 minutes before the accident, the passenger stated to the pilot "I think if I hadn't-a broke that off we wouldn't had any greenhouse by the time we got home". About 18 minutes before the accident, the passenger stated to the pilot "boy those catfish are going crazy down there aren't they". The pilot respond "yep", "must have been the vibrations from the helicopter". About 2 minutes later the passenger and pilot discuss sighting deer in a field. About 1 minute 30 seconds before the accident, the pilot asked the passenger "has this vertical just gotten in here or has it been here for a while?" The passenger replied "we haven't had any verticals at all." The pilot replied, "we do now." The passenger replied, "yeah well it started right after we left back there. I think it maybe ah that's why I was thinking it was the air." About 20 seconds later, the passenger stated that another person had tracked the helicopter's blades before they left and that he was commenting on how smooth it was. About 40 seconds later the pilot stated "this stuff is getting worse." The recording then ended. Witnesses in the area of the accident site stated that they observed the helicopter flying from east to west, just above the treetops. The helicopter began rolling back and forth. They then observed the main rotor blades contact the tail area, and the aft tail boom and tail rotor separate. Shortly after this, the main rotor separated and the helicopter descended and crashed to the ground. A fire erupted during ground impact. Witnesses did not observe any smoke come from the helicopter prior to the accident. The entire main rotor system was accounted for in the wreckage, except for the pitch change horn for the "red" main rotor blade and the majority of the pitch change link that attaches to the "red" pitch change horn at the pitch change links lower rod end. The "red" grip remained in place in the main The surface of the "red" grip exhibited two boreholes that mated with two bushing that were part of the departed and rotor system.

## Brief of Accident (Continued)

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The mating grip surface exhibited a blackish residue near the pitch change horn boreholes, and the missing "red" pitch change horn. extended beyond the boreholes. The crashsite and an extended area back-up the wreckage path were searched extensively, blackish area including by Boy Scout parties; the "red" pitch change horn and most of the "red" pitch change link were not found. Examination of the red grip by an NTSB metallurgist showed the surfaces of both the upper and lower holes showed extensive areas of dark deposits and surface damage consistent with repeated small relative movements against mating objects (fretting). Visible fretting areas covered most of the surface of the bushing counter bores and portions of the fractured surfaces of the threads. Energy dispersive x-ray analysis of samples of the black deposits taken from the upper hole found them to mostly contain aluminum and iron and significant amounts of oxygen along with minor amounts for the other constituents of the grip and bushing. Samples from the lower hole were found to be mostly aluminum with large peaks for iron, cadmium, silicon and oxygen. Both bushing counter bores showed localized material removal and enlargement of the diameters. Up to .020 to 0.025 inches of material were removed in localized areas from the bushing bore. In addition, the bores were deformed and distorted adjacent to the grip surface. The surfaces of the holes, particularly the upper one, also contained circumferential marks in the bushing counter bore, the lock ring diameter and on the fractured threads indicating progressive and incremental movement of the mating objects. No other evidence of failure or malfunction of the helicopter structure, flight controls, engine, or rotor and rotor drive system was found. Aircraft records show the rotor head, including the "red" blade grip and pitch change horn, was last removed from the helicopter in March 1998, 162.2 flight hours before the accident, for blade retention strap replacement.

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Occurrence #1: Phase of Operatior	AIRFRAME/COMPONENT/SYSTEM FAILU	JRE/MALFUNCTION		
Findings 1. ROTORCRA 2. (C) MAINTEL 3. (C) AIRCRAL 4. ROTOR SYS 5. (C) OPERAT 6. ROTORCRA 7. MISC ROTO	FT FLIGHT CONTROL,PITCH CHANGE HO NANCE,INSPECTION - INADEQUATE - COM FT PREFLIGHT - INADEQUATE - PILOT IN G STEM - VIBRATION ION WITH KNOWN DEFICIENCIES IN EQU FT FLIGHT CONTROL,PITCH CHANGE HO RCRAFT,MAIN ROTOR/TAIL BOOM CONTA	RN - LOOSE PART/BOLT/NUT/CLAMF IPANY MAINTENANCE PERSONNEL COMMAND IPMENT - CONTINUED - PILOT IN CO RN - SEPARATION ACT	?/ETC MMAND	
Occurrence #2: Phase of Operatior	IN FLIGHT COLLISION WITH TERRAIN/W DESCENT - UNCONTROLLED	/ATER		

Findings

8. TERRAIN CONDITION - GROUND

Findings Legend: (C) = Cause, (F) = Factor

The National Transportation Safety Board determines the probable cause(s) of this accident as follows.

The failure of the pilot and company maintenance personnel during preflight and periodic inspections to identify the signs of fretting and looseness in the "red" main rotor blade pitch change horn to main rotor blade grip attachment, resulting in the helicopter continuing in service with a loose pitch change horn, separation of the pitch change horn from the blade grip, and inflight breakup of the helicopter due to the main rotor striking the tailboom. Contributing to the accident was the pilot's failure to respond to increased vibration in the main rotor system and land immediately.