Aviation Investigation Final Report

Location:	Robbinsdale, Minnesota	**Accident Number:**	CHI06LA027
Date & Time:	November 8, 2005, 08:58 Local	**Registration:**	N30NM
Aircraft:	Agusta A109-E	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	3 None
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

The helicopter sustained substantial damage during an aborted takeoff from a helicopter-landing pad. The pilot stated that he started the helicopter and "performed a full run-up of both engines and all systems." He reported, "Both engine FADEC [Full-Authority Digital Engine Control] Power Management Switches (PMS) were verified as being in the 'Flight' position, the collective-mounted 100 percent/102 percent switch was in the '102' position, and the number 1 Electronic Display Unit (EDU) showed three vertical yellow lines representing the rpm of both engines as being at 102 percent and that the rotor rpm (Nr) was co-joined with them." He reported that he pulled the helicopter into a five-foot hover. After about 30 seconds of normal hovering flight, the pilot heard a "bang." The pilot reported that the helicopter started to settle vertically downwards, and that he glanced at the number 1 Electronic Display Unit and saw "multiple caution and warning lights." He reported that the aircraft was oscillating laterally as it settled, and that there was a rapid loss of rotor rpm. He used the collective pitch lever to cushion the landing with the remaining rotor rpm. He reported, "As soon as the left main wheel gently touched down the aircraft went into a violent lateral oscillation which was clearly ground resonance. This resonant oscillation increased in severity even though I had the collective pitch lever in the full down position." The left main landing gear collapsed and the helicopter settled onto its left sponson. The tail rotor blades contacted the ground. The helicopter continued to oscillate laterally and the nose of the helicopter swung to the left following main rotor rotation. The pilot shut down both engines and the main rotor blades coasted to a stop. The on-site examination revealed that the damage to the helicopter was consistent with ground resonance. Both engines were run on an engine test stand and no anomalies were evident that would preclude normal engine operation. The examination of the non-volatile memory of the engine electronic controls (EEC's) for both engines did not reveal any preexistent anomaly or fault codes associated with the accident flight. The inspection of the flight controls and aircraft systems did not reveal any anomalies associated with a preexisting condition.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The loss of lift for undetermined reasons.

Findings

Occurrence #1: MISCELLANEOUS/OTHER
Phase of Operation: TAKEOFF - ABORTED

Findings

1. (C) REASON FOR OCCURRENCE UNDETERMINED

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
2. GROUND RESONANCE - ENCOUNTERED - PILOT IN COMMAND

Occurrence #3: GEAR COLLAPSED
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
3. LANDING GEAR,MAIN GEAR - FAILURE
4. LANDING GEAR,MAIN GEAR - OVERLOAD

Factual Information

HISTORY OF FLIGHT

On November 8, 2005, at 0858 central standard time, an Agusta A109-E helicopter, N30NM, operated by North Memorial Health Care, sustained substantial damage during an aborted takeoff from the North Memorial Medical Center's heliport (MY77), located in Robbinsdale, Minnesota. The airline transport pilot, flight nurse, and flight paramedic were not injured. The 14 Code of Federal Regulations Part 91 positioning flight was departing the heliport en route to Crystal Airport (MIC), Minneapolis, Minnesota. Visual meteorological conditions prevailed at the time of the accident. A visual flight rules (VFR) company flight plan was filed.

The pilot reported that after he preflighted the helicopter, he pushed the helicopter out of the hangar and onto the heliport (120 feet by 100 feet, concrete) in preparation for a short positioning flight to MIC. He reported that he started the helicopter and "performed a full run-up of both engines and all systems." He reported, "Both engine FADEC [Full-Authority Digital Engine Control] Power Management Switches (PMS) were verified as being in the 'Flight' position, the collective-mounted 100 percent/102 percent switch was in the '102' position, and the #1 Electronic Display Unit (EDU) showed three vertical yellow lines representing the rpm of both engines as being at 102 percent and that the rotor rpm (Nr) was co-joined with them."

The pilot reported that he pulled the helicopter into a five-foot hover and repositioned it northwards on the heliport for takeoff. After about 30 seconds of normal hovering flight, the pilot heard a "bang." The pilot reported that the helicopter started to settle vertically downwards, and that he glanced at the number 1 Electronic Display Unit (EDU) and saw "multiple caution and warning lights." He reported that the aircraft was oscillating laterally as it settled, and that there was a rapid loss of rotor rpm. He used the collective pitch lever to cushion the landing with the remaining rotor rpm. He reported, "As soon as the left main wheel gently touched down the aircraft went into a violent lateral oscillation which was clearly ground resonance. This resonant oscillation increased in severity even though I had the collective pitch lever in the full down position."

The pilot reported that the helicopter was oscillating laterally and "pounding" the main landing gear. He reported that the left main landing gear collapsed and the helicopter settled onto its left sponson. He reported that the tail rotor blades contacted the ground and he lost tail rotor control. He prevented the main rotor blades from contacting the ground by imputing full right cyclic.

The pilot reported that the helicopter continued to oscillate laterally and the nose of the helicopter swung to the left following main rotor rotation. He released the collective and with his left hand he shut down both engines using the PMS switches and the rotor brake. He

reported the engines shut down, but the rotor brake was ineffective and the main rotor blades coasted to a stop.

The flight nurse reported that everything was routine as the helicopter lifted into a hover and the pilot "backed up" into his normal takeoff position. The flight nurse reported that she looked up at the cockpit panel and observed a red light on. She reported that helicopter landed harder than the pilot's usual "soft landing." The helicopter began to rock from side to side and it became more violent. She reported that the helicopter ended up on its left side with the blades still turning slowly.

The flight paramedic was facing aft in the helicopter. She reported that the pilot completed the aircraft checks and the helicopter lifted into a hover. She reported, "The pilot backed to the right as he always does." She reported that she heard a "noise" and the helicopter began to shake and then "landed hard." She reported the helicopter began to "violently shake and rock and proceeded to make a 180 degree turn."

PERSONNEL INFORMATION

The pilot held an airline transport certificate with a helicopter rating. He held a commercial certificate with single-engine land airplane, single-engine sea airplane, multiengine land airplane, glider, and instrument airplane ratings. He was type rated in numerous helicopters that included: A-109, BH-206, BH-214, HH-12, HU-500, SA-365, SK-55, SK-58, and SK-61. He was a certified flight instructor (CFI) in helicopters, single engine airplane, and a helicopter and airplane instrument instructor. The pilot had a total of 14,445 flight hours with 4,000 hours in Agusta A109's. He had flown 35 hours in the last 90 days and 18 hours in the last 30 days.

AIRCRAFT INFORMATION

The helicopter was an Agusta A109-E, serial number 11065. The helicopter seated four and was configured in an emergency medical services (EMS) configuration. The maximum gross weight was 6,283 pounds. The helicopter was equipped with two Pratt & Whitney Canada PW206C turboshaft engines that developed 732 pounds of shaft horsepower. The helicopter was part of an approved aircraft inspection program (AAIP) and was last inspected on October 2005. The airplane had flown approximately 37 hours since the last inspection and had a total time of 2,481 hours.

METEOROLOGICAL INFORMATION

The 0853 surface weather observation at Minneapolis-St.Paul International Airport (MSP) located about 12 nautical miles to the southeast was: Winds 120 degrees at 9 knots, visibility 10 statute miles, sky clear, temperature 7 degrees Celcius (C), dew point 1 degrees C, altimeter 30.03 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The on-site examination revealed that the helicopter's left main landing gear had collapsed and the helicopter was leaning on its left side sponson. The nose landing gear tire had made about a 180-degree skid mark that was located on the right side of the helicopter. Both composite tail rotor blades exhibited blade strike damage at the tips of the blades.

The visual inspection of the tail boom stinger revealed no visible deformation, but lateral abrasions were present. The tail stinger was compared to an exemplar tail stinger. The comparison revealed that the tail stinger from the accident helicopter exhibited permanent deformation consistent with an upward bending load. An impact mark was observed at the edge of the landing pad that was consistent with a tail stinger strike.

The inspection of the main rotor revealed that three of the four dampers installed had their rod ends sheared off at the base of the threaded portion. The inspection of the main rotor blades revealed substantial damage to the top and bottom skins in the area close to the trim tab (about 3/4 blade span). Chordwise and spanwise cracking with skin delamination was observed. No other damage to the blades was observed, including the blade tip cap areas. The inspection of the flight control system did not reveal any evidence of pre-impact failure or malfunction.

TESTS AND RESEARCH

The engines were sent to Pratt & Whitney Canada for inspection. The Transportation Safety Board of Canada provided oversight for the inspection. Both engines were run on an engine test stand and no anomalies were evident that would preclude normal engine operation.

The engine electronic controls (EEC's) for both engines were sent to the manufacturer, Pratt & Whitney Canada, for examination. The Transportation Safety Board of Canada provided oversight for the inspection. The non-volatile memory in the EEC's logged faults that were recorded by the EEC's between the last engine start and engine shutdown. The Pratt and Whitney report stated, "According to the data retrieved from EEC EEPROM, the fault logged would not have reverted any of the 2 engines to a manual mode."

ADDITIONAL INFORMATION

The FAA, Agusta Aerospace Corporation, and Pratt & Whitney Canada were parties to the investigation.

The helicopter was released to North Memorial Health Care, Brooklyn Center, Minnesota.

Information

Certificate:	Airline transport; Flight instructor	**Age:**	58,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Glider; Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine; Helicopter; Instrument airplane; Instrument helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	August 1, 2005
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	April 1, 2005
Flight Time:	14445 hours (Total, all aircraft), 4000 hours (Total, this make and model), 12465 hours (Pilot In Command, all aircraft), 35 hours (Last 90 days, all aircraft), 18 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Agusta	**Registration:**	N30NM
Model/Series:	A109-E	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	11065
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	October 1, 2005 AAIP	**Certified Max Gross Wt.:**	6283 lbs
Time Since Last Inspection:	37 Hrs	**Engines:**	2 Turbo shaft
Airframe Total Time:	2444 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney Canada
ELT:	Installed, not activated	**Engine Model/Series:**	PW206C
Registered Owner:	North Memorial Health Care	**Rated Power:**	732 Horsepower
Operator:		**Operating Certificate(s) Held:**	On-demand air taxi (135)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	MSP,841 ft msl	**Distance from Accident Site:**	12 Nautical Miles
Observation Time:	08:53 Local	**Direction from Accident Site:**	135°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	120°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.03 inches Hg	**Temperature/Dew Point:**	7°C / 1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Robbinsdale, MN (MY77)	**Type of Flight Plan Filed:**	Company VFR
Destination:	Crystal, MN (MIC)	**Type of Clearance:**	None
Departure Time:	08:58 Local	**Type of Airspace:**	

Airport Information

Airport:	North Memorial Heliport MY77	**Runway Surface Type:**	Concrete
Airport Elevation:	930 ft msl	**Runway Surface Condition:**	Dry
Runway Used:		**IFR Approach:**	None
Runway Length/Width:	120 ft / 100 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	3 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 None	**Latitude, Longitude:**	45.02639,-93.565551

Administrative Information

Investigator In Charge (IIC):	Silliman, James
Additional Participating Persons:	Lyman Roeder; FAA-Minneapolis FSDO; Minneapolis, MN Paolo Ferreri; Agusta Aeorospace Corporation; Philidelphia, PA Tom Berthe; Pratt & Whitney Canada; South Burlington, VT
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