Aviation Investigation Final Report

Location:	VAN NUYS, California	**Accident Number:**	LAX99TA066
Date & Time:	January 2, 1999, 21:15 Local	**Registration:**	N58126
Aircraft:	Bell 205A-1	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Serious, 2 None
Flight Conducted Under:	Part 91: General aviation - Public aircraft		

Analysis

During a night training flight over mountainous terrain the pilot heard a loud 'clunking' sound, which was accompanied by vibrations. The engine then emitted a loud grinding, metallic grating sound. Simultaneously, warning lights, engine chip lights, and the rpm decay light became illuminated. The pilot lowered the collective and entered an autorotation but did not have sufficient airspeed and altitude to reach a dirt road, so he turned down a canyon and performed a hard flare and near-vertical descent with little forward speed. The helicopter landed hard and came to rest on rough uneven terrain surrounded by trees and high vegetation. Postaccident examination revealed that the engine power turbine as viewed from the exhaust exhibited damage. The number 4 turbine wheel was missing all of its blades and the blades on the number 3 turbine wheel were damaged. Scoring was evidenced on the inside diameter of the turbine case in the area of the Nos. 3 and 4 turbine wheels. All the vanes and inner and outer supports of the second stage power turbine nozzle were displaced and/or missing, and fragments of the outer vane support were torn and distorted. The third stage turbine nozzle exhibited extensive damage on the trailing edges of the vanes and on the shroud/outer housing. Metallurgical examination of the turbine components disclosed features indicative of overload fractures without evidence of material defects or fatigue. The metallurgist concluded that the overall type and degree of engine damage was indicative of a component failure in the second stage power turbine nozzle area; however, the cause of the component failure was not determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A loss of engine power due to an undetermined component failure in the second stage power turbine nozzle area. Factors in the accident were the mountainous/hilly nature of the terrain

and the dark night lighting conditions which precluded the pilot from selecting a suitable forced landing area.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: CLIMB

Findings
1. (C) TURBOSHAFT ENGINE,FREE(POWER) TURBINE - FAILURE
2. (C) REASON FOR OCCURRENCE UNDETERMINED

Occurrence #2: FORCED LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
3. (F) TERRAIN CONDITION - MOUNTAINOUS/HILLY
4. (F) LIGHT CONDITION - DARK NIGHT

Occurrence #3: HARD LANDING
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
5. TERRAIN CONDITION - ROUGH/UNEVEN
6. TERRAIN CONDITION - HIGH VEGETATION

Factual Information

On January 2, 1999, at 2115 hours Pacific standard time, a Bell 205A-1, N58126, landed hard during a autorotation in Rustic Canyon, about 7 miles southwest of the Van Nuys, California, airport. The forced landing was precipitated by a loss of engine power during a climb following takeoff. The aircraft sustained substantial damage. The commercial pilot and one crewmember were not injured. The other crewmember sustained serious injuries. The public-use helicopter was being operated by the Los Angeles City Fire Department as a training flight at the time of the accident. The flight originated at the Van Nuys Airport about 2000, and a company visual flight rules (VFR) flight plan was on file. Night visual meteorological conditions prevailed.

The pilot reported that the purpose of the flight was to practice "Night-Sun" operations. After 1 hour of training the pilot landed the helicopter on a dirt road so the crewmembers could switch seats. He reported that after conducting a crew briefing, he lifted off and began a climb to the north. The pilot stated that approximately 10 to 15 seconds later, and about 75 feet agl, he initiated a left turn to the west. He reported that almost immediately after beginning the turn he heard a loud "clunking" sound, which was accompanied by vibrations. The engine then emitted a loud grinding, metallic grating sound. Simultaneously, warning lights, engine chip lights, and the rpm decay light became illuminated. The pilot reported that he immediately lowered the collective and entered an autorotation. He stated that he did not have sufficient airspeed and altitude to reach the dirt road, so he started a 180-degree left turn down the canyon. He informed the crew that they had an engine failure and would be going to the bottom of the canyon. The pilot reported that after reaching treetop level, he performed a hard flare and near-vertical descent with little forward speed. The helicopter landed hard and came to rest on rough uneven terrain surrounded by trees and high vegetation.

The pilot reported that after egress of the aircraft, he did not smell or see smoke, nor did he note any fuel leakage. He further stated that the engine and rotor blades were stopped. The pilot reported that he had not experienced any mechanical abnormalities with the aircraft prior to the onset of the engine problem.

The helicopter was recovered from the site with a hoist assembly and was examined on January 7, 1999 by the Safety Board with technical assistance from Bell Helicopters and Allied Signal. Examination of the airframe revealed that the main cabin assembly was intact. The belly of the aircraft exhibited dents and crushing damage. The cockpit area and flight controls appeared undamaged. The pilot's seat appeared to be bent downward approximately 1 inch at the forward edge. The copilot's seat appeared undamaged.

The main rotor mast and controls had been removed from the transmission. The transmission was still mounted to the airframe and it was noted that the transmission input quill rotated

freely in the freewheel direction (counter-clockwise) but would not rotate in the drive direction. The main driveshaft was intact.

The tailboom was intact but had been removed from the fuselage. The upper right tailboom attachment fitting displayed a fracture; the fractured portion remained attached to the tailboom assembly. A portion of the fuselage mounted tailboom attachment fitting was present at the upper right-side corner of the forward bulkhead of the tailboom. The right-side synchronized elevator assembly was damaged and had been pushed aft in the tailboom structure. The tail rotor assembly was still mounted to the top of the vertical fin. Drive and control continuity was established from the fuselage aft to the tail rotor assembly. One tail rotor blade exhibited a cut approximately 1/16 inch wide and 3/4 inch deep in the leading edge.

The engine was still attached to the airframe. Both legs of the engine mount bipod on the right side of the engine were bent aft. The forward and inner legs of the engine mount were also bent. The engine controls and accessories remained intact. The engine power turbine as viewed from the exhaust exhibited damage. The number 4 turbine wheel was missing all of its blades and the blades on the number 3 turbine wheel were damaged. Scoring was evidenced on the inside diameter of the turbine case in the area of the Nos. 3 and 4 turbine wheels. The engine was removed from the airframe and shipped to Allied Signal Corporation for further testing.

The engine was examined on January 25 and 26, 1999, under the supervision of the Safety Board. Disassembly of the engine revealed that all the vanes and inner and outer supports of the second stage power turbine nozzle were displaced and/or missing, and fragments of the outer vane support were torn and distorted. The third stage turbine nozzle exhibited extensive damage on the trailing edges of the vanes and on the shroud/outer housing. The Allied Signal metallurgist reported that this damage was indicative of secondary damage resulting from the separations of the third stage blades and the fourth stage nozzle. Almost all of the fourth stage turbine nozzle was missing, except for portions of the outer band. The metallurgist was not able to determine the exact cause of the damage; however, he noted that the remaining features on the fourth stage nozzle were indicative of an overload fracture mode.

He further concluded that the separations of the blades on both the third and fourth stage turbine wheel assemblies were indicative of an overload fracture mode. No material defects or fatigue cracks were observed on the overload fractures.

The metallurgist concluded that the overall type and degree of engine damage was indicative of a component failure in the second stage power turbine nozzle area; however, the cause of the component failure was not determined. All other damage observed was concluded to be secondary.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	42,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	August 28, 1998
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	3000 hours (Total, all aircraft), 300 hours (Total, this make and model), 2800 hours (Pilot In Command, all aircraft), 80 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	**Registration:**	N58126
Model/Series:	205A-1 205A-1	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	30136
Landing Gear Type:	High skid	**Seats:**	15
Date/Type of Last Inspection:	November 9, 1998 Annual	**Certified Max Gross Wt.:**	10200 lbs
Time Since Last Inspection:	33 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	6361 Hrs	**Engine Manufacturer:**	Lycoming
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	T53-13B
Registered Owner:	CITY OF LOS ANGELES	**Rated Power:**	1400 Horsepower
Operator:		**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night/bright
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	340°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	16°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	VAN NUYS , CA (VNY)	**Type of Flight Plan Filed:**	Company VFR
Destination:		**Type of Clearance:**	None
Departure Time:	20:00 Local	**Type of Airspace:**	Class E

Airport Information

Airport:		**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious, 2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 2 None	**Latitude, Longitude:**	34.189186,-118.490074(est)

Administrative Information

Investigator In Charge (IIC):	Rich, Jeff
Additional Participating Persons:	DALE HANSON; VAN NUYS , CA JACK SUTTLE; FORT WORTH , TX PHIL HENSLEY; PHOENIX , AZ ROD WILMOT; LOS ANGELES , CA
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Investigation Class:	Class
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