National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: LAX99GA083	Aircraft Registration Number: N992SD
Occurrence Date: 01/30/1999	Most Critical Injury: Serious
Occurrence Type: Accident	Investigated By: NTSB

Location/Time

Nearest City/Place	State	Zip Code	Local Time	Time Zone	
LAKE ELSINORE	CA	92531	1543	PST	

Airport Proximity: Off Airport/Airstrip

Distance From Landing Facility:

Aircraft Information Summary

Aircraft Manufacturer	Model/Series	Type of Aircraft
McDonnell Douglas	369E /369E	Helicopter

Revenue Sightseeing Flight: No

Air Medical Transport Flight: No

Narrative

Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:

*** Note: : NTSB investigators either traveled in support of this investigation or conducted a significant amount of investigative work without any travel, and used data obtained from various sources to prepare this public aircraft accident report. ***

HISTORY OF FLIGHT

On January 30, 1999, at 1543 hours Pacific standard time, a McDonnell Douglas 369E, N992SD, collided with the ground after experiencing a loss of engine power near Lake Elsinore, California. The helicopter was destroyed. The pilot and observer suffered serious injuries. The public-use helicopter was being operated by the Riverside County Sheriff's Department for routine law enforcement patrol at the time of the accident. The flight originated at the Hemet-Ryan Airport in Hemet, California, at 1505, and a company flight plan was filed. Visual meteorological conditions prevailed.

The pilot reported that she and the non-pilot rated observer were responding to a routine dispatch call and were flying about 550 to 650 feet agl. She stated that the engine chip light (amber) became illuminated. She reported that she intended to head back to the airport, but changed her mind and began looking for a landing site. The observer radioed the dispatch center and notified them that they had "engine problems." He reported that about 30 seconds later he heard a grinding noise and heard the rpm decreasing. The pilot reported that the engine-out light (red) became illuminated and the engine-out horn came on. A few seconds later the engine quit. She saw an open field to her left (northwest) and turned toward it. She entered an autorotation by fully lowering the collective. She stated that she didn't roll off the throttle. The observer called dispatch and gave them a position report. The pilot reported that she didn't notice her airspeed in the turn, but remained focused on the landing site. She remembered that the tachometer gauge reflected that the rotor and engine rpm indicator needles were split and she recalled that the rotor rpm indicator needle reflected 420 to 430 rpm. The pilot stated that the angle of descent was good but was slightly steeper than normal. She reported that she initiated the landing flare about 100 feet agl.

The helicopter landed hard. Neither the pilot nor the observer recall the helicopter bouncing or having any forward movement after the landing. The pilot unfastened the observer's seat belt, then undid her own. She reported that the fuel shutoff valve handle was jammed and she was unable to turn it to the "off" position. She further reported that both cockpit doors were also jammed shut and they were not able to egress on their own. Rescue personnel arrived within minutes of the accident and forced the doors open.

Two witnesses reported seeing the helicopter circling overhead prior to impact. They stated that the main rotor blades were turning slowly; they could see each individual blade. There was no engine sound. They observed the helicopter descend at approximately a 45-degree nose-down attitude. The witnesses reported that the helicopter was descending about 50 to 60 mph; they felt that it was moving "too fast for landing." Their last view of the helicopter was at the tree line.

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Narrative (Continued)

PERSONNEL INFORMATION

According to the Federal Aviation Administration (FAA) airman certification database, the pilot held a commercial pilot certificate with rotorcraft-helicopter rating and an instrument helicopter rating. The pilot indicated that at the time of the accident she had about 4,817 total hours of flight time, all in helicopters. She had 2,900 hours in the McDonnell Douglas 369E, including 200 hours in the last 90 days and 73 hours in the last 30 days. According to the FAA aeromedical certification database, the pilot held a second class medical, dated July 8, 1998, with no waivers or limitations.

The Sheriff Department's records reflected that the pilot had completed her last biennial flight review on March 29, 1998, which included emergency maneuvers. She was given satisfactory marks in all categories.

The observer was not a rated pilot. He had been performing duties as an observer since 1993.

AIRCRAFT INFORMATION

The aircraft maintenance records were reviewed. A review of the aircraft daily flight logs did not reveal any unresolved squawks, other than a history of 10 engine chip light activations over a period of approximately 72 flight hours. The records indicated compliance with all Manufacturer Service Notices and all applicable Federal Aviation Administration (FAA) Airworthiness Directives. The records revealed that at the time of the accident, the airframe had a total time of 4093.4 hours. The maintenance department adhered to an Annual and Manufacturer's Inspection Maintenance Program.

The maintenance records revealed that engine chip lights were reported on December 18, 1998, at approximately 4021 hours, and again on December 21, 1998. In both cases, the maintenance department removed and replaced the chip detectors, drained, flushed and replaced the engine oil, and performed a 30-minute ground run/leak check. No discrepancies were noted during either ground check. Following another reported chip light on December 29, the maintenance personnel replaced the turbine assembly, gear box and compressor assembly with overhauled parts. The records reflected that the gearbox and compressor assemblies were installed with "zero hours since overhaul," and the turbine assembly had 2389 hours since overhaul. A ground run, leak check and power assurance check were performed with no noted discrepancies. An engine chip light was reported again on December 30, 1998, and the mechanic reported that he found a small sliver on the bottom chip plug. He cleaned the plug and performed a ground check. Engine chip lights were reported again on January 21 and January 22, 1999. The aircraft did not fly until after a 100-hour inspection was performed on January 28, 1999, during which both chip detectors were examined. The bottom chip detector displayed fuzz. The engine oil was drained and flushed and a leak check was performed again with no reported abnormalities. On January 29, 1999, a pilot reported that the engine chip light came on twice during a 1.5-hour flight. The mechanics discovered a small metallic sliver on the bottom chip plug and removed the turbine assembly. The number 5 bearing spacer and snap ring were found spinning and a new number 5 bearing was installed. The mechanics reported that they reinstalled the turbine, as per the Allison Maintenance Manual. They purged the oil system and replenished it with 5 quarts of oil. The mechanic and pilot then completed a 0.8-hour maintenance flight, during which time the engine chip light became illuminated. The mechanic cleaned the plugs, then returned the engine to service after a ground run and leak check were performed with satisfactory results.

Both the pilot and the mechanic who performed the ground run reported that they visually checked the oil quantity level in the sight gauge before the accident flight and the level appeared adequate.

WRECKAGE AND IMPACT

The wreckage was located in a furrowed field of dry, loose dirt. The fuselage was in an upright position at a 45-degree angle to the furrows. The aircraft skids were spread outward to the point that the belly was touching the ground. Four of the five main rotor blades remained attached to the rotor head. The white blade had separated at the blade doubler. Two of the main rotor blades exhibited upward bends, and one blade tip had impacted the ground and displayed a break a few inches from the hub.

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Narrative (Continued)

A portion of the tail boom and tail rotor driveshaft were located forward of the fuselage. The tail rotor blades remained attached to the tail rotor gearbox and were also located forward of the aircraft. The tail boom stinger was the only aircraft component not located.

The exterior surface of the aircraft fuselage was wrinkled. The underside of the fuselage was cracked and torn, with much of the damage concentrated around the cargo hook attachment area. The lower canopy glass was fractured on both sides of the aircraft. The cockpit and cabin doors were intact but exhibited deformation. No plexiglass was broken from either cabin door. Both engine access doors were warped and twisted. The rescue personnel reported that the engine access doors were found open and they sprayed the interior with water and foam. There was no oil or residue noted on the engine itself or in the engine compartment.

The left and right extended landing gear were spread with both aft struts fractured approximately 12 inches outboard of the damper. The left forward strut elbow and damper assembly were pushed up into the seat support structure.

The tail boom was fractured and damaged at a point inside the plane of rotation of the main rotor blades. Three of the five main rotor blades displayed paint transfer the same color as the tail boom. The separated section of the tail boom remained attached to the upper and lower vertical and horizontal stabilizers.

The cockpit structure was compromised only on the right side floor where the SX-5 searchlight and FLIR pod mounts were pushed upward and had penetrated the lower cockpit structure. Both crew seats displayed deformation of about 1 1/2 inches in the seat pan structures. The seatbelt system remained intact. The crew seats were made of a mesh material and no foreign objects were noted under either seat.

The aircraft was configured for left seat command and was not equipped with dual flight controls. Continuity was established for the cyclic, collective and anti-torque flight control linkage. The collective stick would not move; the left front strut damper had been pushed upward and was contacting the collective interconnecting torque tube. Rescue personnel noted the collective in the full up position at the accident site and had pushed it down during the crew extraction. The N1 and N2 collective linkage continuity was confirmed back to the engine compartment where the control tubes and associated rod end bearings were fractured.

TESTS AND RESEARCH External Engine Examination

External engine examination revealed that N2 rotated, continuous to the output shaft. The compressor would not rotate, but appeared to be absent of debris or foreign object damage (FOD). All pneumatic lines were intact and secure except the Power Turbine Governor PR line, which was found to be only finger-tight at the B-Nut fitting at the governor. All the connections for the oil supply and scavenge lines were secure and there was evidence of oil in the lines at the connections. The oil supply tank was found empty, with no oil or metal residue. The engine oil "IN" line from the oil tank to the engine was fractured through the mid-point of the rigid adapter to engine fitting. The engine oil "OUT" line was intact to the facet filter and contained traces of oil. The oil tank vent line was fractured through the metal tube portion. The facet oil filter contained oil and traces of carbon and metal. The filter housing was approximately 1/2 full of oil and there was pasty residue in the bottom. The oil pump strainer was clean and unobstructed. The oil cooler contained oil and metallic flakes. A pressure test was performed on the oil line which connects from the pump to the facet oil filter and no leaks were detected. There was no oil noted in the two oil lines that run between the scavenge oil pump and the external sump and oil outlet.

There was no evidence of oil splash on the engine or anywhere inside the engine compartment, including the engine doors and surrounding structure.

The engine is equipped with two magnetic chip detector plugs. The top plug attracts metal from the nos. 6, 7, 8 and 1 bearings, and the bottom plug attracts metal from the gearbox, number 5 bearing and forward. Both chip detectors are routed to a single amber warning light in the cockpit. The top plug was found covered in small, metallic flakes, particulate, and oil residue.

Narrative (Continued)

The bottom plug displayed oil residue and fewer metallic flakes than the top plug. About 1/4 pint of oil was drained when the lower chip plug was removed.

A vacuum check was performed on the fuel system. The system would not maintain vacuum pressure from the fuel pump to the shutoff valve. There was fuel present in the fuel line from the fire shield to the fuel spray nozzle and other supply lines. The fuel spray nozzle was clean and unobstructed. The fuel pump filter bowl contained fuel and the filter was clean.

The "Diamond J" reporting instrument for the turbine outlet temperature gauge was removed and placed in another Hughes 369E. It reported that the highest recorded engine temperature during the accident flight was 982 degrees for 4 seconds.

Engine Disassembly and Inspection

The engine was disassembled and examined by the Safety Board at National Airmotive Corporation in Long Beach, California, on February 3, 1999.

The compressor assembly was disconnected from the gearbox and was found to rotate smoothly. The spur adapter gear shaft showed evidence of heat distress and internal coking.

The gearbox was disconnected from the turbine; the N2 gearing rotated freely and the N1 gearing rotated, but with some drag. The gearbox case halves were opened. The interior of the gearbox was clean with no abnormal gear tooth wear. There was lubrication throughout the gearbox. The nos. 2, 2.5, 3 and 4 bearings appeared undamaged and lubricated and no anomalies were noted with the oil delivery system. The oil pump rotated, but with drag. Upon disassembly, the pressure and scavenge gears were found to be intact and lubricated. There was minor scoring and debris present in the scavenge chamber.

The turbine modules were separated and disconnected from the exhaust support. The compressor to turbine shaft (pea shooter) was frozen in the gas producer module and evidenced heavy coking and heat distress; N1 would not rotate via the shaft. The outer combustion case and liner appeared normal and undamaged.

Disassembly of the turbine revealed that the nos. 6 and 7 bearings were both destroyed, and would crumble if touched. The internal sump for the nos. 6 and 7 bearings displayed evidence of metal spray and the external sump was dry with carbon flakes remaining inside. The number 8 bearing appeared to be approximately 80 percent destroyed and displayed evidence of oil starvation and heat distress. The bearing balls were flattened and out of round. The internal sump showed no sign of oil. The number 5 bearing displayed a violet-bluish color, but had not failed. The Allison representative attributed the discoloration to heat distress. The turbine shaft exhibited a bluish heat discoloration, with a pattern of decreasing discoloration moving from the nos. 6 and 7 bearings to the number 1 bearing. There was no visual evidence of oil present downstream from the number 5 bearing. The oil line check valve for the nos. 6, 7 and 8 bearings appeared normal and lubricated on both ends. The check valve was functionally tested and found to be within the specifications required by Rolls-Royce Allison Engine Company, with zero leakage at 3 psi.

Samples of oil from the oil cooler and facet oil filter were retained by the Safety Board for metallurgical analysis. Oil filtration revealed iron, magnesium and silver particles in the oil, but no abrasives such as sand, glass or dirt were noted.

The debris from both magnetic chip detector plugs was removed in layers and tested by semi-quantitative X-ray Energy Dispersive Analysis (XEDA) methods. The composition of each layer analyzed was identified as type M50 bearing material.

Metallurgical Analysis

The disassembled engine and accessories were shipped to Rolls-Royce for further examination and metallurgical analysis.

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The examination was conducted under the supervision of the Federal Aviation Administration (FAA).

The oil pump was inspected and flow tested. The pump met internal tolerance and flow test specifications. The oil tubes and valves were also tested and were found to function properly. The engine oil nozzles were uncollapsed and absent of any residue or debris. All engine oil pressure lines were found to be unobstructed and free to flow.

The inside surface of the oil sump nut cover was dry; no liquid oil residue was present.

The gas producer section components were examined. Inspection of the number 8 bearing showed that the balls were severely distorted and several had separated from the cage. The inner race exhibited metal transfer from the ball pathway. No liquid oil residue was found on any of the bearing components. The Allison metallurgist reported that the metallographic examination through the outer race revealed that the ball pathway had been severely overheated during the bearing failure, typical of an oil starvation event.

The metallurgist opined that the engine failure was due to oil starvation of the nos. 6, 7, and 8 bearings. He stated that the nos. 6 and 7 bearing failures resulted in severe secondary damage to the power turbine shafts and seals, while the number 8 bearing failure led to the gas producer section forward movement, causing heavy rub damage to the wheels and nozzles.

According to the Allison Engine Operation and Maintenance Manual, 10W2, reference 72-00-00, page 336, paragraph 11.G, (3) (d), "a maximum of four occurrences of magnetic chip warning lights encountered within any 50 hours of engine operation requires removal of the engine for shipment to an Allison Authorized Maintenance Center (AMC)." A copy of this directive is appended this file. Extracted data from the maintenance records revealed a total of 10 engine chip light activations in a period of approximately 72 hours. The first chip light occurred about 4021 hours, and the accident occurred at 4093 hours.

ADDITIONAL INFORMATION

The wreckage was released to the Riverside County Sheriff's Department on October 5, 1999.

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Landing Facility/Approach Information

Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
		Ft. MSL	0		

Runway Surface Type:

Runway Surface Condition:

Approach/Arrival Flown: NONE

VFR Approach/Landing: Forced Landing

Aircraft Information

Aircraft Manufacturer	Model/Series	Serial Number
McDonnell Douglas	369E /369E	510E

Airworthiness Certificate(s): Normal

Landing Gear Type: Skid

Amateur Built Acft?	Number of Seats:	Certified Max Gross Wt.	Number of Engines:
No	4	3000 LBS	1

Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:
Turbo Shaft	Allison	250-C20B	420 HP

- Aircraft Inspection Information

Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time
100 Hour	01/1999	2 Hours	4093 Hours

- Emergency Locator Transmitter (ELT) Information

ELT Installed?/Type	ELT Operated?	ELT Aided in Locating Accident Site?
Yes /	Yes	No

Owner/Operator Information

Registered Aircraft Owner	Street Address	City	State	Zip Code
RIVERSIDE COUNTY SHERIFF DEPT.	4850 W STETSON AVE	HEMET	CA	92545

Operator of Aircraft	Street Address	City	State	Zip Code
RIVERSIDE COUNTY SHERIFF DEPT.	4850 W STETSON AVE	HEMET	CA	92545

Operator Does Business As:

Operator Designator Code:

- Type of U.S. Certificate(s) Held: None

Air Carrier Operating Certificate(s):

Operating Certificate:

Operator Certificate:

Regulation Flight Conducted Under: Part 91: General Aviation

Type of Flight Operation Conducted: Public Use

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First Pilot Information

Name	City	State	Date of Birth	Age
On File	On File	On File	On File	42

Sex: F | Seat Occupied: Left | Occupational Pilot? Civilian Pilot | Certificate Number: On File

Certificate(s): Commercial

Airplane Rating(s): None

Rotorcraft/Glider/LTA: Helicopter

Instrument Rating(s): Helicopter

Instructor Rating(s): None

Current Biennial Flight Review?

Medical Cert.: Class 2 | Medical Cert. Status: Valid Medical--no waivers/lim. | Date of Last Medical Exam: 07/1998

- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Mult-Engine	Night	Instrument Actual	Instrument Simulated	Rotorcraft	Glider	Lighter Than Air
Total Time	4817	2900			2000	50	300	4817		
Pilot In Command(PIC)	4200	2800			1900	50	300	4200		
Instructor										
Instruction Received										
Last 90 Days	200	200			136			200		
Last 30 Days	73	73			58			73		
Last 24 Hours	2	2						2		

Seatbelt Used? Yes | Shoulder Harness Used? Yes | Toxicology Performed? No | Second Pilot? No

Flight Plan/Itinerary

Type of Flight Plan Filed: Company VFR

Departure Point	State	Airport Identifier	Departure Time	Time Zone
HEMET	CA	HMT	1505	PST

Destination	State	Airport Identifier
Local Flight		

Type of Clearance: None

Type of Airspace: Class E

Weather Information

Pilot's Source of Wx Information:

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Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
RIV	1655	PST	1538 Ft. MSL	18 NM	355 Deg. Mag.

Sky/Lowest Cloud Condition: Scattered 15000 Ft. AGL

Condition of Light: Day

Lowest Ceiling: Broken 25000 Ft. AGL

Visibility: 60 SM

Altimeter: 30.00 "Hg

Temperature: 18 °C

Dew Point: -2 °C

Weather Conditions at Accident Site: Visual Conditions

Wind Direction: 320

Wind Speed: 7

Wind Gusts:

Visibility (RVR): 0 Ft.

Visibility (RVV) 0 SM

Precip and/or Obscuration:

Accident Information

Aircraft Damage: Destroyed

Aircraft Fire: None

Aircraft Explosion None

- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot		1			1
Second Pilot					
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants					
Other Crew		1			1
Passengers					
- TOTAL ABOARD -		2			2
Other Ground	0	0	0		0
- GRAND TOTAL -	0	2	0		2

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Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

BOB CRISPIN

Additional Persons Participating in This Accident/Incident Investigation:

WARREN SEITZINGER
INDIANAPOLIS, IN

ADRIAN BOOTH
MESA, AZ

TONY BOWEN
HEMET, CA