National Transportation Safety Board
Aviation Incident Final Report

Location:	Los Angeles, CA	**Incident Number:**	LAX01IA262
Date & Time:	07/25/2001, 0250 PDT	**Registration:**	N953SD
Aircraft:	MDHI 520N	**Aircraft Damage:**	Minor
Defining Event:		**Injuries:**	2 None
Flight Conducted Under:	Part 91: General Aviation - Public Aircraft		

Analysis

The helicopter was climbing eastbound after liftoff and was passing 300 feet agl when the crew heard a loud squeal and felt a high frequency vibration in the airframe and in the antitorque control pedals. The pilot executed a 180-degree turn and landed back at the helipad. The NOTAR fan drive system was disassembled for examination. The Aft Tube Assembly transmits antitorque pedal inputs to the NOTAR fan blade pitch change mechanism and moves fore and aft through the hollow rotating fan drive shaft. The tube does not rotate. Three distinct areas of circumferential scoring were noted on the tube; one in the center at roughly the middle of the drive shaft, and one at each end of the tube corresponding to locations just within the fan drive gear box on the forward end and just inside of the fan assembly. The pilot reported that during an earlier flight in the accident helicopter, the antitorque pedals seemed to stick or slightly bind with 2 inches of right pedal displacement. The pilot stated that this was an annoying problem that regularly occurred with all the 520N's in their fleet, and that the maintenance department typically cleared it up by cleaning (lightly sanding) a Teflon coated sliding tube in the NOTAR fan assembly. According to the pilot, dirt and oil would get on this sliding tube and cause it to bind in the housing, and the mechanics would simply clean this tube to resolve the problem. Maintenance department mechanics confirmed that the pedal-sticking problem typically involved foreign material on the aft tubes' Teflon coated pitch slider, and that they routinely resolved the discrepancies by removing the aft tube and lightly sanding the Teflon coating with fine sand paper. With the exception of the aft tube and it's associated pitch slider shaft, extensive examinations and tests of the NOTAR system components revealed no anomalies that could be related to the vibratory event. Examination of the pitch slider shaft found numerous, very fine, axial scratches on the surface, and measurements found that the outer diameter had been reduced by up to 0.014 inch from the manufacturer's specified constant 0.818 inch (+0.001 inch). The hand sanding of the liner resulted in axial surface scratches and a variable shaft outer diameter that was smaller than that required by the MDHI specification. The decreased and variable liner OD degraded the ability to isolate the aft tube assembly from drive system vibrations. The bending mode natural frequencies of the aft tube assembly were assessed to be 65, 220, and 450 Hz. Initial MDHI estimates stated that the first bending mode natural frequency of the aft tube assembly was 94 Hz. The operational rotor speed of the MDHI 520N helicopter is 7.95 Hz, and the operational NOTAR fan and drive system rotational speed is 89.4 Hz. While in comparison, the measured first bending mode natural frequency of the aft tube assembly of 65 Hz offers a margin of 24.4 Hz under the 89.4 Hz operating speed of the NOTAR fan drive syste;, the actual natural frequency may be higher and result in a smaller margin. The investigation determined that a maintenance practice of sanding the Teflon coated pitch slider tube in the NOTAR assembly resulted in excessive clearance between the antitorque system components. This excessive clearance allowed a vibration to occur in those components resulting in the noise and airframe vibrations noted by the pilots.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: the excitation of the first bending mode natural frequency of the aft tube assembly that is installed through the rotating NOTAR fan drive system. Contributing factors to the incident included the operator's maintenance practice of hand-sanding the pitch slider component of the NOTAR fan system.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. (C) ROTORCRAFT FLIGHT CONTROL SYSTEM,NOTAR - VIBRATION
2. (C) MAINTENANCE - IMPROPER - COMPANY MAINTENANCE PERSONNEL

Factual Information

HISTORY OF FLIGHT

On July 25, 2001, at 0250 Pacific daylight time, a McDonnell Douglas Helicopters Incorporated (MDHI) 520N, N953SD, experienced an antitorque control system component malfunction during the takeoff initial climb from the West Helipads at the Los Angeles International Airport (LAX), Los Angeles, California. The helicopter was climbing eastbound after liftoff, and was passing 300 feet agl, when the crew heard a loud squeal and felt a high frequency vibration in the airframe and in the antitorque control pedals. The pilot executed a 180-degree turn and landed back at the West Helipads. The helicopter was owned and operated by the Los Angeles County Sheriff's Department (LASD) under 14 CFR Part 91 of the Federal Aviation Regulations. The helicopter sustained minor damage confined to the affected antitorque control system components. Neither the commercial pilot nor the observer were injured. Night visual meteorological conditions prevailed for the law enforcement patrol flight, which was originating as the continuation of a series of patrol flights that night.

The NOTAR fan drive system was disassembled for examination. The Aft Tube Assembly (P/N 500N7113-11) transmits antitorque pedal inputs to the NOTAR fan blade pitch change mechanism and moves fore and aft through the hollow rotating fan drive shaft. The tube does not rotate. Three distinct areas of circumferential scoring were noted on the tube; one in the center at roughly the middle of the drive shaft, and one at each end of the tube corresponding to locations just within the fan drive gear box on the forward end and just inside of the fan assembly. A light radial scratch was noted on the tube in an area consistent with the forward edge of the pitch change slider assembly.

An Engineering Group was formed and met in Long Beach, California, during the period of July 30 to August 4, 2001, and in Mesa, Arizona, during the period of October 16 to 18, 2001. The NOTAR fan drive system and control system components were retained for further examinations. The examinations were conducted at both the manufacturer's facility and at the headquarters facility of the National Transportation Safety Board. A complete report of the examinations is contained in the Engineering Group factual report, which is contained in the docket for this accident.

LASD PERSONNEL STATEMENTS

Pilot's Statement

The pilot reported that N953SD was assigned to them at the beginning of their shift and there were no open maintenance items. The initial preflight, start and run-up were normal. During the first part of the shift, a 2.3-hour patrol mission was flown, followed by a return and landing at the LASD base in Long Beach. The only discrepancy the pilot noted during this first flight was that the antitorque pedals seemed to stick or slightly bind with 2 inches of right pedal displacement. The pilot stated that this was an annoying problem that regularly occurred with all the 520N's in their fleet, and that the maintenance department typically cleared it up by cleaning a Teflon coated sliding tube in the NOTAR fan assembly. According to the pilot, her understanding was that dirt and oil would get on this sliding tube and cause it to bind in the housing, and the mechanics would simply clean this tube to resolve the problem.

After their lunch break, the pilot and observer resumed patrol. The preflight, start, and run-up were again normal. After takeoff from the Long Beach base, they flew about 1/2 hour and landed at the LAX West Helipads, then conducted a liaison visit with the LAX Air Traffic Control Tower. Following the tower cab visit, the pilot and observer returned to the helicopter to resume the patrol mission. Again, the preflight, start, and run-up were normal. The pilot lifted off and was climbing eastbound from the pads passing through 60 knots at 300 feet agl, when a loud squeal suddenly started in the rear of the helicopter. The onset of the squeal was sudden with no precursor indications of a problem. The high-pitched, piercing squeal was accompanied by a high frequency vibration through the antitorque pedals and through the airframe. The pilot made a 180-degree turn and landed on the West Helipads. The noise and vibration continued throughout the descent and landing, and, through the power reduction to ground idle and the coast down of the rotor system following engine shutdown. The pilot noted that the noise would get louder with left pedal application during the landing flare. Post flight inspection by maintenance personnel revealed damage to several NOTAR fan drive and control tube components. The parts were removed and replaced with airworthy parts.

Summary of Maintenance Personnel Interviews

Mechanics in the LASD maintenance department were interviewed concerning their actions in response to pilot discrepancies noting sticking antitorque pedals. The mechanics noted that this problem typically involved foreign material on the aft tubes Teflon coated pitch slider. The discrepancies could be resolved by removing the aft tube and lightly sanding with fine sand paper the Teflon coating.

DESCRIPTION OF THE 500N HELICOPTER AND THE NOTAR SYSTEM

General

The MDHI 520N helicopter is a single piloted, five place, turbine powered, skid configured, rotary-wing aircraft constructed primarily of aluminum alloy while the tailboom and thruster are primarily constructed of graphite composite. The main rotor is a fully articulated, five-bladed system, with antitorque and directional control provided by the NOTAR system. The NOTAR system is a design in which helicopter antitorque and directional control is markedly different than conventionally designed tail rotor configured helicopters.

The NOTAR system comprises the following subsystems: a NOTAR fan assembly, a circulation control tailboom, a direct-jet variable thruster assembly at the end of the tailboom, and two vertical stabilizers affixed to a horizontal stabilizer in an H-tail configuration.

Power from the Allison Model 250-C20R/2 turbine engine is transmitted through the main drive shaft to the main rotor transmission, through an intermediate drive shaft to the NOTAR fan transmission, and through a NOTAR fan drive shaft to the NOTAR fan assembly. The NOTAR fan drive system also includes the fan support shaft and the fan support bearing. The NOTAR fan transmission increases the input shaft speed to a constant operating speed of 5,388 revolutions per minute (rpm) to drive the NOTAR fan assembly.

The NOTAR fan assembly provides for an air circulation control system within the tail boom that is designed to function as an antitorque device. The high volume, high pressure air is directed tangentially downward through two rows of four horizontal slots along the right side of the tail boom and mixes with main rotor downwash, accelerating the resulting attached boundary layer flow over the curved contour of the tailboom (referred to as the Coanda effect). The accelerated flow creates a low pressure region that results in right, lateral lift to provide some antitorque moment, the remainder of which is provided by the direct-jet variable thruster.

The direct-jet variable thruster assembly and the vertical stabilizers provide additional antitorque moment, and directional control of the helicopter. The direct-jet variable thruster uses NOTAR fan pressurized air, exiting through nozzles on either side of the tail boom, to provide directional control. The direct-jet thruster provides all of the required directional control for hover and low speed flight. The fully moving, left vertical stabilizer provides directional control of the helicopter in forward flight where the control surface can produce lateral lift, unloading the requirement for directional control from the direct-jet variable thruster. The fully moving, right vertical stabilizer is controlled by the Yaw Stability Augmentation System (YSAS), which is designed to enhance the flying qualities of the helicopter in forward flight. The aircraft is capable of controlled flight with the YSAS disabled.

Mechanical Control of the NOTAR System

Conventional directional control pedals at the pilot and copilot stations work through a bellcrank splitter assembly to simultaneously control the collective blade angles of the NOTAR fan assembly, the direct-jet variable thruster, and the left vertical stabilizer. Push-pull tubes transmit directional pedal control displacement from the splitter assembly to the NOTAR fan blade pitch change mechanism. The pitch change mechanism ensures all of the thirteen NOTAR fan blades collectively change by the same amount of commanded pitch.

The longest push-pull tube, the aft tube assembly, is installed through the center of the rotating NOTAR fan drive system. The aft tube assembly does not rotate, and it is restrained at both ends. The forward end of the aft tube assembly is fitted with a 2.0 inch splined shaft that is free to slide axially through a splined tube support installed on the front housing of the NOTAR fan transmission assembly. To connect the aft tube assembly to the directional control system aft of the splitter assembly, a clevis end is screwed into the forward end of the tube once it is installed. The aft end of the aft tube assembly is fitted with a 2.5 inch threaded shaft that is fixed to the NOTAR fan blade pitch change mechanism with a retaining nut. A pitch slider and a pitch plate bearing, installed as part of the NOTAR fan drive system and connecting the NOTAR fan blade pitch change mechanism, is designed to rotationally isolate the aft tube assembly from the NOTAR fan drive system.

Airflow into the tailboom is increased as the directional control pedals are displaced right or left from the neutral position, or minimum commanded airflow. This increased tailboom airflow exits from the direct-jet variable thruster assembly. The splitter assembly also transmits the directional pedal control inputs to the direct-jet variable thruster and the left vertical stabilizer by a three-part cable.

INVESTIGATION OF NOTAR FAN CONTROL SYSTEM AND DRIVE SYSTEM COMPONENTS

Aft Tube Assembly

A visual inspection of the aft tube assembly, Part Number 500N7113-11 Rev. A, was conducted on-site and at the National Transportation Safety Board laboratory in Washington, DC. No Serial Number was assigned to the part.

The tube was covered with green paint with the exception of the two ends. The tube was fitted with a splined rod end and a threaded rod end at the forward and aft ends, respectively. The forward splines were cleaned with soap and the examination did not reveal any unusual teeth wear. The aft threads did not indicate any unusual wear. A light longitudinal scratch was noted on the tube in an area consistent with the edge of the pitch slider when the tube is installed.

Three distinct areas of circumferential scoring were noted along the tube length. In the center scored area of the tube, approximately 1 5/8 inches of green paint had been worn off, and smooth, silver colored, bare metal was exposed. An area of heavier scoring in the middle of the scored area was 5/8-inch long, and exhibited four distinct gray bands.

The circumferentially scored area closest to the aft tube end exhibited the heaviest scoring. The scored area was approximately 3/4 inch long with brown colored circumferential tinting at the forward margin of the heavily scored center area. A Safety Board metallurgist stated that the brown color was indicative of heated paint. Two outer bands, just inside the painted margins, were smooth and exhibited blue tinting. The metallurgist said that the blue tinting indicated high heating of the metal, but he could not determine temperature with certainty. A center band of scoring was gray colored with a rough, granular surface.

The circumferentially scored area closest to the forward tube end exhibited moderately heavy scoring. The scored area was approximately 3/4 inch long with irregular, green-to-silver colored, circumferential tinting at the margins of the scored center area. Two distinct, smooth, gray bands of scoring were inside the margins with a center band of gray colored slightly granular scoring.

The metallurgist stated that the differences in the characteristics of the forward and aft scored areas was likely due to differences in the hardness of the materials that caused the scoring on the tube as well as differences in application force between the two surfaces. The metallurgist stated that it was likely that the scoring of the three areas had occurred during one event. The minimum outer diameters of the scored areas were found to be:

Smooth, Unscored Tube 0.506

Forward Scored Area 0.491

Center Scored Area 0.501

Aft Scored Area 0.498

NOTAR Fan Assembly

No anomalies were noted upon examination of the fan housing, the 13 fan blades, and the pitch plate.

NOTAR Fan Drive System Bearings

The pitch plate bearing and the fan shaft support bearing were sent to the manufacturer, Timken Aerospace, for engineering assessments. Visual inspection and roundness and noise spectrum testing of the bearings at operational rotation speed did not reveal any anomalies.

NOTAR Fan Support Shaft

A visual inspection of the NOTAR fan support shaft with the support shaft coupling attached was conducted on-site and at the Safety Board laboratory. Circumferential scoring was noted on the first 1/4 inch of the forward end of the fan support shaft ID. This scoring location corresponds to the location of the aft scored area of the aft tube assembly.

Pitch Slider

The pitch slider was inspected on-site and at the Safety Board laboratory. Laboratory measurements were made with a video measuring microscope system.

The pitch slider consists of a bearing housing (the large end) and the slider shaft. The inner surface of the slider shaft, viewed without magnification, exhibited circumferential manufacturing boring marks. The outer surface of the slider shaft was covered with a dry, permanently bonded sleeve of black Teflon material (identified as Karon Grade B Liner in accordance with MDHI Drawing. No. 500N5367). The outer diameter of the outer surface was measured to be 3.797 inches. Most of the liner surface was flat black and nonreflective, with two, slightly glossy, more reflective areas exhibited at two axial locations (1.0 inch and 3.25 inches from the inner liner edge closest to the bearing housing). These reflective areas were over approximately the same 90-degree circumference of the liner. Numerous, very fine, axial scratches were apparent on the slider shaft liner surface.

According to MDHI Drawing No. 500N5367, the outer diameter (OD) of the liner is required to be 0.818 inch (+ 0.001 inch). The measured OD of the liner at 0.25 inch increments from the bearing housing end, along orthogonal axes is presented in the following table.

Measured Length Along Karon Liner	Outer Diameter of Pitch Slider Measured at Reference Point	Outer Diameter of Pitch Slider Measured at 90 Degrees From the Reference Point
0.0000	0.8131	0.8133
0.2500	0.8134	0.8142
0.5000	0.8119	0.8124
0.7500	0.8089	0.8097
1.0000	0.8057	0.8060
1.2500	0.8041	0.8044
1.5000	0.8040	0.8040
1.7500	0.8047	0.8049
2.0000	0.8045	0.8052
2.2500	0.8060	0.8063
2.5000	0.8067	0.8077
2.7500	0.8090	0.8092
3.0000	0.8104	0.8106
3.2500	0.8112	0.8113
3.5000	0.8112	0.8116
3.7500	0.8049	0.8047
3.7950	0.7814	0.7838

NOTAR Fan Drive Shaft

A visual inspection of the NOTAR fan drive shaft was conducted on-site and at the Safety Board laboratory. The fan assembly drive shaft was covered with light green paint. There was a handwritten label "AFT" printed on the outside of the shaft, opposite the data plate. KAFLEX flex frame fittings on each end of the shaft exhibited no visual anomalies.

The inside of the shaft was viewed with a boroscope and numerous axial scratches were seen inside the shaft. The unscratched surface of the shaft had a silver-colored finish. A shiny, 0.042 inch wide circumferentially marked band was exhibited at the center of the shaft. The margins of the area were distinctly defined by the termination of the silver-colored finish. A 0.110 inch wide interrupted, circumferential surface mark was exhibited 1.33 inch aft of the center band. The mark was not shiny. A 0.200 inch wide circumferentially marked band was located 1.16 inch forward of the center band.

The shiny center band was seen as a raised protuberance from the ID surface of the shaft. Kamatics Corporation engineers stated that the protuberance was due to the final surface polishing procedure when the one-piece shaft was manufactured. Slight misalignment of the polishing arm can leave a center ridge in the ID of the shaft. The shaft ID was gun drilled from each end of the shaft to the center, and slight misalignment of the honing arm can leave a center ridge in the shaft ID.

The fan drive shaft was sent to the manufacturer, Kamatics Corporation, for an engineering assessment, which included a driveshaft balance check, an overall length measurement, an examination of the torque stripes on the bolts of the end fitting fasteners of the flex frame fittings, breakaway torque measurements for the end fitting fastener bolts, and partial disassembly of the flex frame fittings to examine for fail safe contact. No anomalies were found.

NOTAR Fan Transmission

A visual inspection of the NOTAR fan transmission was conducted on-site. The mounting flanges on the transmission housing were intact and the mounting holes were round, with no elongation. Circumferential scoring was exhibited within the first 1/4 inch of the NOTAR output shaft ID consistent with the as-installed location of the forward scored area of the aft tube assembly. A teardown inspection of the NOTAR fan transmission was conducted at MDHI facilities in accordance with the MDHI Component Overhaul Manual. No anomalies were found.

TESTS PERFORMED DURING INVESTIGATION

NOTAR Fan Transmission Mount and Fan Assembly Mount Alignment

The alignment of the fuselage mounts for the NOTAR fan transmission and the NOTAR fan assembly was checked on-site in accordance with the MDHI 53-30-30 maintenance manual procedures, using tool kits 500N5000-1, 500N5000-2-ATP, and 500N5000-3-ATP. The alignment of the mounts was within the required tolerance ranges specified in the manual.

NOTAR Fan Balance

The NOTAR fan assembly had been balanced by the LASD through normal maintenance practices. NOTAR fan assembly balancing was performed using a Chadwick-Helmuth Model 8500C+ Balancer/Analyzer and a Chadwick-Helmuth Model 8520C Signal Detector. A satisfactory calibration check of the entire system was performed during the on-site visit.

Aft Tube Assembly Frequency Response

Testing was conducted at MDHI facilities to determine the bending mode natural frequencies of the aft tube assembly, 500N7113. Dynamic Labs, of Phoenix, Arizona, was contracted by MDHI to supply the response measurement equipment and perform the impulse hammer tests.

All tests were conducted on a static, mechanically representative, maintenance training 520N fuselage. The drive system was not rotating. Acceleration spectral data of the aft tube assembly response to impulse hammer inputs were collected for different NOTAR fan drive and control component assembly configurations (i.e.: new pitch slider replaced with a worn pitch slider, etc.). Thirty-four configurations were tested. Dynamic Labs conducted the reduction and analysis of the spectral data. As reported by Dynamic Labs, the three lowest bending modes measured during the tests were 65, 220, and 450 Hz, with minor variations in the second and third modal frequencies with assembly configuration changes. It was also reported that the first mode of 65 Hz was not sensitive to assembly configuration changes. The scope of the testing was not sufficient to obtain torsional mode natural frequency data.

Dynamic Labs noted that the impulse hammer did not always excite the three bending modes for each assembly configuration tested. The 65 Hz mode was excited in 10 configurations (29 percent of the 34 tested configurations). The 220 Hz mode was excited in 25 configurations (74 percent of the 34 tested configurations). The 450 Hz mode was excited in 10 configurations (29 percent of the 34 tested configurations). An analysis of the natural frequency of the aft tube assembly was conducted by MDHI prior to the testing. MDHI reported that the natural frequency of the rod, when analyzed as a fixed-pinned rod, was estimated to be 94 Hz in bending and 1120 Hz in torsion.

FLEET-WIDE RESEARCH

The FAA and MDHI Service Difficulty Report (SDR) databases were reviewed. There were no reported incidents of high vibrations experienced in the NOTAR fan drive and control systems. I n addition, there were no reported incidents of anomalous marks, or scoring noted on the aft control tube during routine maintenance on the NOTAR fan drive and control systems.

Safety Board investigators conducted interviews and submitted questionnaires to selected MD 520N operators. Neither the Orange County Police Department in California, nor the Prince Georges County Police Helicopter Unit in Maryland had experienced any:

a. Vibratory incidents with origins traced to the NOTAR fan drive and control systems;

b. Directional control pedals binding;

c. Incidents of anomalous marks or scoring noted on the aft control tube during routine maintenance on the NOTAR fan drive and control systems.

Pilot Information

Certificate:	Commercial	**Age:**	40, Female
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	05/07/2001
Occupational Pilot:		**Last Flight Review or Equivalent:**	03/02/2001
Flight Time:	2700 hours (Total, all aircraft), 1000 hours (Total, this make and model), 240 hours (Last 90 days, all aircraft), 75 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	MDHI	**Registration:**	N953SD
Model/Series:	520N	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	LN070
Landing Gear Type:	Skid	**Seats:**	4
Date/Type of Last Inspection:	07/11/2001, 100 Hour	**Certified Max Gross Wt.:**	3350 lbs
Time Since Last Inspection:	65 Hours	**Engines:**	1 Turbo Shaft
Airframe Total Time:	5852 Hours at time of accident	**Engine Manufacturer:**	Allison
ELT:	Not installed	**Engine Model/Series:**	250-C20R
Registered Owner:	Los Angeles County Sheriff's Department	**Rated Power:**	425
Operator:	Los Angeles County Sheriff's Department	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Night
Observation Facility, Elevation:	LAX, 56 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	0250 PST	**Direction from Accident Site:**	
Lowest Cloud Condition:		**Visibility**	7 Miles
Lowest Ceiling:	Overcast / 1400 ft agl	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	270°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.89 inches Hg	**Temperature/Dew Point:**	17°C / 15°C
Precipitation and Obscuration:			
Departure Point:	Los Angeles, CA (KLAX)	**Type of Flight Plan Filed:**	None
Destination:	Long Beach, CA (KLGB)	**Type of Clearance:**	VFR
Departure Time:	0248 PDT	**Type of Airspace:**	Class D

Airport Information

Airport:	Los Angeles International (LAX)	**Runway Surface Type:**	Concrete
Airport Elevation:		**Runway Surface Condition:**	Dry
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Traffic Pattern

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Minor
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	33.950000, -118.411111

Administrative Information

Investigator In Charge (IIC):	JEFF RICH	**Report Date:**	02/05/2004
Additional Participating Persons:	Nicholas Eull; Federal Aviation Administration; Long Beach, CA John Hobby; MD Helicopters, Inc.; Mesa, AZ Mark Utley; Los Angeles County Sheriff; Long Beach, CA		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		