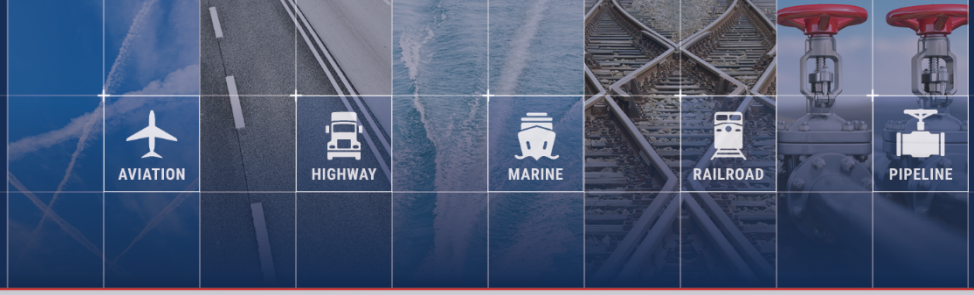

Aviation Investigation Final Report

Location:	ETNA, California	**Accident Number:**	LAX94LA132
Date & Time:	February 23, 1994, 11:00 Local	**Registration:**	N204AP
Aircraft:	BELL TH-1L	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	2 Minor
Flight Conducted Under:	Part 133: Rotorcraft ext. load		

Analysis

THE 42-DEGREE GEAR BOX FAILED SHORTLY AFTER DEPARTING ON A HELICOPTER LOGGING OPERATION. THE PILOT JETTISONED THE LOAD, BUT WAS UNABLE TO STOP THE HELICOPTER'S ROTATION AND IT CRASHED. METALLURGICAL EXAMINATION OF THE GEAR BOX REVEALED A FATIGUE BANDING PATTERN NEAR THE TOOTH ROOT OF THE INPUT GEAR.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: THE FAITUGE OF THE GEAR TOOTH WHICH CAUSED THE FAILURE OF THE 42-DEGREE GEAR BOX.

Findings

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

Findings
1. (C) ROTOR DRIVE SYSTEM,INTERMEDIATE GEARBOX(42 DEG) - FAILURE,TOTAL
2. (C) ROTOR DRIVE SYSTEM,INTERMEDIATE GEARBOX(42 DEG) - FATIGUE

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

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
3. AUTOROTATION - NOT POSSIBLE - PILOT IN COMMAND

Factual Information

On February 23, 1994, about 1100 hours Pacific standard time, a Bell TH-1L helicopter, N204AP, crashed during an emergency autorotation about 3 1/2 miles north of Etna, California. The pilot was conducting a visual flight rules (VFR) local area flight under Title 14 CFR Part 133. The helicopter, operated by Hiser Helicopters Inc., Redmond, Oregon, sustained substantial damage. The certificated commercial pilot-in-command and the certificated second pilot received minor injuries. Visual meteorological conditions prevailed. The flight originated from a helipad next to the accident site about 0945 hours.

The pilot reported in the National Transportation Safety Board Pilot/Operator Aircraft Accident Report, NTSB Form 6120.1/2, that shortly after picking up the 3,200 pounds of logs he felt an audible vibration; the helicopter was between 50 and 60 feet above the ground. The pilot reduced the power and began a descent to return the load to the ground that was followed by a right turn toward the landing area.

The helicopter responded normally, but the intensity of the vibration increased. The vibration decreased in about 5 to 8 seconds after the helicopter entered forward flight. During deceleration, as the longline touched the ground, the helicopter began an uncontrollable spin to the right. The ground mechanic told the pilot via radio communications that the tail rotor "had stopped."

The pilot rolled-off the throttle after about two or three revolutions to stop the rotation, but was unsuccessful. The helicopter struck the ground as it continued to rotate.

The operator told Safety Board investigators that the helicopter's 42-degree gear box tail rotor failed. He also said that the 42-degree gear box had accrued 134 hours of logging activities and a total time of 249 hours since it was overhauled. The previous gear box had accrued 400 hours before the operator prematurely removed it. The operator removed it only to inspect the wear and tear on the gear box.

Safety Board investigators sent the gear box to the Safety Board's Material Laboratory Division for metallurgical examination. The metallurgist reported, in part:

"...that visual examination of the fracture surface on the input gear revealed the presence of [a] fatigue banding pattern over most of the fracture surface. The fatigue arrest markings emanated from a tooth root....

...The fracture surface [was] within about 0.1 inch of the tooth root propagated into the tooth, approximately toward the adjacent tooth root. Beyond about 0.1 inch from the root the crack plane changed and the cracking propagated on a relatively flat plane through the

web. ...A well defined crack arrest pattern was found in the web of the gear.

...Measurement of the radius from which the fatigue cracking initiated yielded a value of 0.04 inch. The size of this radius is specified as 0.015 inch to 0.025 inch. No defects were found in the fatigue crack origin."

The Safety Board's investigator-in-charge returned the 42-degree gear box to the operator on July 6, 1994.

Pilot Information

Certificate:	Commercial	**Age:**	47,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	June 1, 1993
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	14018 hours (Total, all aircraft), 3400 hours (Total, this make and model), 13325 hours (Pilot In Command, all aircraft), 225 hours (Last 90 days, all aircraft), 165 hours (Last 30 days, all aircraft), 9 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	BELL	**Registration:**	N204AP
Model/Series:	TH-1L TH-1L	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	157840
Landing Gear Type:	Skid	**Seats:**	7
Date/Type of Last Inspection:	Continuous airworthiness	**Certified Max Gross Wt.:**	9500 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:		**Engine Manufacturer:**	LYCOMING
ELT:	Not installed	**Engine Model/Series:**	T53-L13
Registered Owner:	SOUTHERN AERO CORP	**Rated Power:**	
Operator:	HISER HELICOPTERS INC.	**Operating Certificate(s) Held:**	
Operator Does Business As:		**Operator Designator Code:**	IQHL

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 4000 ft AGL	**Visibility**	40 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots / 7 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	0°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	1°C / -3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:		**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	09:45 Local	**Type of Airspace:**	Class G

Airport Information

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

Wreckage and Impact Information

Crew Injuries:	2 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Minor	**Latitude, Longitude:**	41.409595,-123.01992(est)

Administrative Information

Investigator In Charge (IIC):	Erickson, Scott
Additional Participating Persons:	ROGER BROWNLOW; RIVERSIDE , CA
Original Publish Date:	November 14, 1994
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=28671