



# Aviation Investigation Final Report

<b>Location:</b>	Gustine, California	<b>Accident Number:</b>	WPR22LA084
<b>Date &amp; Time:</b>	January 23, 2022, 10:30 Local	<b>Registration:</b>	N333XL
<b>Aircraft:</b>	Bell UH-1E	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Sys/Comp malf/fail (non-power)	<b>Injuries:</b>	1 None
<b>Flight Conducted Under:</b>	Part 137: Agricultural		

## Analysis

The pilot was conducting aerial spray applications of a chemical to a field. He had checked the oil quantity of the 90° gearbox during the preflight check but did not recall the quantity of oil at the time. The pilot had operated the helicopter for about 45 minutes and, while making a turn, lost control of the helicopter. The helicopter descended and impacted terrain.

Maintenance records revealed no anomalies. Postaccident examination of the 90° gearbox revealed severe damage to the internal components and no evidence of lubricating oil inside the housing. The pinion was severely deformed, which resulted in the loss of rotational drive to the tail rotor assembly and the subsequent loss of control.

Examination of the oil level sight glass revealed that the inside was covered with a material that did not allow for sufficient viewing of the oil level. It is likely that, when the pilot looked at the oil level sight glass during his preflight check, he interpreted what he saw as an adequate amount of oil.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

Failure of the 90° gearbox due to the lack of lubricating oil, which resulted in a loss of rotational drive to the tail rotor and a subsequent loss of control of the helicopter.

## Findings

Aircraft	Tail rotor gearbox - Malfunction
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## Factual Information

### History of Flight

Maneuvering-low-alt flying      Sys/Comp malf/fail (non-power) (Defining event)

On January 23, 2022, about 1030 Pacific standard time, a Bell UH-1E, N333XL, was substantially damaged when it was involved in an accident near Gustine, California. The pilot was not injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 137 aerial application flight.

The pilot reported that he was applying herbicide to a wheat field and that the accident occurred on the third load of the day and after the pilot had been operating the helicopter for about 45 minutes. At the apex of a turn, the pilot lost control of the helicopter, and it descended and struck terrain, which substantially damaged the main rotor system, tailboom, and fuselage. The pilot turned off the fuel boost and the master electrical switch and exited the helicopter through the roof window. The pilot reported that he had checked the oil level of the 90° gearbox before the flight but did not recall the quantity of oil at the time.

A review of postaccident photos provided by the pilot revealed the helicopter came to rest on its left side in an open, level field. All major components were located in the debris area around the airframe. The tailboom had partially separated from the fuselage. One main rotor blade separated from the hub about 24 inches outboard of the blade grip. The other main rotor blade remained attached and exhibited upward bending about 24 inches from the blade grip. The tail rotor assembly and the 90° gearbox remained attached to the top of the vertical stabilizer. The 90° gearbox had an internal gear that had breached the housing. The green paint around the breach was thermally damaged, and no evidence of oil was observed around the exposed area of the gearbox.

The 90° gearbox was shipped to the National Transportation Safety Board (NTSB) Materials Laboratory. Examination of the 90° gearbox revealed that the housing and the parts within the housing were dry and covered with a black deposit of fine metallic particles and that they contained no evidence of lubricating oil/fluid (see figures 1 and 2). The gear and bearings exhibited evidence of heat damage and deformation. The pinion exhibited severe heat and wear damage, which is also shown in figure 2.

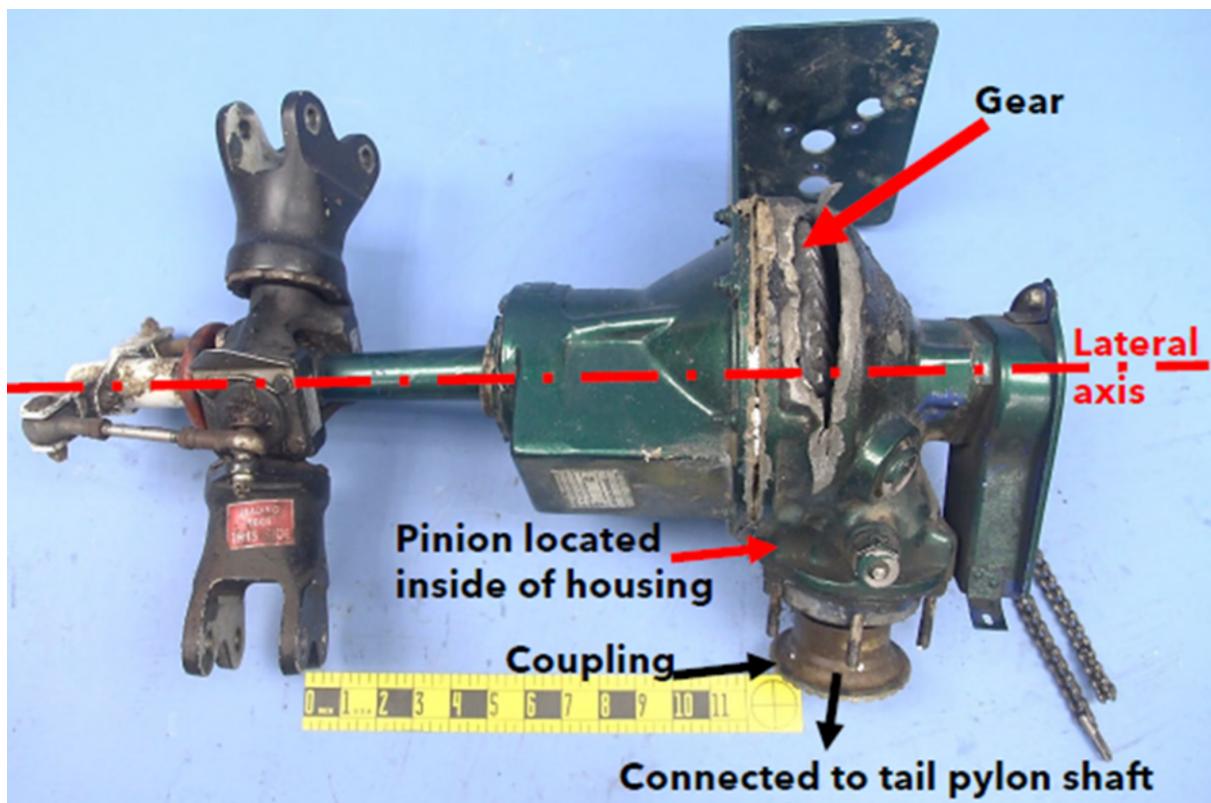


Figure 1. Overall view of the 90° gearbox assembly showing a portion of the exposed gear that breached the gearbox housing.

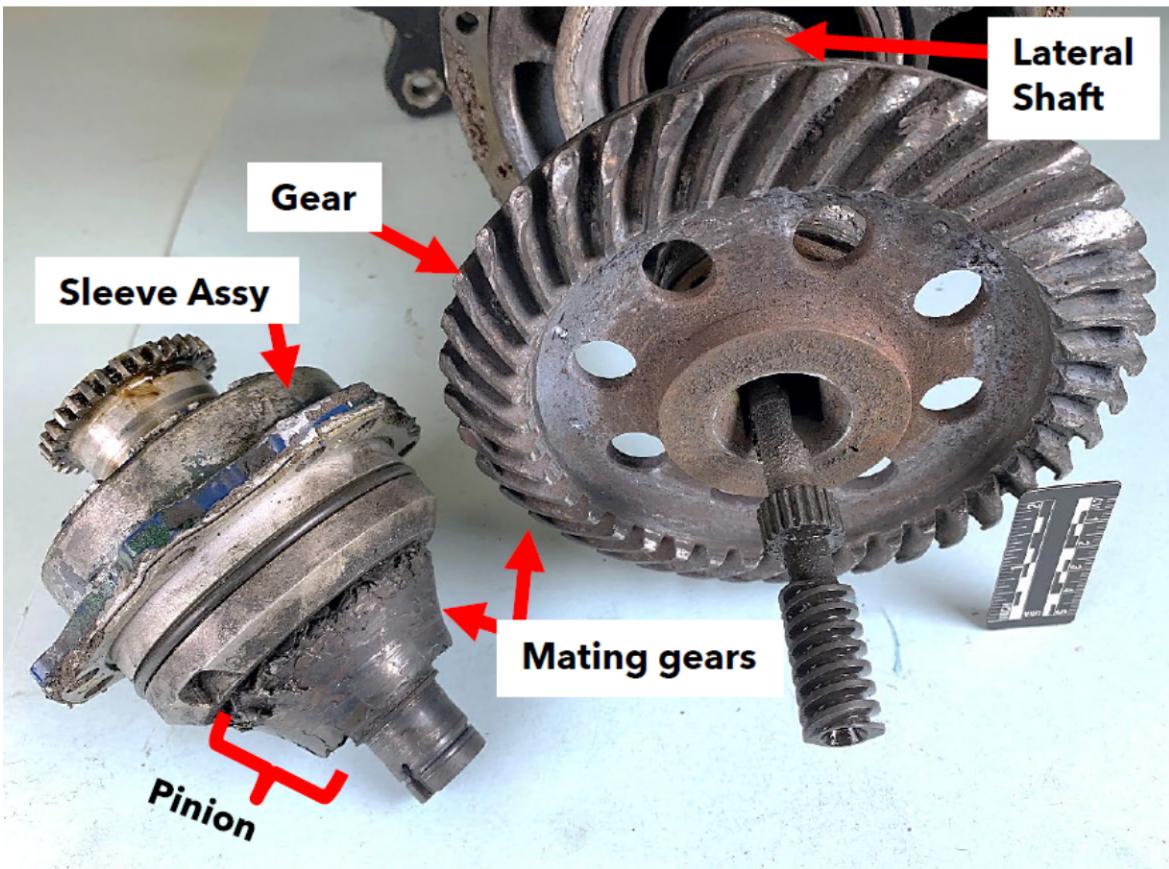


Figure 2. View of the internal components of the 90° gearbox and the damage to the pinion.

The interior of the housing was covered in soot. When a flashlight was aimed at the oil level sight glass, no light passed through it (figure 3).



Figure 3. Oil level sight glass for the 90° gearbox.

Review of the airplane's maintenance records revealed that, on October 23, 2007, the 90° gearbox was installed on the accident helicopter at an airframe time of 8,412 hours. The gearbox had 260.9 hours since overhaul. The gearbox complied with Federal Aviation Administration Airworthiness Directive 90-10-05, dated June 5, 1990, which was issued to prevent the failure of the tail rotor gearbox duplex bearing. On February 15, 2022 (23 days after the accident), the 90° gearbox was removed for examination; at that time, the helicopter had an airframe time of 9,025.8 hours, and the gearbox had accumulated 3,124.5 historical hours and 298.9 hours since overhaul.

## Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	77, Male
<b>Airplane Rating(s):</b>	Single-engine land; Single-engine sea	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	
<b>Medical Certification:</b>	Class 2 With waivers/limitations	<b>Last FAA Medical Exam:</b>	August 28, 2021
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	August 10, 2021
<b>Flight Time:</b>	(Estimated) 27000 hours (Total, all aircraft), 900 hours (Total, this make and model)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Bell	<b>Registration:</b>	N333XL
<b>Model/Series:</b>	UH-1E	<b>Aircraft Category:</b>	Helicopter
<b>Year of Manufacture:</b>	1967	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Restricted (Special)	<b>Serial Number:</b>	154951
<b>Landing Gear Type:</b>	Skid	<b>Seats:</b>	6
<b>Date/Type of Last Inspection:</b>	February 12, 2021 Annual	<b>Certified Max Gross Wt.:</b>	
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Turbo shaft
<b>Airframe Total Time:</b>	9004 Hrs as of last inspection	<b>Engine Manufacturer:</b>	Lycoming
<b>ELT:</b>	Not installed	<b>Engine Model/Series:</b>	T53-L-11D
<b>Registered Owner:</b>	DAVID LEE AIRCRAFT SALES AND LEASING LLC	<b>Rated Power:</b>	1200 Horsepower
<b>Operator:</b>	Marquis Aviation	<b>Operating Certificate(s) Held:</b>	Agricultural aircraft (137)

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KMCE, 153 ft msl	<b>Distance from Accident Site:</b>	24 Nautical Miles
<b>Observation Time:</b>	10:53 Local	<b>Direction from Accident Site:</b>	63°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	5 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	/	<b>Turbulence Type Forecast/Actual:</b>	None / None
<b>Wind Direction:</b>		<b>Turbulence Severity Forecast/Actual:</b>	N/A / N/A
<b>Altimeter Setting:</b>	30.29 inches Hg	<b>Temperature/Dew Point:</b>	12°C / 6°C
<b>Precipitation and Obscuration:</b>	Moderate - None - Haze		
<b>Departure Point:</b>	Los Banos, CA (LSN)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Gustine, CA	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	08:00 Local	<b>Type of Airspace:</b>	Class G

## Airport Information

<b>Airport:</b>	Los Banos LSN	<b>Runway Surface Type:</b>	
<b>Airport Elevation:</b>		<b>Runway Surface Condition:</b>	Vegetation
<b>Runway Used:</b>		<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>		<b>VFR Approach/Landing:</b>	Unknown

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	N/A	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>		<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 None	<b>Latitude, Longitude:</b>	37.102274,-120.97578

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Salazar, Fabian
<b>Additional Participating Persons:</b>	Jason R. Alves; Federal Aviation Administration; Fresno, CA
<b>Original Publish Date:</b>	January 30, 2024
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class 3</a>
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.ntsb.gov/Docket?ProjectID=104563">https://data.ntsb.gov/Docket?ProjectID=104563</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).