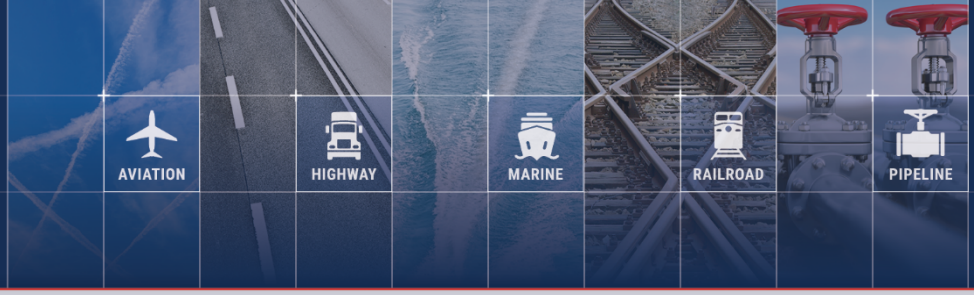

Aviation Investigation Final Report

Location:	SHAFTER, California	**Accident Number:**	LAX96FA045
Date & Time:	November 12, 1995, 11:30 Local	**Registration:**	N78900
Aircraft:	Bell 47D1	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The helicopter was certificated in the restricted category for aerial applications. The pilot completed several aerial application flights, including a water rinsing procedure. The pilot's brother, who had been performing flagging duties, boarded the helicopter after the water rinsing flight. During the flight, the spray boom struck the ground and the helicopter collided with the terrain. The helicopter erupted into flames when it came to rest. The postaccident wreckage examination disclosed no evidence of any preimpact airframe or engine malfunctions or failures.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the pilot misjudged the altitude and ground clearance while performing an unwarranted low altitude flight maneuver.

Findings

Occurrence #1: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: MANEUVERING

Findings
1. (F) LOW ALTITUDE FLIGHT/MANEUVER - PERFORMED - PILOT IN COMMAND
2. (C) ALTITUDE/CLEARANCE - MISJUDGED - PILOT IN COMMAND

Factual Information

HISTORY OF FLIGHT

On November 12, 1995, between 1115 and 1200 hours Pacific standard time, a Bell 47D1 helicopter, N78900, collided with the terrain in an open field about 4 miles northwest of the Shafter airport, Shafter, California. The pilot was conducting a visual flight rules personal flight. The helicopter, operated by Lewis Aviation of Shafter, was destroyed by impact and the resulting postimpact fire; about 10 acres of freshly planted roses were destroyed. The certificated commercial pilot and passenger, the pilot's brother and part-time flagger for the operator, sustained fatal injuries. Visual meteorological conditions prevailed. The flight originated from Shafter airport about 0740 hours; the flight departed the aerial application area at an unknown time.

National Transportation Safety Board investigators interviewed the operator and loader at the operator's facility on November 13, 1995. The operator said that the pilot was scheduled to spray a crop of trees on November 12, 1995, sometime between 0800 and 0900 hours. He was not at his facility when the pilot departed on the aerial application flight.

The operator said that the loader returned to the facility about 1115 hours. The loader told him the pilot was returning shortly. When the pilot did not return by 1200 hours, he drove to the field and found the burnt wreckage at 1215 hours.

The loader said that he and the flagger departed the operator's facility at 0800 hours and arrived near the aerial application area (about 1/4 mile southeast of the accident site) at 0815 hours. The loader was driving the loading platform truck and the flagger followed him in a smaller pickup truck. After they arrived at the loading area, the pilot arrived and landed in a hay field next to the parked trucks.

The loader said that he loaded the helicopter with 60 gallons of chemical (about a 12 percent zinc and 88 percent water mixture). The pilot began spraying the trees at 0900 hours and completed a series of aerial application flights until 1050 hours. The helicopter landed on the loading platform and the loader filled the spray tanks with water, between 30 and 40 gallons, for an aerial rinse. After refueling the helicopter, the pilot departed to spray the trees with the water. The loader departed the area at 1100 hours. The flagger was at the loading area when the loader departed.

There were no ground witnesses.

The accident coordinates are: 35 degrees, 32.81 minutes north latitude and 119 degrees, 15.19 minutes west longitude.

CREW INFORMATION

The pilot held a commercial pilot certificate with airplane ratings for single engine land and instruments, and rotorcraft - helicopter ratings. Safety Board investigators did not recover the pilot's flight hours logbook. The flight hours reflected on page 3 of this report were based on the operator's estimate.

The loader, also a certified commercial pilot/flight instructor and crop duster pilot, said he gave the pilot his last biennial flight review (BFR) on June 30, 1994. The BFR was flown in the accident helicopter.

The operator said that he provided the pilot all of his helicopter and aerial application training. The pilot began this training about 18 months before the accident. He estimated that the pilot accrued more than 800 hours in the accident helicopter make and model.

AIRCRAFT INFORMATION

The operator gave Safety Board investigators the helicopter's maintenance records. Examination of records disclosed that the operator performed an annual inspection on the helicopter on October 25, 1995. The helicopter had accrued about 7,640 hours at the time of the inspection. The operator did not maintain an office flight log, but he estimated that at the time of the accident, the helicopter flew about 20 hours since the annual inspection. The maintenance records did not reflect any open maintenance discrepancies which would have affected the helicopter's performance.

The operator installed the "zero time since major overhaul" engine at the time of the annual inspection.

The helicopter was certificated in the restricted category for aerial application and pest control (spraying) purposes. Title 14 CFR 91.313 states:

(a) No person may operate a restricted category civil aircraft-

(1) For other than the special purpose for which it is certificated

(d) No person may be carried on a restricted category civil aircraft unless that person-

(1) Is a flight crewmember (2) Is a flight crewmember trainee (3) Performs an essential function in connection with a special purpose operation for which the aircraft is certificated; or (4) Is necessary to accomplish the work activity directly associated with that special purpose.

The operator told Safety Board investigators that the flagger was not allowed in the helicopter. He said that the pilot was to dispense the water and then return to the airport.

METEOROLOGICAL INFORMATION

The weather data reflected on page 4 of this report was the Bakersfield airport 1148 hours surface weather observation. Bakersfield airport is the closest surface weather observation facility.

The operator told Safety Board investigators that when he arrived at the accident site, clear skies existed, the visibility was greater than 20 miles, and that the surface winds were from the west-northwest between 2 and 5 knots.

FIRE

The operator reported that the fire was extinguished when he arrived at the accident site. The fire damage was contained to the wreckage and the crops beneath the helicopter. There was no evidence of any chemical or water spillage.

The Kern County Fire Department did not respond to the accident site.

WRECKAGE AND IMPACT INFORMATION

The crash site is located in a field of freshly planted roses. The furrows are oriented in an east to west direction. Ground scars and the wreckage examination revealed the left spray boom initially contacted the ground and the fuselage struck the ground in about a 60-degree nose down and about a 30-degree right banking attitude. The initial ground impact crater is about 34 feet northwest of the initial spray boom impact site. A spray boom nozzle was found at the initial spray boom impact site and matched with the fractured surface of the remaining nozzle piece in the boom.

The helicopter came to rest on its left side facing 260 degrees and about 36 feet north of the main impact area. The cockpit area was incinerated by the resulting postimpact fire. A 34-foot ground scar that conformed to the spray boom shape was oriented in a northwesterly direction.

Investigators found a crescent shaped ground impact mark between 20 to 25 feet east-southeast of the main impact crater. Several paint chip pieces which resembled the main rotor blades paint scheme were found near the crater.

Safety Board investigators conducted a detailed wreckage examination on November 14, 1995, at Valley Aircraft Parts, Tulare, California. The parties listed in this report participated in the examination.

COCKPIT EXAMINATION

The right forward side was crushed upward and the heel plates were rolled under the flight deck. The left forward side displayed some upward crushing. The chin bubble was shattered with pieces in the initial impact crater and spread along the ground path to the main wreckage resting point. The right cyclic grip was broken to the right and was found near the left side of the helicopter in the burnt wreckage area; the grip, however, did not display any fire damage. The right rear of the passenger seat (engine firewall) exhibited inboard crushing. The back side of the pilot seat's metal frame tube displayed a symmetrical 12-inch concave mark; the support tubes were broken in numerous places.

CENTER FRAME EXAMINATION

The right side of the forward tube was missing. The right side vertical tube was broken toward the rear and the right lower tube was missing. The left side of the frame was intact, but was bent to the left.

TAILBOOM ASSEMBLY

The tailboom was buckled; the buckling began about 33 inches from the tailboom/center frame attach point. The lower aft cluster weld tubes were broken and bent down about 60 degrees and 41 inches from the rear center frame attach points. The right lower tube was buckled inward.

The forward section of the tail rotor drive shaft was twisted off. The forward male coupling remained inside the dust cover. The rest of the short shaft was not found. The forward section of the drive shaft was twisted to the right and exhibited torsional overload signatures and longitudinal scrape marks. The transmission shaft also displayed torsional twisting signatures.

The tail rotor assembly and the 90-degree gear box separated from their respective attach points. Both tail rotor blades were broken near their respective attach points. The inboard portion of the tail rotor blades remained connected at their respective blade grips; both tail rotor blades separated outboard of the blade grips. One tail rotor blade exhibited a 7-inch concave impact mark. This mark corresponded with a white paint transference mark found on the tail rotor drive casing. The tail rotor blades are painted white with black stripes.

LEFT SPRAY BOOM

The tip end and five other nozzles were broken; the five nozzles were found along the spray boom ground imprint. The tip end nozzle was found at the southeast end of the boom ground imprint.

The boom separated from its skid tube attach point and was bowed upward and rotated rearward about 80 degrees.

The leading edge displayed numerous lateral scrape marks.

RIGHT SPRAY BOOM

The boom exhibited "S" twisting and its outboard section was bent downward. The 4-foot extension was broken and found about 15 feet west of the initial fuselage impact crater. The boom displayed some leading edge lateral scrape marks.

LEFT SKID

The skid was fractured in two places - at the front and rear vertical support tube attach points. The vertical support tube (front side) fracture displayed upward overload characteristics; the rear support tube fracture displayed downward overload characteristics.

The spray boom attach tube was fractured but was connected to the center vertical support tube. The tube was bent to the left; the bending began about 34 inches from its vertical support tube attach fitting.

RIGHT SKID

The right skid was fractured at its forward vertical tube. The fracture signatures were the same as the left skid. The rear support tube area sustained extensive postcrash fire damage and was melted.

REAR CROSS TUBE

The right side of the tube was bent rearward about 30 degrees. The bending started outboard of the cross tube attach saddle (right rear).

TRANSMISSION ASSEMBLY

Continuity of the transmission assembly was established. Disassembly examination revealed no evidence of any preexisting malfunctions or failures. The freewheeling unit operated normally and the clutch assembly displayed normal wear signatures. The upper and lower planetary gears, the ring gear, the sun gear adapter, and the freewheeling gear displayed normal operating signatures.

ROTOR MAST ASSEMBLY

The pitch change links separated. One stabilizer bar separated from its attach point. The bar was found about 15 feet south of the main wreckage resting point. The remaining bar partially fractured, but remained attached at its respective attach points.

Both main rotor blades remained attached at their respective attach points. One blade drag

brace bolt was clipped off at the clevis. The center section of the bolt remained in the blade. The other blade rotated about 90 degrees and its underside displayed numerous chordwise scrape marks and three vertical tear marks. The blade displayed extensive compression signatures.

The remaining blade was found beneath the left side of the helicopter imbedded in the dirt. The blade end near the blade cuff was incinerated.

ENGINE

The engine sustained fire damage. Continuity of the engine gear and valve train assembly was established. The cylinders, except for the No. 1 and 5 cylinders, produced thumb compression during rotation of the crankshaft.

The No. 1 and 5 cylinders sustained extensive fire damage near their valves. Disassembly examination of the damaged cylinders revealed that the No. 1 cylinder valves were warped. Two of the No. 5 cylinder valve springs tension were below service limits. The mechanic reported that the valve springs tension was diminished due to extensive external heat damage.

Visual examination of the internal components of the engine assembly revealed no evidence of any high temperature distress on the crankshaft and connecting rods. The area near the accessory case displayed some external high temperature distress.

The oil pump operated normally. The screen lockwire and compression gasket torque were normal. The engine inlet oil screen was free of contaminates.

Both magnetos sustained postimpact fire damage and neither magneto could be functionally tested. The left magneto melted from the engine accessory and was found beneath the engine.

The right magneto remained attached to the engine accessory case. The distributor cap sustained postcrash fire damage.

The spark plugs center electrodes were not oval shaped. The spark plug gaps were found within service limits; 0.015 and 0.018 inches.

The carburetor remained attached to the engine accessory case. The throttle valve was found in the open position and its linkage was seized.

MEDICAL AND PATHOLOGICAL INFORMATION

The Kern County Coroner's Office performed post mortem and toxicological examinations on both occupants. A coroner's investigator reported that the toxicological examinations on both occupants were negative for alcohol or drugs.

ADDITIONAL INFORMATION

The wreckage was released to the operator on November 14, 1995. The wreckage was at Valley Aircraft Parts, Inc., when it was released.

Pilot Information

Certificate:	Commercial	**Age:**	28,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	January 30, 1995
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	1000 hours (Total, all aircraft), 8 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	**Registration:**	N78900
Model/Series:	47D1 47D1	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	480
Landing Gear Type:	High skid	**Seats:**	2
Date/Type of Last Inspection:	October 25, 1995 Annual	**Certified Max Gross Wt.:**	3600 lbs
Time Since Last Inspection:	20 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	7760 Hrs	**Engine Manufacturer:**	Lycoming
ELT:	Not installed	**Engine Model/Series:**	VO-435-25A
Registered Owner:	G.K. LEWIS	**Rated Power:**	265 Horsepower
Operator:	LEWIS AVIATION	**Operating Certificate(s) Held:**	
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	BFL ,669 ft msl	**Distance from Accident Site:**	14 Nautical Miles
Observation Time:	11:48 Local	**Direction from Accident Site:**	113°
Lowest Cloud Condition:	Clear	**Visibility**	7 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	270°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	24°C / 9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:		**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	00:00 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:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	2 Fatal	**Latitude, Longitude:**	35.48983,-119.300926(est)

Administrative Information

Investigator In Charge (IIC):	Llorente, A.
Additional Participating Persons:	NORMAN WILKINS; FRESNO , CA DAVID C DISJER; FT WORTH , TX TERRY S PULLIN; SHAFTER , CA MARK W PLATT; VAN NUYS , CA
Original Publish Date:	July 11, 1996
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=29239