



National Transportation Safety Board Aviation Accident Final Report

Location:	GATLINBURG, TN	Accident Number:	ATL91FA013
Date & Time:	11/01/1990, 1400 EST	Registration:	N49DA
Aircraft:	BELL 47J-2	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	1 Serious, 2 Minor

Flight Conducted Under: Part 91: General Aviation - - Sightseeing

Analysis

THE TWO PASSENGERS REPORTED THAT THEY HEARD A 'POP' SOUND, FOLLOWED BY THE HELICOPTER STARTING A CLOCKWISE SPIN TO THE RIGHT. THE HELICOPTER DESCENDED INTO THE TREES ON THE SIDE OF A STEEP SLOPE. INVESTIGATION REVEALED THAT THE TAIL ROTOR DRIVE SHAFT FAILED IMMEDIATELY FORWARD OF THE TAILBOOM EXTENSION TUBE. THE DRIVE SHAFT FAILED FROM FATIGUE CRACKING, PROPAGATING AT A HIGH RATE, SUGGESTING HIGH LOADS. THE T/R DRIVE SHAFT FORWARD BEARING HOUSING OUTER DIAMETER DIMENSION AND THE INNER DIAMETER OF THE TAILBOOM EXTENSION TUBE WERE WORN BEYOND REPLACEMENT LIMITS AND SHOULD HAVE BEEN REPLACED ACCORDING TO THE BELL MAINTENANCE AND OVERHAUL MANUAL. THE PASSENGER THREE-PLACE BENCH SEAT HAD BEEN ALTERED SO THAT THE INDIVIDUAL SEAT BELTS HAD BEEN MODIFIED INTO ONE SINGLE LONG BELT. THE BELT COULD BE OPENED ONLY ON THE LEFT SIDE OF THE BELT; THE BUCKLE ON THE RIGHT SIDE OF THE BELT WAS TAPED CLOSED WITH SILVER DUCT TAPE.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: THE ACCIDENT WAS INADEQUATE MAINTENANCE OF THE HELICOPTER, ALLOWING A TAIL ROTOR DRIVE SHAFT BEARING TO EXCEED WEAR LIMITS. THIS RESULTED IN HIGH LOADS ON THE TAIL ROTOR DRIVE SHAFT, AND THE RESULTING FATIGUE FAILURE OF THE DRIVE SHAFT.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION

Phase of Operation: CRUISE - NORMAL

Findings

1. (C) ROTOR DRIVE SYSTEM, TAIL ROTOR DRIVE SHAFT BEARING - WORN
 2. (C) ROTOR DRIVE SYSTEM, TAIL ROTOR DRIVE SHAFT - FATIGUE
 3. (C) MAINTENANCE, INSPECTION - INADEQUATE - COMPANY MAINTENANCE PERSONNEL
 4. MISC EQPT/FURNISHINGS, SEAT BELT - IMPROPER
-

Occurrence #2: LOSS OF CONTROL - IN FLIGHT

Phase of Operation: CRUISE - NORMAL

Occurrence #3: IN FLIGHT COLLISION WITH OBJECT

Phase of Operation: DESCENT - UNCONTROLLED

Findings

5. OBJECT - TREE(S)
-

Occurrence #4: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

Pilot Information

Certificate:	Commercial	Age:	43, Male
Airplane Rating(s):	Single-engine Land	Seat Occupied:	Front
Other Aircraft Rating(s):	Helicopter	Restraint Used:	Seatbelt
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim.	Last FAA Medical Exam:	04/05/1990
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	8448 hours (Total, all aircraft), 8370 hours (Pilot In Command, all aircraft), 385 hours (Last 90 days, all aircraft), 120 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	BELL	Registration:	N49DA
Model/Series:	47J-2 47J-2	Aircraft Category:	Helicopter
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:		Serial Number:	1825
Landing Gear Type:	Skid	Seats:	4
Date/Type of Last Inspection:	10/07/1990, Annual	Certified Max Gross Wt.:	2950 lbs
Time Since Last Inspection:	85 Hours	Engines:	1 Reciprocating
Airframe Total Time:	8972 Hours	Engine Manufacturer:	LYCOMING
ELT:	Not installed	Engine Model/Series:	VO-540-B1B3
Registered Owner:	PIGEON FORGE HELICOPTERS, INC	Rated Power:	260 hp
Operator:	PIGEON FORGE HELICOPTERS, INC.	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	TYS, 981 ft msl	Distance from Accident Site:	26 Nautical Miles
Observation Time:	1350 EST	Direction from Accident Site:	280°
Lowest Cloud Condition:	Clear / 0 ft agl	Visibility	15 Miles
Lowest Ceiling:	None / 0 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	Calm /	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30 inches Hg	Temperature/Dew Point:	23° C / 6° C
Precipitation and Obscuration:			
Departure Point:	PIGEON FORGE, TN (NONE)	Type of Flight Plan Filed:	None
Destination:		Type of Clearance:	None
Departure Time:	1350 EST	Type of Airspace:	

Wreckage and Impact Information

Crew Injuries:	1 Serious	Aircraft Damage:	Destroyed
Passenger Injuries:	2 Minor	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Serious, 2 Minor	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	HICKS E RALPH	Report Date:	12/14/1992
Additional Participating Persons:			
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 pubinquiry@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).