Aviation Investigation Final Report

Location:	WAYNESVILLE, North Carolina	**Accident Number:**	MIA00GA264
Date & Time:	September 7, 2000, 09:05 Local	**Registration:**	N525BM
Aircraft:	Bell UH-1H	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

According to a witness, N525BM, operated by the North Carolina Forest Service, departed Macon County Airport, Franklin, North Carolina, on September 7, 2000, about 0850 into visual flight rules weather. The FAA flight service stations had been promulgating "Airmet Sierra" warning of low ceilings and mountain obscurations for the Franklin/Waynesville area from 2000 of the night of September 6, 2000, to 1000 of the morning of September 7. The flight followed highway 23/74 to Sylva, continuing toward Waynesville's Haywood County Mountain Research Station where the rotorcraft, its onboard fire fighting equipment, and crew were to serve as a static display for school children. About 5 minutes out, the pilot radioed the Haywood County Forest Ranger who had the landing zone secured for his arrival that he would put the rotorcraft down and wait for unexpected fog to lift. Residents in West Waynesville saw and heard the rotorcraft try to pick its way in very heavy ground fog. The rotorcraft collided with trees in mountainous terrain south of West Waynesville at the 4,400-foot level. Examination at the crash site and factory examinations of the engine and rotor mast revealed no precrash mechanical malfunctions. Use of over-the-counter pharmaceutical compounds of cold and allergy medicines were found in toxicological testing of specimens of the pilot.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: An in-flight encounter with ground level fog due to the pilot's decision to continue VMC flight into instrument conditions, resulting in an in-flight collision with trees.

Findings

Occurrence #1: IN FLIGHT ENCOUNTER WITH WEATHER
Phase of Operation: MANEUVERING

Findings
1. (C) VFR FLIGHT INTO IMC - CONTINUED - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: MANEUVERING

Findings
2. OBJECT - TREE(S)

Factual Information

HISTORY OF FLIGHT

On September 7, 2000, about 0905 eastern daylight time, a Bell UH-1H, N525BM, registered to the USDA Forest Service, operated by the North Carolina Forest Service as a Title 14 CFR Part 91 positioning flight, crashed while maneuvering in the vicinity of Waynesville, North Carolina. Instrument meteorological conditions prevailed and no flight plan was filed. The rotorcraft was destroyed, and the commercially rated pilot and a crew chief sustained fatal injuries. The flight departed Macon County Airport, Franklin, North Carolina, under Forestry Service flight following about 0840.

The same pilot, crewman, and rotorcraft, had spent the previous day at the same location displaying the machine and its onboard fire fighting equipment as part of a 2-day Conservation Day display for Haywood County fifth-grade students. Although the North Carolina Forest Service normally operates their fire-fighting aircraft as strickly "public use", the positioning to a static display would have been performed under the provisions of Federal Air Regulations, Part 91.

According to a Haywood County forest ranger located at the Haywood County Mountain Research Station, Waynesville, who was securing the landing zone, (LZ) for the rotorcraft's arrival, at about 0900, the pilot advised by radio that he was 5 minutes from landing, following highway 23-74 inbound from the southwest, but that ground fog was precluding his progress, and that he would look for a place to land until the fog lifted. The pilot asked for the weather conditions at the LZ and was given, ceiling, 500 to 1,000 feet and 1-mile visibility. There was no acknowledgement.

Beginning about 0910, numerous telephone calls started coming into the Haywood County 911 operator about a low flying helicopter near residences in West Waynesville, (about 3,600 feet elevation). Statements from three witnesses positioned outside, nearby their residences at about 0900, along the rotorcraft's flight path just before the crash, stated the rotorcraft's course from their first sighting to the crash site was generally southwesterly and then southerly through a ravine called the Redbank Branch. One witness stated the rotorcraft flew by her driveway, "at an extremely low altitude" and, "There are power lines in back of the house and he couldn't have been more than 20 feet above them." Following the near miss, she heard a definite change of rotor blade pitch, and the flight disappeared into the fog. The visibility was characterized as, "extremely foggy" and, "...so thick, I couldn't see 50 yards away". A witness further along in the helicopter's flight path could clearly make out the N-numbers on the rotorcraft as it hovered over her driveway, and the sighting gave her the impression that she should ask her sister to move her car so the rotorcraft could land. Soon after its departure up the ravine she heard the definite sounds of blades hitting trees just before the cessation of

engine sounds, altogether. Reference to a topographical map of the crash site revealed that the terrain rises 800 feet within a horizontal distance of 2,375 feet in the direction that she observed the flight continue.

The direction of flight stated by the witnesses represents a course away from the known landing zone. The wreckage was located by North Carolina Forestry Service pilots in dense forest the next day about 1210.

PERSONNEL INFORMATION

The pilot held a private pilot certificate for airplane, single-engine land, and a commercial certificate for airplane, multiengine land and helicopter, with instrument ratings, airplane and helicopter. His most recent FAA second-class medical certificate was issued on April 26, 2000, with no limitations. According to North Carolina Forestry Service pilot employment records, as of August 3, 1999, the pilot listed his flight time as: 1,893 hours-helicopter, 523 hours-single engine, and 638 hours-multiengine for a total of 3,054 flight hours. He had held USDA/USDI Bell 206 series helicopter qualification for reconnaissance and surveillance, mountain flying, snow operations, external load (sling), fire suppression, retardant/water dropping, and long line. He held USDA/USDI copilot qualifications for the C-130, P2V, and PB4Y type aircraft from 1995 to 1997. He spent 6 years 3 months as an Army UH-1H and CH-47D helicopter pilot, and was honorably separated from the Army Reserve as a Chief Warrant Officer-2 on February 28, 1994.

On June 14 and 15, 2000, the pilot satisfactorily completed a UH-1H flight procedures training course given by the Bell Helicopter Customer Training Academy at the North Carolina Forestry Service, Fayetteville, North Carolina. The flight portion of the course consisted of three flights, and the remarks annotated on the training form by the instructor were, "flight procedures refresher complete. Safe in all maneuvers. A pleasure to fly with." On November 5, 1999, the pilot underwent a North Carolina Forestry Service proficiency check flight. The comments section of the evaluation form stated, "Tim gave a good ride". One of the procedures on the form, "Inadvertent IMC Proc" was not checked.

AIRCRAFT INFORMATION

The 1966 Bell UH-1H helicopter, serial No. 66-16023, was military excess, operated by the North Carolina Forestry Service as "Helicopter 9", for the primary purpose of forest fire fighting. The maintenance program used by the forestry service was in accordance with U.S. Army TM 55-1520-210-PM series phase inspections. The rotorcraft was placed into forestry service in 1993, and had undergone a transmission change in March 2000. At the time of the accident, the airframe had accumulated about 6,350 hours and the T53-L-13B turbine engine, ser. No. LE21527, which was installed on November 18, 1998, had accumulated about 849 hours. The rotorcraft had undergone a phase inspection, (phase #4) on March 16, 2000, by the North Carolina Forestry Service at an aircraft total time of 6278.1 hours. The rotorcraft's altimeter and static system had been tested and certified in accordance with FAR 91.411 on January 19,

1999, although the pilots and helicopters of the North Carolina Forestry Service have no requirement to maintain instrument flight currency.

Firefighting tools aboard N525BM for static display were the following: (1) two 240- gallon flexible water buckets called the "Bambi Bucket", (2) parachutes for dropping cargo and, (3) an assortment of fire extinguishers, hand tools, markers, and chain saws.

METEOROLOGICAL INFORMATION

The nearest weather reporting facility was Asheville, elevation 2,165 feet, located about 25 miles to the east of the crash site. The 0854 weather observation was: winds calm, visibility 10 statute miles, 1,500 feet overcast, temperature 58 degrees, dew point 56 degrees, altimeter 30.33 inHg. A 1,500-foot overcast condition translates to solid clouds at ground level at an elevation of 3,665 feet or higher. The wreckage site elevation was about 4,400 feet. Ashville's reported 0954 weather revealed lowering ceiling and visibility.

There was an FAA Automated Flight Service Station (AFSS) promulgated Airman's Meteorological Information, (AIRMET) in effect for the area that included the origination and the destination of the flight. It first came out as "AIRMET Sierra" warning of mountain obscuration for the period 09/06/00 @ 2000 to 09/07/00 @ 0400, and was subsequently extended to 09/07/00 @ 1000. A copy of the AIRMET is included as an attachment to this report.

A forestry service pilot stated that, generally speaking, Macon County Airport was usually the first place affected by low ceilings and fog, and that if you could make it out of there under visual flight rules, the rest of the area would be as good or better.

WRECKAGE AND IMPACT INFORMATION

The crash site was located about a mile south and upslope of milepost 441 on the Blue Ridge Parkway at the 4,400-foot level of the Pinnacle Ridge in the Great Balsam Mountains. The milepost corresponds to the Waynesville lookout on the Parkway. The site consisted of dense primary and secondary growth hardwood forest of trees 50 to 100 feet high at coordinates, N35:26:17.2 by W083:03:37.7 degrees. Examination of tree trunk and canopy damage revealed that first impact with trees occurred on a flight path of about 270 degrees and the wreckage came to rest on a heading of about 140 degrees, magnetic. All components of the airframe, engine, transmission, and rotors were found in the immediate area. The crater and burn pattern on the ground consisted of a 10-foot radius circle around a point coinciding with the forward fuel cell location. In the crater were found the engine, transmission, rotor head and mast, various instrument casings, and remnants of onboard firefighting gear. Cooled ribbons of once molten aluminum and magnesium flowed downhill from the site.

The aft 90 percent of the tail boom and tail rotor did not burn and were located in their normal positions relative to the main airframe wreckage. The tail boom was found inverted and the left

synchronized elevator had been separated by a front-to-aft shear force. The vertical fin, with tail rotor attached, had fractured and separated about 21-inches above the tail boom deck. The four boom attaching bolts were located and revealed that the boom-to-attach structure-mating joint was firmly bolted, precrash. The left landing skid, left cockpit door, and portions of the left cabin sliding door had separated, due to tree collision, and were located about 20 feet from the crater at about 10 o'clock. These door pieces revealed numerous tree strikes and embedded wood within the accordion shaped skin folds. Imbedded in the trunk of a 54-foot tree, about 40 feet from ground level was a piece of the upper left door frame containing the rotorcraft's weight and balance datum point. The main rotor blades, minus the tips, lay adjacent to the crater at 3 o'clock. One tip was found about 11 o'clock at 40 yards and the other about 12 o'clock at 75 yards. Most loose cockpit items such as flashlight, manuals, and hand tools, as well as windshield fragments were sprayed in a 30 degree pie-shaped pattern oriented at 2 o'clock about 30 feet from the main wreckage. Most cockpit controls, instruments, and radios were destroyed by postcrash fire. Both left and right cockpit seats were extensively impact and fire damaged. The pilot's collective control column was found separated, and the throttle setting could not be determined. It was removed for further examination at the Bell factory, with FAA oversight.

The flight control linkages from the cockpit to the actuators, as well as the main and tail rotor control systems had been consumed by postcrash fire. Steel components of the control systems and what securing hardware that survived the fire was found near their normal locations. Control for the synchronized elevator and tail rotor pitch was actioned by hand and determined to be functional, precrash. The transmission and main input drive shaft location was consumed by postcrash fire. The rotorcraft had been modified with the K-flex main drive shaft, and separated pieces of the K-flex were located in the wreckage. Separations appeared to be postcrash related. The mast, its damper support snap rings and snap ring grooves were found intact and in place. The mast wall appeared deformed where the rotor hub static stops contacted the mast, and the mast had corresponding dents. The mast was removed and sent to the Bell factory for examination, with FAA oversight.

The engine inlet, compressor housing, accessories, and accessory gearbox were consumed by postcrash fire. Numerous compressor blades were bent opposite to normal direction of rotation and revealed foreign object damage, (FOD). Numerous compressor stator vanes revealed leading and trailing edge FOD. Most inlet guide vanes, (IGV) had fractured from the inner and outer rings and were missing; however, no core blades or vanes were missing. No precrash malfunction or failure of the gear train was found. One fuel manifold screen was removed and examined with no irregularities noted. The 4th stage turbine wheel and nozzle, as well as the exhaust gas temperature probes, revealed no damage. The fuel control, power turbine governor, and IGV actuator were consumed by postcrash fire. The engine was removed and sent to Honeywell Engines for examination, with FAA overview.

MEDICAL AND PATHOLOGICAL INFORMATION

Postmortem examinations of the pilot and the crew chief were conducted by Dr. Robert L.

Thompson, M.D. and Dr. Thomas D. Owens, M.D., Pathologists, North Carolina Chief Medical Examiner's Office, Chapel Hill, North Carolina, on September 9, 2000. In the case of the pilot, cause of death is reported as multiple traumatic injuries, and in the case of the crew chief, cause of death is reported as massive trauma to body and head. Toxicological tests of specimens from the pilot and the crew chief were conducted by the Federal Aviation Administration Research Laboratory, Oklahoma City, Oklahoma. Tests were negative for ethanol, basic, acidic, and neutral drugs for the crew chief. For the pilot, results were the following:

(1) .292 (ug/ml,ug/g) Doxylamine detected in liver
(2) .089 (ug/ml,ug/g) Doxylamine detected in kidney
(3) Doxylamine present in urine
(4) 2.2795 (ug/ml,ug/g) Diphenhydramine detected in liver
(5) .753 (ug/ml,ug/g) Diphenhydramine detected in kidney
(6) Diphenhydramine present in urine
(7) Dextromethorphan present in urine
(8) Dextrorphan present in urine
(9) Pseudoephedrine detected in liver
(10) Pseudoephedrine detected in kidney
(11) Pseudoephedrine present in urine
(12) Phenylpropanolamine present in urine
(13) 22.441 (ug/ml,ug/g) Acetaminophen detected in urine

Doxylamine is a sedating over-the-counter antihistamine, often used in sleep aids such as Unisom, and commonly found in several multi-symptom cold relievers. Diphenhydramine, (commonly known by the trade name Benadryl) is an over-the-counter antihistamine with sedative effects, found in several sleep aids and many multi-symptom allergy medications. Dextromethorphan is an over-the-counter cough suppressant, available in a large number of preparations, including many multi-symptom cold relievers. Dextrorphan is a metabolite of dextromethorphan. Pseudoephedrine, (commonly known by the trade name, Sudafed) is an over-the-counter decongestant, found in many multi-symptom cold remedies. Phenylpropanolamine is an over-the-counter decongestant that is also a metabolite of pseudoephedrine. Pseudoephedrine is often combined with an antihistamine in over-the-counter allergy relief medications, and with acetaminophen and dextromethorphan in over-the-counter cold medications. Acetaminophen, (commonly known by the trade name Tylenol) is an over-the-counter painkiller/fever reducer, found in many multi-symptom cold relievers. Medications containing doxylamine or diphenhydramine are required to carry warnings that indicate the possibility of drowsiness with their use and call for caution while driving or operating machinery.

According to the pilot's wife, she could not remember that he had contracted cold or flu symptoms before the flight, but it was his habit to take the medicines for preventative measures.

TESTS AND RESEARCH

At the completion of display activities on September 6th, the rotorcraft was flown to the National Guard Armory at Sylva for fueling, where the regular forestry service fuel truck was undergoing routine maintenance. For this reason, fuel contamination inspection records could not be obtained for September 6th. Helicopter 9's fuel tanks were topped off with jet-A turbine fuel and the flight continued to its home base, Macon County Airport, about a 7-minute flight from Sylva. The following day, subsequent to the crash, five fuelings were conducted by the same truck/fuel load for two different helicopters flying search missions with no reports of fuel contamination.

FAA Southeastern Flight Service Data Processing Service stated they have no record of any calls that persons representing N525BM made to the FAA Raleigh-Durham AFSS to obtain a weather or flight condition brief prior to departure. There was Airman's Meteorological Information, (AIRMET) being promulgated by the AFSS's for the Franklin/Waynesville areas, for the time period of the flight, warning of mountain obscuration conditions due to low ceilings and precipitation.

The turbine engine, T53-L-13B, ser. No. LE21527 underwent Honeywell Engines factory examination with FAA oversight. The summary of their findings was: "Reverse bending and foreign object damage (rotation) along with the presence of apparent metal spray deposits (operation) are consistent with an engine that was both rotating and operating at the time of impact. No pre-impact conditions were found that would have interfered with normal operation." A copy of the report is an attachment to this report.

The main rotor mast, part No. 204-040-366-15, serial No. AFS-6406, underwent Bell Helicopter factory examination with FAA oversight. Results of the examination were: The lower end of the mast had portions of melted transmission case attached. The damper support snap rings and snap ring grooves were intact and appeared normal. About 10 inches down from the mast's top was a significant dent that matched the location of the main rotor hub static stops. The upper drive splines were intact and appeared normal. The upper and lower mast nuts were intact, and threaded onto the mast normally and securely. Examination of the collective/throttle control column was inconclusive. A copy of the Bell Helicopter report is an attachment to this report, as well as the FAA concurrence with the findings.

ADDITIONAL INFORMATION

The wreckage, except the main rotor mast, right collective column, and the engine, was returned to the operator and the NTSB form 6120.15, "Wreckage Release" signed on September 9, 2000. The mast, column, and engine were subsequently returned to the operator and the NTSB form 6120.15 was signed on July 23, 2001.

Pilot Information

Certificate:	Commercial; Private	**Age:**	40,U
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	April 26, 2000
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	June 1, 2000
Flight Time:	3054 hours (Total, all aircraft), 300 hours (Total, this make and model), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	**Registration:**	N525BM
Model/Series:	UH-1H UH-1H	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	66-16023
Landing Gear Type:	Skid	**Seats:**	4
Date/Type of Last Inspection:	March 16, 2000 AAIP	**Certified Max Gross Wt.:**	9500 lbs
Time Since Last Inspection:	72 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	6350 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	T-53-L-13B
Registered Owner:	USDA FORESTRY SERVICE	**Rated Power:**	1100 Horsepower
Operator:		**Operating Certificate(s) Held:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KAVL,2165 ft msl	**Distance from Accident Site:**	25 Nautical Miles
Observation Time:	08:54 Local	**Direction from Accident Site:**	90°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 1500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/ None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	0°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	14°C / 13°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	FRANKLIN, NC (1A5)	**Type of Flight Plan Filed:**	None
Destination:	Waynesville, NC	**Type of Clearance:**	None
Departure Time:	08:40 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	35.438056,-83.060554

Administrative Information

Investigator In Charge (IIC):	Stone, Alan
Additional Participating Persons:	John L Crouse; FAA FSDO; Charlotte, NC Matthew Rigsby; Bell Helicopter Textron; Ft. Worth, TX Phillip ` Hensley; Honeywell Engines; Phoenix, AZ Harry Sumner; North Carolina Forestry Service; Clayton, NC
Original Publish Date:	June 4, 2002
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=50212

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