



Aviation Investigation Final Report

Location:	Shelbyville, Texas	Accident Number:	DFW05FA086
Date & Time:	March 10, 2005, 13:54 Local	Registration:	N85BH
Aircraft:	Bell 206B-3	Aircraft Damage:	Substantial
Defining Event:		Injuries:	3 Fatal
Flight Conducted Under:	Public aircraft		

Analysis

While in a slow flight out of ground effect the helicopter lost control and impacted heavily wooded (100-110 foot trees) terrain while on a United States Forest Service (USFS) prescribed fire mission. The prescribed fire was supported by the application of aerial ignition spheres utilizing a cabin mounted plastic sphere dispenser (PSD) machine. According to USFS operating procedures, PSD missions are typically flown at 50-300 feet above the top of the highest vegetation at airspeeds from 20-40 knots. While on the mission a radio distress call, "Mayday, Mayday, Mayday, we are going down," was heard on the mission operating frequency. According to USFS personnel, the voice making the distress call appeared to be that of the ignition specialist on board, not the pilot. No further communications were heard from the helicopter. Post accident examinations and testing of the engine, fuel control, and power turbine governor did not reveal conclusive evidence of mechanical failure. Examination of the airframe did not reveal evidence of a control system failure. Fuel calculations determined that the helicopter should have had about 36.9 gallons of usable fuel on board at the time of the accident. Evidence at the accident site showed some rotation signatures of dynamic drive components, although a power level could not be determined. The USFS inspection of the PSD machine did not reveal evidence of a malfunction that could have contributed to the accident. The helicopter was within weight and balance limits for the type of operation. The reason for the loss of control could not be determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:
The pilot's failure to maintain altitude and clearance for undetermined reasons.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: HOVER - OUT OF GROUND EFFECT

Findings

1. (C) ALTITUDE/CLEARANCE - NOT MAINTAINED - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: DESCENT - UNCONTROLLED

Findings

2. OBJECT - TREE(S)

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

Findings

3. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On March 10, 2005, approximately 1354 central standard time, a Bell 206B-3 helicopter, N85BH, sustained substantial damage when it impacted heavily wooded terrain in the Sabine National Forest near Shelbyville, Texas. The airline transport rated pilot and two United States Department of Agriculture (USDA) Forest Service (USFS) crewmembers sustained fatal injuries. Visual meteorological conditions prevailed, and the flight/mission was being monitored and conducted in accordance with USFS aviation policies for public use aircraft in fire management operations. The flight departed at 1347 from a field helicopter pad (H1), located approximately 7 miles southeast of the accident site.

On the morning of the accident, the helicopter was assigned to support a prescribed fire within heavily wooded terrain with 100-120 foot high trees near Shelbyville, TX. The prescribed fire was supported by the application of aerial ignition spheres utilizing a cabin mounted plastic sphere dispenser (PSD) machine. According to USFS operating procedures, PSD missions are typically flown at 50-300 feet above the top of vegetation at airspeeds from 20-40 knots. The helicopter was based at Angelina County Airport, Lufkin, Texas. Approximately 0928, after a mission brief, the helicopter, with pilot and two USFS personnel on board, and the re-fueling truck re-positioned to H1 (coordinates North 31 degrees 42.110 minutes West 93 degrees 52.540 minutes) and were met by support equipment and personnel from the Sabine National Forest to conduct a prescribed fire mission.

Approximately 1234 an initial recon of the burn area began, followed by approximately 11 minutes of aerial ignition work on the same flight. Approximately 1300 the PSD machine experienced a sphere jam, and the helicopter returned to H1 to resolve the problem. The helicopter shut down at H1 while the PSD machine problem was resolved. The helicopter then departed H1 at 1347 to resume the mission. According to USFS records from ground personnel on the burn, at 1352, the mission ignition specialist onboard the aircraft reported by radio that the helicopter was commencing firing operations. At 1354, a radio distress call was heard by 7 personnel on the burn. According to USFS personnel, the voice making the distress call appeared to be that of the ignition specialist, not the pilot. The call was, "Mayday, Mayday, Mayday, we are going down." No further communications were heard from the helicopter.

At 1417, the helicopter wreckage was found at coordinates North 31 degrees 45.425 minutes West 94 degrees 00.244 minutes. Immediate rescue operations commenced. One USFS employee initially survived the crash and was being transported by ambulance to a local hospital. The passenger died during transport due to extensive injuries sustained in the crash.

PERSONNEL INFORMATION

A review of Federal Aviation Administration (FAA) airman records revealed that the pilot held an airline transport pilot certificate with ratings for airplane single engine land, airplane multiengine land, and rotorcraft-helicopter, and a certified flight instructor certificate with ratings for single and multiengine land, rotorcraft-helicopter, and airplane and rotorcraft instrument. He was also an FAA certificated advanced and instrument ground instructor. His most recent FAA first class limited medical certificate was issued on September 7, 2004, with the limitation, "must have available glasses for near vision" At this time, he reported a total of 3,000 flight hours.

The pilot's personal logbook was obtained. During a review of the logbook, several discrepancies were noted. Rotorcraft time appears to be consistent from the time rotorcraft time is first logged through the page ending February 20, 2004, at which time the pilots logbook shows a total rotorcraft time of 286.1 hours. On the page ending March 2, 2004, in the amount forwarded column, rotorcraft time increases to 1286.1. The page total is 27.3, which was added to time from the previous page for a total time of 1323.4 hours. This was an unaccounted 1,000-hour increase in rotorcraft time from the previous page. The extra 1,000 hours were added to and subtracted from cumulative flight time throughout the remainder of the logbook entries. The last entry in the logbook reflects the pilot's total time in all aircraft to be 2,187.8 hours, 384.4 of that in rotorcraft, and 115.9 hours in make and model.

AIRCRAFT INFORMATION

The 1980-model Bell 206B-3 helicopter was a single pilot, five place, single engine, light helicopter with a two-blade semi rigid main rotor, and a tail rotor that provided directional control. The helicopter was owned by Brainerd Helicopter Service, Inc, and operated by the United States Forest Service. A review of the aircraft logbooks revealed that the last annual inspection was performed on April 26, 2004, at a tachometer time of 309.27 hours. The tachometer read 2,837.4 at the scene of the accident. The aircraft total time was determined to be 4,565 flight hours at the time of the accident.

The helicopter was equipped with a Rolls Royce 250-C20B engine, serial number (S/N) CAE-840516. Historical records for the engine began on April 12, 1991, with 463.1 hours total time. The engine was converted to a Model 250-C20B (same serial number) on March 15, 1993, with a total time of 907.3 hours. Records continued with periodic inspections (100, 300, 600 and Annual) through February 22, 1999. The February 22, 1999, entry indicated that engine, S/N CAE-270208, was removed due to metal on the upper and lower chip detector plugs. There were no previous indications that engine S/N CAE-270208 had been installed. The total time prior to this entry was reflected as 2,653.2 hours on January 1, 1999, and according to the records, should have been for engine S/N CAE-840516. This total time was carried forward to the questionable entry on February 22, 1999, and subsequently crossed out and replaced with an engine total time of 2,296.2. The airframe log showed an entry for engine, S/N CAE 840516 being installed on February 22, 1999, but did not show engine S/N CAE 270208. The entry appeared to be inserted between two previously entered items on a single line and overlapped

the A&P mechanics number from the previous entry. History of engine S/N CAE 840516 could not be determined from the records presented.

Historical records shows the last entry for engine S/N CAE 840516 was on 16 December 2004. Total time was recorded as 4,142.7 hours. The airframe total time was recorded as 4,499.5 hours total time. The daily log indicated a total time of 4,175.6 hours for the engine and 4,563.1 hours for the airframe. The serial number on the component card (FF357738) differed from the serial number on the Canadian Authorized release Certificate (FF37596) for the Bleed Valve.

METEOROLOGICAL INFORMATION

The automated weather observing system at the A.L. Mangham Junior Regional Airport, near Nacogdoches, Texas, located approximately 30 miles southwest of the accident site, reported wind from 250 degrees at 5 knots, 10 statute miles visibility, a clear sky, temperature 22 degrees Celsius

COMMUNICATIONS

The ignition specialist (FS crewmember in left front seat) was communicating with ground personnel on a U.S. Forest Service Tach channel at the time of the accident. He reported that he was resuming fire operations at 1352. At 1354, the ignition specialist made a "Mayday" call on the frequency. There were no further communications from the aircraft.

WRECKAGE AND IMPACT INFORMATION

The helicopter came to rest on its right side in a heavily wooded area on a heading of 135 degrees at coordinates North 31:45.425 West 94:00.244. The initial point of impact was identified as the tops of 50-foot trees located around the wreckage. Global positioning system (GPS) elevation at the accident site was 386 feet msl.

Fuselage - The right skid was fractured just forward of the forward mounting saddle, and the fuselage floor was fractured aft of the forward cross tube. Impact damage was observed on the right rear portion of the fuselage. Approximately 15 pounds of personal gear was found in the aft baggage compartment. Front right and left doors were not installed. The nose of the helicopter exhibited light crushing and all of the Plexiglas chin bubble was broken out. The right forward door post was bent inward and upward. Damage to the left side of the fuselage was unremarkable. No fuel found in the tank; however, an odor consistent with that of jet fuel was present at the accident site. The fuel boost pump access panels were removed, and the rear boost pump valve locking bar was found loose (approximately 0.065 in.). The forward boost pump valve locking bar was found slightly loose (0.035 in). The fuel quantity indicating float access panel was removed, and the forward fuel quantity indicator lead ("C" post) was found in a loose condition.

Cockpit - All circuit breakers were in and the battery and generator switches were found in the "ON" position. The Hobbs meter indicated a time of 2,837.4 hours. The directional gyro/attitude indicator switch was "ON". The altimeter was set to a barometric pressure setting of 30.09 inches of Mercury. The directional gyro indicated a 210 degree heading. The artificial horizon displayed a nose-up right-bank attitude. The fuel valve switch was "ON". The right seat pan was crushed downward approximately two inches. Located at the forward most point of the wreckage debris were two Interstate DCS-33 12-volt batteries, which were reportedly removed from the helicopter battery compartment during rescue operations.

Controls - Control continuity to all flight controls was established. The collective control lever exhibited overload fracture outboard of the collective attachment control collar. Movement at the collective hydraulic actuator bell crank resulted in corresponding movement at the collective attachment control collar, and pre-impact control continuity was confirmed from the collective up to the main rotor system. The cyclic control stick exhibited an overload fracture at the base of the stick forward of the attachment collar. Movement of the control tubes resulted in the movement from the attachment collar up to the hydraulic actuator. A visual inspection confirmed control continuity from the hydraulic actuator to the main rotor pitch change horns. The anti-torque control tube was fractured at the tail rotor control pedal bellcrank. Removal of the broom closet panel revealed that movement of the tail rotor control tube was prevented due to crushing of the surrounding structure. Movement of control tube above the crushing resulted in corresponding movement of the control tube forward of the fracture at the tailboom. The tailboom section of the anti-torque control tube was separated from the tailboom during the impact sequence, and each end exhibited overload fracture. Movement of the control tube at the forward end of the tail rotor resulted in a corresponding pitch change in the tail rotor blades, confirming pre-impact control continuity in the anti-torque pedal system.

Transmission and Main Rotor System - The transmission remained attached to the airframe and the main transmission pylon mounts remained in place and attached to main transmission. The transmission displaced in an aft, downward direction, forcing the K-flex coupling into the isolation mount cover. The forward attachment of the main driveshaft was separated at the K-flex coupling and had multiple overload fractures of the K-flex. Scoring of the roof panel adjacent to the fractured K-flex was observed, and was consistent with circumferential flailing of the drive shaft, indicative that the drive was rotating at impact. There was no notable damage to the main rotor control system, up to the rotating swashplate. One of the two pitch change control tubes, extending from the rotating swashplate to the pitch-change horn, displayed an overload fracture approximately mid-length. One rotor blade, which reportedly came to rest forward of the main wreckage, exhibited trailing edge impact damage that was consistent with the diameter of trees in the immediate vicinity of the impact. The blade fractured just outboard of the doublers. The other blade exhibited trailing edge impact, and chord wise damage. The blade also exhibited chord wise scoring throughout the length of the blade. Both blades displayed damage consistent with a high pitch, slow turning rotor at impact.

Tail Rotor - The tailboom fractured just forward of the tail rotor gear box mounting pad. As a result, the tail rotor control tube fractured in overload as described above. Additionally, the tail rotor drive shaft decoupled from the tail rotor gear box and the aft portion of the tailboom, along with the tail rotor gear box assembly was located approximately 15 feet from the main wreckage. The tail rotor assembly remained intact, though the tail rotor blades displayed both impact and fire damage. The tail rotor pitch change assembly moved freely by hand and resulted in corresponding pitch change of the tail rotor blades. As the tail rotor blades were rotated by hand, the gear box rotated freely without any identifiable grinding or binding. The chord wise accordion bending of the tail rotor blades was consistent with low, or no, power at impact. The forward end of the tail rotor drive shaft exhibited torsional shearing. Deformation of spacers was progressively more identifiable forward of the torsional separation in the tail rotor drive. All hanger bearings rotated freely with no evidence of heat distress. The aft end spline of the tail rotor drive shaft was found decoupled. The torsional shearing of the tail rotor drive shaft was consistent with sudden stoppage forward of the drive shaft fracture point.

Engine - The left side of the engine compartment appeared normal. The left side engine mounts were intact. The Pc pneumatic air line was intact to the PT Governor "T" fitting. All pneumatic system B-nuts were at least finger tight. The PT Governor pointer indicated a high power application. The linkage was intact in the engine compartment, but was separated on the hydraulic deck and at the collective itself. The right side engine compartment door was uniformly crushed into the right side of the engine. The right side engine mounts were bent. The horizontal fire shield was crushed inward from the right side. The right side compressor air discharge tube was crushed from a right side impact. The forward end was partially separated from the compressor scroll. The right side of the outer combustion case was partially crushed from impact. There were no noted separated pneumatic tubes. Some tubes were crushed and deformed from impact damage. All pneumatic system B-nuts were at least finger tight. The 4th stage power turbine wheel would not rotate with attempts at hand rotation.

PSD Machine - The PSD machine was found inside the aircraft still strapped in its installed position. Some slight denting damage was found on the hopper and the plastic lid was broken off from the hopper at the hinges. Plastic spheres had been ejected from the hopper and were strewn within the cabin and outside the cabin around the aircraft. Several nylon fabric bags containing additional plastic spheres were still securely attached to their tether and intact. In each of the two slipper blocks on the same side as the PSD machine controls, slipper blocks 1 and 2, a partially burned plastic sphere was found. That is, one plastic sphere in slipper block 1 and one plastic sphere in slipper block two. The other two slipper blocks, 3 and 4, were empty. Black ash residue was found on the outside of the lower portion of the feed chutes above blocks 1 and 2. The inside feeder control lever was in the up position. This lever in the up position allows the plastic spheres to feed into the two inner slipper blocks; slipper blocks 2 and 3. The outside feeder control lever was in the down position. In the down position, plastic spheres are restricted from entering blocks 1 and 4. The power control toggle switch was found in the on position. The speed control switch was found in the slow position. It is unknown whether the emergency water was used. The power cord from the machine to the

hopper was disconnected. The main power cord from the machine to the helicopter was disconnected at the cannon plug. It is unknown whether these plugs were disconnected prior to impact, during impact, or by the rescue personnel first to arrive at the accident site.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot Dr. Brown, Forensic Pathologist, Jefferson County, Texas. Toxicological tests will be conducted at the FAA's Civil Aeromedical Institute (CAMI), Oklahoma City, Oklahoma.

TESTS AND RESEARCH

The wreckage was recovered to Air Salvage of Dallas, Lancaster, Texas, on March 12, 2005, for further examinations. On March 16, 2005, representatives from the NTSB, USFS, Bell Helicopter, and Rolls-Royce Engines convened at Air Salvage of Dallas to examine the wreckage.

Airframe - When the airframe fuel filter was removed a small amount of retained debris was noted and the filter was clean. External power was applied to the helicopter to check gauges, warning horns, annunciator lights, and fuel boost pumps. When power was applied; the fuel gauge reading was +100 gallons, annunciator lights illuminated for the Fuel Pump, Tail Rotor Chip, Rotor Low, and Engine-Out. The low-rotor warning horn was audible. When power was applied to the airframe fuel boost pumps, no audible indication of pump operation was noted. The pumps were then removed and bench tested. They appeared to be operating, and pressure and volume were not verified.

Engine - The fuel flow control, which should be set on the "low" setting, was set to an intermediate position (an etched setting between "low" and "high"). Fuel from the fire shield to the fuel nozzle could not be verified due to premature removal of the fuel line. Both chip detectors were removed, and a slight amount of fuzz was found on one of the chip detectors. The tach generators were removed. N1 rotated freely and smoothly with continuity to N1 drive train. The engine fuel filter was removed and was found clean and full with clear and bright fuel. The oil filter was removed from the accessory gearbox and the oil was normal in color with no burning indications. The bleed valve was found in an open position and closed fully when actuated by hand and returned to an open position when released. The fuel nozzle was removed and its screen was intact and free of debris.

The engine was shipped to Aeromaritime in Mesa, Arizona, for disassembly and further examination on April 7, 2005. After the shipping container was opened a component inventory and part numbers were verified. Pneumatic system leak checks were conducted and a slight leak was found at the PC line filter. The right side shoulder of outer combustion case (OCC) was cut away, and the combustion liner and case appeared normal. The right side compressor air discharge tube, all pneumatic lines, oil lines, fuel lines, and attachments were removed and inspected. After removal of the power turbine governor and fuel control, the drive shaft and

splines were found intact. The first stage nozzle shield was intact and first stage nozzle appeared normal. The first stage wheel appeared normal with no visible damage to blades. The second stage wheel appeared normal with no visible damage to blades. The gas producer rotor rotated free and smooth by hand. Turbine shafting (pinion gear coupling, turbine to compressor coupling, power turbine inner and outer shafts) were intact when removed. The power turbine rotor could not be rotated by hand due to impact damage. The power turbine rotor was then removed from the exhaust collector, after which, the power turbine was then able to rotated by hand. Rotational scoring on the fourth stage nozzle was noted corresponding to the tip path planes of the third and fourth stage wheels. A drive spline was inserted into the N1 drive train of the accessory gear box, manually turned, and fuel pump pumped fuel from outlet. No anomalies were noted on the N1 side of the accessory gear box. Both the accessory gear box and compressor rotated free and smooth by hand and there was no noted damage. In summary, no conditions were found that would have precluded the engine from normal operation. The fuel control and power turbine governor were packaged and sent to Honeywell, South Bend, Indiana for bench testing.

Functional testing of the fuel control unit did not reveal conditions that would have precluded normal operation. Functional testing of the power turbine governor found out of limits repeatability on the initial test run. The repeatability improved on each subsequent test run and after the fourth test run was within test specifications. Disassembly of the unit disclosed wear material (Teflon) on the spool valve assembly where it interfaces with the Teflon tube. Signs of vibration were evident on the spool bearing and flyweights. No other test points and part inspections revealed anomalies.

ADDITIONAL INFORMATION

Aerial Ignition Information as provided by the USFS:

Prescribed fire is a method of reducing the build-up of live and/or dead organic material in managed forest or range environments. This reduction in biomass has general short and long term benefits in that it may reduce the risk of uncontrolled wildfires, remove or prevent the establishment of undesired plant species, improve the health of established desired trees and plants, and improve wildlife habitat. Prescribed burning operations are performed in a variety of manners including hand ignition and aerial ignition which involves the application of burning material, generally fuel of some nature, to designated areas under specified and desirable meteorological and fuel conditions.

During aerial application of fuel, there are two primary methods of fire application: helitorch and Premo Mark III Aerial Ignition System. A helitorch utilizes gelled gasoline and is pumped from a barrel suspended beneath the helicopter. The Premo Mark III Aerial Ignition Device utilizes a small polystyrene ball, 32 mm in diameter, known more commonly as a plastic sphere, containing approximately 3.0 grams of Potassium Permanganate (KMnO) 99% reagent: an oxidizer used in a crystallized/powder form. When the KMnO comes in contact with Ethylene Glycol (anti-freeze), a combustive exothermic reaction occurs.

The Premo Mark III Aerial Ignition Device, often times referred to as a PSD (plastic sphere dispenser) machine or Ping-Pong ball machine, achieves the chemical reaction by physically injecting the plastic sphere with the ethylene glycol. The combustive reaction takes approximately 15 to 30 seconds to occur. During that time, prior to combustion, the machine ejects the ball, or essentially drops it. The PSD machine requires 24 volts DC power to operate.

For prescribed fire operations, the PSD machine is secured in the cabin of a helicopter. A nylon web strap runs from one side of the machine out the left side of the aircraft under the belly of the helicopter and then back into the aircraft right side attaching to the opposite side of the PSD machine. Normal configuration requires the removal of the right aft door (on Bell Helicopters) allowing the machine to extend over the door sill to drop the plastic spheres to the ground. The PSD machine comprises a hopper which holds approximately 450 plastic spheres; 4 chutes which funnel the plastic spheres to the slipper blocks; 4 needles which inject the plastic spheres with the ethylene glycol in a timed sequential order in each of the slipper blocks; two feed control levers; a 9 liter ethylene glycol tank; a 3.2 liter emergency water tank; a 2 amp drive motor; and a 2 amp glycol pump. Total weight of machine wet is approximately 98.0 lbs.

The feed control levers allow for the use of either 2 chutes or 4 chutes thus managing the quantity of balls injected and dropped from the machine. The PSD machine also has a slow and high speed controlling the rate at which balls are fed into the slipper blocks. During normal operations, spacing of the balls is achieved by a combination of the speed setting of the PSD machine, number of chutes used (1, 2 or 4 (using one chute requires the installation of a spacing kit which blocks off one of the chutes)), and helicopter airspeed. Normal PSD operations require helicopter flight below 500 ft. AGL and less than 50 mph. Optimum airspeed for application is 25-35 mph. Hovering out of ground effect (HOGF) often occurs. Application of the plastic spheres is generally performed in strips with the intent of allowing the fire to spread in a 'backing' manner.

It is not uncommon for a plastic sphere to become jammed or lodged in the PSD machine during operation. A jammed ball, if left unattended, could potentially ignite in the machine and then spread fire to the other plastic spheres in the machine and hopper. Operators are trained to respond at the first sign of a jam or smoke. Water can be injected into the slipper blocks from the water reservoir with a push of a button. Additional water is carried on board as a back up. With the first sign of smoke the pilot is alerted and on agreement with the operator will seek a landing sight to remove the PSD machine if necessary. If necessary, the PSD machine can be cut free from its restraining strap and dropped from the helicopter. However, development of a fire is rather slow and the resolution of any smoke or fire related problem is generally accomplished with the application of water.

Fueling History of the Accident Helicopter:

On March 6, 2005, Helicopter N85BH fueled at Angelina Co. Airport from the airports fuel truck.

At approximately 0900 the helicopter took on 71 gallons of Jet-A fuel. The fuel serviceman stated that he thought that it was a "topped-off". If that was the case, the helicopter would have had approximately 91 gallons on board before the first flight that morning. During the course of the day, the helicopter logged 4.3 flight hours. It was fueled two additional times from its own service truck for a total of 56.4 gallons, according to the fuel logs. The fuel burn rate for a 206B-3 is specified in the contract at 27 gallons per hour. 4.3 flight hours at 27 gallons per hour equals 116.1 gallons of fuel consumed during the day. The starting fuel quantity was approximately 91 gallons, plus the two fuelings equaling 56.4 gallons for a total of 147.4 gallons. Total gallons pumped, 147.4 gallons, minus the fuel consumed, 116.1 gallons, the result is 31.3 gallons remaining in the fuel tank at days end. The next fueling was on March 9, 2005. A total of 15 gallons was pumped bringing the on board total fuel to approximately 46.1 gallons. The fuel was dispensed from one of Angelina County Airport fuel trucks. On March 10, 2005, the helicopter flew from Angelina Co. Airport to H1 near the project area. Flight time from Angelina Co. Airport to H1 was approximately 30 minutes, consuming approximately 13.5 gallons. Fuel on board after flight would have been an estimated 32.6 gallons. At H1, before initiating the prescribed fire mission, N85BH took on 10 gallons of fuel from its service truck bringing the total to approximately 42.6 gallons. N85BH then flew a partial fuel cycle lasting approximately 46 minutes performing aerial ignition. Fuel consumed would have been approximately 20.7 gallons leaving 21.9 gallons on board. N85BH then took on an additional 20 gallons of fuel bringing the total on board fuel to approximately 41.9 gallons. N85BH then departed H1 at 1347 after fueling returned to the burn area to resume ignition operations. N85BH was reported down 11 minutes later, at 1358. Fuel consumed during that 11 minutes would have been approximately 5 gallons. Usable fuel on board at the time of accident should have been approximately 36.9 gallons.

The helicopter wreckage and components were released to the owner after examinations were completed.

Pilot Information

Certificate:	Airline transport; Flight instructor	Age:	45, Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	
Instrument Rating(s):	Airplane; Helicopter	Second Pilot Present:	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Helicopter; Instrument airplane; Instrument helicopter	Toxicology Performed:	Yes
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	September 1, 2004
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	February 1, 2005
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	Registration:	N85BH
Model/Series:	206B-3	Aircraft Category:	Helicopter
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	3792
Landing Gear Type:	Skid	Seats:	
Date/Type of Last Inspection:	December 1, 2004 Annual	Certified Max Gross Wt.:	3350 lbs
Time Since Last Inspection:	65 Hrs	Engines:	1 Turbo shaft
Airframe Total Time:	4564.5 Hrs at time of accident	Engine Manufacturer:	Rolls-Royce
ELT:	Installed, not activated	Engine Model/Series:	250-C20B
Registered Owner:	Brainerd Helicopter Service Inc.	Rated Power:	420 Horsepower
Operator:	USDA Forest Service	Operating Certificate(s) Held:	None

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:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	5 knots / None	Turbulence Type Forecast/Actual:	/
Wind Direction:	250°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.92 inches Hg	Temperature/Dew Point:	22°C / 3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Shelbyville, TX	Type of Flight Plan Filed:	Company VFR
Destination:		Type of Clearance:	
Departure Time:	13:47 Local	Type of Airspace:	

Wreckage and Impact Information

Crew Injuries:	3 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	3 Fatal	Latitude, Longitude:	31.751111,-94.000556

Administrative Information

Investigator In Charge (IIC):	Lemishko, Alexander
Additional Participating Persons:	Richard Law; FAA; Houston, TX Larry Hindman; USFS; Albuquerque, NM Robert Ketchum; Rolls Royce; Indianapolis, IN Lee Fisher; Honeywell; South Bend, IN
Original Publish Date:	November 29, 2006
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=61129

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](#).