



National Transportation Safety Board Aviation Accident Final Report

Location:	Huntsville, Texas	Accident Number:	DEN08FA101
Date & Time:	June 8, 2008, 02:48 Local	Registration:	N416PH
Aircraft:	Bell 407	Aircraft Damage:	Destroyed
Defining Event:	Controlled flight into terr/obj (CFIT)	Injuries:	4 Fatal
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled - Air Medical (Medical emergency)		

Analysis

This report was updated on August 14, 2009.

An Emergency Medical Services (EMS) flight dispatch was requested from the accident operator, since a previous EMS operator had "aborted" the same requested mission flight. The EMS operator, who had "aborted" the same mission approximately one hour and 30 minutes prior to the accident flight, reported low clouds in the vicinity of the accident site. No PIREP was reported with the FAA. Official weather reporting stations in the area recorded visual flight rules weather conditions. The pilot contacted his company's operations control center and discussed observed weather and the reasoning for the "turndown" by the other EMS operator. It was agreed that weather observation stations were reporting visual flight rules weather conditions and the flight was accepted. The EMS flight powered up for the accident leg at 0244:11 and departed at 0246:56. The onboard flight tracking system recorded the flight until 0247 to an altitude of 1,016 feet mean sea level (600 feet above the ground), on a flight path of 170 degrees.

The wreckage was located 2.5 miles southwest of the last known coordinates in densely forested terrain, the next morning, in the exact location where the other EMS operator had encountered low clouds and lost their reference to surface light sources. Sheared tree tops indicate initial impact occurred with the helicopter's main rotor blade system, in a straight, nose low attitude. The flight path terrain was dark, without surface reference lights, and there was no moon. The accident helicopter was equipped with the Aviation Night Vision Imaging System and radar altimeter; however the settings on the radar altimeter could not be established and the pilot was not utilizing night vision goggles. The helicopter was not equipped with Helicopter Terrain Awareness Warning System (HTAWS). The pilot was appropriately trained and certified to fly the accident flight. An examination of the helicopter

airframe, engine, and related systems revealed no anomalies.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to identify and arrest the helicopter's descent, which resulted in its impact with terrain. Contributing to the accident was the limited outside visual reference due to the dark night conditions.

Findings

Environmental issues	Dark - Contributed to outcome
Aircraft	(general) - Not attained/maintained
Personnel issues	(general) - Pilot

Factual Information

This report was updated on August 14, 2009.

On June 8, 2008, at 0248 central daylight time, a Bell 407 emergency medical services (EMS) helicopter, N416PH, owned by PHI, Inc., and operated by PHI as Med 12, was destroyed when it impacted a heavily forested area in the Sam Houston National Forest, south of Huntsville, Texas. Dark night visual meteorological conditions prevailed at the time of the accident. The air ambulance flight was being operated under the provisions of Title 14 Code of Federal Regulations Part 135 on a company visual flight rules (VFR) flight plan. The pilot, flight nurse, flight paramedic, and passenger were fatally injured. The flight had departed the Huntsville Memorial Hospital Heliport (KTE03) at 0246, after picking up a patient, and was en route to the John S. Dunn Helistop (K38TE) at the Herman Memorial Hospital, Houston, Texas.

The flight to K38TE was 68.7 nautical miles on a magnetic bearing of 168.1 degrees. The accident helicopter was equipped with a Global Positioning System (GPS) flight tracking system referred to as "Outerlink." According to the Outerlink system, the helicopter powered up for flight at 0244:11 and departed the hospital at 0246:56. The last coordinates recorded by the Outerlink system were recorded at 0247 at an altitude of 1,016 feet mean sea level (approximately 600 feet above ground level (agl)), while traveling at a groundspeed of 106 knots. The calculated direction of flight was 170 degrees. Med 12's first position report was due at 0300.

According to an emergency room clerk at Memorial Hospital - The Woodlands, the accident flight contacted him over the radio to place his hospital on standby for the patient. A female provided a patient assessment and during the radio call a male voice could be heard. It could not be distinguished what the male voice was saying. The radio call became unreadable and did "not come back." Memorial Hospital - The Woodlands Heliport (K26TS) was located 36.5 miles from KTE03 on a magnetic bearing of 166.8 degrees. He could not recall the exact time.

At 0259, one minute prior to Med 12's required position report, the Air Force Rescue Coordination Center contacted the PHI Communications Center in Lafayette, Louisiana, regarding an emergency locator transmitter signal they were receiving, registered to N416PH (Med 12). Search and rescue efforts were initiated immediately and multiple attempts to communicate with the missing helicopter were made.

The wreckage was located by aerial search and rescue teams at 0830, about 2.5 miles southwest of the last known coordinates, with the aid of the 406 MHz emergency locator transmitter (ELT).

The National Transportation Safety Board (Safety Board) Investigator in Charge (IIC) interviewed several witnesses. These witnesses were located to the north of the impact location. According to one witness, between 0245 and 0300 he heard a helicopter fly over his home with "high pitch" sounds. He stated that helicopters fly over his house all the time; however, this one woke him up, as it was loud. He assumed that the helicopter was flying relatively low, as it was vibrating his house.

PERSONNEL INFORMATION

The pilot, age 63, held an airline transport pilot certificate with a rotorcraft helicopter rating last issued on November 21, 1991. He was issued a second class airman medical certificate on March 13, 2008. The certificate contained the limitation "holder shall wear corrective lenses."

The pilot was hired by PHI Inc, in January 1976. According to PHI's records, the pilot had logged no less than 20,537 hours flight time in rotorcraft; 200 of which was in the make and model of the accident helicopter, and no less than 224 hours at night. The pilot had been flying EMS operations for PHI for 18 months and had accumulated 205.5 hours in EMS operations; 36 hours of which were in the past 90 days and 5.4 hours at night. Their records reflect that the pilot had accepted 36 night flights within the previous 18 months.

The pilot's airman competency/proficiency check for CFR 135.293 (Initial and recurrent pilot testing), and 135.299 (Pilot in command: Line checks: Routes and Airports) was completed with a satisfactory rating in all tested areas on November 17, 2007. The flight check was conducted in a Bell 407 helicopter in daylight conditions. Transition training to EMS operations was performed in November of 2006. At this time, night operations training was conducted.

According to PHI's records, the pilot had been on the day shift (0700 to 1900) from May 15th through the 28th, 2008. He started duty for the night shift (1900 to 0700) on May 30, 2008, had two days off, and then continued with the night shift until June 8, 2008. Following his rotation to the night shift, the pilot had logged one hour and 27 minutes of flight time on the shift prior to the accident. In addition he logged 25 minutes on the night of the accident, while positioning the helicopter from his base to the hospital.

The pilot had not been trained for the use of NVIS. According to PHI's director of safety, there were no safety issues or occurrences that involved the pilot, prior to the accident.

AIRCRAFT INFORMATION

The accident helicopter, a Bell 407 (serial number 53276), was manufactured in 1998. It was registered with the FAA on a standard airworthiness certificate for normal operations. The helicopter was powered by a Rolls-Royce turbo shaft C-47B engine rated at 650 shaft horsepower.

The helicopter was registered to and operated by PHI Inc. of Lafayette, Louisiana, and was maintained under an Approved Inspection Program (AAIP), by PHI out of the Bryan, Texas, base. A review of the maintenance records indicated that an AAIP, event two inspection had been completed on April 16, 2008, at an airframe total time of 6,141 hours and 8 minutes. The helicopter had flown approximately 92 hours and 11 minutes between the last inspection and the accident and had a total airframe time of 6,233 hours and 19 minutes.

The helicopter was equipped with the Aviation Night Vision Imaging System (cockpit lighting system that is compatible with night vision goggles) in April 2008 and had a Free Flight radar

altimeter installed. The helicopter was not equipped with Helicopter Terrain Awareness Warning System (HTAWS).

METEOROLOGICAL INFORMATION

The Safety Board IIC interviewed the pilot for Memorial Herman Life Flight that had accepted the same patient transfer flight the morning of the accident. According to this pilot, the weather en route to Huntsville, Texas, was VFR. Prior to his flight, the lowest weather reported for his entire flight was at Huntsville and at the time of the report, the weather was "better than 2,000 [ceiling] and ten [miles visibility]."

He departed Memorial Herman at 0106 and flew GPS direct towards Huntsville. There were no traffic or weather concerns at the time of his departure. While en route, approximately 5 miles south of the hospital (KTE03), at 1,400 feet he encountered "wispy clouds." He descended to 1,200 feet and encountered more clouds, continued to descend, to 1,000 feet, encountered more clouds, and finally descended to 800 feet when the visibility decreased rapidly. He stated that he could see to the east but had lost his "surface light reference." He turned immediately to the right, towards the "freeway system" and was immediately back in good weather. He stated that the low clouds and visibility were "pretty sudden and pretty dramatic." The flight was aborted after encountering the weather. Upon his return, he entered this information into a pilot website "weatherturndown.com."

The Terminal Aerodrome Forecast (TAF) for KUTS forecasted winds at 140 degrees at seven knots, visibility greater than six miles, and broken clouds at 1,500 feet for the time period just prior to the accident. The area forecast for southern Texas forecasted cloud cover at 2,000 feet above ground level. The outlook was for visual flight rules conditions. Airman's Meteorological Information (AIRMET) for instrument flight rules (IFR), turbulence, and icing had not been issued for the accident helicopter's route of flight. Significant IFR, icing, or turbulent conditions were not expected outside of convective activity.

The closest official weather observation station was Huntsville Municipal Airport (KUTS), Huntsville, Texas, located six nautical miles (nm) north of the accident site. The elevation of the weather observation station was 363 feet msl. The routine aviation weather report (METAR) for KUTS, issued at 0235, reported, winds variable at six knots; visibility ten miles; sky condition scattered 1,200 feet; temperature 26 degrees Celsius (C); dewpoint 23 degrees C; altimeter 29.98 inches.

The METAR for Lone Star Executive Airport (KCXO), Conroe, Texas, (located 18 nautical miles southeast of the accident site) issued at 0240 reported winds, 160 degrees at six knots; visibility ten miles; sky condition, few clouds at 1,700 feet; temperature, 26 degrees C; dewpoint, 23 degrees C; altimeter 29.97 inches.

According to the United States Naval Observatory, Astronomical Applications Department Sun and Moon Data, the moon rose at 1023 on the preceding day and set at 0015 the day of the accident. The moon was waxing crescent with 30 percent of the moon's visible disk illuminated.

COMMUNICATIONS

Recordings of telephone conversations involving PHI dispatch were provided to the Safety Board IIC for the investigation. These recordings were transcribed, revealing the following:

Approximately 0120 PHI dispatch was contacted by Huntsville Memorial Hospital emergency room with a patient transfer request. The caller stated that they had initially requested "Herman" but the flight was "aborted" due to "some kind of cloud overhead, a patch of fog." The caller asked if they had a helicopter available and if a weather check could be performed.

The pilot was notified of the flight and performed a weather check for the route of flight. After his weather check, he contacted PHI's Enhanced Operational Control Center (EOCC) to discuss his weather observations and the previous "turn down." Both the pilot and EOCC supervisor were observing "ten miles" visibility and ceilings acceptable for the flight. It was not understood by the pilot or the supervisor as to the reason the other operator "turned down" the flight. The pilot contacted EOCC a second time to discuss that the previous flight had been "turned down" due to "fog." The pilot and the EOCC supervisor discussed further weather observations with the same conclusion, that the restriction to visibility reported by the previous flight was not observed by any official weather reporting station.

The pilot contacted the EOCC supervisor a third time after arriving at Huntsville. The pilot reported that the flight was without problems and the weather was as forecast. Further weather observations were discussed between the pilot and EOCC supervisor with the same conclusions, that it was unknown where the visibility restriction experienced by the previous flight was encountered.

FLIGHT RECORDERS

The helicopter was equipped with a full authority digital engine control unit (FADEC). The unit had separated from the helicopter and was located approximately 10 to 15 feet west of the main wreckage. The unit was shipped to Indianapolis, Indiana, for data extraction. On June 10, 2008, under the auspices of the Federal Aviation Administration (FAA), a FADEC download was conducted.

Two full lines of data and one partial line of data were recovered. The first line recorded a torque exceedance at 110 percent. The second line recorded an NR (main rotor) droop at 90 percent. According to Rolls Royce, this is consistent with a sudden stoppage. The small amount of data recovered was due to the electrical power loss during the impact sequence.

WRECKAGE AND IMPACT INFORMATION

The accident site was located in densely forested terrain. Lake Conroe, 16 miles long and 10 miles at its widest point, was located six miles to the southwest of the main wreckage. Multiple bodies of water, including Lake Raven, Sunset Lake, Elkins Lake, and Club Lake, were all located within 2 miles of the initial impact point. The accident site was at a terrain elevation of 344 feet msl and the helicopter impacted on a magnetic heading of 180 degrees. The initial impact point was identified as several trees, 80 to 100 feet in height at a terrain elevation of

354 feet mean sea level (msl). The tops of multiple trees and many branches exhibited separation features consistent with being torn and cut. Tree and branch width varied from less than one inch to over 13 inches in diameter.

The green main rotor blade was located 156 feet southeast of the initial impact point. Pieces of fragmented honeycomb and Plexiglas, the transmission cowling, and a cabin door were all located in the debris path that extended from the initial impact towards the main wreckage. A tree, measuring 13 inches in diameter at the point of separation, was broken approximately 30 feet from the tree base in the direction of impact. This tree was located 100 feet north of the forward tail boom.

The transmission and mast were located 511 feet south of the initial impact point. The aft portion of the tail boom, including the tail rotor and tail rotor gearbox, was located 50 feet west of the transmission and mast assembly. The forward portion of the tail boom, including the right side horizontal stabilizer, a portion of the tail rotor drive shaft, left side horizontal stabilizer, and right side auxiliary fin separated from the fuselage and came to rest 578 feet south of the initial impact point.

The aft portion of the fuselage, to include the aft cabin, and engine assembly, was located 22 feet south of the tail boom. The center portion of fuselage to include the center portion of the cabin, a section of the landing skid, and the blue main rotor blade, came to rest inverted 22 feet south from the aft portion of the fuselage. The forward portion of fuselage to include the cockpit and instrument panel, and a portion of the landing skid, came to rest inverted ten feet south of the center fuselage section and 629 feet south of the initial impact point. The smell of fuel was dominant near the main wreckage.

MEDICAL AND PATHOLOGICAL INFORMATION

The autopsy was performed on the pilot by the Southwestern Institute of Forensic Sciences, Dallas, Texas, on June 9, 2008, as authorized by the Justice of the Peace, Precinct 3, Walker County, Texas. The autopsy revealed the cause of death as "blunt force injuries."

During the autopsy, specimens were collected for toxicological testing to be performed by the FAA's Civil Aerospace Medical Institute, Oklahoma City, Oklahoma (CAMI Reference #200800113001). Tests for carbon monoxide, cyanide, and ethanol were negative. Diphenhydramine was detected in the urine but was not detected in the blood. Diphenhydramine can be used as an antihistamine, sleep aid, or cough suppressant.

TESTS AND RESEARCH

The wreckage was recovered on June 9, 2008, and relocated to a storage facility in Lancaster, Texas, for further examination. The wreckage was examined by investigators from the National Transportation Safety Board, Federal Aviation Administration, Bell Helicopter, Rolls Royce, and representatives from PHI Inc. on June 10th and 11th.

The wreckage was laid out in a partial mock-up manner. The left forward portion of the fuselage was crushed aft and down. The upper right side of the cabin structure, just aft of the

pilot's seat, was crushed down and aft. The roof of the fuselage separated and was fragmented. The instrument panel was crushed and many instruments destroyed. The Kollsman Window was set at 29.96 inches.

The aft portion of the tail boom included the vertical fin, gearbox, and tail rotor and exhibited crushed and torn metal, near the stabilizer, consistent with a main rotor strike. The third driveshaft on the tail boom had wood embedded in the fractured end. The shaft exhibited circumferential scoring two inches from the point of separation. Tail rotor controls were continuous from the point of tail boom separation aft to the tail rotor with both the driveshaft and pitch control. The target blade exhibited leading edge scratching that was green and brown in color. The non-target blade exhibited a leading edge dent at midspan. The fractured driveshaft was rotated by hand and movement through the tail rotor gearbox to both tail rotor blades was noted.

The right side horizontal stabilizer, including the leading edge slat and auxiliary fin, was missing the inboard 12 inches of the leading edge slat. The trailing edge section separated at an angle from the outboard leading edge, inboard to the trailing edge. The outboard portion of the stabilizer exhibited a diagonal direction of separation.

The top portion of the right endplate fin on the horizontal stabilizer separated and the remaining tip was bent down and outboard at an angle from forward to aft. The leading edge of the upper portion of the vertical fin was unremarkable and the trailing edge was crushed in and wrinkled. The lower portion of the vertical fin leading edge exhibited a small point of impact at midspan and the trailing edge at the same point was wrinkled.

The main transmission and roof structure separated from the fuselage. The mast was bent approximately 35 degrees at the top surface of the rotating swashplate. Tree bark was imbedded into the mast, along a 13-inch span. All four main rotor blades separated from the mast with broomstraw separation signatures on all four composite main rotor yoke flexures. All controls were traced through multiple fracture points and determined to be continuous at the time of impact.

The blue main rotor blade exhibited a leading edge gouge 16 inches outboard from the center blade boltholes. The gouge was three inches in length, 0.5 inches in depth, in which the skin was torn and the fiberglass splintered. Wood fibers were noted within the gouge. Black paint transfer, consistent with the color of the tail boom, was noted along the outboard 17 inches of the blade tip.

The orange main rotor blade exhibited leading edge scoring and scratching. The blade honeycomb, skin, and afterbody was partially fragmented and separated starting four inches aft of the leading edge, from 20 inches inboard from the blade tip to 65 inches outboard from the blade bolt holes. The blade exhibited a chordwise overload fracture of the leading edge abrasion strip 73.5 inches inboard from the blade tip. Vegetation particles were observed in the fracture and along the leading edge of the blade and leading edge scratches were brown in color, consistent with tree bark. At the leading edge abrasion strip fracture the composite spar material was "spongy" in feel and was buckled. Impact forces dislocated the yoke flexure (observed at approximately 45 degrees on scene) in the direction of rotation.

The red main rotor blade exhibited leading edge scratching along the entire span of the blade. Crosshatch scoring of the blade skin initiated 57 inches outboard from the end of the blade and continued for 40 inches. The crosshatch scoring was consistent with blade flexing. The green main rotor blade exhibited leading edge scratching along the entire span of the blade but was otherwise intact.

The forward cross tube separated from the skid assembly on the right forward portion of the skid. The left step was unremarkable. The right side step separated from the skid in two pieces. The aft cross tube separated from the skid assembly on the aft rear portion of the skid. All separation surfaces were consistent with overload separation. The skids exhibited light surface scratching and scraping but were otherwise unremarkable. The skids were relatively clean with no evidence of deformation or dirt on the toe of either skid tube.

The engine assembly remained partially attached to the aft portion of the main wreckage. The compressor and turbine separated partially from the gearbox and was disengaged. The starter generator pad was rotated by hand resulting in free and continuous rotation to the spur adapter gear shaft, confirming N1 continuity. The forward splines on the spur adapter gear were "rotationally ground down" providing evidence of rotation of N1 at the time of impact.

The tail rotor out put shaft was rotated manually exhibiting continuity and rotation through the accessory gearbox to the power take off gear. The number four power turbine wheel was rotated by hand resulting in free and smooth rotation, confirming N2 continuity. Rotation to the power turbine to pinion gear coupling was noted. The number one gas producer wheel was rotated by hand resulting in free and smooth rotation.

The upper and lower chip detector were found clean, and "oil wetted." Both fuel and oil filters were examined and found to be free of contamination.

On June 17th and 18th, 2008, the caution panel and several cockpit gauges were taken to Bell Laboratory for further examination under the auspices of the FAA. The bulbs from the caution and warning panel were examined with the aid of the stereozoom microscope to determine the condition of the internal filament. No remarkable anomalies were noted. Each instrument was examined for slap marks or scratching. The following positions were noted: Horizontal Situation Indicator - Course needle set to 166 degrees, compass heading fixed due to damage at a heading of 181 degrees. Air speed indicator - A needle slap paint remnant was noted at the 64-knot position. No other significant indications or slap marks were noted.

ADDITIONAL INFORMATION

PHI Inc. was issued an operating certificate by the Civil Aviation Board (now the FAA) in 1949 to conduct on-demand air taxi operations. PHI has conducted EMS flights since 1949; however, dedicated air medical service was started in 1981. At the time of the accident, PHI conducted air ambulance operations in 16 states with 68 bases. The accident crew was based at Bryan, Texas. The corporate headquarters, including training, the Director of Operations, Chief Pilot, and Director of Safety were located in Lafayette, Louisiana. The operating certificate was

managed by the FAA Flight Standards District Office in Baton Rouge, Louisiana.

At the time of the accident, the company was operating 12 different make and models of helicopters and employed 300 EMS pilots (650 total pilots). Prior to employment, each pilot was required to have a minimum of 1,500 hours total time; 1,000 hours of which is required to be pilot-in-command time.

Audits and Accreditations

On June 22, 2007, PHI's Bryan, Texas, base was awarded provisional accreditation with the Commission on Accreditation of Medical Transport Systems (CAMTS). Accreditation dates are January 18, 2008, through January 18, 2011. Their last audit was conducted on December 13, 2007. They maintained their status with CAMTS and were current at the time of the accident.

The standards from CAMTS require that each pilot have a minimum of 2,000 hours total time; 1,500 hours of which must be in helicopters prior to assignment, 1,000 hours of which must be as pilot-in-command (PIC) in rotorcraft, and 100 hours of which must be as PIC in night conditions. They also recommend that 50 percent of the recommended training hours be conducted at night. This was incorporated into the CAMTS guidelines on January 1, 2007. The pilot met CAMTS training and experience requirements at the time of his initial Air Medical assignment.

Operations Manual

A copy of the PHI General Operations Manual (GOM) was provided to the Safety Board IIC for the course of the investigation. The GOM Air Medical Operations section outlined weather minimums for unaided, night, non-hostile/non-mountainous local flights as 800-foot ceiling and three miles visibility and cross-country flights as 1,000 foot ceiling and five miles visibility. Night, unaided, hostile/mountainous local and cross country flight minimums were 1,000 foot ceiling and three miles visibility and 2,000 foot ceiling and 5 miles visibility respectively.

Unaided flight is defined as flight without NVG. Hostile terrain is defined in the GOM as "an environment in which a safe forced landing cannot be accomplished because the surface is unsuitable or the aircraft occupants cannot be adequately protected from the elements..."

The GOM Radar Altimeter Policy was developed for "the avoidance of Controlled Flight Into Terrain." According to this policy, except for takeoff and landing, the altitude alert (decision height) should be set at 400 feet for night VFR conditions. According to the radar altimeter manufacturer, when the helicopter descends below the decision height set by the pilot, an alert light and aural tone are the only warnings provided.

Pre-Flight Risk Assessment

The PHI GOM, Section 6.1, addressed the Air Medical Risk Matrix required for use prior to all air medical and air medical reposition flights. The pilots are instructed that the flight shall not be attempted when the matrix score is in the unacceptable range. When the matrix score is such to require management review, the on call manager who exercises operational control is

to be contacted.

At every crew change, each base exercises an Enhanced Operational Control Matrix and reports the results to the local EOCC. The matrix is scored as follows:

One point is assigned for each of the following:

1. Less than three months on current job/base
2. Less than six months in PHI EMS
3. Less than 200 hours in type
4. Last flight greater than 30 days
5. Navigation or Radios on MEL
6. New or Unfamiliar equipment
7. Less than six NVG operations in the last 60 days

Two points are assigned for each of the following:

1. Last night flight greater than 30 days (night requests only)
2. Greater than 90 days since the last practice instrument approach
3. Back-up/Spare aircraft (if different from regular aircraft)

One point is deducted for each of the following:

1. Greater than 500 hours in type
2. IFR capable aircraft
3. At least one of the medical crew has more than one year of experience
4. PHI pilot and at least one crewmember are PHI AMRM trained

Two points are deducted if the aircraft and crew are NVG equipped, current, and used. Four points are deducted if the entire flight will be conducted under instrument flight rules. A total of zero to ten points results in a green status, eleven to 15 in a yellow status, and 16 or greater in a red status. If the base is in a yellow status, EOC concurrence with flight dispatch is required. If the base is in a red status, flights will not be dispatched.

Prior to every flight, each pilot exercises the Dynamic Risk Matrix and reports the results to the local EOCC prior to dispatch. The matrix is scored as follows:

One point is assigned for each of the following:

1. High wind or gust spread (greater than 30 knots or greater than 15 knots spread)
2. Moderate turbulence
3. Mountainous or hostile terrain
4. Class B or C airspace

Two points are assigned for each of the following:

1. Ceiling within 500 feet of program minimums
2. Visibility within two miles of program minimums
3. Precipitation with convective activity within five miles of course
4. Unaided night flight

Three points are added for low ground reference or visible moisture during flight in freezing

conditions. Four points are added for deteriorating weather that will be "yellow" during flight duration. Five points are added for a temperature/dewpoint spread within 2 degrees C with less than five knots of wind. One point is subtracted for favorable weather being reported at the destination and high ground reference.

A grand total of the dynamic score falls within three categories. A normal category, scored from zero to ten, allows pilot approval of the flight. An EOC manager level, scored from eleven to 15, requires the pilot to refuse the flight or an EOC manager to approve the flight. An unacceptable level, scored at 16 or greater requires an automatic cancellation of the flight.

Prior to the accident flight, the base at College Station was in a green status and the risk score for the accident flight was one.

Enhanced Operational Control

PHI operates two main Enhanced Operational Control Centers (EOCC) and five satellite communication centers. The two main centers are located in Lafayette, Louisiana, and Phoenix, Arizona; Phoenix being home to the Emergency Medical Services (EMS) portion of the EOCC.

Each EOCC is manned by multiple dispatchers. These dispatchers are not FAA certified dispatchers; however, they are trained in emergency response. Each dispatcher works a 12-hour shift and experiences an average of 275 contacts per day, including voice and electronic communications. They have the capability to work up to 15 aircraft at one time. EMS operations are 24/7 operations.

Each EOCC also has a supervisor on duty at all times. This individual monitors weather conditions throughout the area of operations and ensures station status as shifts change throughout the day. These individuals are all pilots and are available to each flight crew to "provide support when decisions are tough." These supervisors are to be utilized as if a part of crew resource management.

Each dispatch station is equipped with a computer, one or two monitors, a telephone, and radio. Each computer is equipped with software designed to provide updated weather information, satellite tracking of all active operations, current maps, flight details, and flight timers. Programs and software include Outerlink, Golden Hour, Meteorologics, and Delorme Topo USA. Each conversation is recorded and retained for training and debriefs and are kept for 60 days.

All calls for dispatch are made to the EOCC. The dispatcher will determine which aircraft is best positioned for the mission, including a review of base status, and will notify the crew by page/radio/telephone. Base status is determined at crew change and with changes in weather and crew conditions as the shift progresses. A green status indicates the crew is flyable and the mission will be accepted without issues. A yellow status indicates that some form of dynamic safety concern exists that requires EOCC involvement. Red status indicates that flight safety cannot be maintained and the flight will never be dispatched.

The dispatcher will enter all applicable flight/patient information into various programs and as soon as the aircraft powers up, the Outerlink tracking is activated. Outerlink provides satellite tracking capabilities and can provide GPS coordinates, ground speed, a pictorial depiction of aircraft location, and text communications between the aircraft and dispatch. Position reports are made by the pilot every 15 minutes. If a position report is not recorded in Outerlink and Golden Hour, an alarm will sound, alerting the dispatcher and prompting them to follow-up with the flight status of the aircraft. Normally, the Outerlink records positions every 30 seconds; if an emergency is declared, the system starts recording position and information every ten seconds. Once the flight has landed uneventfully, the flight record is closed out by the dispatcher.

PHI Safety Actions

Following the accident PHI took several immediate steps to increase safety within their EMS operations. On June 27, 2008, PHI issued Flight Operations Notice 08-13 regarding "Weather Turndowns by Other Operators or Agencies Air Medical." This notice instructed the EOCC and/or pilot to directly contact the program or agency when it is known that they had refused or aborted a flight due to weather. This notice provided a decision making process flow for establishing a go/reject decision for the flight. In addition, this notice instructed pilots to submit a pilot report (PIREP) to the FAA Flight Service Station for any flight that is aborted due to un-forecasted or unanticipated weather conditions.

On June 27, 2008, PHI also issued Flight Operations Notice 08-14 regarding "Routes of Flight - Single Engine Helicopters Air Medical." With regards to night flights, pilots are instructed to maintain within auto rotational distance of known non-hostile terrain during the entire route of flight, except for brief periods for takeoff and landing, or short routes of less than five miles. "Areas without sufficient surface lighting to maintain adequate visual surface reference shall be avoided by all non NVG equipped/crewed VFR aircraft. NVG may be utilized to insure adequate visual surface reference." In addition, each base was instructed to develop and maintain for planning purposes, procedures depicting areas that are considered hostile, and the preferred routes that comply with this notice.

FAA Regulations

According the CFR 135.67 - "Reporting potentially hazardous meteorological conditions and irregularities of ground facilities or navigation aids: Whenever a pilot encounters a potentially hazardous meteorological condition... the knowledge of which the pilot considers essential to the safety of other flights, the pilot shall notify an appropriate ground radio station as soon as practicable."

OTHER INFORMATION

The weather conditions that existed at the accident site during the time of the accident were instrument flight rules. Dark night conditions prevailed. The helicopter was not equipped with a terrain awareness warning system (TAWS). The pilot was not utilizing a night vision imaging system (NVIS) during the flight. A radar altimeter was installed on the helicopter, but the setting could not be determined. The accident was being tracked by a flight following program,

and did receive flight dispatch services prior to the initiation of the flight. Additionally, a formal flight risk assessment was performed prior to the flight.

On February 7, 2006, the NTSB issued four safety recommendations to the FAA addressing EMS operations. They are as follows:

NTSB Recommendation No. A-06-12 - Require all EMS operators to comply with 14 CFR Part 135 operations specifications during the conduct of all flights with medical personnel onboard.

NTSB Recommendation No. A-06-13 - Require all EMS operators to develop and implement flight risk evaluation programs that include training all employees involved in the operation, procedures that support the systematic evaluation of flight risks, and consultation with others trained in EMS flight operations if the risks reach a predefined level.

NTSB Recommendation No. A-06-14 - Require EMS operators to use formalized dispatch and flight-following procedures that include up-to-date weather information and assistance in flight risk assessment decisions.

NTSB Recommendation No. A-06-15 - Require EMS operators to install terrain awareness and warning systems on their aircraft and to provide adequate training to ensure that flight crews are capable of using the systems to safely conduct EMS operations.

These four recommendations were also placed on the NTSB's "Most Wanted List of Safety Improvements" in October 2008.

Additionally, the NTSB stated in its January 2006 Special Investigation Report on EMS Operations that they were pleased that the FAA encouraged the use of night vision imaging systems in EMS operations, and that the NTSB would continue to monitor the applicability and usage of these devices in the EMS industry.

Also, on December 21, 2007, the NTSB issued two safety recommendations to the FAA regarding the use of radar altimeters in EMS night operations. They are as follows:

NTSB Recommendation No. A-07-111 - Require helicopter EMS operators to install radar altimeters in all helicopters used in HEMS night operations.

NTSB Recommendation No. A-07-112 - Ensure that the minimum equipment lists for helicopters used in helicopter EMS operations require that radar altimeters be operable during flights conducted at night.

History of Flight

Enroute-climb to cruise	Loss of visual reference
Enroute-climb to cruise	Controlled flight into terr/obj (CFIT) (Defining event)

Pilot Information

Certificate:	Airline transport	Age:	63, Male
Airplane Rating(s):	None	Seat Occupied:	Left
Other Aircraft Rating(s):	Helicopter	Restraint Used:	
Instrument Rating(s):	Helicopter	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	March 1, 2008
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	November 1, 2007
Flight Time:	20537 hours (Total, all aircraft), 199 hours (Total, this make and model), 15229 hours (Pilot In Command, all aircraft), 36 hours (Last 90 days, all aircraft), 13 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	Registration:	N416PH
Model/Series:	407	Aircraft Category:	Helicopter
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	53276
Landing Gear Type:	High skid	Seats:	4
Date/Type of Last Inspection:	June 1, 2008 AAIP	Certified Max Gross Wt.:	5000 lbs
Time Since Last Inspection:		Engines:	1 Turbo shaft
Airframe Total Time:	6185 Hrs at time of accident	Engine Manufacturer:	Rolls-Royce
ELT:	Installed, activated, aided in locating accident	Engine Model/Series:	C-47B
Registered Owner:		Rated Power:	650 Horsepower
Operator:		Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Night/dark
Observation Facility, Elevation:	KUTS, 363 ft msl	Distance from Accident Site:	8 Nautical Miles
Observation Time:	02:35 Local	Direction from Accident Site:	315°
Lowest Cloud Condition:	Scattered / 1200 ft AGL	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	6 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.97 inches Hg	Temperature/Dew Point:	26° C / 23° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Huntsville, TX (TE03)	Type of Flight Plan Filed:	Company VFR
Destination:	Houston, TX (38TE)	Type of Clearance:	None
Departure Time:	02:46 Local	Type of Airspace:	

Wreckage and Impact Information

Crew Injuries:	3 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	1 Fatal	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	4 Fatal	Latitude, Longitude:	30.630832, -95.563888

Administrative Information

Investigator In Charge (IIC):	Rodi, Jennifer
Additional Participating Persons:	Dave Keenan; FAA AAI-100; Washington, DC Matthew Rigsby; FAA Rotorcraft Directorate; Fort Worth, TX Mark C Stuntzner; Bell Helicopter; Fort Worth, TX Michael C Hurst; PHI, Inc; Lafayette, LA David W Riser; Rolls-Royce; Indianapolis, IN Denis Rivard; Transportation Safety Board - Canada
Original Publish Date:	January 15, 2009
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=68181

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](#).