National Transportation Safety Board
Aviation Accident Final Report

Location:	La Crosse, Wisconsin	**Accident Number:**	CHI08FA128
Date & Time:	May 10, 2008, 22:45 Local	**Registration:**	N135UW
Aircraft:	EUROCOPTER DEUTSCHLAND GMBH EC 135 T2+	**Aircraft Damage:**	Destroyed
Defining Event:	Controlled flight into terr/obj (CFIT)	**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

After transporting a patient to a local hospital and refueling at La Crosse Municipal Airport (LSE), the emergency medical services (EMS) helicopter departed LSE (elevation 656 feet mean sea level [msl]) about 2234 central daylight time (all times in this brief are central daylight time) on a return flight to its base heliport. Dark night visual meteorological conditions (VMC) prevailed at LSE. A ramp services employee at LSE who had observed the helicopter lift off and proceed east-southeast observed “moderate” rain and “fair” visibility at the time of takeoff. Witnesses located southeast of the airport reported hearing the helicopter in flight about the time of the accident, and one witness reported hearing a loud crashing sound. A search was initiated shortly after the crash but was hampered by the terrain and fog that had formed overnight. A search located the helicopter the following morning; the helicopter had impacted trees along a sparsely populated ridgeline about 5 miles southeast of LSE. The elevation of the ridgeline was approximately 1,164 feet msl, with 50- to 60-foot-tall trees in the area initially struck by the helicopter.

Distribution of the wreckage was consistent with the helicopter impacting the trees in a nearly level flight attitude under controlled flight. Examination of the helicopter’s engines revealed inlet debris, rotational scoring, and centrifugal turbine blade overload failures consistent with the engines being operated at a moderate to high power level (on both engines) at the time of impact. Nonvolatile memory downloaded from the digital engine control units (DECUs) indicated that both engines were in “flight mode” at the time of impact. Although the left engine main selector switch was observed in the “idle” position after the accident, the lack of anomalies related to the switch and the corresponding DECU in flight mode are consistent with the switch having been moved as a result of impact. No preimpact mechanical malfunctions of the helicopter were found.

The reported weather conditions at LSE about 2253 included VMC: calm winds, 8 miles visibility in light rain, few clouds at 1,400 feet above ground level (agl) [2,056 feet msl], overcast clouds at 5,000 feet agl (5,656 feet msl), temperature 10 degrees C, dew point 8 degrees C, and altimeter 29.70 inches of mercury. The preflight weather briefing obtained by the pilot about 1 hour before departure indicated VMC along the route of flight at the time of the briefing but forecasted deteriorating conditions later in the evening after about 2200, including possible instrument meteorological conditions (IMC). Search and rescue personnel reported fog and mist along the ridgeline overnight during the search operations. Additionally, an EMS pilot for another operator reported that when he departed LSE about 2 hours before the accident flight, fog was beginning to form on the west side of the Mississippi River and in the bluffs east of his flight route. He subsequently returned to LSE and declined at least one additional flight that evening due to deteriorating weather conditions. Because of the variability in weather conditions on the night of the accident, the investigation could not determine if the pilot encountered IMC at the time of the accident.

The pilot was transferred to the accident operator as a result of the accident operator's acquisition of his previous employer about 3 months before the accident. The accident pilot was initially qualified as visual flight rules (VFR)-only. An instrument proficiency check was not completed in conjunction with initial training. As a result, the accident pilot was limited to VFR-only operations at the time of the accident. (The accident pilot was current for instrument flight rules [IFR] at his previous place of employment.)

During preflight planning, the pilot should have identified any obstacles along the route of flight, including the tree-covered ridgeline. Company records indicated that the pilot had completed one prior flight to LSE within the previous 16-month period, which was about 2 months before the accident. To assist pilots, maximum elevation figures (MEF) are noted on sectional charts and are derived from such features as terrain, trees, and towers. An MEF is specified for each latitude/longitude quadrangle on the chart. Operation at or above the applicable MEF will ensure terrain and obstacle clearance. The MEF for the La Crosse area is 2,200 feet msl. In addition to the MEF, sectional charts depict terrain elevation and specific obstacle height information. If the accident pilot had observed the MEF of 2,200 feet msl, or the terrain elevation/obstacle height information, it would have provided clearance of the tree covered ridgeline. The elevation of the ridge in the vicinity of the tree strikes was approximately 1,164 feet msl. With the 50- to 60-foot-tall trees, the elevation of the treetops was about 1,224 feet msl, providing a margin of approximately 831 feet to the level of the reported "few clouds" and 4,431 feet to the overcast layer of clouds.

According to Air Methods Corporation, the accident pilot performed a formal flight risk assessment before the flight. Further, the flight was being tracked by a company flight-following program and received flight dispatch services before the start of the flight. According to the Air Methods General Operating Manual, the pilot's risk assessment was to be recorded in the pilot's daily flight log. However, the pilot's daily flight log was destroyed during the crash.

The pilot entered a risk assessment of "A" (normal operations) into the flight dispatch computer system before the flight. While the weather in the LSE area was marginal at the time of the accident, it was above the minimums required by Federal Aviation Administration (FAA) regulations and the operator's procedures. There were no identified weather risks that would have warranted classifying the flight in the risk assessment category "B" (caution).

A radar altimeter was installed on the helicopter and, according to Air Methods, was normally set to 500 feet for night flight. On December 21, 2007, the National Transportation Safety Board (NTSB) issued Safety Recommendations A-07-111 and -112, asking the FAA, respectively, to require helicopter EMS (HEMS) operators to install radar altimeters in all helicopters used in HEMS night operations and ensure that the minimum equipment lists for helicopters used in HEMS operations require that radar altimeters be operable during flights conducted at night. On March 10, 2008, the FAA stated that it agreed with the intent of these recommendations and was considering rulemaking to require all 14 Code of Federal Regulations Part 135 HEMS operators conducting night HEMS operations to have an operable radar altimeter installed in the helicopter. On August 17, 2009, the FAA indicated that it revised FAA Order 8900.1, "Flight Standards Information Management System," to provide standards and procedures for inspectors to evaluate flat light or whiteout training programs for all helicopter operators. The FAA also stated that an in-progress notice of proposed rulemaking (NPRM) for air ambulance and commercial helicopter operations would address the safety intent of these recommendations.

On March 12, 2010, the NTSB stated that, although it agrees that increased training for pilots may be of benefit in avoiding accidents where radar altimeters are needed, issuing guidance and standards for such training is not responsive to these recommendations. The NTSB further indicated that it is pleased to learn that the planned NPRM will include language proposing the recommended requirements for radar altimeters. Pending the issuance of a final rule requiring (1) the installation of radar altimeters in all helicopters used in HEMS night operations and (2) the inclusion of a requirement on the minimum equipment lists that these altimeters be operable on all helicopters during HEMS flights conducted at night, Safety Recommendations A-07-111 and 112 were classified "Open—Acceptable Response." In this accident, the radar altimeter should have alerted the pilot when terrain clearance dropped below 500 feet agl. Although Air Methods' company policy was to set the radar altimeter to 500 feet for night flight, the NTSB was unable to verify that the radar altimeter was, in fact, turned on and set to 500 feet for the accident flight. Assuming that the radar altimeter was turned on, set to 500 feet, and functioning properly at the time of the accident, the pilot likely would have received numerous alerts between 4 nautical miles (nm) and 2 nm from the point of impact and constant alerts from 2 nm to the point of impact. The NTSB was unable to determine why the pilot did not take corrective action in response to the alerts from the radar altimeter or, if the pilot did take corrective action, why it was ineffective. There was no record of any maintenance issues regarding the accident helicopter's radar altimeter.

The helicopter was not equipped with a terrain awareness and warning system (TAWS). TAWS detects terrain or other obstructions along the flightpath and provides an audible alert to warn the pilot to take corrective action. TAWS looks forward to detect terrain and obstacles in front of the aircraft, while the radar altimeter looks down to measure the distance between the aircraft and the terrain below the aircraft. In addition, TAWS issues an audible alert, whereas the radar altimeter issues a visual alert. Typically, a HEMS pilot flying at night would benefit from an audible alert because the pilot would be looking forward out of the cockpit for a VFR flight; the radar altimeter is used mainly in the IFR environment. Further, because the clouds were low on the night of the accident, the pilot may have been deliberately flying below 500 feet to avoid the clouds. In that case, the pilot may have been purposely ignoring radar altimeter illuminations, but TAWS would have captured his attention because it looks forward and provides an audible alert.

On February 7, 2006, the NTSB issued Safety Recommendation A-06-15, which asked the FAA to require EMS operators to install TAWS on their aircraft and to provide adequate training to ensure that flight crews are capable of using the systems to safely conduct EMS operations. The FAA responded that, while it would work with industry to address issues related to the installation of TAWS on EMS aircraft, it would address the issue of controlled flight into terrain by emphasizing effective preflight planning.

The FAA further stated that the Radio Technical Commission for Aeronautics established a committee tasked with developing helicopter TAWS (H-TAWS) standards and that, in March 2008, the commission completed the development of minimum operational performance standards for H-TAWS. On December 17, 2008, the FAA published Technical Standard Order C194, "Helicopter Terrain Awareness and Warning System," based on the commission standards. On January 23, 2009, the NTSB indicated that the continuing delays in development of a final rule to require H-TAWS were not acceptable. On November 4, 2009, the FAA responded by indicating that it was developing an NPRM to address this recommendation and that it planned to complete work on the NPRM in January 2010. The NPRM has not yet been issued. On November 13, 2009, the NTSB reiterated Safety Recommendation A-06-15 in its report regarding the September 27, 2008, accident involving an Aerospatiale SA365N1, N92MD, operated by the Maryland State Police, which crashed during approach to landing near District Heights, Maryland. On February 18, 2010, the NTSB indicated that it remained concerned about the time required to develop and issue this requirement. The NTSB classified Safety Recommendation A-06-15 "Open—Unacceptable Response," pending adoption of a requirement that all EMS operators equip their aircraft with and use TAWS. An installed and operable H-TAWS unit would likely have alerted the accident pilot to the rising terrain and provided an opportunity to climb, thereby allowing the pilot to avoid the ridgeline.

Member Sumwalt did not approve this brief and probable cause. Member Sumwalt filed a dissenting statement that can be found in the public docket for this accident.

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 clearance from trees along the top of a ridgeline due to inadequate preflight planning, insufficient altitude, and the lack of a helicopter terrain awareness and warning system.

Member Sumwalt did not approve this brief and probable cause. Member Sumwalt filed a dissenting statement that can be found in the public docket for this accident.

Findings

Personnel issues	Incorrect action performance - Pilot

Factual Information

HISTORY OF FLIGHT

On May 10, 2008, about 2237 central daylight time, a Eurocopter Deutschland GmbH EC 135 T2+ air medical configured helicopter, N135UW, operated by Air Methods Corporation, was destroyed during an in-flight collision with trees and terrain near La Crosse, Wisconsin. The flight was conducted in accordance with 14 Code of Federal Regulations Part 91. A flight plan had not been filed with the Federal Aviation Administration (FAA). Night visual meteorological conditions prevailed in the vicinity of the accident site. The pilot, physician and flight nurse sustained fatal injuries. The flight departed the La Crosse Municipal Airport (LSE), La Crosse, Wisconsin, at 2234. The intended destination was the University of Wisconsin Hospital heliport (WS27) in Madison, Wisconsin.

The helicopter was equipped with global positioning system (GPS) tracking equipment that provided departure, arrival and en route position information to the operator's Operations Control Center (OCC). Flight progress was automatically updated approximately every three minutes and tracked by the operator's OCC. According to the GPS flight-following data, the flight initially departed WS27 about 2038 en route to Prairie du Chien Memorial Hospital, Prairie du Chien, Wisconsin. The flight arrived there about 2113 and picked up a patient. The flight subsequently departed about 2131 and proceeded to Gunderson-Lutheran Hospital in La Crosse, arriving about 2154. After dropping off the patient, the crew departed about 2209 and repositioned the helicopter to LSE for refueling. The flight departed LSE at 2234 with the intention of returning to WS27. No further position updates were received from the accident helicopter.

The line service technician who fueled the helicopter noted that when it departed, it lifted off vertically and proceeded east-southeast. Regarding the weather conditions, he added that the visibility was "fair", with a "low ceiling" and "moderate rain" at the time.

A witness located approximately 4.2 miles east-southeast of LSE reported hearing a helicopter fly over about 2230. He was in a restaurant parking lot getting into his car at the time. He noted that it sounded like a Medlink helicopter. He reported that it seemed to be "traveling at a high rate of speed, and was flying low." He recalled thinking that it was not going to clear the bluffs.

A second witness contacted the La Crosse County Sheriff's Office about 2240 and stated that he heard a helicopter flying overhead, when the sound of the engine disappeared followed by a loud crashing sound. Local authorities initiated a search at that time.

At 2304, the helicopter operator notified local authorities that the helicopter was missing. The helicopter wreckage was subsequently located about 0826 the next morning.

PERSONNEL INFORMATION

The pilot, age 39, held a Commercial Pilot certificate with single and multi-engine land

airplane, helicopter, instrument airplane, and instrument helicopter ratings. He was issued a Second-Class Airman Medical certificate on July 14, 2007, with a limitation for corrective lenses. The pilot also held a Mechanic certificate with airframe and powerplant ratings.

The pilot's logbook was not obtained by the NTSB. The operator reported the accident pilot's flight experience as 4,003 hours total flight time, with 2,741 hours in rotorcraft, and 121 hours in EC135 helicopters. The pilot's night flight time was 545 hours and instrument flight time was 216 hours. Within the 90-day period prior to the accident, the pilot had flown 49 hours in EC135 helicopters. Duty time records indicated that in the 30-day period prior to the accident, the pilot had flown 17.0 hours. Of that total, 5.8 hours were at night. The operator initially noted that the pilot had accumulated 2.7 hours of actual instrument flight time during the previous 12 months. However, they subsequently advised that the accident pilot had accumulated 2.5 hours of instrument flight time between July 2005 and March 2008. During the 12-month period preceding the accident, the pilot acquired a total of 0.4 hours actual instrument flight time; all of which was during a single flight on May 17, 2007.

The accident pilot was hired by CJ Systems on March 1, 2001, as a mechanic. CJ Systems operated the University of Wisconsin Med Flight program at that time. During his tenure as a mechanic, he reportedly also acted as a pilot on maintenance test flights. He transferred to a full-time pilot position on December 1, 2005. Air Methods Corporation purchased CJ Systems in March 2008, and the Madison-based pilots were transferred to Air Methods.

At the time of the transition to Air Methods, the pilots were provided training under the Air Methods operating certificate. Training records indicated that the accident pilot completed basic indoctrination for Air Methods and EC 135 helicopter specific ground training in January 2008. He completed further training related to aeronautical knowledge and EC 135 P2 helicopter specific knowledge between February 2008 and April 2008. On March 10th and 11th, 2008, the accident pilot completed 3.5 hours flight training in an EC 135 T2+ helicopter. According to company records, he passed Part 135 Competency and Line Checks on March 11, 2008. An instrument proficiency check was not completed at that time. As a result, the accident pilot was limited to visual flight rules (VFR) operations under the Air Methods certificate at the time of the accident.

There were two flights on record to the La Crosse area for the accident pilot between January 1, 2007, and the day of the accident. On March 7, 2008, the pilot had transported a patient from Prairie du Chien Memorial Hospital to Gunderson Lutheran Hospital in La Crosse. The second was the flight on the evening of the accident.

AIRCRAFT INFORMATION

The accident helicopter was a 2007 Eurocopter Deutschland GmbH EC 135 T2+ helicopter, serial number 0535. It was powered by two Turbomeca Arrius 2B2 turboshaft engines. The helicopter was certificated under FAA type certificate H88EU and issued a standard airworthiness certificate on March 14, 2007. It had accumulated 456.7 hours total flight time as of the day of the accident. Both engines had accumulated the same amount of time as the airframe. In the 30-day period prior to the accident, the helicopter accumulated 39.8 hours.

The helicopter was maintained under an FAA Approved Aircraft Inspection Program (AAIP). A routine airworthiness check was completed on the day of the accident with no discrepancies noted. According to the operator's records, the most recent inspection procedure was a 400-Hour inspection completed on March 17, 2008, at 386.1 hours airframe total time.

A 12-Month inspection and a 100-Hour Supplementary inspection were completed on February 26, 2008, at 375.7 hours total airframe time. Altimeter and pitot static system inspections were also completed at that time. During those inspections, a crack was observed in the upper and lower skins of one of the main rotor blades. The blade was replaced at that time.

The maintenance records noted that on April 16, 2008, the helicopter fell off a tug damaging the landing light and the electrical cannon plug. The damage was repaired and the aircraft returned to service. With the exception of an inoperative landing light, there were no further discrepancies recorded in the aircraft maintenance records within the 90-day period prior to the accident. The records noted that landing light bulb had been replaced prior to the day of the accident.

At the time of the accident, the helicopter was equipped with a radar altimeter. It was not equipped, nor was it required to be equipped, with a terrain awareness warning system (TAWS).

METEOROLOGICAL INFORMATION

The National Weather Service (NWS) Surface Analysis Chart valid at 2200 depicted a low pressure system to the south of the accident site over northern Missouri, with an occluded front extending southward from that low. Several low-pressure troughs extended north and northeastward across Iowa and into northwestern Illinois. A second low-pressure system was located over south-central Minnesota, with a stationary front extending north-northeast through Minnesota and northern Wisconsin.

The NWS Weather Depiction Chart for 2300 depicted an area of IFR conditions over southern Minnesota and portions of Iowa. Surrounding the area of IFR conditions was an area of marginal visual flight rules (MVFR) conditions that included most of Minnesota, Iowa and western Wisconsin and Illinois. VFR conditions extended over central and eastern Wisconsin and Illinois. The intended route of flight, the accident site, and the destination were in the area of MVFR conditions.

IFR conditions are defined as ceilings (broken or overcast cloud layers) below 1,000 feet above ground level (agl) and/or visibilities less than 3 statute miles. MVFR conditions are defined as ceilings between 1,000 feet agl and 3,000 feet agl, and/or visibilities between 3 and 5 miles inclusive. VFR conditions are defined as ceilings above 3,000 feet agl and visibilities greater than 5 miles.

The closest weather reporting facility to the accident site was at LSE. LSE was located approximately 5 miles northwest of the accident site. At 2153, the LSE Automated Surface Observations System (ASOS) recorded weather conditions as: Calm winds; 4 miles visibility in light rain and mist; scattered clouds at 1,300 feet agl; overcast clouds at 3,500 feet agl;

temperature 10 degrees Celsius; dew point 8 degrees Celsius; and altimeter 29.72 inches of mercury.

At 2253, the LSE ASOS recorded conditions as: Calm winds; 8 miles visibility in light rain; few clouds at 1,400 feet agl; overcast clouds at 5,000 feet agl; temperature 10 degrees Celsius; dew point 8 degrees Celsius; and altimeter 29.70 inches of mercury.

The Area Forecast for southwest Wisconsin issued at 2045 and valid until 0900 the following morning, was for overcast clouds at 6,000 feet agl, with cloud tops to 15,000 feet mean sea level (msl). From 2400, conditions were forecast to be 2,000 feet agl, and visibilities of 3 to 5 miles in light rain and mist. After 0900, the extended outlook consisted of MVFR conditions due to low ceilings and visibilities restricted by rain, with winds over 25 knots.

No Significant Meteorological Information advisories (SIGMETs), Convective SIGMETs, or Severe Weather Forecast Alerts were current over Wisconsin at the time of the accident. However, Airmen's Meteorological Information (AIRMET) Sierra was issued at 2145 and was valid until 0400 the following morning. It warned of possible IFR conditions along the route of flight.

The LSE Terminal Aerodrome Forecast (TAF) issued at 1830 called for: Winds from 130 degrees at 7 knots; visibility greater than 6 miles in light rain; scattered clouds at 3,500 feet agl; and an overcast ceiling at 5,000 feet agl. At 2400, conditions were expected to be: Winds from 020 at 6 knots; visibility 5 miles in light rain and mist; and an overcast cloud ceiling at 2,500 feet agl.

The pilot obtained a preflight weather briefing beginning at 2117 for the route from Prairie du Chein to La Crosse and back to Madison. The briefer provided a synopsis of current and forecast conditions. He indicated that deteriorating weather conditions were expected after 2200 with IFR conditions possible. The briefer informed the pilot of AIRMET Sierra update 7, issued at 1545 and valid until 2200, warning of IFR conditions southwest of a line from Minneapolis to Bradford, Illinois (BDF). The accident site was located approximately 35 miles northeast of this boundary.

An EMS pilot operating in the area that evening reported that he departed La Crosse at 2024 en route to Arcadia, Wisconsin. He stated that fog was beginning to form on the west side of the Mississippi River. Fog was also beginning to form on the bluffs to the east of his route of flight. He subsequently returned to La Crosse about 2115. He declined at least one additional flight request that evening due to deteriorating weather conditions.

Fire department personnel reported that there was fog and mist along the ridgeline overnight during the search operations.

Sunset occurred at 2019, with civil twilight ending at 2052. The sun was more than 15 degrees below the horizon about the time of the accident. The moon was about 30 degrees above the horizon at the time of the accident. It was in a waxing crescent phase with approximately 39 percent of the moon's disk illuminated. The moon set at 0154 on May 11th, about 3 hours after the accident.

AIRPORT INFORMATION

La Crosse Municipal Airport (LSE) was located on French Island on the Mississippi River near La Crosse, Wisconsin. The airport elevation was 655 feet. Ridgelines rose to approximately 1,200 feet mean sea level on both the east and west sides of the river. The cities of La Crosse and Onalaska were located between the river and the ridgeline east of the airport. The ridges were sparsely populated.

WRECKAGE AND IMPACT INFORMATION

The accident helicopter impacted trees along a wooded ridgeline in a sparsely populated area approximately 4.5 miles southeast of LSE. Tree strikes and main rotor blade fragments were observed at the top of the ridgeline. The right landing skid separated from the airframe at the top of the ridge. The elevation of the ridge in the vicinity of the tree strikes was approximately 1,164 feet (GPS altitude/elevation). The trees were estimated to be 50 to 60 feet tall. The tree strikes were located near the top of the trees; approximately 50 to 55 feet above ground level.

The main wreckage came to rest on a descending hillside, east of the ridgeline. This was on the opposite side of the ridgeline from the departure airport. The helicopter came to rest about 600 feet from the initial tree strikes at the top of the ridgeline, at an elevation of approximately 928 feet (GPS altitude/elevation). The tail boom and Fenestron (tail rotor) separated from the fuselage. It came to rest about 20 feet from the main wreckage.

The main wreckage consisted of the fuselage (cockpit and cabin areas), the engines, main rotor transmission, main rotor mast and main rotor blade roots. The cockpit and cabin areas were completely compromised. The altimeter setting was 29.71 inches when observed at the accident site. The engines remained with the airframe; however, the engine housings were dented and deformed consistent with impact damage. The main rotor blade roots remained attached to the rotor mast; however, the blades were fragmented. The swash plate and pitch change links were observed intact. The transmission exhibited continuity through the assembly when rotated. The left engine drive shaft was bent approximately 20 degrees at the aft end. The right engine drive shaft appeared intact. Both drive shafts were separated from the engine drive splines when observed at the accident site. The flight control servos remained secured to the airframe. The flight control rods between the servos and the cockpit controls were fragmented. The tail boom and Fenestron were fragmented. A section of the Fenestron drive shaft approximately 4 feet in length was separated near the forward end of the tailboom and forward of the Fenestron shroud.

A teardown inspection of the engines was conducted at the manufacturer's facility under direct supervision of the NTSB. The air inlets of both engine contained debris, which appeared consistent with dirt and wood fragments. The compressor and turbine sections of both engines exhibited scoring and scrape markings consistent with rotation at impact. The left engine power turbine blades had all sheared off at the blade roots. Examination of the fracture surfaces revealed features consistent with overload failure. No evidence of pre-existing cracking was observed on any of the blade fractures. The right engine power turbine blades

remained intact.

The DC power/engine control panel remained with the instrument panel. However, the instrument panel was dislodged from its normal position in the cockpit. The left (ENG 1) main selector switch was in the IDLE position when observed at the accident site. The right (ENG 2) main switch was in the FLIGHT position when observed at the accident site. The left and right switch guards, intended to prevent inadvertent movement from the IDLE to the OFF position, were both engaged. The main engine selector switch detents, intended to prevent inadvertent movement from the FLIGHT to the IDLE position, functioned properly when examined after the accident.

The Full Authority Digital Engine Control (FADEC) system switches control electrical power to the engine control units. They are located adjacent to their respective main engine selector switches on the engine control panel. Both switches were in the ON position when observed at the accident site. The FADEC switches were not configured with switch guards.

The Engine Mode Selector switches are located on the lower/forward section of the overhead panel. Switch positions are NORM (normal operation) and MAN (manual operation). Both the left (ENG 1) and right (ENG 2) mode selector switches were in the NORM position and the switch guards were engaged when observed at the accident site.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy of the pilot was performed at the Regina Medical Center in Hastings, Minnesota, on May 12, 2008. The report noted multiple traumatic injuries due to a helicopter crash.

A Forensic Toxicology Fatal Accident Report was prepared by the FAA Civil Aerospace Medical Institute. The results were negative for all substances tested.

TESTS AND RESEARCH

The Digital Engine Control Units (DECUs) were examined by the component manufacturer under supervision of the Federal Aviation Administration. Retained (non-volatile) memory was recovered successfully from each unit. The left and right engine DECU total operating times were 516.3 hours and 389.9 hours, respectively. Both units had been powered-up (battery power on) for 408 seconds (6.8 minutes) at the time the most recent anomalies were recorded. No anomalies had been recorded during the previous 80 hours of DECU operation.

The most recent anomalies consisted of an overspeed event recorded by the right engine DECU, and a maintenance event recorded by the left engine DECU. Both blocks were recorded at 408 seconds (6.8 minutes). At the time of the overspeed event, the right engine turbine speed (N2) was 117.69 percent. At the time of the maintenance event, the left engine turbine speed (N2) was 117.81 percent. Both DECUs were in Flight Mode at the time the events were recorded. No faults were recorded subsequent to the overspeed and maintenance events.

In normal operation, detection of an overspeed condition automatically results in the affected engine being shut down by the DECU. In order to prevent both engines from being shut down

automatically, a cross-inhibit function deactivates the overspeed protection for the remaining engine. An Overspeed Block is recorded by the DECU associated with the engine experiencing the overspeed condition. The DECU associated with the remaining engine records a Maintenance Block at the point overspeed protection is deactivated.

Visual examination of the left DECU revealed a single bent pin on the J2 connector. Specifically, the #14 pin was bent over 180-degrees. The adjacent pins did not exhibit any mechanical damage or surface discoloration. The remaining pins on the J2 connector appeared intact and undamaged. The connector base consisted of a rubber inlay over a glass insulator. The affected #14 pin provided power for the "OEI 30 second" indication to the pilot. Disruption of that circuit results in no signal being received by the Vehicle Engine Multifunction Display (VEMD) and a lack of the "OEI 30 second" indication to the pilot. According to the manufacturer, the ability of the DECU to control the engine is not impacted by the associated circuit.

The Vehicle Engine Multifunction Display (VEMD) and the Caution Advisory Display (CAD) installed in the accident helicopter were downloaded. The flight duration recorded by the VEMD is based on collective position, as opposed to operation or power-up time, as in the case of the DECUs. Additionally, the flight duration parameter is only updated every 80 seconds. The flight duration parameter was recorded as 2 minutes 53 seconds. The parameter would have been expected to be updated again at 4 minutes 13 seconds.

The VEMD contained 8 fault messages between 3 minutes 20.0 seconds and 3 minutes 24.5 seconds flight duration. (The current flight time is also recorded with the associated fault message and is independent of the flight duration parameter noted previously.) The initial 5 faults were associated with a loss of reliable torque, static pressure, and outside air temperature data. At that time, the recorded left and right engine compressor and turbine speeds were about 88 percent and 90 percent, respectively. At 3 minutes 24.0 seconds, the VEMD received a failure message (FAIL_FADEC) from the engine control unit (DECU). A fault related to a deviation in the outside air temperature (OAT) data (SURV_DOM_OAT_BUS) was also recorded at 3 minutes 24.0 seconds. At 3 minutes 24.5 seconds, the VEMD declared a DECU link failure (SURV_FADEC) due to a lack of data from the DECU over three successive data cycles. There were no further fault messages recorded by the VEMD.

The CAD recorded a single fault message at 3 minutes 24 seconds. The message was related to a deviation in the main fuel tank sensor power supply.

ADDITIONAL INFORMATION

The operator's General Operations Manual (GOM) provided minimum weather and altitude requirements for flight operations. VFR flight was to be conducted no less than 300 feet agl for day operations, and 500 feet agl for night operations. Weather minimums required by the GOM consisted of an 800-foot ceiling and 3 miles visibility for day operations, and a 1,000-foot ceiling and 5 miles visibility for night operations.

Maximum elevation figures (MEF) are noted on sectional charts. They are derived from features such as terrain, trees, and towers. They are specified for each latitude/longitude

quadrangle on the sectional chart. Operation at or above the applicable MEF will ensure terrain and obstacle clearance. The MEF for the La Crosse area was 2,200 feet msl.

Weight and balance calculations indicated that the helicopter was operating within the prescribed loading and center-of-gravity (CG) limitations. The estimated maximum gross mass and CG location for the accident flight was 2,830 kg and 4.291 meters, respectively. Manufacturer's performance data indicated that the rate of climb at 2,830 kg, with one engine inoperative (OEI), the operating engine at maximum continuous power, and at 65 knots, was approximately 260 feet per minute. With all engines operating (AEO), the helicopter's rate of climb was estimated to exceed 1,200 feet per minute.

History of Flight

Enroute	Controlled flight into terr/obj (CFIT) (Defining event)

Pilot Information

Certificate:	Commercial	**Age:**	39
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):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	July 14, 2007
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 11, 2008
Flight Time:	3950 hours (Total, all aircraft), 70 hours (Total, this make and model), 17 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	EUROCOPTER DEUTSCHLAND GMBH	**Registration:**	N135UW
Model/Series:	EC 135 T2+	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	0535
Landing Gear Type:	Skid	**Seats:**	12
Date/Type of Last Inspection:	March 17, 2008 AAIP	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	71 Hrs	**Engines:**	2 Turbo shaft
Airframe Total Time:	457 Hrs	**Engine Manufacturer:**	TURBOMECA
ELT:	Installed	**Engine Model/Series:**	ARRIUS 2B2
Registered Owner:		**Rated Power:**	642 Horsepower
Operator:		**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	QMLA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night/dark
Observation Facility, Elevation:	LSE,656 ft msl	**Distance from Accident Site:**	5 Nautical Miles
Observation Time:	22:53 Local	**Direction from Accident Site:**	280°
Lowest Cloud Condition:	Few / 1400 ft AGL	**Visibility**	8 miles
Lowest Ceiling:	Overcast / 5000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.7 inches Hg	**Temperature/Dew Point:**	10°C / 8°C
Precipitation and Obscuration:	Light - None - Rain		
Departure Point:	La Crosse, WI (LSE)	**Type of Flight Plan Filed:**	None
Destination:	Madison, WI (WS27)	**Type of Clearance:**	VFR
Departure Time:	22:34 Local	**Type of Airspace:**	

Airport Information

Airport:	La Crosse Municipal LSE	**Runway Surface Type:**	
Airport Elevation:	656 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	3 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 Fatal	**Latitude, Longitude:**	43.841945,-91.165557

Administrative Information

Investigator In Charge (IIC):	Sorensen, Timothy
Additional Participating Persons:	Christine Soucy; FAA -- Office of Accident Investigation; Washington, DC Ed Stockhausen; Air Methods Corporation; Englewood, CO Lindsay Cunningham; American Eurocopter LLC; Grand Prairie, TX Archie Whitten; Turbomeca USA; Grand Prairie, TX
Original Publish Date:	September 2, 2010
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=67988

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.