



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

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|--------------------------------|----------------------------|-------------------------|-------------|
| Location: | Wilton, Iowa | Accident Number: | CEN11FA507 |
| Date & Time: | July 25, 2011, 11:30 Local | Registration: | N3880J |
| Aircraft: | Sikorsky UH-34D | Aircraft Damage: | Substantial |
| Defining Event: | Loss of control in flight | Injuries: | 1 Fatal |
| Flight Conducted Under: | Part 137: Agricultural | | |

Analysis

The pilot flew the helicopter toward an agricultural field that was to be sprayed with fungicide. As the helicopter flew along the edge of the field, the pilot brought the helicopter into an out-of-ground-effect hover and performed a left pedal turn. The helicopter descended and impacted terrain. The helicopter was operated with a fuel grade that reduced the maximum engine power and the available climb rate for the conditions at the time of the accident. According to the Rotorcraft Flying Handbook, Basic Flight Maneuvers, Hovering Turn, it states in part, "...It should be noted that during a turn to the left, more power will need to be added because left pedal pressure increases the pitch angle of the tail rotor, which, in turn, requires additional power from the engine..." It is likely that the helicopter did not have sufficient power to perform the hovering turn successfully. A postaccident examination did not reveal any mechanical anomalies that would have precluded the helicopter's operation.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The inadequate performance planning by the pilot that resulted in reduced climb capability while transitioning to an out-of-ground effect hover with a left pedal turn.

Findings

Personnel issues

Performance calculations - Pilot

Aircraft

Climb capability - Not attained/maintained

Factual Information

History of Flight

| | |
|-----------------------------------|--|
| Maneuvering-low-alt flying | Loss of control in flight (Defining event) |
| Uncontrolled descent | Collision with terr/obj (non-CFIT) |

HISTORY OF FLIGHT

On July 25, 2011, about 1130 central daylight time, a Sikorsky UH-34D, N3880J, impacted terrain while spraying fungicide on a corn field near Wilton, Iowa. The certificated airline transport pilot sustained fatal injuries. The helicopter sustained substantial damage, which included postimpact fire damage. The helicopter was registered to US Helicopter LLC and operated by Southern Helicopter Services LLC under the provisions of 14 Code of Federal Regulations Part 137 as an aerial application flight. Visual meteorological conditions prevailed at the time of the accident and no flight plan had been filed for the local flight. The flight originated from a field about 3/4 mile from the accident site about 1125.

The pilot landed the helicopter near the field to be sprayed where it was loaded with 5 gallons of fungicide, 250 gallons of water, and 150 gallons of 100 octane fuel. The loaders were not certain of the actual weight of the product but were able to determine that the takeoff weight should not have exceeded the maximum takeoff weight.

According to the Federal Aviation Administration (FAA), the pilot flew toward the field that was to be sprayed to conduct an aerial survey at an altitude of nearby powerlines, which were about 40-50 feet above ground level. As the helicopter flew on a southerly heading along the eastern edge of the field, the helicopter was brought into an out-of-ground-effect hover. A left pedal turn was performed, and the helicopter descended and impacted into trees and terrain near the field.

A witness stated that the helicopter flew over his farm southbound. When the helicopter began to turn and pitch, it "shuttered and sputtered" and then descended out of his view.

PERSONNEL INFORMATION

The pilot held an airline transport pilot certificate with an airplane multiengine land rating and commercial privileges with airplane single-engine land, rotorcraft-helicopter, and instrument helicopter ratings. On January 12, 2011, a rotorcraft-helicopter rating was added to his flight instructor certificate, which had airplane single-engine, airplane multiengine, and instrument airplane ratings. He held a mechanic certificate with airframe and powerplant ratings.

According to his Airman Certificate and/or Rating Application, dated July 9, 2011, for a SK-58

type rating, the pilot reported his flight experience as 10 hours of flight time in an SK-58-CH34C and a total rotorcraft flight time of 8,000 hours. On July 16, 2011, he was issued a Temporary Airman Certificate with an SK-58 type rating.

The FAA received a pilot logbook dated from April 5, 2005 to January 12, 2011, from the pilot's family. As of January 12, 2011, the logbook total duration of flight was 12,273.2 hours, of which 8,637 hours were in helicopters. The subsequent logbook pages were blank except for the Endorsements section, which contained three flight review endorsements dated in 2000, 2002, and 2010.

An undated endorsement by a flight instructor for the pilot's SK-58 type rating was provided to the National Transportation Safety Board Investigator-In-Charge (ICC) by the aircraft recovery service that recovered the wreckage.

No training records and/or subsequent logbook records were received by the FAA or the IIC.

AIRCRAFT INFORMATION

The aircraft was a 1961 Sikorsky UH-34D, serial number 148821, helicopter that was powered by a Wright Cyclone R1820-84C, serial number 523464, engine. Maintenance records showed that the helicopter's last 15-, 50-, 100-hour, and annual inspection was dated June 21, 2011. The engine received a 100-hour inspection that was signed but not dated by an airframe and powerplant mechanic at a total time of 1,933.9 hours and a time since overhaul of 133.9 hours, which corresponded to the total time and time since overhaul of another maintenance record dated June 28, 2011.

According to the NAVTOPS Flight Manual for UH-34D, G and J helicopters, the UH-34D had a main rotor diameter of 56 feet.

The latest type certificate data sheet (TCDS) for the Sikorsky UH-34D, dated January 24, 2005, was designated as abandoned and last held by Pacific Aviation, Inc, Orland, California. The TCDS showed that if 100/130 octane fuel would be used rather than 115/145 octane fuel, then the engine takeoff limits would reduce takeoff power from 1,575 horsepower to 1,475 horsepower, manifold pressure would be reduced from 56.5 to 53.0 inches at sea level and 55.5 inches at 700 feet to 52.0 inches at 2,990 feet. There was a straight-line manifold pressure variation with the listed altitudes. Maximum continuous horsepower remained unchanged from 1,275 horsepower with the different fuel grades. The TCDS listed a maximum gross weight of 12,500 lbs.

An exemplar weight and balance form for another H-34 helicopter had a restricted weight of 13,000 pounds and a useful load of 5,431 pounds.

According to the operator, the weight and balance information for N3880J was kept in the helicopter. The operator stated that he did not have an additional weight and balance form or

its copy. The operator estimated that the useful load would allow the helicopter to carry 1,100 - 1,200 pounds and 1/2 fuel, which was 75 gallons. The weight and balance form for the helicopter was not recovered nor was one received by the FAA or IIC.

The pilot reported his weight as 190 pounds at the time of his last pilot rating issuance on July 16, 2011.

METEOROLOGICAL INFORMATION

The Iowa City Municipal Airport (IOW), Iowa City, Iowa, automated surface observing system (ASOS) was located about 23 nautical miles west of the accident site at an elevation of about 668 feet mean sea level (MSL). The IOW ASOS recorded at 1152: wind - calm; visibility 10 statute miles; sky condition - clear; temperature - 28 degrees Celsius; dew point - 21 degrees Celsius; altimeter - 30.01 inches of mercury.

The Davenport Municipal Airport (DVN), Davenport, Iowa, ASOS was located about 20 nautical miles east of the accident site at an elevation of about 751 feet MSL. The DVN ASOS recorded at 1152: wind - variable at 3 knots; visibility 10 statute miles; sky condition - clear; temperature - 28 degrees Celsius; dew point - 20 degrees; altimeter - 30.01 inches of mercury.

According to the National Weather Service (NWS) Relative Humidity Calculator, the relative humidities for IOW ASOS and DVN ASOS recorded temperatures was 65.83 percent and 61.9 percent, respectively.

The pressure altitude based upon the IOW ASOS and DVN ASOS recordings were 558.6 feet and 673 feet, respectively.

WRECKAGE AND IMPACT INFORMATION

The main wreckage, which consisted of the all the components of the helicopter, was resting in a wooded area near the field that was to be sprayed. Several tree limbs surrounding the wreckage were broken and were resting on the wreckage. A postimpact fire ensued.

The helicopter wreckage was examined after its recovery at a salvage facility by the IIC and a representative from the FAA Rotorcraft Directorate, Fort Worth, Texas.

The wreckage displayed postaccident fire damage and sooting of the airframe, engine, rotor systems, transmission systems, and flight control systems. Fire consumed the fuselage from the nose to the pylon (vertical stabilizer), to the main rotor hub assembly, and main landing gear.

The main rotor blades were cut near the blade root during wreckage recovery. The root sections of the main rotor blades were attached to the main rotor hub assembly. Components of the main rotor assembly were intact. Tree material was embedded within the main rotor

assembly control linkage. All of the four main rotor blades exhibited bending and/or trailing edge impact damage.

The pylon (vertical stabilizer) was separated about mid span from the pylon bottom and top of the pylon, which contained the intact tail rotor assembly. All four of the tail rotor blades were attached to the tail rotor hub and exhibited impact damage. Each tail rotor blade was bent approximately 90 degrees along the mid chord of each blade, which was consistent with rotation.

All of the engine cylinder assemblies were intact except for one cylinder assembly. The face of this cylinder assembly's piston was not damaged and did not contain any embedded metallic debris. Damage to the engine and accessories precluded functional testing.

No mechanical anomalies were noted that would have precluded operation.

MEDICAL AND PATHOLOGICAL INFORMATION

On November 27, 2001, the pilot was issued an Order of Revocation of his airman medical certificate for an incorrect statement that was made on his medical certificate application.

The pilot was issued his last airman medical certificate on July 5, 2011. His last medical certificate was a second class medical certificate with the following restriction: "Must have available glasses for near vision."

An autopsy of the pilot was conducted by the Iowa Office of the State Medical Examiner, Ankeny, Iowa, on July 26, 2011. The Report of Autopsy stated that the cause of death was "Multiple blunt force and thermal injuries."

The FAA Final Forensic Toxicology Fatal Accident Report for the pilot stated: no carbon monoxide detected in blood, no cyanide detected in blood, no ethanol detected in vitreous, and no drugs detected in urine.

TESTS AND RESEARCH

Performance charts contained in NAVTOPS Flight Manual for the UH-34D were based upon a fuel grade of 115/145 octane. The Take-Off Gross Weight Limitation chart was based upon maximum power and 2,800 rpm. IOW and DVN ASOS recorded conditions for pressure altitude and specific humidity conditions showed that at a weight of 13,000 lbs, a 0 feet per minute (FPM) climb rate increasing to 300 FPM at 12,450 lbs.

The Rotorcraft Flying Handbook, FAA-H-8083-21, Chapter 9, Basic Flight Maneuvers, Hovering Turn, stated, "It should be noted that during a turn to the left, more power will need to be added because left pedal pressure increases the pitch angle of the tail rotor, which, in turn, requires additional power from the engine."

The Rotorcraft Flying Handbook, Ground Effect, states, "This effect usually occurs less than one rotor diameter above the surface. ...When the helicopter gains vertically with no forward speed, induced airflow is no longer restricted, and the blade tip vortices increase with the decrease in outward airflow. As a result, drag increases which means a high pitch angle, and more power is needed to move the air down through the rotor.

The Rotorcraft Flying Handbook discusses vortex ring state (settling with power) as "an aerodynamic condition where the helicopter may be in a vertical decent with up to maximum power applied, and little or no cyclic authority... A fully developed vortex ring state is characterized by an unstable condition where the helicopter experiences uncommanded pitch and roll oscillations, has little or no cyclic authority..."

Pilot Information

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| Certificate: | Airline transport; Commercial | Age: | 54, Male |
| Airplane Rating(s): | Single-engine land; Multi-engine land | Seat Occupied: | |
| Other Aircraft Rating(s): | Helicopter | Restraint Used: | |
| Instrument Rating(s): | Helicopter | Second Pilot Present: | No |
| Instructor Rating(s): | Airplane multi-engine; Airplane single-engine; Helicopter | Toxicology Performed: | Yes |
| Medical Certification: | Class 2 With waivers/limitations | Last FAA Medical Exam: | July 5, 2011 |
| Occupational Pilot: | Yes | Last Flight Review or Equivalent: | |
| Flight Time: | 12273 hours (Total, all aircraft), 10 hours (Total, this make and model) | | |

Aircraft and Owner/Operator Information

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|--------------------------------------|---------------------------------|---------------------------------------|-----------------|
| Aircraft Make: | Sikorsky | Registration: | N3880J |
| Model/Series: | UH-34D | Aircraft Category: | Helicopter |
| Year of Manufacture: | | Amateur Built: | |
| Airworthiness Certificate: | Experimental (Special) | Serial Number: | 148821 |
| Landing Gear Type: | | Seats: | |
| Date/Type of Last Inspection: | June 21, 2011 Annual | Certified Max Gross Wt.: | |
| Time Since Last Inspection: | | Engines: | 1 Reciprocating |
| Airframe Total Time: | | Engine Manufacturer: | Wright Cyclone |
| ELT: | | Engine Model/Series: | R-1820-84C |
| Registered Owner: | US Helicopter LLC | Rated Power: | |
| Operator: | Southern Helicopter Service LLC | Operating Certificate(s) Held: | |
| Operator Does Business As: | | Operator Designator Code: | Z5NG |

Meteorological Information and Flight Plan

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|---|----------------------------------|---|-------------------|
| Conditions at Accident Site: | Visual (VMC) | Condition of Light: | Day |
| Observation Facility, Elevation: | IOW,668 ft msl | Distance from Accident Site: | 20 Nautical Miles |
| Observation Time: | 11:52 Local | Direction from Accident Site: | 270° |
| Lowest Cloud Condition: | Clear | Visibility | 10 miles |
| Lowest Ceiling: | None | Visibility (RVR): | |
| Wind Speed/Gusts: | / None | Turbulence Type Forecast/Actual: | / |
| Wind Direction: | | Turbulence Severity Forecast/Actual: | / |
| Altimeter Setting: | 30.01 inches Hg | Temperature/Dew Point: | 28°C / 21°C |
| Precipitation and Obscuration: | No Obscuration; No Precipitation | | |
| Departure Point: | Wilton, IA | Type of Flight Plan Filed: | None |
| Destination: | Wilton, IA | Type of Clearance: | None |
| Departure Time: | 11:25 Local | Type of Airspace: | |

Wreckage and Impact Information

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|----------------------------|---------|-----------------------------|---------------------------|
| Crew Injuries: | 1 Fatal | Aircraft Damage: | Substantial |
| Passenger Injuries: | | Aircraft Fire: | On-ground |
| Ground Injuries: | N/A | Aircraft Explosion: | None |
| Total Injuries: | 1 Fatal | Latitude, Longitude: | 41.580337,-91.020278(est) |

Administrative Information

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| Investigator In Charge (IIC): | Gallo, Mitchell |
| Additional Participating Persons: | Harrison McNaughton; Federal Aviation Administration; Des Moines, IA Matt Rigsby; Federal Aviation Administration; Fort Worth, TX |
| Original Publish Date: | February 27, 2013 |
| Last Revision Date: | |
| Investigation Class: | Class |
| Note: | The NTSB traveled to the scene of this accident. |
| Investigation Docket: | https://data.nts.gov/Docket?ProjectID=81232 |

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](#).