



Aviation Investigation Final Report

Location:	Eureka, Nevada	Accident Number:	WPR13GA128
Date & Time:	February 18, 2013, 14:24 Local	Registration:	N20620
Aircraft:	Bell 206B	Aircraft Damage:	Substantial
Defining Event:	Low altitude operation/event	Injuries:	1 Fatal
Flight Conducted Under:	Public aircraft		

Analysis

The pilot was flying a helicopter as part of a Department of Interior (DOI) reseeding project when the helicopter struck the static line above a set of power transmission lines. Postaccident examination of the engine and airframe revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation. The length and direction of the debris field was consistent with the helicopter traveling in the direction of, and at a rate of speed consistent with, a seed dispersal run.

The pilot was familiar with the area and was aware of the transmission lines, having performed a reconnaissance flight and flown over them multiple times during the previous flights that day. In the area of the accident site, the power lines began an ascent up an adjacent hill, with the static lines diverging such that they were about 40 feet higher than the power lines at the collision location. The static lines were of thinner gauge and could easily have been obscured by the surrounding hilly terrain. The lines were depicted on the relevant Federal Aviation Administration sectional chart. The helicopter was not equipped with a wire strike protection system nor was it required to be under the terms of the DOI contract. Neither the power nor static lines were equipped with visibility markers nor were they required to be due to their elevation above ground level.

The pilot had flown 40.5 hours over the last 5 days as part of the reseeding project, which was just short of the DOI contract maximum. A review his sleep history indicated that he received adequate rest the night before the accident. On the morning of the accident, he had flown 10 application runs in an area about 70 miles away. He took a lunch break about 3 hours before the accident, then flew 20 separate seed application runs and 10 reloads. His total flight time for that day was 6.6 hours. The low-level and "nap of the earth" flight operations required considerable concentration, most likely resulting in task- and/or work-related fatigue at the end of the day. By comparison, the United States Army recommends a maximum flight time of 8 hours per day or 37 hours per week, with a reduction of a factor of 1.3 to 1.6 for low-level and "nap of the earth" flying; thus the pilot would have exceeded their duty hour recommendations for each of the 5 days leading up to and including the accident day.

The pilot held an assisted special issuance second-class medical certificate based on a reported history of diabetes for which he was taking medication. His most recent medical examination revealed a new diagnosis for hypertension, as well as preexisting cataracts in both eyes, which exhibited no change since his last examination a year prior. In part due to the lack of an autopsy, the relevance of these findings, combined with his likely work-related fatigue, could not be determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's failure to maintain clearance from a wire while maneuvering during low-altitude operations. Contributing to the accident was task- and/or work-related fatigue.

Findings	
Personnel issues	Task monitoring/vigilance - Pilot
Aircraft	Altitude - Not attained/maintained
Personnel issues	Visual function - Pilot
Personnel issues	(general) - Pilot
Environmental issues	Wire - Awareness of condition
Personnel issues	Fatigue due to work schedule - Pilot

Factual Information

History of Flight

Maneuvering-low-alt flying	Loss of visual reference
Maneuvering-low-alt flying	Low altitude operation/event (Defining event)

On February 18, 2013, at 1424 Pacific standard time, a Bell 206B helicopter, N20620, collided with power transmission lines near Eureka, Nevada. El Aero Services, Inc., owned the helicopter, which was being operated by the Bureau of Land Management (BLM), U.S. Department of the Interior (DOI), as a public-use seed-dispersal flight. The commercial pilot sustained fatal injuries; the helicopter was substantially damaged during the accident sequence. The flight departed about 1420 from a temporary loading area 2 miles east of the accident site. Visual meteorological conditions prevailed, and no flight plan had been filed.

The helicopter was utilized for a low-level (100-200 feet above ground level) aerial reseeding project for the area damaged by the "Pinto Fire," which occurred in June 2012, just east of Eureka. The land was managed by the BLM, and the services of El Aero were retained for the DOI utilizing an "On Call" contract.

At 0700 on the morning of the accident, the pilot departed in the helicopter from Ely Airport (Yelland Field), Ely, Nevada. He proceeded 40 miles south-southwest to a helispot south of Lund, at the base of Ninemile Mountain. Over the course of the next 2 hours he performed about 10 separate seed application runs utilizing a seeder attached to the bottom of the helicopter, returning to the helispot to reload each time. At 0947, he departed for a second helispot 70 miles northwest in the Pinto Creek Ranch area, along the eastern foothills of the Diamond Mountains range. From there he flew a reconnaissance mission along the intended drop zone with the BLM Helicopter Manager. The manager stated that during the flight he made the pilot aware of two separate sets of power transmission lines in and around the seeding area. The pilot had experience flying in that area before, and informed the manager that there was in fact a third set of power lines in the seeding area.

The pilot then performed multiple uneventful seed-dispersal runs throughout the morning. The operation continued after lunch, however, after departing for the last drop of the day, he did not return. A search was initiated, and at 1500 the helicopter wreckage was located.

Pilot Information

Certificate:	Commercial; Flight instructor	Age:	74
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	4-point
Instrument Rating(s):	Airplane	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:	April 11, 2012
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	(Estimated) 37500 hours (Total, all aircraft), 10000 hours (Total, this make and model), 80 hours (Last 30 days, all aircraft), 6.5 hours (Last 24 hours, all aircraft)		

The 74-year-old pilot held a commercial pilot certificate with ratings for airplane single and multi-engine land, rotorcraft-helicopter, and instrument airplane. He additionally held a flight instructor rating for airplane single and multi-engine, and rotorcraft-helicopter, as well as an airframe and powerplant mechanic certificate with inspection authorization. Due to a history of diabetes he held an aviation medical examiner assisted special issuance (AASI) second-class medical certificate issued in April 2012, with limitations that he must wear lenses for near and distant vision. At the time of application for the medical certificate, he reported a total flight experience of 37,500 flight hours. His most recent airman competency/proficiency check was performed on April 26, 2012.

The pilot was involved in another helicopter accident, which occurred while herding horses on October 18, 2007, in Medora, North Dakota. The NTSB determined the probable cause of the accident as, "The pilot failed to maintain clearance from the fence while maneuvering at a low altitude". See NTSB accident number CHI08CA021 for further details.

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	Registration:	N20620
Model/Series:	206B	Aircraft Category:	Helicopter
Year of Manufacture:	1981	Amateur Built:	
Airworthiness Certificate:	Restricted (Special)	Serial Number:	3369
Landing Gear Type:	Skid	Seats:	5
Date/Type of Last Inspection:	February 8, 2013 100 hour	Certified Max Gross Wt.:	3200 lbs
Time Since Last Inspection:	20 Hrs	Engines:	1 Turbo shaft
Airframe Total Time:	15540 Hrs as of last inspection	Engine Manufacturer:	Rolls Royce
ELT:	Not installed	Engine Model/Series:	250-C20
Registered Owner:	EL AERO SERVICES INC	Rated Power:	
Operator:	Bureau of Land Management	Operating Certificate(s) Held:	None

The helicopter was manufactured in 1981 and equipped with a Rolls-Royce/Allison 250-C20B gas turbine engine.

A review of the maintenance logbooks revealed that the last inspection was for a 100-hour engine and airframe exam dated February 8, 2013. At that time the airframe had accumulated a total flight time of 15,540 hours, with the engine accruing 1,492.8 hours since major overhaul.

The helicopter was equipped with a seed spreading system, the operation of which was controlled by the pilot in conjunction with the onboard agricultural navigation system. The seeder consisted of a bucket and dispersal mechanism, and was attached to the helicopter's belly hook. The lowest portion of the seeder was about 11 feet below the skids. The helicopter was not equipped with a wire strike protection system, nor was it required to be under the terms of the DOI contract.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	05U,5958 ft msl	Distance from Accident Site:	12 Nautical Miles
Observation Time:	14:15 Local	Direction from Accident Site:	340°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	/	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.9 inches Hg	Temperature/Dew Point:	7°C / -8°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Eureka, NV (ELY)	Type of Flight Plan Filed:	Company VFR
Destination:	Eureka, NV (ELY)	Type of Clearance:	None
Departure Time:	14:20 Local	Type of Airspace:	

An automated surface weather observation at Eureka Airport (elevation 5,958 feet msl, 12 miles northwest of the accident site) was issued at 1415. It indicated calm wind; clear skies, with visibilities of 10 miles; temperature of 7 degrees C; dew point -8 degrees C; and an altimeter setting at 29.91 inches of mercury.

According to the U.S. Naval Observatory, Astronomical Applications Department, the altitude of the Sun when viewed from Ely at 1425 would have been 28.4 degrees, with an Azimuth (E of N) of 223.2 degrees.

Airport Information

Airport:	Ely ELY	Runway Surface Type:	
Airport Elevation:	6259 ft msl	Runway Surface Condition:	Dry
Runway Used:		IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	39.481388,-115.839164

The general area of the accident site was snow covered, and comprised of rolling hills intermittently dispersed with burnt trees. The terrain immediately to the west rose to a peak about 300 feet above the accident site.

The entire helicopter, with the exception of the main rotor blades, was located about 475 feet north of a set of power transmission lines, at an elevation of about 6,700 feet mean sea level (msl). The lines traversed from east to west, climbing about 300 feet with the terrain. The lines consisted of three sets of horizontally positioned tandem power cables. Above the power cables were two thinner-gauge static lines; the southern static line was severed, and was found draped over the power cables. The seeder was half full with seeds, and was located about 10 feet from the helicopter. The intermediate area was covered with a layer of seeds. Both main rotor blades remained attached to the mast head, and had come to rest to the south, midway between the power lines and helicopter.

The helicopter sustained crush damage from the nose through to the aft bulkhead, and the tailboom was severed just forward of the horizontal stabilizer. The outboard sections of both main rotor blades exhibited serrated gouges, with upper and lower skin striations consistent in appearance with the severed static line. Similar patterns were present on the main rotor mast. The seeder exhibited a similar gouge in its upper skin, with horizontal scratches and black sooting on the forward surface of its bucket, about 5 feet below the helicopter skids.

Medical and Pathological Information

The White Pine County Sheriff/Coroner completed an external examination and indicated the cause of death as massive head trauma. Subsequently, the pilot's remains were released to the local funeral home, where the Elko County Coroner assisted with recovering blood/tissue samples for toxicology.

Toxicological tests on the recovered specimens were performed by the FAA Civil Aerospace Medical Institute (CAMI). Analysis revealed negative findings for carbon monoxide. The results were positive for Pioglitazone, which was detected in the Blood and Liver, and negative for all remaining screened drug substances and ingested alcohol. Refer to the toxicology report included in the public docket for specific test parameters and results.

According to CAMI, Pioglitazone is a prescription drug of the class thiazolidinedione with hypoglycemic (antihyperglycemic, antidiabetic) action, used for the management of type 2 diabetes

mellitus. The pilot reported the use of both Pioglitazone (Actos), and the following medications on his most recent application for a medical certificate: Metformin (Glucophage XR), Glimepiride (Amaryl), Aspirin, Simvastatin (Zocor), Losartan (Cozaar).

The pilot was issued the AASI medical certificate based on a reported history of diabetes mellitus for which he was taking medication. His most recent medical examination revealed a new diagnosis for hypertension, as well as preexisting cataracts in both eyes, which exhibited no change since his last examination in April 2011.

Tests and Research

Navigation Systems

The helicopter was equipped with an Automated Flight Following System (AFF), an Ag-Nav GPS based agricultural navigation system, and a Garmin GPSMap 496 GPS receiver.

The AFF system transmitted positional reports without altitude information to the U.S. Department of Agriculture Forest Service data center at roughly 2-minute intervals; the last recorded position occurred at the accident site at 14:23:38. The Garmin unit did not contain any data for the accident flight, and was most likely off at the time of the accident.

The Ag-Nav system was utilized by the pilot to disperse seed, and was configured to record its position every 0.6 seconds. In addition, the unit was capable of recording heading, altitude, and "spray" status. The unit sustained impact damage, and was sent to the National Transportation Safety Board Office of Research and Engineering for examination, and then to Ag-Nav in Ontario, Canada, for data extraction. The data corroborated the AFF information, albeit at a higher resolution.

The data revealed that the helicopter had administered seeds in the area over the course of 20 separate passes prior to the accident. Each pass was oriented north-south, about 1 mile long and 80 feet apart, with the helicopter typically returning to be reloaded after every 2 passes. The power transmission lines and two of their associated towers transected the area, with the helicopter flying over the lines on every pass. Throughout the passes, the helicopter maintained a ground clearance of between 100 and 200 feet agl. The last recorded position was located about 2,000 feet south of the main rotor blades and power lines, at the southern boundary of the application area. At that time the helicopter was climbing from 6,634 to 6,696 feet, and transitioning from the pass heading of 162 degrees true, to 172 degrees. The unit recorded that the spray system was set to off just prior to the helicopter reaching the southern boundary. The final position reports and spray status followed a similar profile to the other passes, and were consistent with the pilot initiating a climbing right turn for an application run.

The impact sequence was not recorded. According to representatives from Ag-Nav, the unit contains a 10-second memory buffer, and as such will not record the last 10 seconds of data if electrical power is unexpectedly interrupted.

Helicopter Exam

The engine sustained minimal damage during the accident sequence, and remained attached to its airframe mounts. All engine controls remained attached, and all fuel, pneumatic, and hydraulic lines remained firmly in place at their fittings. The stage 4 turbine wheel appeared intact, and there were no indications of oil leaks or catastrophic engine failure.

The rotor mast remained attached to the airframe, and was canted about 45 degrees aft along with the main rotor gearbox. The collective and cyclic control linkages had sustained varying degrees of impact damage from the main rotor gearbox through to the head; both were bent at and separated from their respective fittings. Examination of the main rotor head revealed that it had separated from the mast just below the droop stops. The mast exhibited bending damage to both sides in the immediate vicinity of the break.

Tail rotor drive train continuity was established from the main gearbox through to both tail rotor blades, with the drive shaft separating from the main gearbox at the output coupling. The tail rotor pitch control tube had been cut at the bulkhead by recovery personnel, and remained continuous through to the tail rotor pitch links.

Additional Information

Pilot Itinerary

The pilot began the seeding mission on the morning of February 13, when he departed from his home airport in Elko, Nevada, in the accident helicopter. For the next 4 days, he accumulated about 8 hours of flight per day, totaling 33.9 hours. On the day of the accident he accumulated 6.6 hours of flight time, and as such his 5-day total for the period leading up to the accident was 40.5 hours.

Examination of the pilot's flight history for the prior 2 months revealed 6-day flight time totals of between 8 and 28.4 flight hours.

The helicopter fuel truck driver had been working with the pilot all week for the seeding operations. They had shared a hotel room each evening in order to reduce expenses. On the night prior to the accident, the pilot went to bed at 2030 and awoke at 0530. He was not aware of the pilot waking up or having sleeping problems during the night. He stated that he had shared rooms with the pilot on prior missions and that nothing about that evening stood out as unusual.

Pilot Fatigue Issues

With regards to the effect of time-on-task as a cause of fatigue and an influence on performance among helicopter pilots, one such study (A.M. Stave, "The Effects of Cockpit Environment on Long-Term Pilot Performance," Human Factors, Vol. 19 (1977)), examined the effect of a helicopter cockpit environment and continuous flying activity on subjective fatigue and pilot performance. For this study, flight legs

were designed to simulate repetitive circular, helicopter air taxi flights conducted under instrument flight rules in a metropolitan area, with complete circuits lasting about 1 hour and including three approaches and landings. Pilots flew for flight periods varying between 3 and 8 hours, with rest breaks permitted during the 4- and 8-hour flight periods. Pilot performance was measured, and the pilots also provided ratings of subjective fatigue each hour.

Time-on-task and subjective fatigue were found to have no effect on some basic aspects of flying performance, but they were associated with increased "lapses" in performance, such as navigational errors. The study found that subjective fatigue increased with time-on-task, peaking during the last hour of flight, but scheduled breaks delayed the onset of subjective fatigue.

Flight Time and Duty Period Limitations

The DOI contract specified limits for the pilot, which capped flight time during any assigned duty period to 8 hours. Thirty-six or more flight hours in a consecutive 6-day period required the next calendar day off duty, with a maximum of 42 hours in any consecutive 6-day period. These flight limitations exceeded those required under the rules pertaining to agricultural aircraft operations, governed under Federal Air Regulations part 137, which do not set specific flight time limitations.

By comparison, United States Army flight regulations (Headquarters Department of the Army, Aviation Flight Regulations, U.S. Army Regulation 95-1(Washington, DC: HQDA, 1997)) allow local commanders flexibility in developing flight time limitations for helicopter pilots, but they recommend that flight time be limited to 8 hours per 24-hour period, 15 hours per 48-hour period, and 37 hours per week. Army regulations also recommend that maximum helicopter pilot flight times be reduced by factors of 1.3 for day contour or low-level flight and 1.6 for day, "nap of the earth" flight. These recommendations were developed based on data which indicated that low-altitude flight profiles following terrain contours and lower-altitude, terrain-hugging flights were more fatiguing for pilots than higher-altitude flights.

Power Transmission Lines

According to the power company, the base of the transmission tower to the east of the accident site was at an elevation of 6,557 feet, with the west tower at 6,870 feet. The power cables were attached to the towers about 45 feet above the ground, with the static lines a further 20 feet higher. The towers were separated by a distance of about 1,800 feet, and the power cables sagged about 40 feet below the static lines at the center point. Neither the power nor static lines were equipped with visibility markers; their height above the ground did not require the use of such markers.

The accident site was located within the area covered by the FAA Las Vegas Sectional Aeronautical Chart, and the power transmission lines were depicted on the chart in the vicinity of the accident site.

Administrative Information

Investigator In Charge (IIC):	Simpson, Elliott
Additional Participating Persons:	William C Kunder; Federal Aviation Administration FSDO; Reno, NV
Original Publish Date:	March 13, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=86245

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