



Aviation Investigation Factual Report

Location:	Perrysburg, Ohio	Accident Number:	CEN18FA074
Date & Time:	January 15, 2018, 11:36 Local	Registration:	N4QX
Aircraft:	MD HELICOPTERS INC 369HM	Aircraft Damage:	Substantial
Defining Event:	Loss of engine power (total)	Injuries:	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Aerial observation		

On January 15, 2018, about 1136 eastern standard time, a MD Helicopters Inc. 369HM helicopter, N4QX, was substantially damaged when it impacted terrain near Perrysburg, Ohio. The commercial pilot and crewmember were fatally injured. The helicopter was owned and operated by Vista One Inc., under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91 as an aerial observation flight. Instrument meteorological conditions prevailed and no Federal Aviation Administration (FAA) flight was filed for the flight. The local flight departed Wood County Airport (1G0), Bowling Green, Ohio, at 1024.

According to the owner of Vista One Inc., the pilot departed from the company base at the Wayne County Airport (BJJ), Wooster, Ohio, on the morning of the accident. The pilot landed at 1G0 to pick up the powerline inspector. The pilot fueled the helicopter with 20.68 gallons of Jet A fuel at 1G0. The accident flight was the first leg of aerial inspections on the transmission towers for the Toledo Edison power grid. The team was scheduled to conduct aerial inspections from Bowling Green to the Indiana/Ohio border over the following 4 weeks.

A security camera at the Bowling Green Flight Center (1G0), located about ¼ mile from the fuel pumps, captured the arrival and departure of the helicopter. The helicopter arrived at 0920:56 and departed at 1023:53. About 1013, two people exited the building and moved towards the helicopter. They walked back and forth between the helicopter and the building and then walked around the helicopter for several minutes. Due to the distance of the helicopter from the camera, it is not clear what the specific preflight activities were. It appears that both people boarded the helicopter before the helicopter departed.

A witness, located just south of the accident site, observed the helicopter descend "at an angle" before it impacted terrain. The witness was indoors at the time and did not hear the helicopter.

A search of radar facilities did not find any primary or secondary radar targets consistent with the accident helicopter. Data recovered from a handheld global positioning system unit (GPS), located in the wreckage, started at 1017:14 at 1G0 and terminated at 1136:34, at the accident location. Track data illustrated the helicopter in multiple right turns consistent with line inspection operations. The last few minutes of the track data showed the helicopter at an altitude between 800 ft and 840 ft mean sea level (msl) or between 180 ft and 220 ft above ground level (agl) and at an airspeed of less than 10 knots.

Pilot Information

Certificate:	Commercial; Flight instructor	Age:	32, Male
Airplane Rating(s):	None	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	4-point
Instrument Rating(s):	Helicopter	Second Pilot Present:	No
Instructor Rating(s):	Helicopter	Toxicology Performed:	Yes
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	April 24, 2017
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	June 26, 2017
Flight Time:	(Estimated) 1219.4 hours (Total, all aircraft), 212.6 hours (Total, this make and model), 183.6 hours (Last 90 days, all aircraft), 31.3 hours (Last 30 days, all aircraft), 1.2 hours (Last 24 hours, all aircraft)		

At the time of his most recent medical certificate application, the pilot reported no chronic medical conditions and no medications. The medical certificate contained the limitation "Must wear corrective lenses."

The pilot's flight logbook contained entries dated between May 27, 2013, and December 28, 2017. The pilot had logged no less than 1,219.4 hours in helicopters; 212.7 hours of which were logged in the make and model of the accident helicopter. The pilot had logged 97.9 hours of simulated instrument flight time, and no flight time in actual instrument conditions. The last simulated instrument flight (0.4 hours dual received) was conducted September 30, 2015, in a Robinson R44 II helicopter.

The pilot started work at Vista One Inc. on September 6, 2017, and recorded a flight in his logbook, dated 9/6/17, of .5 hours with the note "Vista 1 First Day." The pilot had logged 309.3 hours of flight time in company helicopters between September 6, 2017, and December 28, 2017.

The company did not provide any training records for the pilot. The owner recalled conducting a training flight with the pilot the week before the accident but did not provide any specifics for that flight. This flight was not logged in the pilot's flight logbook. The owner mentioned that the pilot had difficulty recalling how to clear the GPS track just before the accident flight. He also stated that the pilot did not recall how to operate the throttle past the detent. He did not report any other concerns with the pilot's performance.

Crewmember

The powerline inspector worked for Vista One Inc. for 2 to 3 years. He lived in West Virginia and would drive to Ohio when it was time to work. According to the crewmember's family, he had been flying from platforms for line inspection and maintenance since 2004. The owner of Vista One Inc. stated that the crewmember drove from his home West Virginia the evening before the accident and met the pilot at 1G0 for work on the day of the accident.

Aircraft and Owner/Operator Information

Aircraft Make:	MD HELICOPTERS INC	Registration:	N4QX
Model/Series:	369HM	Aircraft Category:	Helicopter
Year of Manufacture:	1971	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	610209M
Landing Gear Type:	High skid	Seats:	3
Date/Type of Last Inspection:	October 25, 2017 Annual	Certified Max Gross Wt.:	2550 lbs
Time Since Last Inspection:	62 Hrs	Engines:	1 Turbo shaft
Airframe Total Time:	10373.1 Hrs at time of accident	Engine Manufacturer:	Rolls-Royce
ELT:	C91A installed, not activated	Engine Model/Series:	M250-C20B
Registered Owner:	VISTA One INC	Rated Power:	317 Horsepower
Operator:	VISTA One INC	Operating Certificate(s) Held:	Rotorcraft external load (133)

According to the MD 500 Rotorcraft Flight Manual (RFM) the helicopter was certificated in the normal helicopter category for day and night visual flight rules (VFR) operations.

The helicopter was not equipped, nor was it required to be equipped, with either a radar altimeter or emergency locator transmitter.

The RFM stated that flight into known icing is prohibited. "Flight operation is permitted in falling and/or blowing snow only when the Automatic engine Reignition Kit and Engine Failure Warning System are installed and operable."

The helicopter was equipped with the late configuration warning and caution indicators which included a "flashing red engine out warning indicator" in addition to an "audible warning tone in headset." These indicators annunciate when gas generator speed (N1) falls below 55%.

The helicopter was equipped with the automatic engine reignition kit, a later modified system (250-C18 or C20). According to the RFM, this kit arms the automatic reignition system whenever there is transmission oil pressure and the ARMED (lower light) light is illuminated. Rotor speeds less than 98 +/- 1% of the power turbine speed (N2) or N1 speed is below 55%, the RE-IGN (upper light) is illuminated and the igniter is activated. The RE-IGN light only goes out when manually reset by the pilot.

The helicopter was also equipped with the anti-ice airframe fuel filter. This filter is designed to filter out ice particles and other solid contaminants from the fuel before it enters the engine fuel system. The RFM stated that use of this filter removes the requirement for using fuel containing anti-ice additives.

Rolls-Royce Engine

The Rolls-Royce M250-C20 Operations and Maintenance Manual contained several warnings regarding operations in snow and ice: "AT AMBIENT TEMPERATURES BELOW 4°C (40°F). SOME TYPE OF ANTI-ICE PROTECTION IS REQUIRED, SUCH AS AN ANTI-ICE ADDITIVE OR A MEANS OF AIRFRAME FUEL ICE ELIMINATION. ENGINE FLAMEOUT COULD RESULT FROM FAILURE TO USE ANTI-ICE PROTECTION."

It further notes that, "SNOW OR ICE SLUGS CAN CAUSE THE ENGINE TO FLAME OUT. BE SURE AVAILABLE PREVENTATIVE EQUIPMENT IS INSTALLED AND IN PROPER WORKING ORDER WHEN FLYING IN CONDITIONS WHERE SNOW OR ICE BUILD UP MIGHT OCCUR."

According to Rolls-Royce, a 1968 study showed that as little as 30 grams of snow/slush ingested in the engine inlet can induce a flameout in the Allison 250-series engines.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	Condition of Light:	Day
Observation Facility, Elevation:	KTDZ, 623 ft msl	Distance from Accident Site:	4 Nautical Miles
Observation Time:	11:30 Local	Direction from Accident Site:	
Lowest Cloud Condition:	Few / 1400 ft AGL	Visibility	2 miles
Lowest Ceiling:	Broken / 3200 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	9 knots / None	Turbulence Type Forecast/Actual:	None / None
Wind Direction:	130°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	30.29 inches Hg	Temperature/Dew Point:	-7°C / -9°C
Precipitation and Obscuration:	Light - None - Snow		
Departure Point:	Bowling Green, OH (1G0)	Type of Flight Plan Filed:	None
Destination:	Bowling Green, OH (1G0)	Type of Clearance:	None
Departure Time:	10:24 Local	Type of Airspace:	Class G

A weather study was conducted by the National Transportation Safety Board (NTSB) in support of this accident investigation and the detailed weather study is available in the public docket.

The National Weather Service (NWS) Surface Analysis Chart for 1000 local depicted a low-pressure system located over southern Wisconsin with its associated frontal boundary stretching northward into Canada and southward into Illinois, Indiana, and Missouri. A high-pressure system was located over central Virginia. The accident site was located in between the high- and low-pressure systems. The station models around the accident site depicted air temperatures in the mid to high teens (Fahrenheit (F)), dew point temperatures in the low teens, with temperature-dew point spreads of 5° F or less, an east-southeast wind of 5 to 10 knots, overcast sky cover, and light snow.

The Geostationary Operational Environmental Satellite-16 depicted abundant cloud cover above the accident site at the time of the accident, with that cloud cover moving from southwest to northeast. Infrared imagery indicated cloud tops at 13,000 ft msl.

There was a meteorological impact statement valid for the accident site at the time of the accident for areas of marginal visual flight rules and instrument flight rules with light snow spreading from west to east in addition to light to patchy moderate ice between 1,500 ft and 10,000 ft msl spreading from west to east. There were Airmen's Meteorological Information (AIRMET) Sierra and Zulu valid for the accident site at the accident time for IFR conditions due to precipitation and mist and moderate icing conditions below 15,000 ft msl.

A search of official weather briefing sources, such as contract Automated Flight Service Station (AFSS) provider Leidos weather briefings and the Direct User Access Terminal Service (DUATS), was done and the accident pilot did not request a weather briefing through Leidos or DUATS.

A search of archived ForeFlight information indicated that ForeFlight did not have any record of the accident pilot requesting a weather briefing before or during the accident flight. ForeFlight did record that the accident pilot accessed the Central Great Lakes NOAA Doppler radar loop weather Imagery at 0958:07. With no internet access while in flight, ForeFlight is still able to access weather information directly from the FAA but leaves no remote record of such access. It is unknown if the accident pilot checked or received additional weather information before or during the accident flight.

The weather conditions at 1G0 were visible in the security camera video. The visibility was reduced, and it was snowing. Witnesses at the airport characterized the weather at 1 ¼ to 1 ½ miles visibility, with moderate snow, and unknown ceilings. Photographs taken by law enforcement following the accident further illustrate falling snow and flat light and or white out conditions at the time of the accident.

The general manager of the Bowling Green Flight Center reported that it was snowing when the accident helicopter arrived at the 1G0 fuel pump area around 0920. It was still snowing when the accident flight departed around 1024 with 1 to 1 ½ miles visibility. The flight support manager recalled 1 ¼ miles visibility and the accident helicopter departed into instrument meteorological conditions with moderate snow.

The Current Icing Potential (CIP) product created by the National Weather Service and valid for the accident site indicated between a 20% to 50% probability of icing at 1,000 ft and 2,000 ft at 1200 at the accident site. The CIP indicated that the icing near the accident site would likely be trace to moderate intensity. The CIP also indicated an unknown chance of supercooled large droplets (SLD) near the accident site around the accident time.

Wreckage and Impact Information

Crew Injuries:	2 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal	Latitude, Longitude:	41.501667,-83.445274(est)

The accident site was in a dormant corn/bean field at an elevation of 620 ft msl. The wreckage came to rest about 120 ft west of power lines. There was no evidence that the helicopter impacted either the power lines or the transmission towers. There was no evidence of a postcrash fire. There were no ground scars leading up to the wreckage. The ground was frozen, and it had snowed before, during, and after the accident. Photographs provided by first responders illustrated extensive debris and disturbed ground immediately adjacent to the belly of the helicopter. The helicopter came to rest on its left side with the nose oriented on a heading of 256°.

The main wreckage included the fuselage, tail boom, and main rotor system. Two main rotor blades came to rest on the ground and two main rotor blades were extended in the air. The tail boom was partially separated, and the left skid was separated, fractured into multiple pieces, and located about 20 ft south of the main wreckage.

The wreckage was recovered from the scene and relocated to a secure facility for further examination.

Wreckage Examination

The wreckage of the helicopter was examined under the auspices of the NTSB investigator in charge. The extensive details of the wreckage examination are contained in the docket for this accident.

The lower fuselage exhibited extensive upward crushing along the entire span of the fuselage. The cabin of the fuselage was crushed up from the floor/belly of the helicopter. The left side of the helicopter exhibited more upward and sideways crush as compared to the right side. The upper and lower windscreens on the left and right side were impact damaged and fragmented.

The collective control, cyclic control, and anti-torque pedals were impact damaged but were otherwise continuous and correct. The tail rotor driveshaft was continuous from the main rotor transmission aft to the separation point at the tail boom. The tail rotor controls were continuous from the break at the center seat box area aft to the separation point at the tail boom.

The main rotor hub exhibited varying degrees of damage to the feathering bearings, droop stops, and upper hub areas consistent with excessive coning and downward flapping of the main rotor blades. The main rotor rotating controls from the rotating swashplate up to each respective pitch horn were intact.

The tail boom was partially separated about 25 inches forward of the aft frame assembly and remained attached at the electrical cables. The tail rotor driveshaft was impact separated at that point. The tail rotor control rod was impact separated. The tail rotor was rotated by hand and driveshaft continuity was confirmed up to its separation point. Both tail rotor blades were wrinkled and bent several inches outboard from the blade root. The tail rotor pitch control was actuated by hand and functioned as designed; control rod continuity was confirmed forward to the tail boom fracture location. There was no evidence of main rotor strike at the tail boom.

The horizontal and upper vertical fin were unremarkable. The lower vertical fin was impact damaged and crushed to the left.

The blue main rotor blade remained attached to the hub and was bent and wrinkled at the trailing edge

along the entire span of the blade. The white main rotor blade remained attached to the hub and was bent down about 90° at the root of the blade. The blade was bent and wrinkled at the trailing edge along the entire span of the blade. The red main rotor blade remained attached to the hub and was bent up about 45° at the root of the blade. The blade was wrinkled at the trailing edge along the entire span of the blade. The yellow main rotor blade remained attached to the hub and was bent and wrinkled at the trailing edge along the entire span of the blade.

Both the governor and the fuel control cables were continuous but distorted and both related bell cranks were impact damaged. The anti-ice cable was continuous and distorted. The positions of these controls at the engine were unreliable. There was drive continuity from the engine to the main rotor and the overrunning clutch was actuated by hand and functioned as designed.

The instrument panel was impact damaged. The airspeed read zero knots; the Kollsman Window was set at 30.44; the vertical speed indicator indicated 100 ft down.

The fuel bladder was impact damaged. The fuel line at the fuel shut off valve contained about a quarter cup of fuel. There was residual evidence of fuel in the bladder. The start pump was impact separated from its mounting plate. The float arm on the fuel sending unit was bent. No visual contamination was noted in the sump area.

The airframe fuel filter contained fuel and the fuel was unremarkable. The fuel was smoky in appearance with a small amount of black particulate matter and water at the bottom. The airframe fuel filter element was unremarkable.

The engine and its accessories were removed for further examination. The engine was intact, and external damage was noted to the outer combustion case. The fuel pump, fuel control unit, and the N1 turned freely when rotated by hand. The N2 did not rotate. Neither the upper nor the lower chip detectors displayed ferrous particles. The compressor inlet and first stage blades were free of any foreign object debris damage. The fourth stage turbine wheel was unremarkable and normal in appearance. All the external fuel, oil, and air line connections were at least finger tight. The fuel pump filter element was free of debris and normal in appearance. Fuel was present in the engine mounted fuel lines.

The following fuel system components were removed, and cursory inspections conducted: fuel nozzle, fuel control unit, power turbine governor, and fuel pump. The driveshafts for the fuel pump and starter generator were fractured consistent with impact damage. The fuel control unit housing was impact damaged.

Engine Examination

A NTSB Powerplants Group was convened following the initial wreckage examination. The engine was evaluated at Keystone Turbine Services under the auspices of the NTSB Powerplants Group Chairman and at the direction of the powerplants group. The examination of the engine and related systems revealed no mechanical anomalies that would have precluded normal operations. The details of the examination are contained in the Powerplants Group Chairman's factual report available in the public docket for this investigation.

The examination of the engine did not reveal soft or hard body damage on the first stage compressor blades. According to the engine manufacturer, they had 9 events on record involving a loss of engine power due to water, snow, or ice ingestion. The manufacturer stated that ingestion of snow does not always result in visible damage to the blades.

Garmin GPSMAP

A handheld Garmin GPSMAP 496 was recovered from the wreckage and sent to the NTSB's Recorders Laboratory for data recovery. Two tracks were recovered; the second track being consistent with the accident flight. The details of this data are contained in the public docket for this investigation.

Switch and Panel Examination

The auto re-ignition indicator panel and the "Warning and Caution" panel were submitted to the NTSB Materials Laboratory for examination. The radiographs for the re-ignition panel bulbs showed that the RE-IGN light bulb filaments were intact and stretched. The ARMED light bulb filaments were broken and stretched. The radiographs for all the light bulbs in the "Warning and Caution" panel were intact and not stretched.

Medical and Pathological Information

The Lucas County Coroner's Office, Toledo, Ohio, performed the autopsy on the pilot on January 16, 2018. The autopsy concluded that the cause of death was "multiple blunt force trauma" and the report listed the specific injuries.

The FAA Forensic Sciences Laboratory, Oklahoma City, Oklahoma, performed toxicological tests on specimens that were collected during the pilot's autopsy. Results were negative for all tests conducted.

Organizational and Management Information

Vista One Inc held a 14 CFR Part 133 Rotorcraft External Load certificate. The company conducted powerline inspections under 14 CFR Part 91 and in the past had conducted 14 CFR Part 91 sightseeing operations. Before the accident there were only two pilots employed, the accident pilot and the company owner. The owner stated that there were no operations or company manuals outlining operations procedures or company policies.

According to the owner of the company, line inspection flights, such as the accident flight, involved the helicopter flying along the powerline, circling the tower, and then continuing along the line. It was the responsibility of the crewmember, using binoculars and a camera, to inspect the towers and lines for the security of cotter keys, nuts, bolts, and so on. The pilot would position the helicopter skids above the static line, about 20 ft, during these flights. He stated that it was typical for the helicopter to cover

between 2 and 3 miles in an hour. In the accident report form, the owner stated that it was not normal to inspect the lines in snow and blowing snow due to the poor visibility and wind gusts.

According to several interviews with family members, both the pilot and the crewmember had expressed concerns about the maintenance of the helicopter. The crewmember expressed separately to his wife that the maintenance on the helicopters was a concern for him.

Both the pilot and the crewmember also expressed pressure from management to complete the missions in a very timely manner, regardless of the weather. The wife of the crewmember recalled multiple conversations between the crewmember and the owner regarding the weather – it was "horrible with cold and snow in the forecast." According to the crewmember's wife, the owner placed a lot of pressure on taking and completing the flights as they only had a short time to complete the work.

Additional Information

An estimated weight and balance calculation showed that the helicopter had a takeoff weight of 1,900 pounds. According to the RFM and based on the weather at the time of the accident, there was enough power available for the planned flight. According to the Height-Velocity Diagram in the RFM, the helicopter was operating within the cross-hatched regions of the diagram. The RFM stated in part:

"...These areas represent hazardous airspeed/altitude combinations from which a successful autorotation landing may be difficult to perform. Operation within the cross-hatched area is not prohibited, but should be undertaken only with extreme caution."

Title 14 CFR Part 91.155 Basic VFR weather minimums states that helicopters operating in class G airspace at 1,200 ft or less above the surface during day operations must have ½ statute mile visibility and remain clear of clouds.

In November 2013, the FAA issued Special Airworthiness Information Bulletin (SAIB SW-08-03R4) – Recommendations for Rotorcraft During Icing/Snowy Conditions. The SAIB describes the "procedures to reduce the probability of an engine in-flight shutdown due to ice and/or snow ingestion. MOST helicopters are not approved or equipped for flight into icing conditions." "Snow and ice can build up in the engine intakes and plenums when the rotorcraft is on the ground with the engine(s) not operating or are operating at a low power settings for extended periods." The SAIB went on to state that "Snow may accumulate on or in the engine inlet area during hover..."

In addition, the FAA safety pamphlet "Flying in Flat Flight and White Out Conditions" addressed the dangers associated with these weather conditions. These dangers include the lack of reference points to be used in determined depth perception while landing.

The Helicopter Association International (HAI) Utilities, Patrol and Construction Committee Safety Guide for Helicopter Operators stated that detailed power line patrols, such as the accident flight, "require the aircraft to spend extended periods in hovering flight out-of-ground effect or in slow flight."

Administrative Information

Investigator In Charge (IIC):	Rodi, Jennifer
Additional Participating Persons:	Julio A Galarza; Federal Aviation Administration; Cleveland, OH John Hobby; Boeing; Mesa, AZ Joan Gregoire; MD Helicopters Inc; Mesa, AZ Jon-Adam Michael; Rolls-Royce; Indianapolis, IN
Report Date:	June 19, 2019
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=96607

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](#).