Aviation Investigation Final Report

Location:	Erie, Colorado	**Accident Number:**	CEN15FA126
Date & Time:	January 26, 2015, 12:02 Local	**Registration:**	N86235
Aircraft:	Enstrom 280FX	**Aircraft Damage:**	Destroyed
Defining Event:	Inflight upset	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The flight instructor and the student pilot were conducting a local instructional flight in the helicopter. The helicopter was on final approach to land when one of the three main rotor blades (#2 blade) separated from the main rotor head. The main transmission and main rotor head (with #1 and #3 blades still attached) then separated from the helicopter, and the helicopter descended to ground impact. Examination of the wreckage revealed that the separation of the #2 blade was due to fracture of the #2 main rotor blade spindle.

The #2 spindle fractured at the inboard end of the threads. Metallurgical analysis of the fractured spindle revealed signatures consistent with a fatigue crack initiating from multiple origins that propagated across 92% of the spindle cross-section; the remaining 8% of the fracture surface exhibited signatures consistent with overload. The high percentage of stable fatigue fracture growth versus overload suggested that low loading propagated the crack. Further, corrosion was visible on the fracture surface in the fatigue initiation area, which indicated that the crack had been present and growing for some time. Similar fatigue cracks were observed emanating from thread roots on the #1 and #3 spindles; the crack in the #3 spindle emanated from the inboard-most thread, similar to the crack in the #2 spindle, and the crack in the #1 spindle emanated from the cotter pin hole. Both of these cracks were shorter than the crack in the #2 spindle, and the fatigue on their fracture surfaces had only propagated a small amount through the #1 and #3 spindle cross-sections.

The root radii of the threads on all three of the spindles did not meet the thread form specified on the manufacturer's drawing. Cross-sections of the threads from the three spindles showed that the #2 spindle and the #3 spindle had flat-bottomed threads; the #1 spindle did not have flat-bottomed threads but had threads with a sharper than specified root radius. A subsequent finite element analysis determined that the flat-bottomed threads and the sharper than specified root radius threads would result in higher stresses at the threads, which likely contributed to the crack initiation within the threads.

Further, the investigation determined that the predicted loads used in the original fatigue analysis during the design of the spindle did not account for a bending load at the spindle threads. The omission of bending loads during design and the flat-bottom quality of the threads led to stresses greater than used in the original fatigue life calculation by the manufacturer. Further, the finite element analysis of the spindle revealed that, once a crack has initiated, the bending loads at the spindle threads would be sufficient to propagate the crack at a rate similar to that of the total time accumulated on the #2 spindle (about 9,300 flight hours).

Before the accident, the spindle was not a life-limited part, and there were no recurrent inspections specified for the spindle threads, resulting in a low likelihood of the operator detecting the fatigue fracture within the spindle threads before the accident. Following this accident, the manufacturer released a service directive bulletin and the Federal Aviation Administration released an airworthiness directive that require a magnetic particle inspection of spindles with 1,500 hours or more time in service.

Probable Cause and Findings

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

An in-flight failure of the helicopter's #2 main rotor spindle due to undetected fatigue cracking, which resulted in an in-flight breakup. Contributing to failure were the nonconforming thread root radius of the spindle and the manufacturer's failure to include a bending moment within the spindle threads when performing the fatigue analysis during initial design of the spindle.

Findings

Aircraft	(general) - Failure
Aircraft	(general) - Design
Aircraft	(general) - Capability exceeded
Organizational issues	Equipment manufacture - Manufacturer

Factual Information

History of Flight

Autorotation	Inflight upset (Defining event)

HISTORY OF FLIGHT

On January 26, 2015, about 1202 mountain standard time (MST), an Enstrom 280FX, N86235, was destroyed when it impacted terrain during final approach for landing at Erie Municipal Airport (EIK), Erie, Colorado. Both the instructor pilot and student pilot were fatally injured. The helicopter was registered to New Course Aviation Company and operated by Mountain One Helicopters as a 14 *Code of Federal Regulations* Part 91 instructional flight. Visual meteorological conditions prevailed for the local flight, which operated without a flight plan.

According to a witness interview, the helicopter was on final approach to land on the runway at what seemed like a steep angle of descent. As the helicopter descended, she heard a loud "pop." After the pop, the helicopter began to rotate and then the main rotor (MR) blades separated from the top of the helicopter. The remainder of the helicopter descended to ground impact and then "exploded."

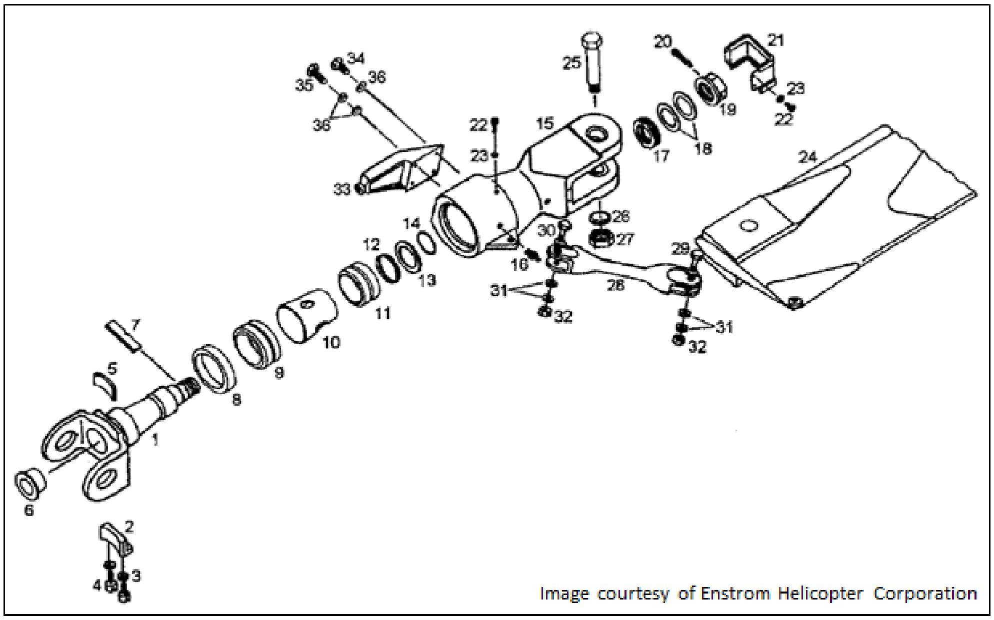
All three MR blades were found during the on-scene investigation and were identified as blades #1 through #3. The #2 MR blade was found separated from the MR head, which still contained MR blades #1 and #3. Post accident examination revealed that the #2 MR blade had separated due to a fractured spindle.

PERSONNEL INFORMATION

AIRCRAFT INFORMATION

The helicopter, an Enstrom 280FX, was a three-seat, single-engine helicopter (serial number 2002) manufactured in 1985. The three-bladed MR system was powered by a turbo-charged Lycoming HIO-360-F1AD engine rated at 225 horsepower at 3050 rpm.

The inboard end of each main rotor blade is attached to its respective grip and drag link. Each rotor blade is attached to the outboard side of its respective grip via a retention bolt. At the inboard side of each grip, a pitch arm and drag link are attached to the leading and trailing sides, respectively, of the grip. Two feather bearings, which accommodate rotor blade pitch change motion, a bearing spacer, and a spindle are installed within the grip. A Lamiflex bearing, a spindle retention nut, and a cover are installed at the threaded outboard end of the spindle. Two flanges at the inboard end of the spindle attach to a universal block, the latter of which is attached to the main rotor hub, that accommodate rotor blade flapping and lead-lag motions. See figure 1.



Selected index numbers:
Spindle (1)
Feather bearings (9, 11)
Bearing spacer (10)
Grip (15)
Lamiflex bearing (17)
Retention nut (19)
Cotter pin (20)
Cover (21)
Main rotor blade (24)
Blade retention bolt (25)
Drag link (26)
Pitch arm (33)

Figure 1: Enstrom spindle and grip assembly

According to the maintenance records, the most recent 100-hour inspection was completed on March 17, 2014, at an airframe total time of 9,167 hours. During this annual inspection, all three Lamiflex bearings were replaced. Additionally, all three MR grip assemblies were removed to "purge and clean" the flapping hinge bearings, then were reassembled and preloaded per the Enstrom Maintenance Manual. Lastly, the leading-edge tape was replaced on one of the MR blades; the helicopter was then flight tested and subsequently adjusted for proper track and balance. No other maintenance to the MR grips or blades was performed during this inspection or at any other time between the inspection and the accident.

According to the maintenance records, the #2 spindle, part number (P/N) 28-14282-13, serial number (S/N) 03-014-84N, had not been replaced since the helicopter's manufacture. At the time of the accident, the spindles were not life limited, and there were no recurrent inspections specified for the spindle threads. According to the Enstrom Maintenance Manual, the Lamiflex bearings required replacement every 5 years.

When the MR is assembled, the spindle threads reside under the retention nut retaining the Lamiflex bearing. The retention nut must be removed in order to examine the entire threaded region of the spindle for damage. It is unknown whether a thread crack, once grown to a sufficient depth, would produce an out-of-track MR blade. Examination of the maintenance records for the accident helicopter revealed at least 9 instances, from the time the helicopter was manufactured, of Lamiflex bearing replacement for the #2 spindle. (The Enstrom Maintenance Manual the Enstrom Maintenance manual requires the lamiflex bearing to be replaced every 5 years.) However, there was no pattern in the Lamiflex bearing replacement intervals or interrelated note of the helicopter's MR track and balance or the helicopter's flying characteristics.

During manufacture, the cotter pin hole in the spindle is match-drilled with the spindle retention nut installed. There is no specific requirement on the dimension for the cotter pin hole in the engineering drawing to break the sharp edges or chamfer the edges at the cotter pin hole after it is match-drilled.

Breaking or chamfering the sharp edges is typically used to reduce stress concentrations that may arise from the matched-drill process.

METEOROLOGICAL INFORMATION

The 1155 weather observation at EIK reported no wind, visibility 10 miles, clear skies, temperature 09ºCelsius (C), dew point 11ºC; barometric altimeter setting 30.18 inches of mercury.

AIRPORT INFORMATION

EIK is a publicly-owned airport without an air traffic control tower. The airport was equipped with one runway designated as runway 15/33. Runway 15/33 was a 4,700-ft-long by 60-ft-wide runway and was reported as "in good condition." The elevation of the threshold of runway 15 was about 5,076 ft above mean sea level.

WRECKAGE AND IMPACT INFORMATION

The helicopter came to rest upright with the right skid low off the east side of the runway. The main wreckage contained the main fuselage (flight deck, skids, tail boom) and engine. The aircraft wreckage displayed severe damage from a high energy vertical impact and post impact fire.

The MR head (with the #1 and #3 MR blades still attached) and MR gearbox were located about 299 ft from the main wreckage at a heading of 350º. The threaded portion of the spindle and associated retention nut on the #2 blade was missing; however, the inboard portion of the spindle was still attached. The #2 MR blade assembly, including the blade, the grip, the threaded portion of the spindle, the retention nut, and the drag link, was located about 657 ft from the main wreckage at a heading of 263º. The #2 blade did not exhibit any damage or indications of contact with any part of the aircraft. An approximate 18-inch section of the leading edge spar and balance weight for the #1 rotor blade was located about 493 ft from the main wreckage at a heading of approximately 248º. The tail rotor blades were found about 290 ft and 666 ft from the main wreckage, at headings of 276º and 325º, respectively. Several other pieces of wreckage were scattered around the approach end of runway 15. The tail rotor gearbox was not located.

Flight control continuity was established in the cabin area from the controls up to the MR gearbox and MR hub. The Hobbs meter located in the center pedestal indicated 9,332.7 hours.

The tailboom exhibited a MR blade strike. Examination of the MR gearbox mounts indicated that the gearbox mounts were intact and separation from the airframe occurred at the pylon. The overrunning clutch operated normally.

During the wreckage examination at the recovery facility, the #2 MR blade assembly (S/N 3469) was disassembled by removing the blade from the grip and removing the Lamiflex cover. The retention nut was found behind the cover with the fractured threaded end of the spindle still attached to the nut, and the cotter pin installed. Additionally, the Lamiflex bearing and shims were located behind the cover. The Lamiflex bearing (S/N 9383) had a manufacturing date of February 7, 2013.

TEST AND RESEARCH

Materials Laboratory Part Examination

The three sets of spindles, nuts, shims, grips, and Lamiflex bearings from the helicopter's rotor arm assemblies were sent to the NTSB Materials Laboratory in Washington, DC for detailed examination.

#2 Spindle

The threaded end of the #2 spindle had separated in-flight and was submitted still assembled inside the mating #2 retention nut. With exception of a small region on the #2 spindle threaded end fracture surface, most of the fracture surface of the #2 spindle was covered in a black-colored substance consistent with degraded grease. Dirt and debris coated the surface of the remaining inboard portion of the #2 spindle.

The threaded end of the #2 spindle was disassembled from the mating #2 nut, cleaned, and examined in more detail. About 92% of the fracture surface on the separated #2 spindle was flat, and had beach marks consistent with fatigue cracking. (Beach marks are macroscopic progression marks on the fracture surface of a fatigue crack that indicate successive positions of the advancing crack front.) The separation occurred through the root of the end thread (thread closest inboard), and the fatigue crack emanated from the trailing edge (TE) side of the spindle. Corrosion was visible on the fracture surface of the #2 spindle in the fatigue crack initiation area.

The remaining 8% of the fracture surface on the separated #2 spindle was rough and had a shear lip, which was consistent with overload. The shear lip was on the leading-edge side of the spindle, opposite the fatigue crack initiation area on the TE side. This was the same area on the fracture surface that was not covered with black grease. The fracture surface in the area of the shear lip on the #2 spindle fracture surface had features showing microvoid coalescence, which were consistent with overstress. On various portions across the entire fracture surface, shiny areas consistent with mechanical damage were observed.

The average root radius measurement for the #2 spindle was smaller than what was defined in the thread form profile specified by the Enstrom spindle drawing. The remainder of the thread features conformed to the required thread form profile. For additional details of the thread form profile, see the Materials Lab Factual Report in the docket for this investigation.

A cross-section was prepared through the separated #2 spindle threaded end. The hardness of the #2 spindle was within the range specified on the Enstrom spindle drawing. The threads of the #2 spindle were examined in the prepared cross-section. Corners with tight radii were observed in the flat-bottomed thread roots. The threads looked to be cut, rather than rolled, and no decarburization (a process used to reduce the carbon content in metal) or abusive machining was detected. The microstructure of the #2 spindle was tempered martensite and consistent with alloy steel.

#1 and #3 Spindles

The #1 and #3 spindles were completely covered in red/brown grease; the grease was removed and the threaded ends were further cleaned for detailed examination. The average root radius measurements for the #1 and #3 spindles were smaller than what was defined in the thread form profile specified on the Enstrom spindle drawing. The remainder of the thread form features conformed to the required thread form profile. The threads on the #1 spindle were flat-bottomed and had tight radii in the corners, similar to the threads on the #2 spindle. The threads on the #3 spindle were not flat-bottomed, but the radii were smaller than specified.

The threaded ends of the #1 and #3 spindles were examined using magnetic particle inspection (MPI). Multiple MPI indications were observed in the thread roots of both spindles. There was one very bright linear crack indication in the root of the end thread on the trailing edge (TE) side of the #3 spindle, which was the same location from which the fatigue cracking on the #2 thread initiated.

A bright linear crack indication was also observed in the root of one of the threads on the #1 spindle on the TE side. However, this indication was observed in the root between two threads about mid-length down the threaded end and in a thread root adjacent to the cotter pin hole. A portion of the crack indication was visible on the inner diameter of the cotter pin hole. The crack indication extended out of the cotter pin hole towards the top side of the #1 spindle. Additional MPI indications also were observed running parallel along portions of multiple thread roots. The parallel indications were in similar locations to where the spindle #2 had tight radii in the thread corners.

The fracture surfaces of the cracks in the threads of the #1 and #3 spindles were flat with features consistent with fatigue cracking. Dark areas were observed on the fracture surface of the #3 spindle, consistent with corrosion products.

No metallurgical issues were observed with the remaining components of the rotor arm assemblies.

Finite Element (FE) Modeling

As a result of the fatigue cracking and fracturing found on the helicopter's spindles, FE modeling was performed to examine local stresses on the spindle. Modeling revealed that there was a possibility that, in addition to a longitudinal centrifugal force, the loading on the threaded portion of the spindle may include lateral forces and bending moments. Two regions of interest were studied: the threaded portion of the spindle where the #2 spindle separated due to a fatigue crack that propagated and the cotter pin hole region where cracks were found in the #1 spindle. In November 2015, Enstrom instrumented the MR spindles of an exemplar helicopter with strain gauges to determine whether there was existence of bending loads at spindle threads. These tests revealed that a bending moment existed that increased the stresses in the threaded area of the spindle with a bending moment that was not previously accounted for during the spindle design.

Spindle 2-D Model

The measured #2 spindle profile was used to construct the FE model of the accident spindle. The corner radii were chosen to be 0.003 inch for all thread roots. A model of a spindle with specified larger 0.009" thread profile was also constructed for comparison purpose. The 2-D models with these two profiles will be referred to as the "measured" model and the "nominal" model. The geometry of the nut was approximated from design drawings.

The only external load considered for the 2-D model was the axial centrifugal force due to blade rotation. According to Enstrom, during the design of the spindle it was assumed that this was the most significant load acting on the threaded portion of the spindle. The magnitude of the force was chosen to be 21,460 lbs, which, according to design calculations, corresponded to the maximum force allowed at a rotation speed of 385 rpm. This force was applied as a pressure to the nut surface contacting the Lamiflex bearing (which was not included in this model). This surface was constrained to remain horizontal during the simulation, which is an assumption that was intended to account for the stiffness of the Lamiflex bearing.

The Lamiflex bearing is stiff, it is not rigid as discussed later in this report. This assumption resulted in a nonuniform pressure distribution on the loading surface.

The longitudinal normal stress was the dominating stress component of the analyses and was the primary quantity of interest. With the measured thread profile, the peak stress occurred in the root region of the first tooth from the bottom, which coincided with the location of the crack that caused the failure of the #2 spindle. With the specified thread profile, stress values were the highest in two regions: the first tooth root and the stress relief feature beneath the threads. The peak stress magnitudes were 149 ksi and 84 ksi for the measured and nominal thread profiles, respectively.

Retention Assembly 3-D Model

During the investigation, it was determined that there was a possibility that in addition to the longitudinal centrifugal force, the loading on the threaded portion of the spindle may include lateral forces and bending moments. A 3-D model of the entire retention assembly was built to compute the loads to be applied to the detailed local 3-D FE models of the threaded portion of the spindle. The global 3-D FE model consisted of the flapping pin, the blade grip, the spindle, the two bearings inside the grip, the Lamiflex bearing, and the nut.

The forces and moments obtained from the global analysis were applied to the local model as external loadings. The loadings were applied in two steps. In the first step, only the axial force was applied. In the second step, the two transverse forces and the two bending moments were applied in addition to the axial force. This was done to study the effect of bending moment and transverse force, which was accomplished by looking at the differences in stress values between the two loading steps.

To represent the most severe loading scenarios, 4 cases were developed to analyze the 'worst case' loading scenarios. These cases used the measured thread profile and the nominal thread profile with a stiff Lamiflex bearing. In the first model case where longitudinal (axial) normal stresses were applied in the threaded region, the stress level in the first thread was doubled in the measured thread versus the nominal thread. In the second model case where the longitudinal (axial) normal stresses were applied to the measured thread profile with and without bending moments, the elastic stresses at the first thread increased about 14% with a bending moment. In the third model case where the longitudinal (axial) normal stresses were applied to the nominal thread profile with and without bending moments, the elastic stresses at the first thread similarly increased about 14% with a bending moment. Lastly, in the fourth model case where longitudinal (axial) normal stresses were applied in the measured threaded profile with a stiff Lamiflex bearing versus a soft Lamiflex bearing, the elastic stresses at the first thread increased about 15% with a stiff bearing.

Cotter Pin 3-D Model

The #1 spindle of the accident helicopter revealed cracking at the cotter pin hole. Additionally, inspection reports received after issuance of an emergency airworthiness directive (details below) to perform a magnetic particle inspection of the spindle threads revealed about 20% of inspected spindles showed evidence of a crack at the cotter pin hole. Because of this cracking detected on spindles in the area of the cotter pin hole, a new FE model was developed to determine if in-flight loading could have caused high stresses near the cotter pin hole that in turn induced the cracking.

Peak stress values occurred in the first thread root, while no high stresses were observed near the cotter pin hole or in the pin. It was determined that the cotter pin was not significantly loaded, and not related to the inboard cracks.

Computed Tomography (CT) Scans

CT scans of the #1 and #3 spindles were completed by an independent laboratory under the direction of an NTSB investigator.

The results of the CT scans showed that both the #1 and #3 spindles had indications of cracking. These crack indications were extremely faint, consistent with cracks that were very narrow. Some of the crack indications were in spindle areas where magnetic particle inspections had indicated that cracks were present. However, some of the crack indications were in areas where no cracks were indicated in the magnetic particle inspections.

It could not be determined why the CT crack indications appeared in areas where no magnetic particle inspection crack indications appeared. The CT crack indications could be erroneous, caused by random noise in the images, or the cracks noted in the CT indications could be of such small dimensions that they did not create an indication during the magnetic particle inspection. Because of this uncertainty, none of the crack indications provided any information on the formation process for the cracks.

ADDITIONAL INFORMATION

On February 11, 2015, Enstrom Helicopter Corporation (Enstrom) issued Service Directive Bulletin (SDB) No. 0119, that required an MPI for MR spindles, P/N 28-14282-11 and 28-14282-13, that were in service more than 5,000 hours. The bulletin specified that the MPI should be completed within the next 5 hours of time-in-service (TIS). For MR spindles with less than 5,000 hours TIS, the spindle should be removed and sent to Enstrom for MPI at or before 5,000 hours TIS. The SDB also specified a repetitive MPI conducted every 300 hours after the initial 5,000 hour TIS.

On February 12, 2015, the FAA issued Emergency Airworthiness Directive (EAD) 2015-04-51 requiring that any spindle with 5,000 hours or more TIS, or where the hours TIS of the spindle was not known, have an MPI before further flight to determine if a crack exists. If a crack in the spindle was found, replace the spindle before further flight. Results of the MPI testing for all spindles meeting the requirement were to be reported to the FAA.

Based in the findings of the MPI tests conducted after the issuance of Enstrom's initial SDB, a revised SDB (Revision 1) was issued by Enstrom on April 1, 2015. The revision reduced the TIS before MPI was required from 5,000 hours to 3,500 hours. On June 1, 2015, Enstrom issued Revision 2 to the SDB further reducing the TIS before MPI was required from 3,500 hours to 1,500 hours.

On April 10, 2015, the FAA superseded EAD 2015-04-51 with EAD 2015-08-51 which advised that, based on inspection reports received by the FAA, about 20% of the spindles that were MPI tested had evidence of cracks. As such, the FAA expanded the applicability of spindles requiring testing to those with 1,500 or more hours TIS.

In August 2015, Enstrom conducted a flight strain survey to characterize the loads placed on the P/N 28-14282-13 spindles during normal and abnormal flight conditions to determine whether there was existence of bending loads at the spindle threads. The strain surveys revealed bending moments that were not accounted for in the original spindle analysis.

Additionally, Enstrom performed a crack growth analysis to evaluate cracks about the cotter pin hole. At the time of the analysis, less than 6% of the overall spindles returned from the field exhibited cracks in the cotter pin hole (much less than the approximately 20% recorded when the FAA EAD 2015-04-51 was first released). Other than two spindles from the accident aircraft, no additional spindles were found to exhibit cracks about the inboard threaded region of the spindle. As a result of the analysis, on June 24, 2016, Enstrom issued Revision 3 to the SDB. This revision modified the original 300-hour repetitive MPI requirement to a 500-hour interval repetitive MPI after the initial MPI at 1,500 hours TIS.

The Federal Register, dated March 2, 2017, announced a notice of proposed rulemaking (NPRM) to issue an airworthiness directive (AD) for Enstrom MR spindles (P/N 28-14282-11 or 28-14282-13) to establish a life limit of 1,500 hours TIS and require a recurring inspection interval of 500 hours until the spindle reaches its new life limit of 1,500 hours TIS.

Flight instructor Information

Certificate:	Commercial; Flight instructor	**Age:**	23,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	August 13, 2014
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	1223.3 hours (Total, all aircraft), 87 hours (Last 90 days, all aircraft), 4.9 hours (Last 30 days, all aircraft)		

Student pilot Information

Certificate:	Student	**Age:**	25,Female
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	July 31, 2014
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	65.8 hours (Total, all aircraft), 65.8 hours (Total, this make and model), 29.2 hours (Last 90 days, all aircraft), 8.5 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Enstrom	**Registration:**	N86235
Model/Series:	280FX FX	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	2002
Landing Gear Type:	N/A; Ski	**Seats:**	2
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	LYCOMING
ELT:		**Engine Model/Series:**	HI0-360 SER
Registered Owner:	On file	**Rated Power:**	205 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	EIK,5130 ft msl	**Distance from Accident Site:**	5 Nautical Miles
Observation Time:	11:55 Local	**Direction from Accident Site:**	330°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	22°C / -9°C
Precipitation and Obscuration:			
Departure Point:	Erie, CO	**Type of Flight Plan Filed:**	None
Destination:	Erie, CO	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	

Airport Information

Airport:	Erie Municipal EIK	**Runway Surface Type:**	Concrete
Airport Elevation:	5130 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	15	**IFR Approach:**	None
Runway Length/Width:	4700 ft / 60 ft	**VFR Approach/Landing:**	Traffic pattern

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	2 Fatal	**Latitude, Longitude:**	40.015556,-105.049446(est)

Administrative Information

Investigator In Charge (IIC):	Liedler, Courtney
Additional Participating Persons:	
Original Publish Date:	July 26, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=90662