NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF AVIATION SAFETY

2018

OPERATIONS FACTUAL REPORT

WPR16FA040

A. ACCIDENT

Operator:	Air Methods Corporation
Location:	Superior, Arizona
Date:	December 15, 2015
Time:	1723 mountain standard time
Aircraft:	Airbus AS350B3 ASTAR

B. OPERATIONS GROUP

GROUP CHAIRMAN

Zoë Keliher
Air Safety Investigator
National Transportation Safety Board
Western Pacific Region
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Kenneth Nettles
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Air Methods Corporation
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C. SUMMARY

On December 15, 2015, about 1723 mountain standard time[1], an Airbus helicopter, AS350B3, N74317, was substantially damaged when it impacted terrain while maneuvering near Superior, Arizona. The helicopter air ambulance (HAA) was registered to Air Methods Corporation[2] and was doing business as Native Air Ambulance, under the provisions of Title 14 *Code of Federal Regulations* Part 135. The commercial pilot, and flight nurse sustained fatal injuries and the

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[1] All times in this report are expressed in terms of a 24-hour clock and mountain standard time unless otherwise noted.
[2] For ease in reading, the operator with be referred to as Air Methods for the remainder of this report.

flight paramedic sustained serious injuries. [3] Visual meteorological conditions prevailed and a company visual flight rules (VFR) flight plan was filed for the flight. The cross-country positioning flight originated from the Phoenix-Mesa Gateway Airport, Mesa, Arizona, at 1705 with an intended destination of Globe, Arizona.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board (NTSB) operations investigator did not accompany the Investigator-In-Charge (IIC) to the scene of the accident. However, after the on-scene activities were completed, the operations investigator interviewed the Federal Aviation Administration (FAA) Principal Operations Inspector (POI) and Principal Maintenance Inspector (PMI) for Air Methods, numerous Air Methods employees, and additional individuals who knew the accident pilot or had knowledge of Air Methods operations. NTSB investigators obtained data, records, manuals, timelines, and other pertinent documents from Air Methods, Airbus Helicopters, the FAA, cellular phones, and an Appareo GAU2000 data recording device that was installed in the helicopter by Air Methods.

1.0 HISTORY OF FLIGHT

1.1 DAY OF THE ACCIDENT

On the morning of the accident the pilot, nurse, and medic were at Air Methods' base in Globe participating in their normal routines, which included completing their respective online training modules. Everything seemed normal and they were all in good spirits. Data obtained from the pilot's phone indicated that he had checked weather at 1308.

At 1508 Air Methods received an intake request for a patient transport from Cobre Valley Community Hospital, Globe, to Banner Baywood Medical Center, Mesa, Arizona. Such transports between the two hospitals were common. The request was relayed to the pilot, and at 1518 he made his notification to AirCom[4] that he was lifting off from Globe, en route to Cobre Valley. He reported landing at 1521 and then subsequently departed to Banner Baywood at 1540. The helicopter landed at 1605 and the patient was unloaded. The helicopter departed to Phoenix-Mesa Gateway Airport at 1640 with the purpose of refueling[5]. At 1641 the AirCom flight plan was changed by the communication specialist and at 1642 a fuel leg was added to the flight plan to account for the Gateway stop.

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[3] For ease of reading the flight nurse and flight paramedic will be referred to as nurse and medic, respectively.
[4] AirCom is a communications center that provides flight following services to Air Methods aircraft; see Section 6.2.
[5] As normal practice for the Globe bases, the helicopter would routinely refuel at Gateway Airport. See Section 6.5.

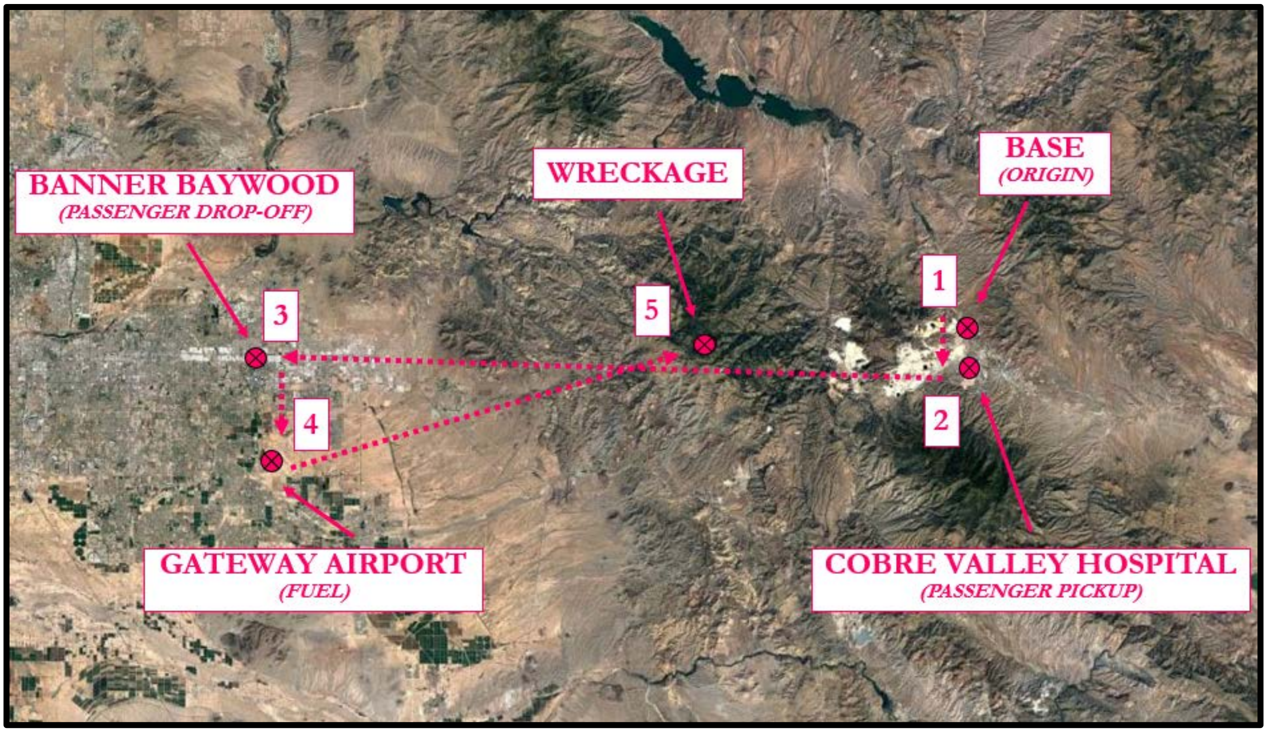

Figure 01: Overview of Flight

The helicopter landed at Gateway at 1647 and after parking in the normal transient aircraft ramp area, the nurse and medic went inside the fixed based operator (FBO) facilities. The fueler and pilot made small talk and then the pilot requested that 51 gallons of fuel be added to the helicopter[6]. The fueler reported that the flight crew all appeared to be in good spirits and to get along well with each other.

[6] The fuel receipt indicates the fueler added 51 gallons of Jet A, which was billed at 1718. See Attachment C.

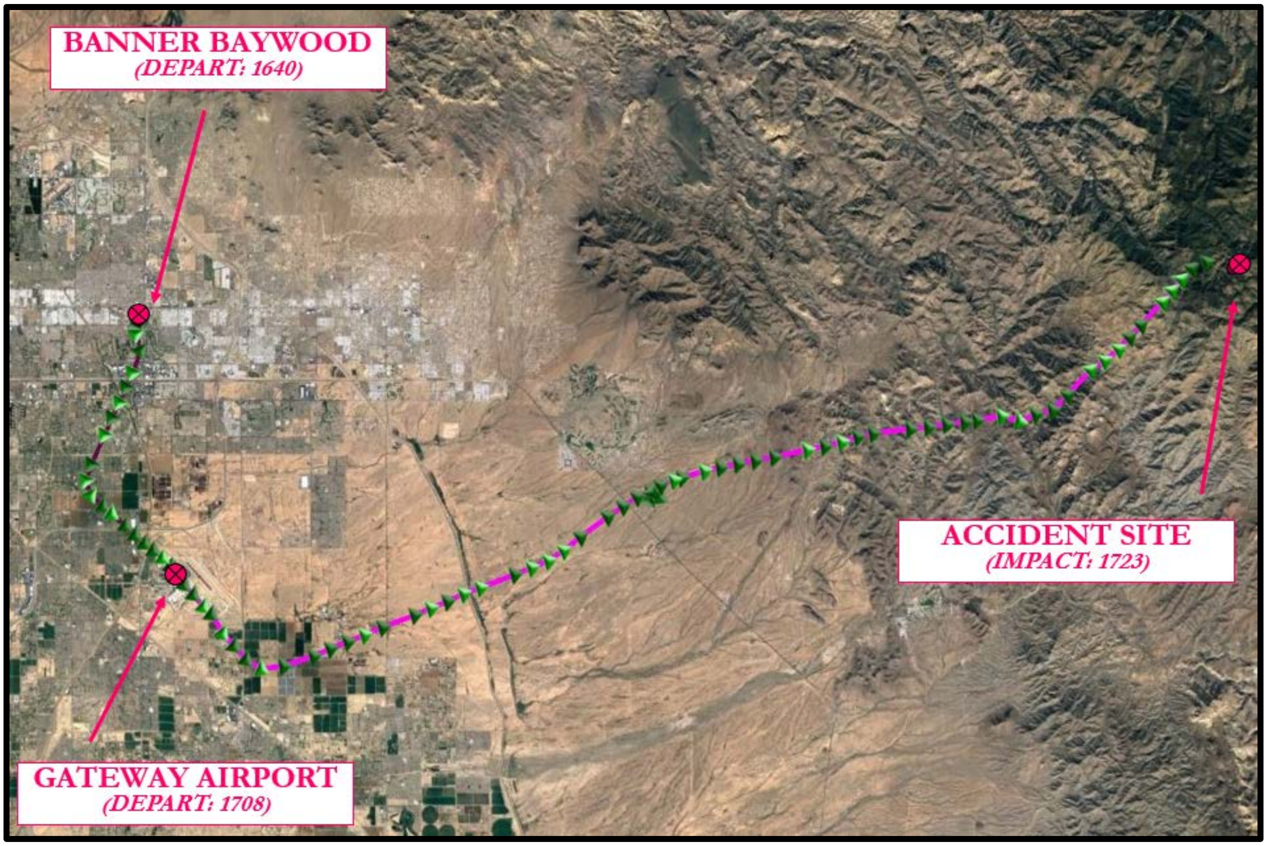

Figure 02: Accident Flight Showing Prior Leg and Times of Departure

1.2 ACCIDENT FLIGHT LEG

The pilot transmitted to AirCom that he was departing Gateway carrying three people and that the helicopter was carrying 1 hour and 50 minutes of fuel on board; he reported that the estimated time en route back to the base was 25 minutes. The flight departed about 1708 and shortly thereafter, the pilot conveyed to the medical crew that they would be flying lower due to the hazy conditions in the valley (chimney smoke).[7] Maintaining an easterly heading, the pilot made a gradual ascent to about 600 ft above ground level (agl)[8] during which time the nurse made a request to the pilot asking if they would be able to orbit over a house.[9] About 1715 the pilot began a right 360-° orbit over the house and a minute later the helicopter continued eastbound toward the base.

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[7] The medic stated that they did not appear to be flying any lower than normal.
[8] For a complete description of the altitudes, headings, and helicopter performance information used in this report see the Helicopter Performance Memorandum in the public docket.
[9] The nurse's daughter resided at a house along the flight path between Gateway and Globe. The nurse would occasionally ask pilots to briefly circle over the house, and arrange by text message for someone to take his daughter outside so he could wave while circling above in the helicopter.

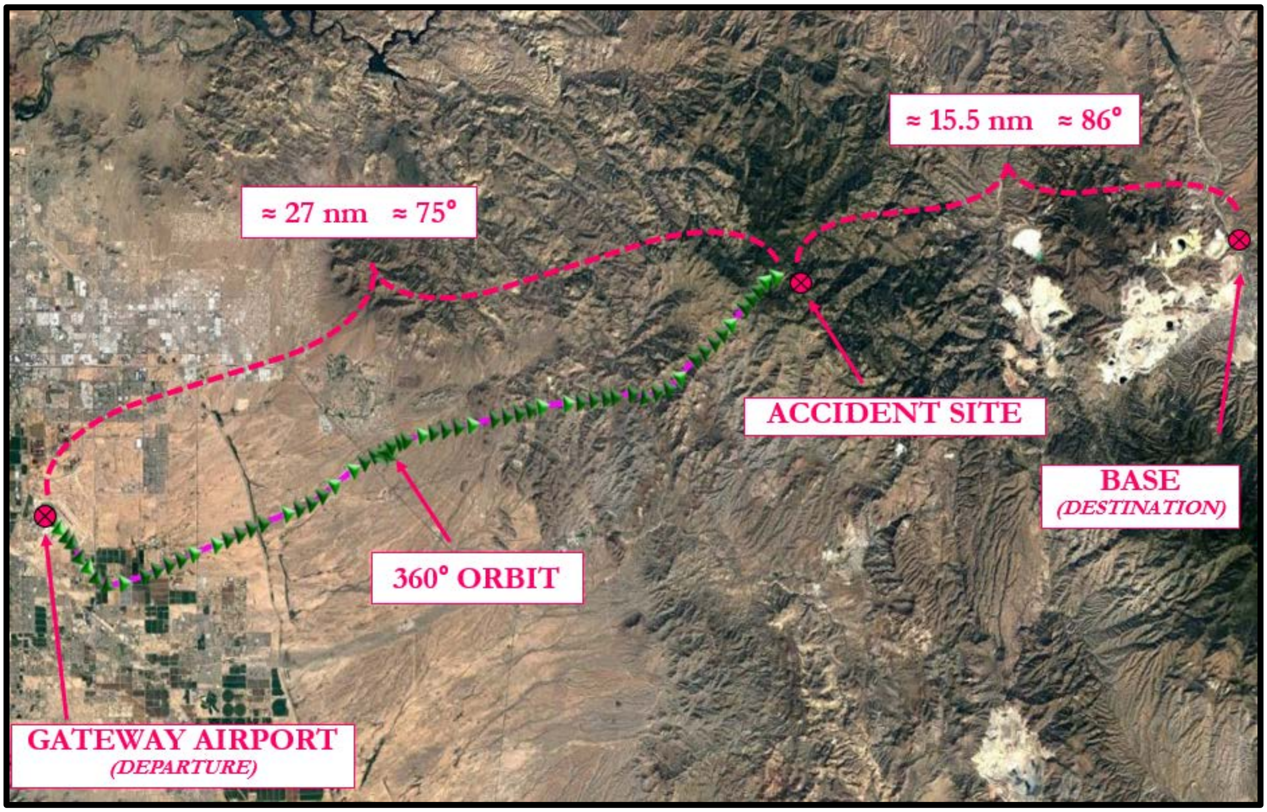

Figure 03: Accident Flight

The medical crew were diligently looking outside as they approached the mountains because in the valley there were several remote-control aircraft parks and they would regularly watch for high-flying drones. As the helicopter transitioned into mountainous terrain, around 1719 the medic had his laptop balanced on his knees and was working on charting[10] and the nurse was completing paperwork from the patient pickup as well as using his cell phone.[11] According to the medic, nothing seemed out of the ordinary and the conversation was more idle chatter. He recalled all of them talking about cardiac patients and discussing how, because time was more critical in those situations, they needed to strategize how they could move more quickly.

According to the performance memorandum,

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[10] Medical crews would routinely finish the data entry for the patient, referred to as charting, on the way back to base because the information was due within one hour of landing. Typically, on the way back to base, the nurse would perform the charting and the medic would be scanning outside for traffic and obstructions.

[11] According to the Air Methods GOM "to prevent distractions, the PIC [pilot-in-command] shall not allow cellular phones/portable electronic devices to be used or turned on during ground operations and taxi/hover including taxi and hover operations, takeoff, en route, approach, and landing."

> [After entering the mountainous terrain], the height of the helicopter above the terrain (agl) varied considerably, as the terrain elevation rose and fell. Between 1718 and 1720, the agl altitude varied between 240 ft and 1,150 ft. Between 1720 and the end of the flight, the agl altitude varied between 30 ft and 770 ft. During this period, the agl altitude dropped below 100 ft on three occasions: at 1720:30 (60 ft agl); 1721:28 and 1723:07 (both 30 ft agl). At these points, the airspeed was between 108 and 114 knots indicated airspeed (KIAS).

The medic later recalled that during this portion of the flight everything appeared normal and they continued east past a rock formation that the pilot would routinely fly past and look at. He described that each pilot had their own route back to the base and the accident pilot's route would normally be more scenic and pass by that rock formation. About 1721 the helicopter passed the rock formation and began on a more northly heading following a canyon maneuvering lower as it passed over ridgelines.

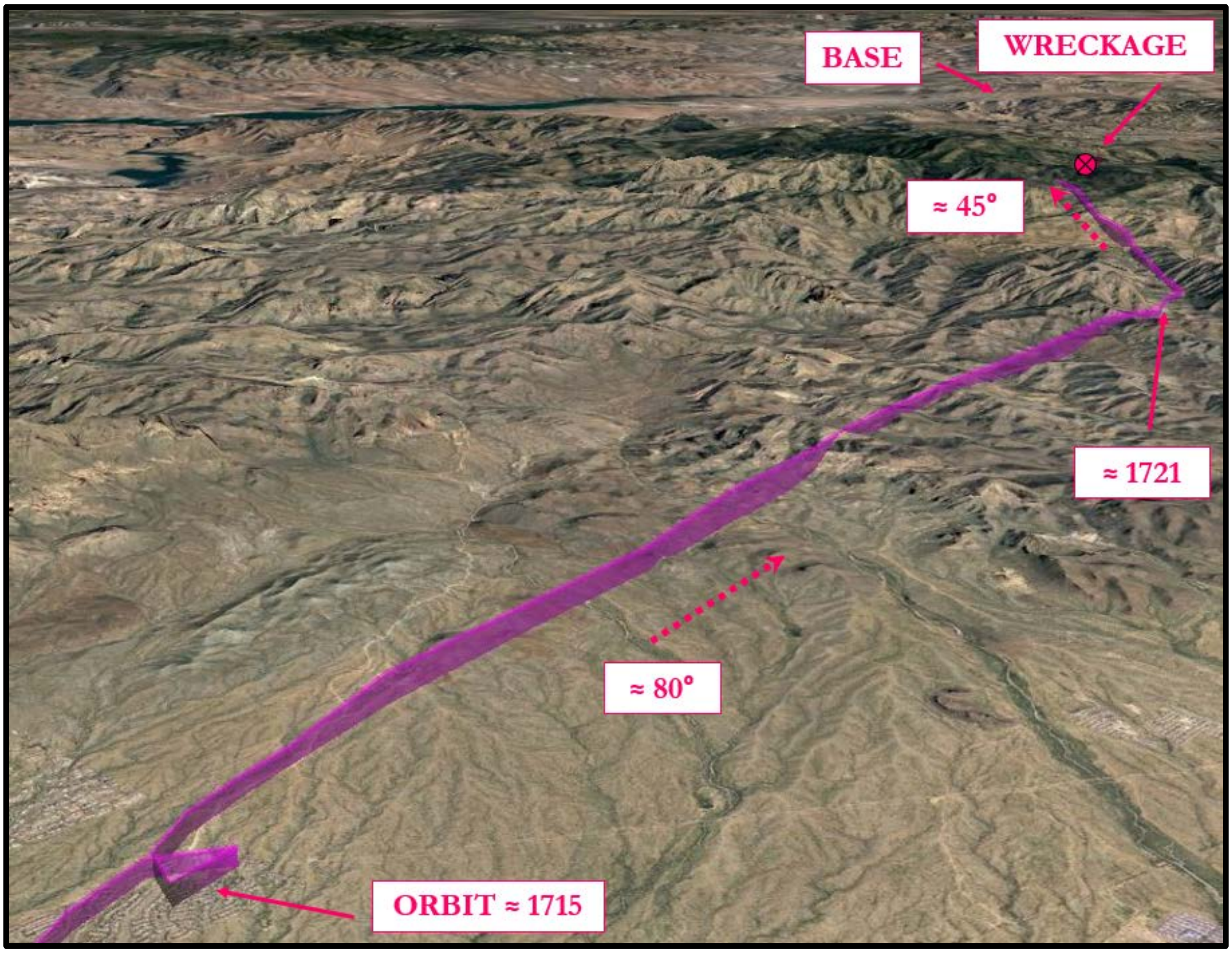

Figure 04: Flight Path from Gateway Airport Approaching Mountainous Terrain

The helicopter flew nearly perpendicularly over the north-south oriented Rogers Canyon and at 1723:07 it continued through a saddle on the canyon's easterly wall, clearing the terrain by about 30 ft agl. As it passed over the eastern ridgeline, the helicopter banked to the right, changed from a ground track of about 43° to 76°, and reached a ground speed of about 120 kts.[12] According to the medic, the pilot was talking to the nurse about hunting and they discussed how there was a lot of game in the area they were flying over. The conversation then turned to the pilot reminiscing about his time in the Army and being overseas. The medic recalled the pilot was talking about having been deployed and the different helicopter attacks they would do during those times. The pilot reminisced about seeing the enemies on the ridgelines and telling them about firing on the enemy troops. He told them what it would feel like when the attack helicopter shot off rocket pods and how they would light up the skyline. [13] Immediately before the accident, the pilot was talking about the different types of helicopters that they used while engaging with enemy forces and described using rockets and guns, while making machine gun noises to add effect to his story.

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[12] During the last minute of the flight, the groundspeed varied between about 103 and 144 knots; see the performance memorandum for plots of groundspeed, airspeed, and other performance parameters.
[13] The medic stated that the pilot had never elaborated on what his military experience was but believed that he clearly had some combat experiences overseas.

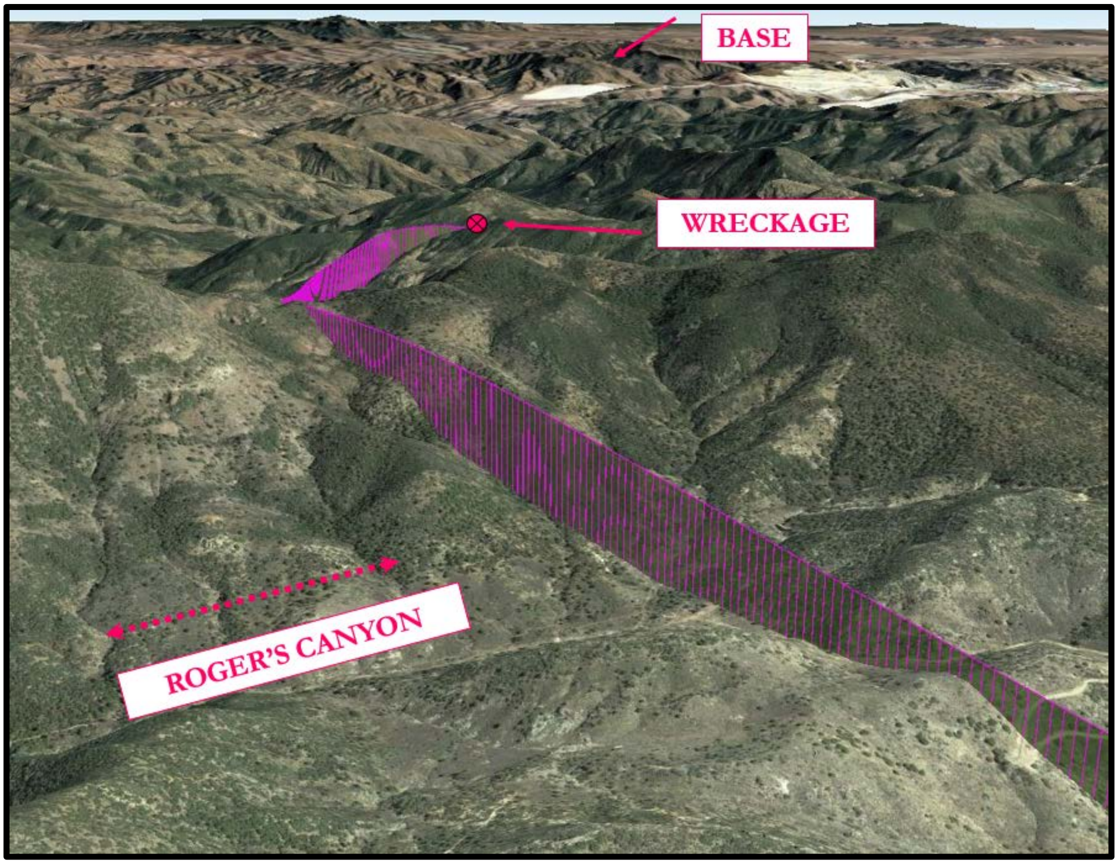

Figure 05: Last Seconds of Flight with Relation to Roger's Canyon

After the helicopter cleared the ridge, it started to descend and accelerate. The ground speed reached a maximum of 148 kts at 1723:21.[14] During this time, the helicopter was in a gentle right bank (approximately 5° - 10° of roll) as the heading changed from 76° at 1723:18 to about 90° at 1723:32.

The helicopter then started began a right roll toward a an approximately 970 ft.-wide saddle in a ridgeline to the right of its flight path. According to the medic, around this time[15] the pilot said "Oh shit" in a panicked voice. The medic immediately looked up from the laptop and out the front windscreen. He saw a ridgeline immediately in their flight path and terrain filling up the view as they were approaching very close. The helicopter's nose tipped upward and he saw the sky.
The medic described the subsequent motions of the helicopter as a violent hard right bank, and characterized the feeling akin to a U-turn course reversal at 60 mph. The medic stated that he did

[14] See discussion of speed in the Helicopter Performance Memorandum
[15] It is not possible to determine the exact timing of the pilot's exclamation relative to the beginning of the right roll, or whether the exclamation preceded or followed the start of the roll.

not see or hear anything out of the ordinary and the pilot did not say anything else but was making jerky fast hand movements. The medic described the feeling as if the pilot was performing an evasive maneuver and the helicopter did not have enough altitude and was too close for them to clear the terrain.

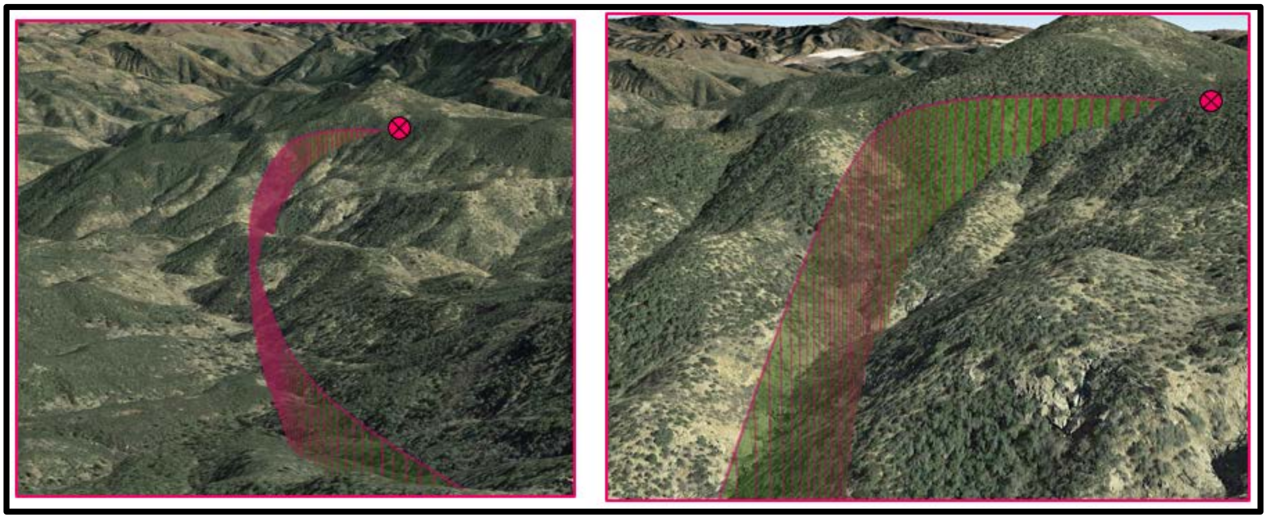

Figure 06: Flight Path During the Last Seconds of the Flight Relative to the Surrounding Terrain

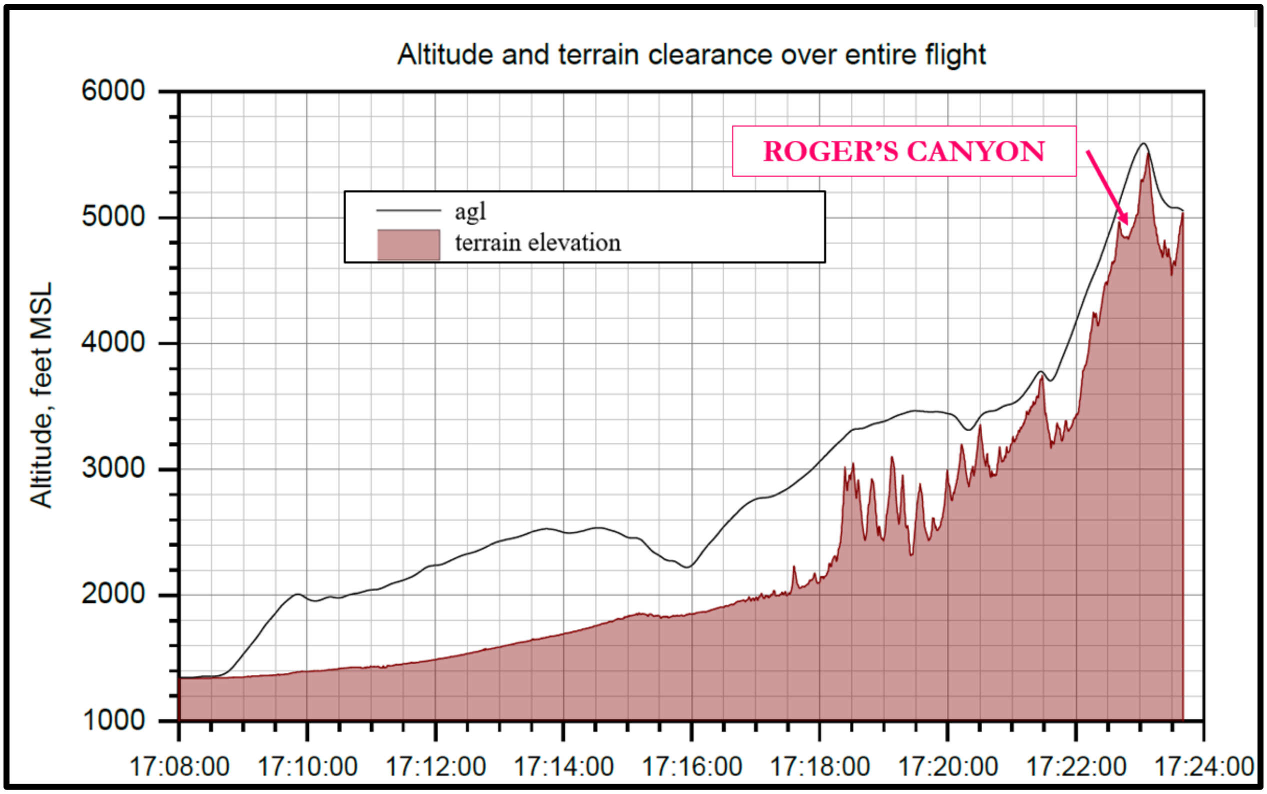

Figure 07: Terrain Elevation and Helicopter Altitude Plotted vs. Time

The helicopter impacted terrain and the medic stated that he felt as if they tumbled. The windscreen blew inside the cockpit and he could feel the vegetation scrape alongside him. The medic stated that he never lost consciousness and the helicopter came to rest with him hanging off the left side of the fuselage suspended by the straps of his seatbelt harness. His helmet and glasses had come off and he cut himself out of the harness and slid down to the snow.

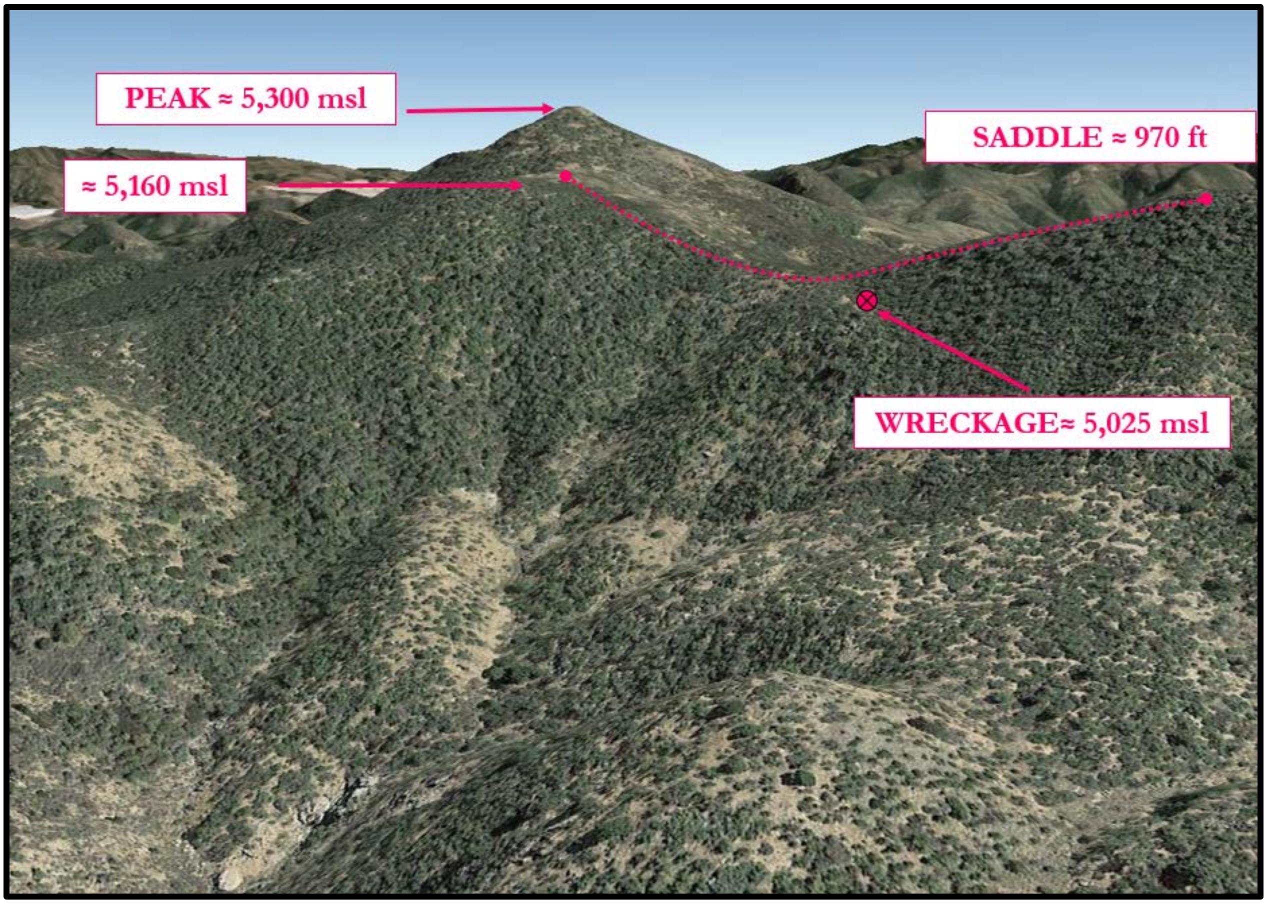

Figure 08: Accident Site Relative to the Surrounding Terrain

1.3 POST IMPACT

The medic recalled hearing the pilot take his last breaths, but he never heard him say anything. The nurse then began to talk to him and relayed that he was pinned under the helicopter's right skid. He was asking the medic for help, but the medic relayed that he was unable to move from his injuries. The medic had become soaked in fuel and was worried that the wreckage was going to catch on fire. The fuel continued to pour out of the wreckage in a continuous steady stream, similar to a running faucet.

The medic and nurse both attempted to free the nurse from underneath the helicopter but they were unable to move. Around sunset they both became very cold and he noted that another helicopter had passed over them, which he thought was an indication that Air Methods was looking for them since they were convinced that the ELT must have been activated from the impact. They tried to use their cell phones but did not have any reception.

The nurse indicated that he believed his lung had collapsed and was having difficulty breathing. He was trying to reach a needle in the lower left pocket of his flight suit but his movement was restricted from his injuries. Once the sun went down, they became very cold and the nurse's breathing became very labored. Shortly thereafter he passed away.

Some time later the medic heard a helicopter in the distance, and because of the darkness, he took his cell phone out in an attempt to signal the helicopter as to his location (knowing that they would likely be wearing night vision goggles and would be able to see the light). A helicopter orbited over him and then another helicopter came shortly thereafter.

1.4 FLIGHTS BETWEEN GATEWAY AIRPORT AND GLOBE BASE

The recorded radar data was recovered for all Native 5 flights between the Gateway Airport and Globe Base between September 15, 2015, and the accident, which consisted of 96 flights, 25 of which were conducted by the pilot.[16] The direct 43 nm flight leg was on a course of about 79°. The flights paths chosen varied with the most northly path and the most southerly path 10 nm apart. Other pilots at the base reported that they did not have a specific method for deciding which path to take back to the base, but would vary the routes to make the flight less monotonous. A majority of the flights were conducted at an en route altitude between 6,000 to 7,000 ft msl, which would provide about 1,000 to 2,000 ft clearance above the peaks and valleys of the Superstition Mountains. In comparison the other flights, the accident flight was conducted considerably lower in altitude, at a higher ground speed and on a less direct path. There were two other flights that showed the helicopter performed an orbit while en route over the area of the nurse's house.

[16] The accident helicopter N74317 underwent regular maintenance during this timeframe and between November 06 and December 06 the same make and model helicopter, N418TY was flown.

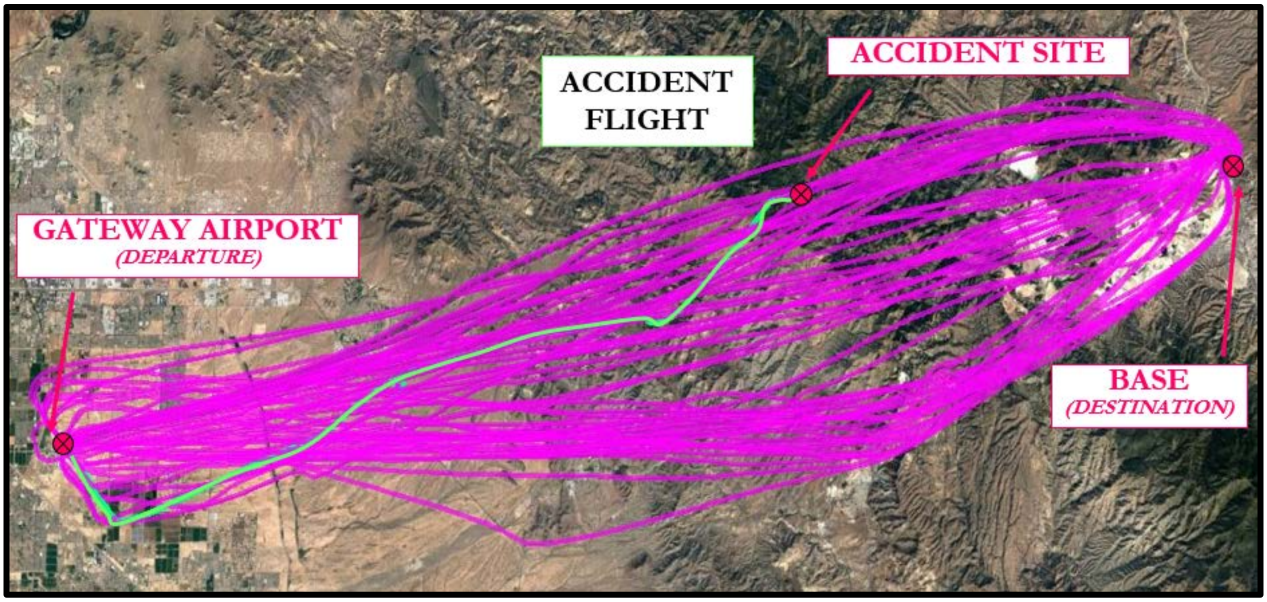

Figure 09: All 96 Flights from Gateway to Base (accident flight in green)

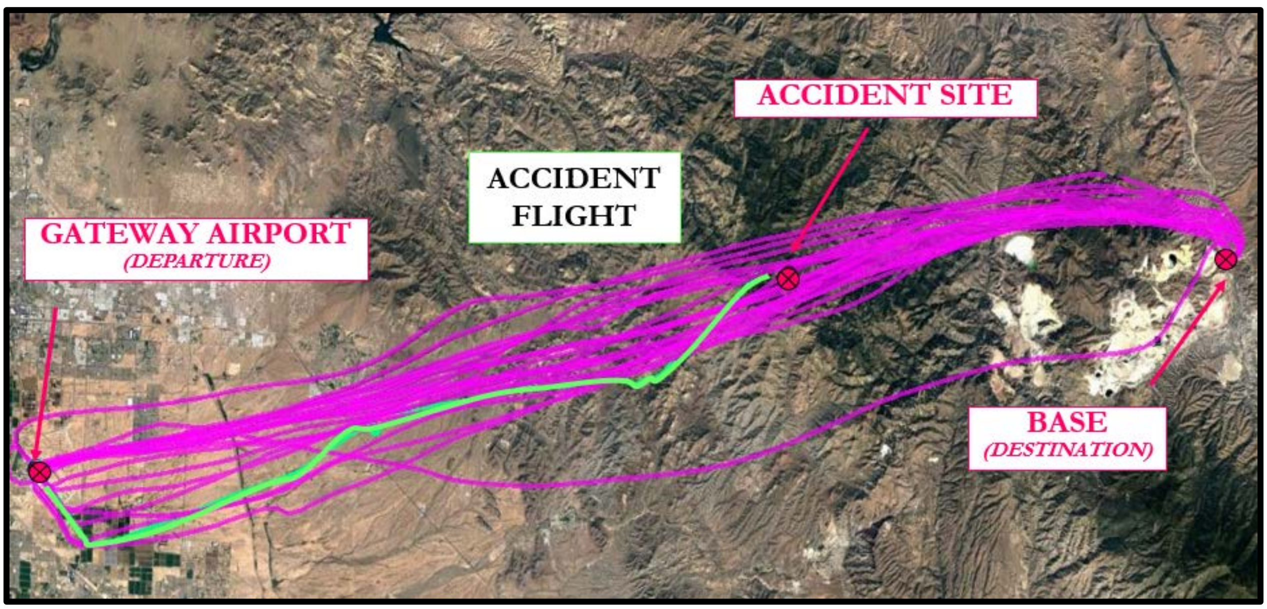

Figure 10: Accident Pilot's 25 Flights from Gateway to Base (accident flight in green)

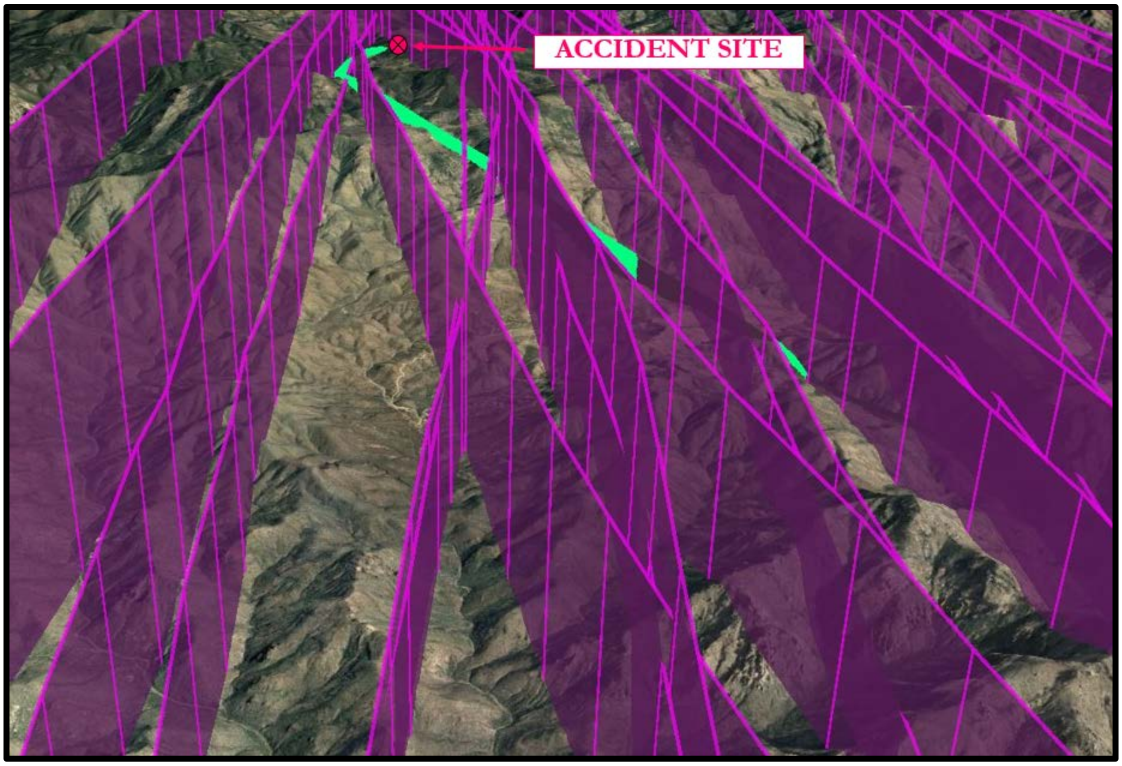

Figure 11: Flights from Gateway to Base Showing Altitude Variations (accident flight in green)

In December 2015 the pilot had flown the flight leg on four separate occasions all in the morning hours: December 01 (departed about 1050), December 06 (departed about 0420), and twice on December 11 (departed at 0120 and 0702). The December 01 flight was similar to the accident flight where the helicopter passed over the Roger's Canyon ridgeline and descended into the canyon, lower than the accident flight path. The nurse on that flight did not recall anything abnormal and did not think the pilot flew the leg lower than any of the other flights.

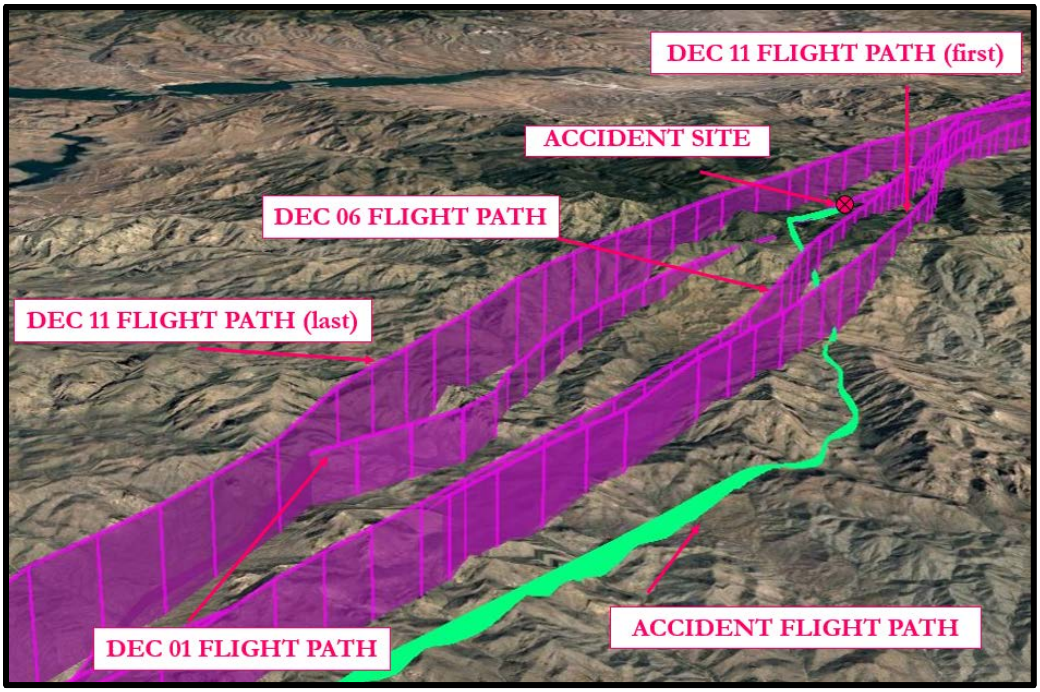

Figure 12: Accident Pilot's December Flight Paths

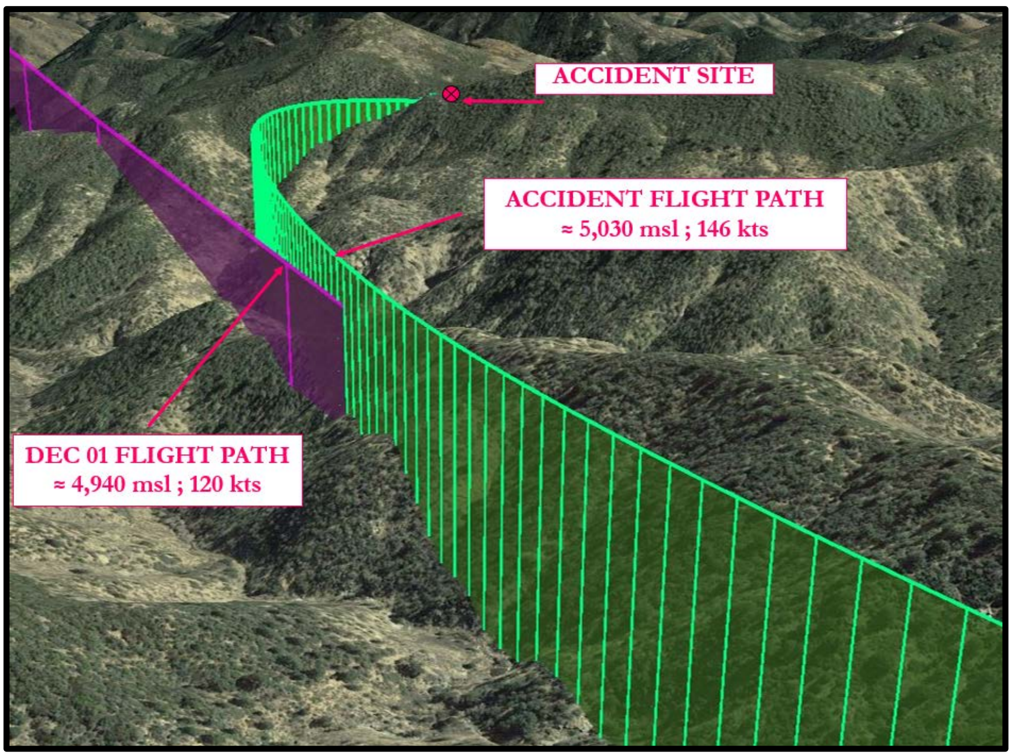

Figure 13: Comparison of Accident Pilot's December 01 Flight and Accident Flight

2.0 INJURIES TO PERSONS

Injuries	Crew	Passengers	Total
Fatal	2	0	2
Serious	1	0	1
Minor/none	0	0	0
Total	3	0	3

Figure 14: Injuries Sustained as a Result of the Accident

3.0 PERSONNEL INFORMATION

3.1 PILOT-IN-COMMAND (PIC)[17]

David John Schneider Jr.

The pilot, age 51, was certified to fly the Airbus AS350B3 helicopter in accordance with existing Federal Aviation Regulations (FAR). A review of the FAA Airman and Medical Records database disclosed that the pilot held a certified flight instructor (CFI) and commercial certificate for helicopter rotorcraft; the certificate listed no type ratings. His second-class medical certificate was issued on December 08, 2015, with the limitation that he must have available glasses for near vision while exercising the privileges of his airmen certificate.

The PIC held the following licenses and ratings:

Certificate	Rating	Date of Issuance
Commercial Pilot	Rotorcraft- Helicopter	7/28/2010
Commercial Pilot	Instrument Helicopter	7/28/2010
Flight Instructor	Rotorcraft- Helicopter	2/15/2013

Figure 15: Pilot's Certificates and Ratings

On the application for his last medical certificate, the pilot stated that his total flight experience was 5,670 hours, of which 67 occurred in the 6 months prior. Within the pilot's personal belongings, a resume was found that he appeared to have been updating. In his updated notes, he labeled his total flight time as PIC as 5,550 hours of which 4,000 were acquired in turbine-engine equipped helicopters. He also delineated the categories of flight time amassed to include the

[17] See Attachment A: Pilot Information

following: nighttime, 210; mountain-time (flight over terrain elevations between 5,000 and 11,500 ft msl), 425; under night-vision-goggles, 50; last six months, 100; and AS350 time, 3,020. In the resume he indicated he had undergone the Bell B206 Turbine Transition Course and had “extensive wildland firefighting/search and rescue experience (Helitack / USNPS).”

In the employment history section of the resume, the pilot listed his experience from 1990-1993 as flight instruction, tours, power and pipeline patrol, photography, film, and television. From 1993-1996 he listed his experience as working for a new Montana helicopter company where he added experience in a Bell B206III of: “fire, snow survey, game counts, tours, heliskiing, and seismic.” From 1996 to 2010 he listed experience of Helitack Operations for the US National Park Service as: “wildland firefighter, senior firefighter, emergency medical technician, helicopter operations.” From June 2010 to July 2014 he listed two Hawaii-based helicopter companies where he was employed. He did not fly outside of work.

The medic stated that the pilot was the Safety Officer for the Globe Base and took the job very seriously. He stated that the pilot flew lower than the other pilots but was never dangerously low. The pilot was one of his favorites to fly with because he was very helpful and would aid the medical crew with duties such as cleaning out the stretchers. He did not think that the pilot took risks or operated dangerously. He stated the pilot was never one of the pilot’s that would show-off or take unnecessary risks, but did classify him as being more “macho” than the other pilots.

The pilot regularly flew with gloves on his hands. At the accident site, he was not wearing a left glove and the right glove was partially rolled off his hand. It could not be determined if the pilot had his sun visor down.

Schedule

According to the pilot's calendar he began his day-shift working week on December 14 and was scheduled to continue on day shift until December 17. The day of the accident (December 15) he kept the day-shift schedule, working at the base from 0630 to 1830.

DECEMBER 2015																														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
D	D	D	N	N	N				N				D	D	D	D	N	N	N								D	D	D	D

Figure 16: Pilot’s December Schedule Showing Day (D) and Night (N) Shifts

The crew had access to off-duty housing in the town of Globe. The pilot would regularly stay in one of these rooms and slept there the night before the accident.

Medical and Pathological Information

Postmortem examinations were performed on the pilot and passenger by the Pinal County Sheriff's Office, Pinal County, Arizona. The cause of death for the pilot was reported as multiple blunt force injuries. In addition to his injuries, the autopsy identified an anomaly consistent with a cavernous hemangioma. The FAA Forensic Toxicology Research Team at the Civil Aviation Medical Institute (CAMI) performed toxicological testing of specimens collected during the autopsy. The results of the specimens were negative for carbon monoxide, cyanide, ethanol and other drugs.

On the pilot's last application for second-class medical certificate, which occurred seven days prior to the accident, he reported his medications being: Metoprolol Tartrate (25 mg twice daily) for hypertension. He reported doctor visits for hypertension on both December 2014 and July 2015; he additionally stated he had left elbow tendon (tennis elbow) surgery in May 2015. The doctor reported with the regards to the elbow, the pilot had full range of motion with no problems noted.

The FAA reviewed the pilot's military discharge documents which revealed he had been honorably discharged; he had failed the medical qualifications for flight training, but the nature of the failure is unknown.

Training[18]

Pilot training records provided by Air Methods revealed that he received his most recent annual FAR 135.293 and FAR 135.299 Airman Competency/Proficiency Check on August 22, 2015. All areas of the examination were graded as 'S' (satisfactory) and no discrepancies were noted; the flight time was 1.0 hour. The pilot completed the following training during his employment at Air Methods:

DATE	HELO	PASS	TYPE of TRAINING	SOURCE
9/10/2014	AS350	Yes	Indoc and FAA 135.293/.299 Recurrent (and NVG)	Air Methods
1/5/2015	Ground	Yes	Local Area Training	Air Methods
5/8/2015	Sim	Yes	Section One Training: General Info	Air Methods
8/21/2015	Ground	Yes	FAA 135.331/.351 Recurrent (and NVG)	Air Methods
8/22/2015	AS350	Yes	FAA 135.293/.299 Recurrent (and NVG)	Air Methods

Figure 17: Pilot's Training Since Employed at Air Methods

3.2 CREW RESOURCE MANAGEMENT

The medic described the pilot and medical crew as friends. He commented that it was fun to work with your friends where everyone is in a good mood and joking around. The medic stated

[18] The pilot's complete training information is contained in Attachment A: Pilot Information

that he believed that if they had not been distracted with paperwork and on the laptop, he would have felt comfortable challenging the pilot about the low altitude. He would not think the pilot would be defensive or that he would not be able to confront him if he felt unsafe.

Other flight nurses and medics all described the pilot as a fun person to work with and in constant communication. Everyone interviewed at the Globe base, including other pilots, was under the impression that the accident pilot had flown in the military prior to his employment at Air Methods, even though he never had.

4.0 HELICOPTER INFORMATION

Manufactured in 2007 by Airbus Helicopters, the AS350B3 ASTAR (serial number 4317), was registered as N74317; at the time of the accident the helicopter had accrued a total time of 4,236 hours. The helicopter was equipped with a Turbomeca Arriel 2B1 turboshaft engine, which had a total time of about 2,491 hours. The helicopter's total (gross) weight at the time of the accident was calculated to be 4,446 lbs[19]. The never exceed speed VNE was calculated to be about 140 kts indicated airspeed (IAS).[20]

	WT/Total Weight	Arm	Moment
PILOT	227.00	61.020	13,851.540
CO-PILOT		61.020	0.000
REAR PAX	165.00	99.990	16,498.350
	220.00	99.990	21,997.800
		99.990	0.000
		99.990	0.000
CABIN FREIGHT		88.580	0.000
SIDE HOLDS		125.980	0.000
AFT HOLD		181.100	0.000
PAYLOAD TOTAL	612.00		52,347.690
EMPTY AIRCRAFT	3,218.00	136.470	439,160.460
+ FUEL ON T/O	711.00	136.810	97,271.910
TOTAL T/O 4961 max	4,541.00	129.659	588,780.060
- FUEL BURN 282lb/hr	95.00	136.810	12,996.950
TOTAL LANDING	4,446.00	129.506	575,783.110

Figure 18: Weight and Balance at Accident

[19] See Attachment B

[20] VNE was 155 kts IAS, less 3 kts per 1,000 ft of altitude. Immediately before the accident, the helicopter was maneuvering around 5,200 ft msl between 123 and 130 kts IAS, 130 and 137 kts true airspeed (TAS), and 140-144 kts ground speed.

4.1 FLIGHT CONTROLS AND HYDRAULIC SYSTEM

The Airbus AS350 B3 is equipped with a single hydraulic system, which provides 600-psi hydraulic boost to the cyclic, collective, and tail rotor controls. The main rotor control system consists of a series of rigid rods interconnected by bell cranks and reversing levers. The respective control linkages interface with the swash plate through three hydraulic servo actuators, which are designed to exert the necessary control force; all three servos together control changes in collective pitch. A mixing unit is located aft of the cockpit and utilized as an interface for the cyclic and collective pitch controls. The unit enables each control to operate independently without mutually coupling.

The helicopter is designed so that in the event of a hydraulic pressure failure, main rotor servo accumulators provide boost (over a duration of about 30 seconds) enabling the pilot to land if the helicopter is configured in a hover, or establish the recommended airspeed (40 to 60 kts) to lessen control forces in forward flight. According to Airbus the helicopter can be flown without hydraulic pressure, which will require a lateral control force of about 9 pounds and a forward cyclic control force of about 11 pounds.

If the servo pressure is exceeded the hydraulic system reaches its limitation and the remaining required force has to be supplied by the pilot via the flight controls. This can be felt by an apparent stiffening of the controls, which become gradually heavier to operate. The phenomenon which then arises is called servo transparency.

Servo Transparency[21]

Servo Transparency begins when the aerodynamic forces acting to change the pitch of the rotor blades exceed the hydraulic servo actuators' capability to resist those forces and maintain the commanded blade pitch angles. The force deficit is then transmitted back to the pilot's cyclic and collective controls. On clockwise turning main rotor systems such as the AS350B3, the right servo receives the highest load when maneuvering (retreating blade), resulting in an uncommanded right and aft cyclic motion accompanied by down collective movement. The pilot's control force to counter this aerodynamically-induced phenomena are relatively high and according to Airbus "may give a pilot who is not aware of this phenomenon an impression that the controls are jammed." If the pilot does not reduce the maneuver, the aircraft will roll right and pitch-up. The amplitude of the induced control feedback loads is proportional to the severity of the maneuver, but the phenomenon normally lasts less than 2 seconds.

[21] See the Helicopter Performance Memorandum for a complete discussion of servo transparency

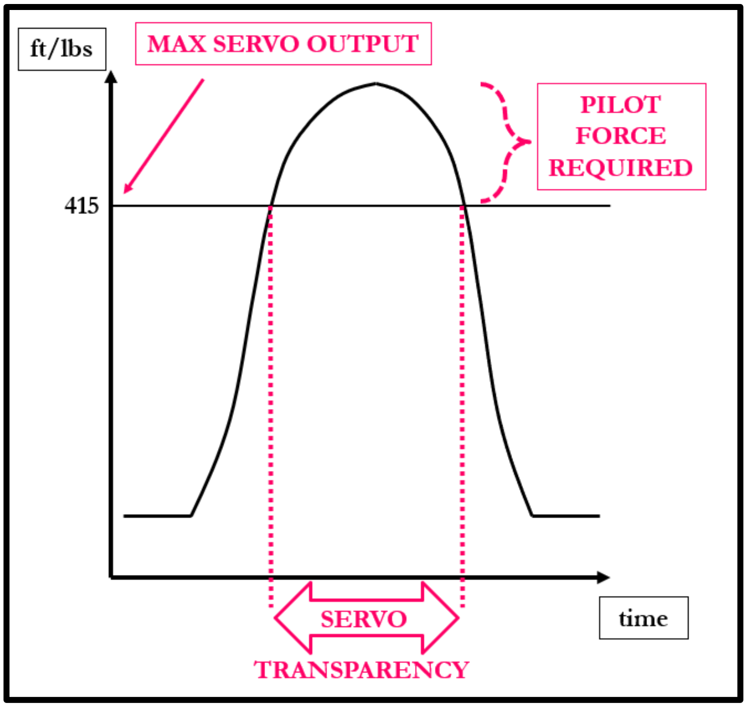

Figure 19: Visual Representation of the Servo Transparency Phenomena.

According to Airbus, the general load on the main rotor increases under the following conditions: high speed, high torque (increase in collective pitch), high g-load, increase in density altitude. Although the helicopter will self-correct and recover from the servo transparency, the potential exists for a significant flight path deviation. The onset of servo transparency is rapid and could conceivably lead to a helicopter in a right turn exceeding 90° of bank before the pilot was able to recognize what was happening and react accordingly. The associated transition from light and responsive controls to heavy controls that require considerable force to counter the uncommanded maneuver, could cause an unsuspecting pilot to believe that he was experiencing a malfunction, rather than a known characteristic of the helicopter when maneuvered at the published performance limits.

The helicopter is not equipped with an indicator or warning to alert the pilot that he is approaching flight conditions susceptible to servo transparency. Additionally, while the Rotorcraft Flight Manual (RFM) describes servo transparency qualitatively, it does not contain specific, quantitative limitations that must be respected in order to avoid servo transparency, or present diagrams a pilot can use to predict when the phenomena will be encountered. Servo transparency results from a combination of the factors referred to above; critical combinations of these factors only become apparent after the fact.

The maximum torque that a servo can deliver is 415 ft-lbs (depending on the pressure in the accumulator). In situations where more torque (or force[22]) is necessary to adjust the blade angle of a main rotor blade, the pilot must add the additional force manually. Although the extra need for force comes gradually, it happens over a relatively short period of time. The cyclic on the AS350 normally requires very little force. The pilot may, depending on how much friction he or she has added, experience that the stick force required changes change dramatically over a brief period which would give the pilot the perception that the controls are jammed.

Servo Transparency Onset in Accident Flight[23]

Based on the calculations described in the Performance memo, the helicopter likely experienced the servo transparency phenomena during the final 6 seconds of recorded data (from 1723:34 to the end of the GAU2000 data at 1723:40). After the helicopter passed over the eastern ridge of Roger's Canyon at 1723:07, the helicopter entered the valley and then maintained a shallow right roll angle. At 1723:32, the right roll angle and normal load factor suddenly started to increase. These changes in roll angle and load factor started below the servo transparency threshold, but crossed into conditions where servo transparency would be expected around 1723:34. The medic describes observing the pilot's hand motions just prior to the crash as seeming "fast, real fast, jerky fast," which is consistent with a struggle with the cyclic forces resulting from servo transparency. He additionally described an aggressive hard right turn which is consistent with the rapid onset of servo transparency.

5.0 METEOROLOGICAL INFORMATION

The closest weather observation station was at the Phoenix-Mesa Gateway Airport, Mesa, Arizona, located about 26.5 nautical miles (nm) southwest of the accident site. A routine aviation weather report (METAR) was issued at 1647 (about 30 minutes prior to the accident). It stated: wind 300° at 5 knots; visibility 45 miles (sm); few clouds at 7,000 ft; temperature 52° Fahrenheit; dew point 23° Fahrenheit; altimeter 30.00 inches of mercury. At 1750 the observation was updated to: wind 270° at 3 knots; visibility 20 m; temperature 46° Fahrenheit; dew point 28° Fahrenheit; altimeter 30.01 inches of mercury.

According to the U.S. Naval Observatory at the time of the accident, the sun was 1.49° below the western horizon on a magnetic bearing of 243°. The moon was waxing crescent with 20% of the visible disk illuminated. Sunset and the end of civil twilight occurred at 1718 and 1746, respectively.[24]

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[22] Torque is equal to force multiplied by a lever arm; to simplify the discussion that follows, "force" will be used to refer to both a force itself and the torque resulting from that force multiplied by its lever arm.
[23] See the Helicopter Performance Memorandum
[24] See Attachment E: Sun and Moon Calculations

A review of the weather data[25] revealed that there was potential for light low-level wind shear over the terrain in the accident area. Given the desert terrain, at sunset (when the accident occurred) the temperature at the ground would have cooled quickly due to dryer air and no cloud layer. This is consistent with the potential of a low-level inversion right near the ground which could form instantly, resulting in a low-level wind shear with low to moderate turbulence below 400 to 500 ft agl.

FAA Advisory Circular 00-6B (AC-00-06B), section 17.2.3.1, describes how areas near temperature inversions are favored for wind shear conditions. The AC notes that "Strong wind shears often occur across temperature inversion layers, which can generate turbulence."

6.0 COMPANY INFORMATION

According to the Director of Operations, Air Methods is the largest commercial on-demand air taxi operator specializing in helicopter air ambulance (HAA) services. The company was established in 1982 in Colorado, and in 2015 served 42 states with air medical transport services (both community-based and hospital-based). The Air Medical Services Division, which generated 86 percent of their total revenue, provided medical care, aircraft operation, and maintenance in accordance with the Federal Aviation Regulations (FAR) Part 135 standards. They operated 372 helicopters and 28 fixed wing aircraft; the helicopter fleet was 80 percent Airbus, consisting of 117 AS350s. As of December 31, 2015, Air Methods had 4,554 full time and 244 part time employees, consisting of 1,456 pilots; 935 aviation machinists, airframe and power plant mechanics, and other manufacturing and maintenance positions; 1,314 flight nurses and paramedics; 365 dispatch and transfer center personnel; and 728 business development, billing, and administrative personnel. In 2015, Air Methods conducted 63,104 patient transports out of 293 bases, of which 209 were community-based.

Air Methods operates in accordance with FAA approved Operations Specifications (Ops Spec) for Title 14 CFR Part 135 under certificate number QMLA253U. The latest Ops Spec un-numbered revision was dated December 01, 2015. Contained in the Ops Spec was authorization to conduct on-demand operations, single engine instrument flight rules passenger-carrying operations, use of an autopilot in lieu of a second-in-command, and night vision goggle operations.

In accordance with 14 CFR Part 135.21, Air Methods kept current a General Operating Manual (GOM), which identified management policies and responsibilities, training/currency policies, and the procedures under which flights are to be conducted. Prior to the accident, the latest revision of the GOM was revision 8, dated March 11, 2014.

[25] See Attachment G: Weather Information

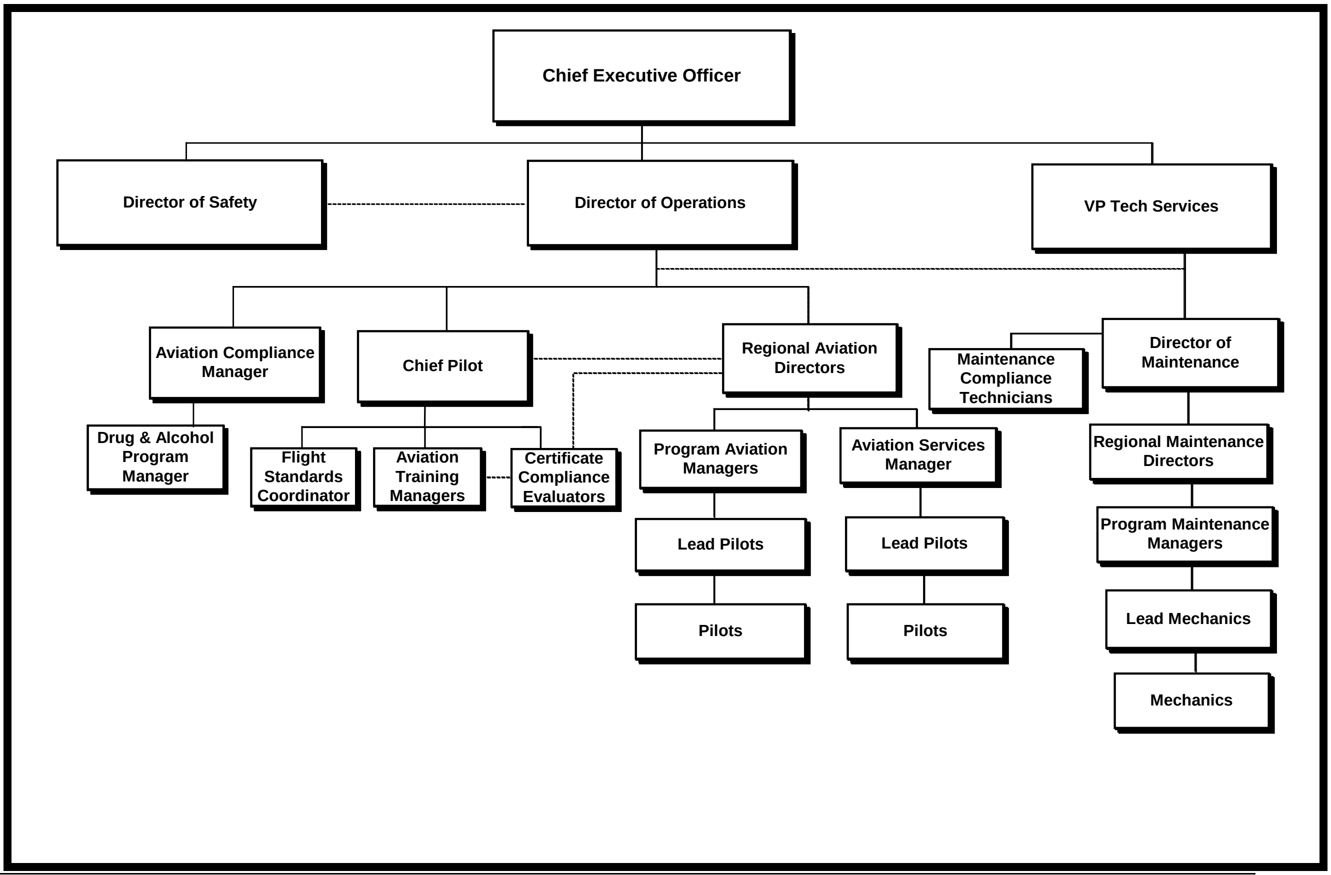

Figure 20: Company Organization

The Director of Operations reports to the Vice President, and supervises the Chief Pilot, the Director of Maintenance, the Aviation Compliance Manager, and Regional Aviation Directors. He additionally ensures that all flight operations are conducted safely and in compliance with all FAR's, Operations Specifications, and Air Methods policies and procedures, and has authority to act for the certificate holder (Air Methods). The chief pilot reports to the Director of Operations, and supervises Aviation Training Managers, the Flight Standards Coordinator, Certificate Compliance Evaluators, and Pilots. Additionally, he is responsible for all pilot records, ensures pilots are current and qualified, supervises all training activities, ensures all company aircraft are properly equipped, and develops training manuals and programs. The Regional Aviation Directors report to the Director of Operations, and supervise Program Aviation Managers and Aviation Services Managers. They are also responsible for overseeing daily operational activities, ensure all flight operations are conducted safely and in compliance with FAR's, the Operations Manual, Operations Specifications, and company policies.

6.1 GLOBE OPERATIONS

The accident helicopter and crew were based in Globe, Arizona, which was referred to as Native 5.[26] It was operated according to a community-based model, wherein Air Methods acts as an independent entrepreneur and earns revenue only when it provides helicopter transport. A typical Air Methods community-based facility has about 13 full-time employees, including pilots and medical crew at each base. Community-based revenue comes from flight fees billed directly to patients, their insurers, or to governmental entities.

Native 5 was collocated in Globe Arizona with Native 3. Base personnel would keep the helicopter fueled with between 78 to 87 gallons of fuel which would suffice for the majority of Air Methods' service area. The Gateway Airport was one of the preferred fueling areas.

6.2 AIRCOM

The communications center, AirCom, located in Omaha, Nebraska, is delegated the authority to provide flight following services to Air Methods aircraft. They are responsible for filing company flight plans prior to each flight and tracking the aircraft until flight completion. AirCom employs 155 people,[27] of which 105 are communication specialists. The communication center is divided into regions and each specialist is only assigned to one region. All regions are supervised by an operations manager, and a day and night assistant operations managers. There is a floor supervisor for each region, which supervises 10-12 communication specialist.

The regions are divided into clusters of desks, which AirCom refers to as "banks," and where the specialists sit at "consoles." Typically Consoles 1 ("San Carlos") and 2 ("White River") in the "Western bank" are assigned to the Arizona region and together provide services to 19 aircraft.

[26] The primary helicopter used at Native 5 was the accident helicopter N74317, but other helicopters would be used if that helicopter was rotated out for routine maintenance. Internally Air Methods documents refer to the base as PHOAZ, number 5219.
[27] As of the date of the accident.

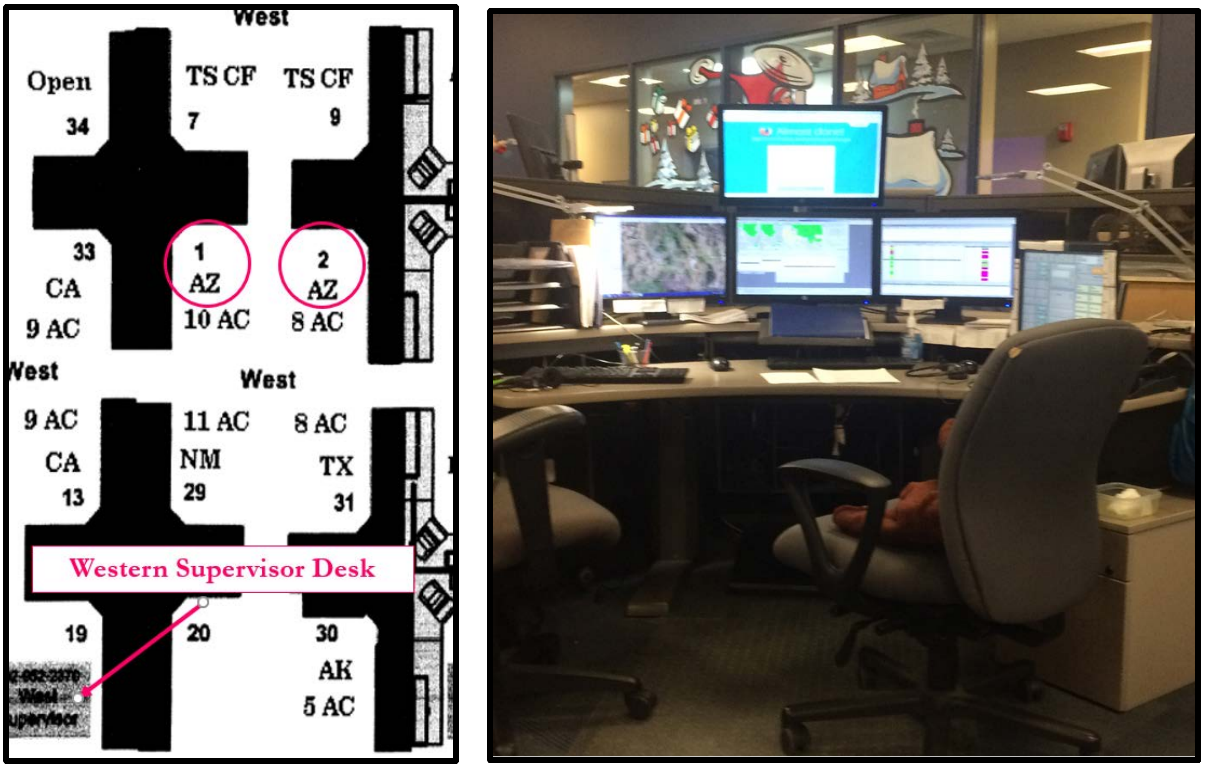

Figure 21: Layout of West Bank and Position of Desks and Console 1.

Duties

Flight requests (e.g., requests for a patient transports or medical evacuations) were routed through an AirCom specialist who would receive the request from the local/state run area dispatch system. The specialist would then notify the Air Methods pilot of the request and enter the required flight plans into the AMC (an internet-based flight logging program) and RescueNet (a computerized dispatch and billing program) prior to departure. All known legs would be entered at this time. Thereafter, the specialist would coordinate the patient transfer with the requesting agency and receiving hospital while providing flight following.

According to the Air Method's GOM, the AirCom specialist enters and updates all flight plan information in AMC and RescueNet in a timely fashion, including departure and arrival points, liftoff and landing times, position reports, and flight plan changes. When an aircraft lifts off for an assigned flight, the pilot provides the specialist with the following information: the number of people on board, fuel load remaining in flight time (hours and minutes), destination, Estimated Time of Arrival (ETA), and risk assessment value. Position reports are not required if the helicopter is equipped with a SkyConnect tracking device. If the helicopter is not equipped with a SkyConnect or if it malfunctions, the pilot is required to make a position report every 15 minutes. If the pilot fails to make the report, the specialist is required to call the aircraft and request a current position report. When landing is assured at the intended destination, the pilot will notify the specialist by radio or telephone of the landing time which enables the specialist to complete or “land” the flight in AMC and RescueNet.

Communications Specialists

As part of the investigation, the NTSB reviewed the FAA approved Communication Specialist training. The purpose of the training is to acquaint recently hired specialists new to air operations with Air Method’s policies, procedures, forms, and organizational and administrative practices, and to ensure they have acquired basic communication and flight following skills. The training generally consists of a two-week program and four tests which the trainee must pass. Thereafter, the trainee would begin on-the-job-training for about 2 to 4 months before he/she would be considered able to perform the required duties independently. At first the trainee is “tethered” to a trainer who will listen and monitor their operations. Later they will be assigned a bank partner and receive a “checkride” to ensure they are performing satisfactorily.

According to the AirCom Director, the specialists are mostly Omaha locals. He estimated there was about a 24% attrition of specialists per year. Scheduling consisted of 36 and 40 hour work weeks. The 12-hour daytime shifts were from 0400, 0430 and 0500 to 1600, 1630, 1700, respectively.[28] The remaining 12 hours in each day comprised the nighttime shifts.

6.3 Operational Control Center (OCC)

When AirCom entered the flight plan into RescueNet, the Air Methods Operational Control Center (OCC) in Englewood, Colorado, would be notified. The OCC was primarily responsible for ongoing risk assessment while providing advisory/alert information affecting Air Methods aircraft using a flight management system (FMS) that monitors the aircraft position. Advisories/alerts may include, but are not limited to, flying in the vicinity of marginal or deteriorating weather conditions, temporary flight restrictions (TFR), ground proximity, or any other circumstance that could become a hazard to flight. All alerts were normally communicated to the pilot through AirCom. The OCC was able to communicate to Air Methods aircraft directly through SkyConnect or through the aircraft radios. The OCC was also responsible for initiating and managing Air Methods post-accident/incident response plan. An experienced EMS helicopter pilot was always on duty at one of the three OCC workstations and during night operations.

6.4 Computer Software

[28] Given in mountain standard time.

Air Methods uses RescueNet for their Computer Aided Dispatch (CAD) and billing program which is the primary software for "building flights" at AirCom. AVL Hub is the data center for GPS tracking data. When a helicopter's rotor begins to turn the GPS data ping is sent to the GPS vendor (i.e., Skyconnect/Outerlink and Skytrack) and the vendor in turn sends the data feed which encompasses the latitude/longitude and tail number. That information goes into a database that AVL Hub uses for the Air Methods network.

AirCom uses RescueNet when the flight is generated and creates the approved dispatch. From RescueNet the information is sent to the Air Methods OCC FMS that provides the tail number and flight plan, and the FMS system matches the tail number with corresponding graphical overlays on the FMS display. The actual helicopter position as from GPS data is overlaid on the route defined in the flight plan together with the FMS weather information. A significant departure of the helicopter GPS track from the planned flight route would be flagged on the OCC FMS display by the helicopter's icon changing color. The AirCom does not have access to the FMS display. However, the FMS monitoring of the GPS track against the planned route ends when the flight plan is closed after the patient is dropped off at the destination.

After the AirCom specialist logs the trip as completed (i.e., lands the aircraft in RescueNet), the information is sent to RescueNet's billing module. The track data is taken out of AVL hub and the mileage calculated. The actual miles flown during the patient transport leg are sent to the RescueNet billing module, which also includes the dispatch record and medical record EMS charts. This information is directed to a team for pre-billing. AirMethods does not use Appareo data for tracking, but according to the Director of Operations has future plans to incorporate that data into the FMS.

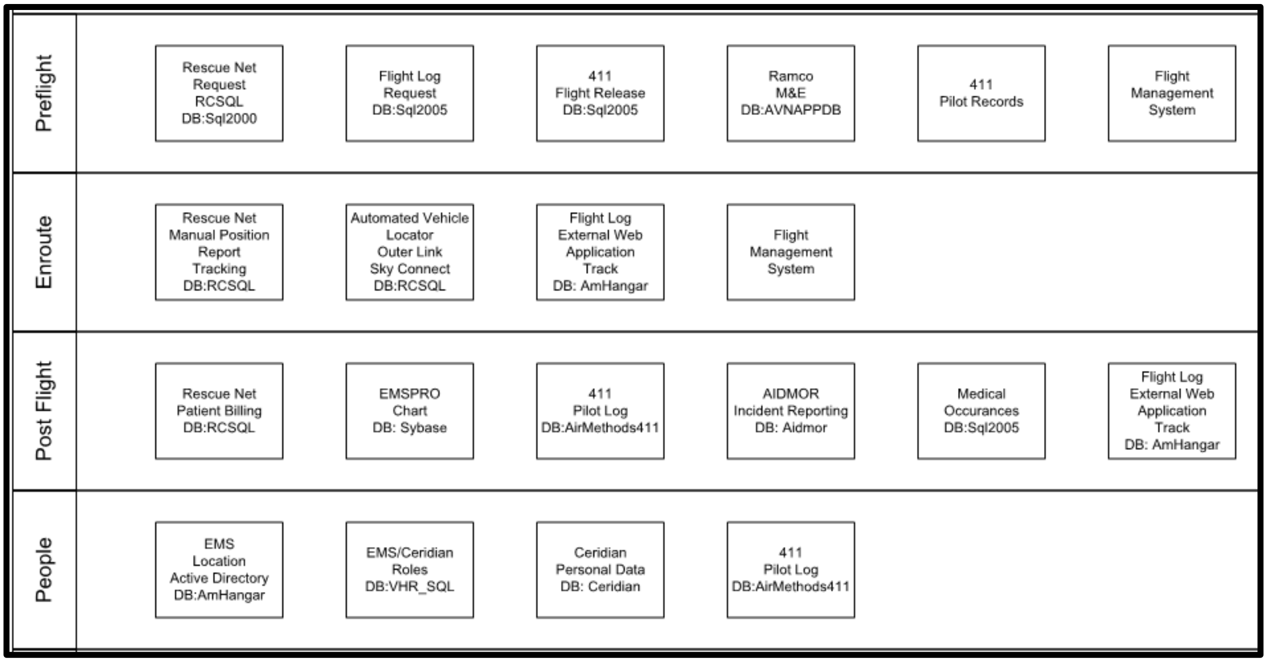

Figure 22: Computer Systems Used for Various Operations

6.5 PILOT SCHEDULING

The Air Methods pilots belonged to the Office and Professional International Union that had a collective bargaining agreement (CBA)[29] with the company that outlined the pilot scheduling. Article 16 of the CBA stated that the pilots at each base shall determine the appropriate schedules of service consistent with company and customer service requirements, and maintain schedules of service, which provide 1 day off for each day scheduled. The Native 5 base pilots were scheduled in a 7-days on, 7 days off duty cycle. Each 7-day duty period consisted of 4-day shifts and 3-night shifts, or vice versa, to balance the total time between day and night shifts. The typical day shift was from 0630 to 1830, and the typical night shift was from 1830 to 0630. Most pilots arrived about 20 minutes prior to the scheduled turnover time. The Native 5 base was a trailer home with private rooms where the air and medical crews could rest and sleep between flights.

6.6 PILOT TRAINING

The Air Methods training department consisted of 52 people all of whom are overseen by the Chief Pilot. When a pilot is hired he/she will go through indoctrination training. As part of the hiring process, the pilot will undergo drug test screening, a background and Pilot Records Improvement Act (PRIA) check. After a pilot is hired, he/she is sent to Air Methods

[29] See Attachment D: Collective Bargaining Agreement

headquarters in Denver to attend a 10-day ground school. This includes general training about company policies, FAR review, human factors, night vision goggles, etc. Thereafter, the pilot is branched off into the aircraft specific model that they will be flying. The flight training portion encompasses about eight hours of flight time which includes a checkride. After the ground and flight training are complete the pilot performs local area familiarization at the base. This takes about five hours of flight training in the area before he/she is determined to be ready to start performing the normal duties. Upon successful completion of a simulated transport flight from the base, the pilot is signed off to start their normal duties.

During the flight training portion of the pilots' indoctrination there is a form for each training flight and checkride. The trainer is not provided information about the pilot including his or her total hours or flight experience. The assistant chief pilot decides if remedial training is needed in addition to the indoctrination and spends time during the indoctrination, setting up expectations. The training department and operations work hand-in-hand as a general training philosophy.

In accordance with 14 CFR Part 135.21, Air Methods GOM identified training/currency policies.

General and Semi-annual Training

Chapter 1 of the Air Methods Pilot Training Program, titled "General", addresses the overall scope, purpose, and various definitions of training. Semi-Annual Training is addressed in Chapter 1 as follows; "This category of training is required by Air Methods and will be provided to all crewmembers. Semi-annual training is scheduled and due 6 months after the base month. A crewmember may complete semi-annual training grace month early or grace month late." FAA regulation requires only that a pilot complete an annual FAR Part 135 airman competency check.

6.7 AIR METHODS GOM POLICY ON MINIMUM ALTITUDES

Air Methods' GOM Section 3.9 provided a policy for minimum altitudes for VFR operations. The policy stated:

> At all times, with the exception of takeoffs and landings, Air Methods' pilots will operate at an altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or

property on the surface. While en route, Air Methods' helicopter pilots will maintain at least the following minimum altitudes:
• DAY: 300 ft AGL.
• NIGHT: 500 ft AGL

In addition, a note stated: "In all cases, aircraft will not be operated so as to pose a danger to persons or property on the surface."

Following the accident, the company issued Safety Bulletin 08-2015, that stated the company was implementing a zero-tolerance policy for deviations from the GOM minimum altitudes.[30]

6.8 SAFETY PROGRAM AND CULTURE

The Air Methods General Operations Manual provided information about the company's safety program. The manual indicated that Air Methods was committed to attaining "the highest level of safety" in accomplishing the company's mission. The manual also indicated the core elements that comprised Air Methods' safety program, which included the company's safety management system (SMS) policy manual and accident, incident, damage, malfunction, and operations reports (AIDMOR).

When fully staffed, the Air Methods safety department comprised a Vice President of Safety and Risk Management, a Director of Flight Safety, six Regional Safety Directors, a Flight Operational Quality Assurance (FOQA) Manager, an "excellence through quality" manager, an Aviation Safety Action Program/maintenance safety action program (ASAP/MSAP) manager, and 156 field safety representatives.

During post-accident interviews, Air Methods personnel indicated that the company participated in several safety programs (in addition to SMS, AIDMOR, ASAP/MSAP, and FOQA), including the line operational safety audit program, the internal evaluation program, the AlertLine application, and post-accident and incident reporting. Pilots could also communicate safety-related information with management in person or via e-mail or telephone.

The Globe base completed daily safety discussions that were to be based on different sections of the GOM. The pilot was the safety officer for Native 5. The last 2 briefings completed he signed off as covering: equipment backup and fuel leakage response.

Operational Risk Assessment Program

The Air Methods GOM detailed the operational risk assessment program they developed and implemented to assist pilots in identifying, assessing, and managing risks, and then provides

[30] See Attachment K: Minimum Altitude Notice

mitigation guidance. The risk assessment matrix is utilized for each flight assignment, and is recorded in the daily flight log. The matrix breaks down the categories of risk as A (low risk), B (medium risk), C (high risk), and D (extremely high risk). The pilot uses weather criteria and cross references with aircraft status, environment specifics, and fatigue, for both day and night operations. During the accident flight, the pilot reported to AirCom a risk assessment value of "B". According to Air Methods, a risk assessment value of "B" is common.

The pilots flight release for the day of the accident was issued at 0619 and until 2019.

6.9 ATTRITION

The pilot interviewed stated that they liked flying for Air Methods, although most of them had flown for a prior company that was bought by Air Methods. The Director of Safety estimated that the attrition rate of the pilots is lower than the rest of the industry because of the competitive pay and schedule flexibility.

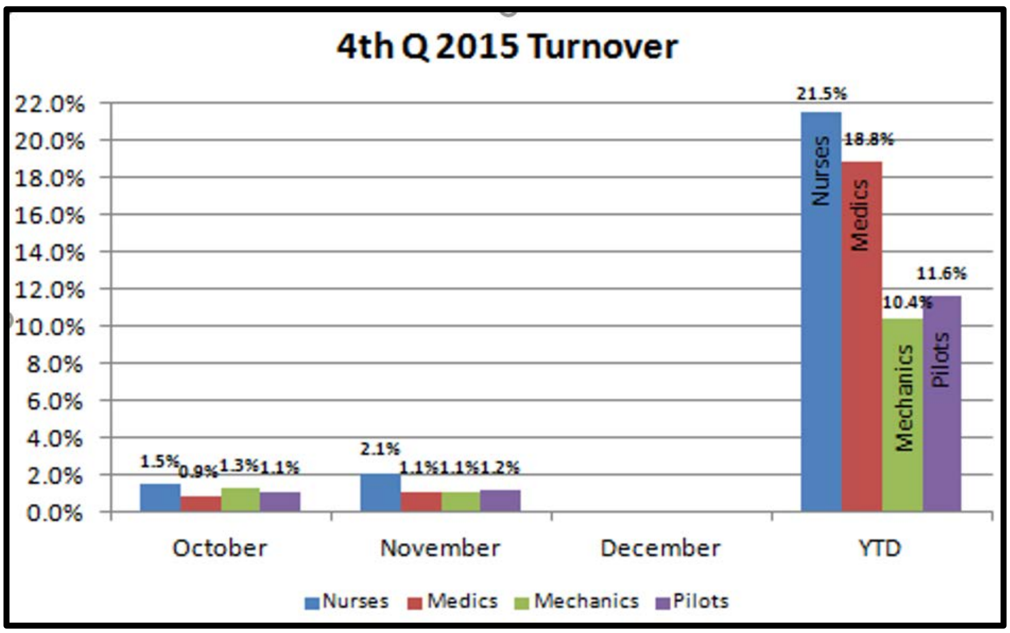

Figure 23: Attrition the Months Prior to the Accident

7.0 RESPONSE

According to the Air Methods GOM, "Any aircraft on a VFR flight which fails to arrive at any given destination within a 15-minute time factor of the most recent estimated time of arrival (ETA)… will be considered overdue or missing." Upon expiration of the 15-minute time factor without communication, the communicator [i.e., the AirCom specialist assigned to the flight] is to initiate the lost communications/overdue aircraft procedures. Thereafter the communication specialist's initial steps include: contacting the referring and receiving hospitals to confirm the aircraft is not there; making at least two attempts to contact the aircraft on the appropriate frequency; notify appropriate Air Methods officials; contact the OCC to inquire if they know the status of the aircraft. The Post Accident/Incident Plan (PAIP) is initiated thereafter.

7.1 AirCom

The helicopter impacted terrain about 1723:40, although the last radar return from SkyConnect was at 1723:18 and the last return in RescueNet was 1723:29. At 1816 AirCom noted that there were no anomalies or issues to report during the shift and dispatch showed that a review was completed. According to the pilot's company cell phone, AirCom first attempted to contact the pilot at 1923. A minute later RescueNet recorded that the helicopter landed at the base at 1924:15, for reasons that will be explained below.

On the day of the accident, the San Carlos desk shift was from 0430-1630 and 1630-2000.[31] The specialist handling the accident helicopter worked the shift from 1630-2000 and was situated at console 1[32]. On the day of the accident, she arrived before 1630 and noted that the specialists at the consoles were not able to give their normal pass down information[33] because they were too busy. She pulled up the flights covered by Console 1 and immediately began to start taking lift and landing information.

[31] These times are in mountain standard time to be consistent with the accident location, despite Omaha being central standard time.
[32] She would normally be stationed at console 2.
[33] Usually, when a specialist begins their shift, they have a verbal and written "pass down" where the specialist they are relieving informs them of activities during their shift.

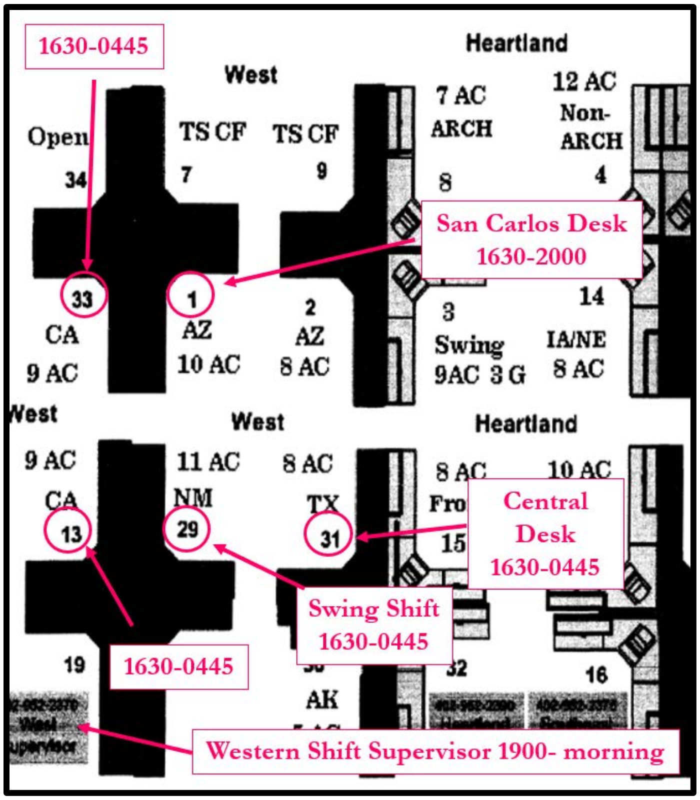

Figure 24: Desk Occupancy and Shifts During Accident.

The specialist quickly became busy with numerous aircraft calling in to the point where she began to physically write down the lift times and planned to later enter that information in the computer when flight activity slowed. She received so many calls that other specialists in the Western bank began to answer some of the calls for her. One of the specialists in her bank left for the day at 1650 and the other left at 1700, both commenting that she would be okay because all the aircraft were in the air, returning back to base[34] and the on-call person would be arriving later. She estimated she was handling 6-8 flights when they left, which was abnormal since she normally would only be handling 1-2 flights. Even with a partner she would normally be sharing a load of 6 flights. As the night progressed, she continued to physically write down the flights and times and reasoned that when it slowed down she would go back in the system and enter the correct liftoff and land times.

The specialist talked to the accident pilot and took the flight's liftoff information from Gateway Airport going back to their base.[35] The specialist received a notification on her computer screen that the helicopter should be close to landing, at which point she clicked "OK" for the

[34] They were all likely showing they had not landed yet, because the specialist had yet to enter the land time, which closes out the flight and makes the aircraft show as available for future requests.

[35] The entry in RescueNet shows that entered a liftoff time of 1705:52.

helicopter's status and then clicked "Cancel" to stop the notification and keep the helicopter within its required time.[36]

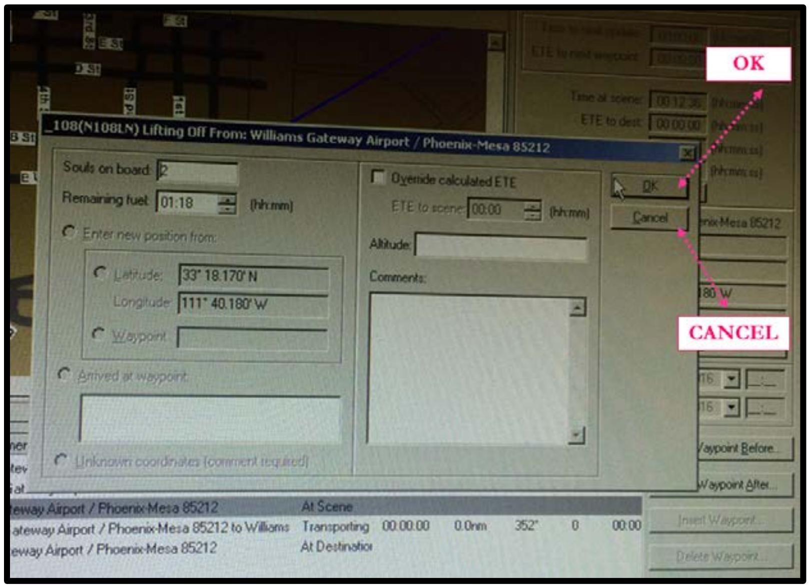

Figure 25: Example of Pop-Up Notification of Landing Aircraft

About 1900 the AirCom Operations Manager intercepted a call from a hospital inquiring about Native Air 17 and he went to the Arizona console to speak with the specialist about the status of the helicopter. She stated that she didn't know where any of the aircraft were and he immediately logged onto another console and began trying to locate all of the helicopters, which was difficult because she had written most of the information down on a paper.

The Assistant Operations Manager opened the software and pulled up the flight logs one at a time in an effort to gain situational awareness and determine where all the helicopters were located. He noted that Native 5 (N74317) was last tracked two hours prior and asked all of the specialist if anyone had talked to the aircraft. He probed further upon which the night shift communications supervisor landed/completed the flight in RescueNet. The Assistant Operations Manager, not having confirmation that anyone on the team had actually spoken to the crew of Native 5, (N74317) began to request assistance of other entities, bases in the local area, as well as diverting Native Air 17 to fly to the last tracked position that was recorded. Native Air 17 advised that they were getting low on fuel and had to return back to their base but had seen the accident location.

[36] When an aircraft stops flight following (e.g., if landed, if GPS contact is lost, etc), a box will pop-up and the specialist is trained that they should try to establish communications through the radio and then through a satellite phone. If the helicopter is still in the air, the specialist can update the position by entering the coordinates in a box and the timer will reset for five minutes. The specialist must first acknowledge by clicking "OK" and the specialist can click "Cancel" the box will disappear permanently.

Accident AirCom Staff

The specialist handling the accident helicopter began with Air Methods on July 06, 2015. The first time she worked the desk without a trainer was November 20. On November 21 the specialist sent an email to her manager stating that she was concerned about taking the night shift without a partner. She stated that "the night shift is really overwhelming" and that she did not think she was as prepared as people thought she was.[37] The night of the accident was her first time working a desk without a partner.

She described her on-the-job training as having to stay focused on the radios so as to prioritize answering calls. She would often feel too busy without a partner, but felt her supervisors would not listen to her.

The day of the accident the Western Shift Supervisor left at 1730 and did not provide the normal pass down information to the night supervisor, who arrived at 1900. After arriving, the night supervisor logged into his computer, and after being asked by another communication specialist, observed that both Native 3 and 5 were not showing as available. As he became aware that there were discrepancies, the Operations Manager had made his way to the accident specialist's console.

On the day of the accident, the Operations Manager arrived around 1700. Upon arrival, he made a quick walk through the floor and did not observe anything unusual. He was tethered into console 36 and monitoring a trainee's progress. He additionally conducted side meetings with other supervisors. He stated that the call volume did not seem unusual (same as previous nights), although he did put in a request to activate the on-call person for additional assistance. He did not speak to the specialist handling the accident helicopter until he made the call about Native 5 to Native 17.

7.2 OCC

The Air Methods OCC had the flight plan displayed for the accident flight. The flight plan was comprised of four segments and had been built up, as per normal protocol, by AirCom. There were no alerts in the Flight Management System within OCC for segment 1 (the flight to Cobre Valley), and common alerts were given for segment 2 (the patient transport leg) which included 4 nm deviation alerts. The following are the segments listed and indications given to OCC through the FMS.

1. Globe base to Cobre Valley Community Hospital
   Blue helicopter depicting a community-based service flight
2. Cobra Valley Community Hospital to Banner Baywood Medical Center

[37] See Attachment I: Records of Conversation Miscellaneous

Blue helicopter indicating a community-based service flight following segments with alerts of 4nm deviation from route

3. Banner Baywood Medical Center to Williams Gateway Airport
   White helicopter indicating helicopter back to base
4. Williams Gateway Airport
   White helicopter indicating helicopter back to base

In segments 3 and 4, when the helicopter was en route to obtain fuel and then back to base, the flight plan disappeared in the FMS and the helicopter is displayed as a "ghost"[38] while they are receiving satellite tracking data. When the helicopter is in ghost mode, the FMS does not generate overdue alerts. Instead, overdue alerts are typically displayed 15 minutes after the helicopter fails to report its location via a ring around the last known position; the overdue ring will continue to expand every minute thereafter. When the helicopter has no satellite signal and there is no flight plan present (as on "ghosted" flight segments), the helicopter will not be displayed in FMS, which is consistent with why the accident helicopter disappeared from the FMS screen after its satellite signal was lost.

7. 3 TIMELINE[39]

At 1930 and then 1941 AirCom telephoned OCC querying for the pilot's personal cell phone number and informed them that they lost tracking of the helicopter. The OCC specialist verified the last signal received was at 1723 but relayed that RescueNet showed the helicopter landing at 1924, to which AirCom responded that they (AirCom) had closed the flight, which essentially "lands" the helicopter. At 2009 Native 17 reported that they had located the wreckage. At 2154 the San Carlos Department of Public Safety relayed that they had hoisted two medics down to the crash site to assist the occupants.

The FAA's Phoenix-Mesa Gateway Airport tower controller received a call from AirCom stating that the helicopter departed at 1705 and wondered if the tower had "heard anything from them recently." She was unsure of the time zone but said it was about 2.5 hours prior and that they hadn't heard "anything from 1723 and on." The controller asked what the estimated of arrival was for the helicopter to arrive at Globe. She responded that the flight time should have been 21 minutes.

Zoë Keliher
Air Safety Investigator

[38] The display is referred to as a "ghost" because the helicopter graphic turns white.
[39] See Attachment L: OCC's Notes From Accident