Air Methods A350B3e accident
Frisco, CO
July 3, 2015
CEN15MA290

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ATTACHMENT 1

Interview Summaries

35 Pages

Interviewee: Matthew Bowe, Flight Nurse, Centura Health
Date/Time: July 22, 2015, 1630 mdt[1]
Location: Frisco, Colorado
Representative: Peter W. Rietz, lawyer, and his wife
Present: Jennifer Rodi (NTSB)

During the interview, Mr. Bowe stated the following:

Mr. Bowe was a flight nurse with Centura Health and was based at the Summit Medical Center. He had been employed there for 4 years. He flew with Capt. Mahany off and on for 4 years and full time for the last year.

The accident flight was a public relations flight to a Boy Scout wilderness camp. On the morning of the accident the crew (the pilot and two flight nurses) conducted their routine briefing. These briefings typically take place every morning and involve the entire flight crew. During these briefings they discuss weather, crew readiness, maintenance issues, public relations activities for the day, scheduled flights for the day, fuel load, NVG currency, and any other concerns for the day. Bowe did not recall the specifics of the morning briefing but did not recall any specific or unique concerns and nothing stuck out for the accident flight.

Bowe did not recall if fuel had been added prior to the flight. He remarked that it is typical for the time of year for there to be between 65 and 85 gallons of fuel on board. Prior to the flight he recalls the GPU being pulled prior to takeoff but did not recall his specific preflight activities either inside or outside of the helicopter.

He stated that prior to takeoff there is a pilot challenge crew response checklist. He is confident that this was performed but does not recall it specifically. He did not recall the specifics of Mahany's checklist use prior to taking off.

When asked to clarify his statement regarding "trying to gain forward airspeed" he stated that he could not clarify – he was not sure if this is what actually happened or what was expected.

When asked to elaborate on his statement regarding the unusual pitch he stated that a normal takeoff involves a smooth lift and a smooth turn. If the pilot is going to perform something abnormal it is briefed prior to the flight – nothing was briefed regarding an abnormal takeoff.

After the takeoff Bowe did not recall any caution lights, horns, alarms, nor did he smell anything abnormal.

Bowe called out to Mahany during the takeoff and was asked what control inputs he could see. He could not recall him doing anything with the collective and could otherwise not see the cyclic or pedals. He stated that they were well above the hangar – at least 40 feet – and at least 80 feet above the ground at their greatest height.

[1] Mountain daylight time (mdt)

Bowe's injuries included L1 burst (fracture) which involved compression and bruising to the spinal cord – a pure conus injury. His symptoms included urinary and bowl function issues and neuropathic pain. He also had a transverse process fracture. He had scratches and scrapes but no burn injuries. He was admitted on July 3rd and discharged on July 20th.

Bowe provided the following description of the accident flight and elaboration on typical procedures:

The normal direction of departure and egress route is to the north. During the takeoff there was an immediate shutter, fore to aft pitch movement right at takeoff – a bucking-type movement and a lousy takeoff. Bowe was going to "raz" Mahany about the takeoff because it was so rough and so not typical.

The helicopter turned or rotated to the north harsher than it should have been but the expected direction to turn. The helicopter paused for a split second and then continued to spin 360 degrees around. He did not recall the winds from the day of the accident but did not perceive them to be an issue.

The helicopter paused again in a north or hopeful direction and he was thinking LTE. He was aware of what LTE was and knew that the pilot needed to put it back down or gain forward airspeed. At this time he called out Mahany's name but he did not respond. Typically Mahany talks a lot and is only quiet when he is working hard. From the back, Mahany had the look of a person with a firm grip on the cyclic with his right hand.

Both flight nurses tightened their seatbelts and the helicopter lurched forward, and he perceived this as an attempt to gain forward airspeed. Then the helicopter started spinning violently or intently. Bowe had never been in a spin that violent before. All of the spins up to this point were in a flat axis. Once the spins became violent he did not recall a lot.

During the impact his eyes were closed. He felt like the helicopter struck several things – back, side, side… and he felt his head hit an object. He opened his eyes and felt a ringing in his head – he did not recall any smells. He was disoriented and dazed. He did not recall unbuckling his seatbelt – he felt like he was half in his seat and half out. His left foot was edged on the right side of the pilot's seat and the pilot's oxygen. He felt he was sideways but not completely 90 degrees.

Mahany was out of his seat on the gall wing door. His head was scrunched – it was hard to reach him so he pinched his cheek with no response. There was liquid pooling on the ground under and around Mahany and Bowe's flight suit was soaked in fuel which was later cut off of him. It was a full body, long sleeve, nomex flight suite provided by the company. He was not aware of the burn rating for the suit.

He saw a cyclist approaching the wreckage and felt the urge to egress. He tried to move and used his hands to unwedge his leg. He pushed himself up out of the helicopter and felt as if he fell off or out towards the ground. He stumbled and rolled clear and then recalled being drug away from the helicopter.

He recalled a “wave of fire” pour over Mahany. The emergency room tech responded with a fire extinguisher and he recalled Mahany being put next to him. He tried to help Mahany but he could not move. Mahany moaned and gurgled but did not say anything.

Interviewee:	Karen Sue Mahany, Spouse of accident pilot
Date/Time:	November 19, 2015, 1015 mst[2]
Location:	Air Methods Corporation, Englewood, CO, via phone
Representative:	Roger, brother
Present:	Katherine Wilson (NTSB), Jennifer Rodi (NTSB)

During the interview, Mrs. Mahany stated the following:

She met her husband, Capt. Mahany, when she was a flight nurse for Flight for Life. She started in November 1998. He had left Flight for Life right before that. She thought he was gone about 18 months with a corporate job and then returned to Flight for Life in December 1999; that was when they met.

Mahany had been voted as the vice president of the pilot's union. He had a lot of passion in that and would have work to do for that on his days off. He had held that position for about 6 months prior to the accident. He always did union work when he was off duty.

Mahany joined the military and attended boot camp in February 1970, and volunteered and attended flight school in April 1970; he flew helicopters.

He liked flying EMS helicopters because it was a stable position. He had flown a lot of jobs around the country, EMS provided stability for his family.

Mahany liked Air Methods as an organization. He loved Flight for Life and working for Air Methods kept him with Flight for Life. He had previously worked for Rocky Mountain Helicopters which was absorbed by Air Methods. There was nothing that Mahany did not like about working for Air Methods. When he would attend meetings at the Air Methods headquarters, he would stay longer because he liked visiting with everyone.

He was concerned about the number of EMS helicopters that crashed on a regular basis. He had mentioned the fuel containment system; when she asked him about a hard landing, he said it was a flying gas tank and would go up like a bomb. He was also concerned about flying a single engine aircraft across the mountains and had made it well known to the Flight for Life organization on several occasions that they should transition to dual engine aircraft for the safety of everyone.

He had been flying from the Frisco base since September 2004. He had been flying in Denver before a position came open in Frisco.

About 1-2 years prior to the accident, Mahany had a checkride in a simulator and he felt that it was not "real life" and was geared towards the younger pilots who were "video savvy." She thought the simulator training was in Dallas. He told her that most pilots he talked to said it was not real life flying and was not an accurate testing of their ability to fly the aircraft. Air Methods

[2] Mountain standard time (mst)

made a decision to change that because it was not realistic. She thought training occurred in March 2014.

In the past, he had flown outside of work, but that was before they got married. After they got married, he enjoyed being with her on his days off so he stopped flying.

Asked to describe what Mahany was like personally, she said he was so fun and he lit up a room when he walked in. An old Army friend of Mahany send her an email that said "there are two kinds of people in this world – ones that knew Pat Mahany and ones that wished they knew Pat Mahany." He was kind, always had something very funny to say, quick witted and religious. He did things the way he was taught to do them; she thought that was because of his catholic upbringing. He was a rules follower even though he was gregarious. He would do anything for his friends. Their 20 year age difference was not an issue.

At the time of the accident, they were living in Golden but for 11 years prior to that they lived in Silverthorne. They sold their house in September 2014, and had rented a house in Golden so that she could be closer to her job as a nurse anesthetist. They also rented a "lock off" apartment in Silverthorne from September 2014, until June 2015. Because they were moving to Missouri at the end of the month, Mahany was going to live in their RV in the interim beginning on July 1, 2015. She clarified that they drove to Frisco, CO, on July 2, and stayed in the RV. He was on duty July 3 and planned to stay in the RV while he was on duty. His normal schedule was 3 days on, 3 nights on, 6 days off.

Regarding his activities in the 72 hours prior to the accident, she was working on June 30, 2015, and he was off duty. He did things around the house until she got home between 1600-1700. He would cooked dinner if she was working and he was off. She did not recall anything specific about what they did that night or going anywhere; they were homebodies. Mahany in particular when getting ready for his shift, he liked to relax and chill; he loved home. Because she was working on July 1, they would have gone to bed by 2100. He would go to bed with her and might watch TV for 15-20 minutes and then would go to sleep. She got up about 0500 on July 1 and he would stay in bed. They had 4 dogs and he probably got up about 0600 to feed them. He did not discuss his activities with her that day but they exchanged text messages. They would have gone to bed about 2100 again on July 1. They slept at their rental in Golden. There were no distractions or disruptions during the night. He did not mention being tired when he woke up on July 2.

On July 2, she go off work about 1630 and they had texted several times. During the day he had gone to get the RV out of storage, washed it at the truck stop, got groceries and packed the RV. He waited for her to get home before driving to Frisco. They were on the road between 1730-1745; traffic was slow. He drove the RV and she drove their pickup truck. She stopped to pick up sandwiches for dinner and he continued to Frisco, arriving before she did. She thought he arrived in Frisco about 1830, and the RV was set up when she arrived about 15 minutes later. He was very happy. They ate dinner and then got a call from friends who invited them over that evening. A friend stopped by the RV before they left and stayed for about 30 minutes. They arrived at their friends' house in Dillon around 2000 and stayed about an hour. Mahany wanted to get back and go to sleep. They were both in bed by 2200; both were creatures of habit and got "really,

really tired by then." There was nothing that woke them up in the middle of the night; it was really quiet there.

On July 3, she stayed in bed when Mahany went to shower at the hospital around 0630. He likely got up a little after 0600. He was very regimented in his routine. He was a morning person and was whistling that morning; whistling was a sign that he was happy and felt good. They talked in the morning on the phone and exchanged text messages. He was really happy when they talked that morning. Nothing was out of the ordinary. He called her at 1236 according to her phone. He told her that he had a PR flight at 1330. He was chipper and said it was a really nice day. The duty day on July 3 was his normal schedule that he had for the last 27 years.

He would take naps when on duty, typically in the afternoon. She did not know if he took one the day of the accident. He would sometimes read and sometimes nap in the pilot's quarters in the hospital. The room was a gathering place for the crew and had a TV. She thought he usually napped about 1500.

He never mentioned any daytime sleepiness. He did not have any difficulties sleeping, did not snore and did not have sleep apnea. He had told her that he was an efficient sleeper. He always felt good with 7-8 hours of sleep.

He had been involved in accidents previously. He had been shot down three times in Vietnam and was physically shot; he flew the OH-6 as a scout pilot. Two of the three times he was shot down, he was picked up right away and the other time he had to walk around for a while before being picked up. He was shot and received the purple heart. A few months after he started with Flight for Life in 1987, the tail rotor hit a sign as he tried to maneuver the helicopter away from a drunk driver that crashed through the police barricades. He also had a wire strike in the Grand Canyon prior to being hired by Flight for Life in 1987; in that event, he was able to control the helicopter and land without incident or injury.

He received a plaque from Rocky Mountain Helicopters; it was a safety award. He had never been disciplined for his performance.

In the 12 months before the accident, he had not have any changes, good or bad, to his health. In the 12 months before the accident, their financial situation improved because she was no longer in school and they had two incomes. Regarding any changes in his personal life, good or bad, in the 12 months before the accident, she said his brother, who was 3 years younger, died in May 2014, and his dad died in July 2014. Mahany's great-grandson was born in January 2015, but he had not yet met him.

Mrs. Mahany grew up in Missouri and when to school there, and as a couple they honeymooned at Lake of the Ozarks. Capt. Mahany loved outdoor activities and his dream was to live on or near a lake. They could make more money in Missouri and the cost of living was less than it was in Colorado. They had planned to buy a really nice house by the lake. She had received a job offer in Missouri and her husband was offered an open position at the Osage Beach, MO, base. Everything was going to be easier in Missouri.

Mrs. Mahany described her husband as a healthy individual. He walked outside with the dogs and on a treadmill for exercise, was a soccer player, and was very athletic and extremely coordinated. He would not become fatigued easily. He took Allopurinol for his gout, baby aspirin, Lipitor for his cholesterol, which was controlled, Synthroid, and multiple vitamins. He took the vitamins and Synthroid in the morning and the Allopurinol and Lipitor at night. He ate a healthy diet, did not like fatty foods, and did not drink soda. He did not have any recent illness and had not had a respiratory infection for 2 years.

Mahany wore reading glasses for reading and wore them when flying. He had recently gotten a new pair.

Mahany had chronic tinnitus and nothing could be done about it. He could hear fine but it was annoying and he had learned to live with it; he did not wear a hearing aid.

Mahany would drink alcohol but never on his "stretch." On six days off he might have one drink two days into his off stretch. He had one drink the night prior to the accident and was done with it by 9 pm. He did not smoke tobacco nor did he use illicit drugs. He did not take any medications, prescription or nonprescription, within the 72 hours prior to the flight that would have affected his performance.

He usually had a cup of coffee every morning and a microwavable breakfast burrito. He never wanted to be cranky and hungry. She did not know whether he had breakfast the morning of the accident but said he was close with the medical crew so she thought they might have gone to breakfast.

Following the accident he could not speak to her, she was only able to speak to him.
There were no external pressures from the company or from his personal life that might have affected his performance the morning of the accident. Flight for Life had a policy "three to say go one to say no" and the pilot trumped. He had turned down flights in past with no repercussions. Everyone trusted his decision.

Mrs. Mahany had heard her husband mention a safety switch with the new aircraft. The pilots were not very happy about it. It was counterintuitive to the pilots and all of the pilots felt that way. He mentioned the switch 2 to 3 months before the accident when he was on the phone with another pilot; she perceived that the concern did not resolve.

After the accident, she found a typed scripture in his wallet. He did not want to die and one of his greatest fears was burning alive. Crew members felt if they were flying with Mahany that nothing bad would ever happen. After the accident, they were terrified because they did not know what happened; if it could happen to Mahany it could happen to anyone. He was everyone's favorite pilot and crew members knew he would always do the right thing. He spoke his mind and was a big safety advocate. He kept pushing against external hoist operations due to safety issues and concerns.

Interviewee:	Gregory David Bonneau, Helicopter Air Ambulance Pilot, Hamilton, Texas, Base, Air Methods
Date/Time:	November 19, 2015, 1155 mst
Location:	Air Methods Headquarters, Centennial, CO, via phone
Representative:	Corey Wright, Attorney, Wilson, Elser, Moskowitz, Edelman & Dicker LLP
Present:	Katherine Wilson (NTSB), Jennifer Rodi (NTSB), Dennis McCall (Air Methods)

During the interview, Capt. Bonneau stated the following:

He had been flying since 1978 and had 30 years of military service in fixed and rotor wing aircraft, both single and dual engine, and was type rated in the BE300. He had about 4700 hours total time. Prior to being hired by Air Methods, he was an instructor pilot, safety officer and accident investigator for the US Army in Iraq.

He was hired by Air Methods on December 2, 2013, and had been based in Hamilton, Texas, except when training. He was appointed as the field safety representative in Denver and was the field safety representative at his base now.

His duties and responsibilities as the field safety representative were to conduct monthly safety classes and meetings, oversee the SMS program for all pilots and aircraft members, FOD, accident prevention, promotions, and all things that went along with that. He was a representative for the base regarding safety issues and concerns. He reported to Tom Smith.

As a helicopter air ambulance pilot, he would be ready to fly during his normal shift and safely fly from point A to point B in day or night conditions, with night vision goggles. He reported to the lead pilot.[3] He did not see a division of duties between being the safety representative and an air ambulance pilot. He thought every pilot should be a safety representative and he thought Air Methods instilled that in everyone. In his official position as the safety representative, he kept up with various programs at the base when he was not flying. He had ample time when not flying to do those duties and to communicate. He became the field safety representative in summer 2014.

Prior to operating the AS350B3e, he received differences training. He thought it was at the end of December 2013, after his indoctrination and initial training received at Grand Prairie. Differences training included ground and flight training; there was no simulator training. It was conducted in Abilene, Texas, by Mr. Uchiyama.

Differences training included the checklist, and precautions and cautions associated with the hydraulic isolation switch. The switch would be turned off and on. In the off position, there was no light or indication that the system was off. It was emphasized as a caution in training. It was discussed in classroom and flight training.

[3] In an email from the Air Methods Director of Operations dated December 15, 2015, it was stated that Mr. Bonneau reported to Eric Schreiner.

The switch being off was demonstrated in flight. Taking off without hydraulic assistance would involve control issues. They had to demonstrate their capability to takeoff without hydraulic assistance or could even be a go around without assistance. Pilots had to demonstrate that they could control the aircraft in flight. This occurred during initial training.

Differences training was offered only one time to pilots.

Not every type of model aircraft was used in training. In recurrent training, pilots might not fly a dual hydraulics aircraft. If there was a difference in the procedures, it would be communicated to pilots via the 411 system prior to release. Pilots must physically go to the document and close it. They must acknowledge that they received the document. There were multiple back ups because the regional director would also send stuff out. If he did not understand something, he would ask for clarification from the lead pilot.

He thought the differences training received was adequate.

He used the expanded checklist for the hydraulic checks every time. Pilots must use the checklist; it was a callout-response item. On the expanded checklist, some items could be done from memory but he did not do that.

There was a recent change to the procedure where the hydraulic check was performed post flight rather than preflight.

He was informed of the Airbus Helicopters Safety Information Notice regarding hydraulic power about 2 months after his incident, which occurred in June 2014. He could not recall if the notice came via email or the 411 system. He was not aware of any changes to training as a result of the notice. He thought the need to have the hydraulic assist switch in training had always been emphasized in training. It was always reinforced because there was no indication if a pilot forgot to turn the switch back on. He could not recall if there was additional emphasis on the switch in recurrent training after the notice came out.

He thought he received simulator training during initial indoctrination training but could not recall if it was an AS350 simulator. The training focused on instruments and inadvertent IMC.

From his recollection of his incident, the hydraulic assist switch was in the on position.

Pilots received training on stuck pedals in both initial and flight training. Asked what the procedure would be for a stuck pedal immediately after takeoff, he said that during his incident, as the aircraft lifted off it began to lose control and rotated counterclockwise. He realized he could not takeoff and fly. He got closer to the ground, about 3 feet, and executed a hovering autorotation. He thought he had no damage to the helicopter but there was minor skid damage.

Pilots had received training on hover autorotations and it was covered orally, but the pedals were not fixed because it would not be a practical maneuver to do.

He was not aware of any differences between the Air Methods checklist and the AS350 flight manual.

He rarely switched between single and dual hydraulic helicopters. He thought he flew a single hydraulic helicopter once per year if there was the need for a backup when their aircraft was down; he had maybe flown a single hydraulic aircraft only once since being hired.

He did not have any concerns about the AS350B3e or the hydraulic isolation switch and lack of a caution light prior to his incident. He was not aware of any concerns by his colleagues; they did not voice any concerns to him.

They did not simulate a hydraulic failure at liftoff in flight training.

Without hydraulic assistance at takeoff, it was going to take greater force to move the pedals. In flight, they practiced stuck pedals so he had a good idea of what it should feel like.

He had never simulated a stuck pedal at takeoff to know what it would be like, but he assumed the feel and forces required would be similar as when they simulated it in flight.

Training for a hydraulic failure was performed in flight on the downwind leg. The instructor would identify and isolate the hydraulic assist switch to the off position. This was always performed in the single hydraulic aircraft during recurrent training, never in a dual hydraulic aircraft, which was very different.

When doing the runup at the time of his incident, the procedure was to turn the switch off prior to takeoff at the time of his incident. Feedback and force on the pedals was greater. He experienced that. In that procedure, they had an ACCU TST button to allow release of the pressure and what helped to assist if there was a hydraulic failure. They would turn the ACCU TST off and ensure hydraulic cutoff switch was back on and things were operating normally. He wanted to make sure the pedals were centered when the hydraulic switch was turned back on and to make sure there was no unusual feedback or movement. The aircraft still had power steering to collective and cyclic during the test; it was only isolated to the tail rotor. In his incident, he recalled moving the pedals as it was a part of the check. If hydraulics were lost, the pedals should still be movable with additional force. The secondary was the ACCU TST button which allowed for greater movement. He had experienced what it was like during that test on the ground with no hydraulics.

His assumption was he should have some control with enough force exerted.

In his incident, it was an immediate rotation and he was caught off guard. He exerted more pedal pressure. After 3-4 spins, he decided he was not going to be able to slipstream and fly away to a landing. He got down, lowered the collective until the helicopter was about 3 feet above the ground, and did a hovering autorotation. When he went from flight to idle, that was enough relief of torque to safely land the aircraft with minimal damage.

He could not fly away because of the situation he was in. He could not move the pedals a ¼ of an inch.

They were trained to do a hovering autorotation if spinning while in ground effect. If he was out of ground of effect, he would want to get flying as soon as possible; airspeed was your friend and the aerodynamic forces on the tail will start to slipstream that. Then he would come in and prepare for a minimal ground run, a run on landing with a shallow approach. That was what was taught.

It was his belief that if the aircraft was spinning and had enough altitude, he believed he would fly out of it. That was what he planned on doing. In his incident, he was only 5-10 feet above the ground so it made sense for him to get the aircraft on the ground and do a hovering autorotation as he was taught. When he rolled the throttle off, the spinning stopped. As he "cushioned", the aircraft made a ¼ turn maybe; at that time he was level but it was the reason there was damage.

He did not know the difference between the AATD and a simulator. In Denver, pilots flew in an AATD. There was no movement and he saw it as a procedural trainer.

Asked if he was concerned that he flew a dual hydraulic aircraft but trained in a single hydraulic aircraft, he said pilots flew multiple type aircraft and were equally trained to fly either.

He did not have any concerns flying the AS350B3e after his incident.

He thought it was always better to have lights and whistles but he felt comfortable flying the aircraft. In his opinion, it would be good to have the caution light when the hydraulic assist switch was off.

He had never been in a spin and tried to fly out of it. He was thinking hypothetical. When he took off, he maybe corkscrewed up to about 10 feet. A hovering autorotation will reduce the torque and he could put it on the ground. He had not tried it and did not think that he would like to. Given his situation and his surroundings, a hovering autorotation was best.

As he lifted from the ground, the aircraft immediately began to yaw to the left. He thought he said after his incident that he had a stuck pedal. He thought he climbed and said his statement after his incident said he had climbed to 15 feet. There was no input on the right pedal to control the torque.

Interviewee:	John Lynn Peterson, Lead Pilot, Frisco Base, Air Methods
Date/Time:	November 20, 2015, 0715 mst
Location:	St. Anthony Summit Medical Center, Frisco, CO
Representative:	Corey Wright, Attorney, Wilson, Elser, Moskowitz, Edelman & Dicker LLP
Present:	Katherine Wilson (NTSB), Jennifer Rodi (NTSB), Dennis McCall (Air Methods), Edward Stenby (PHPA Local 109)

During the interview, Capt. Peterson stated the following:

He had been the lead pilot at the Frisco base for about 5 years. Prior to that he was a line pilot. He had been at the Frisco base about 12 years. He was hired by Air Methods as a line pilot and first worked at the Denver base for 1 year until a position opened in Frisco.

His duties and responsibilities as a lead pilot were to perform administration work, such as making sure shifts were covered, payroll, and ensuring publications were up to date. He also flew as a line pilot. About 90% of his time was spent flying and 10% was spent doing administration work. He reported to Rodney Balak, the program manager.

He attended the US Army flight school in 1970 and flew in the Army for 30 years. He retired and about 2 years later he wanted to fly again. He was hired by Air Methods in June 2003. He had about 8000 hours total time, all rotorcraft time, and about 1000 hours in the AS350. He only flew the AS350 at Air Methods.

He used a checklist when performing preflight checks. At the time of the accident, the hydraulics check was a part of the before takeoff checklist and he used the expanded checklist to perform the check. He believed it was required that pilots use the checklist to perform the hydraulic check versus doing it from memory.

He received differences training prior to Air Methods acquiring the AS350B3e. Additional training was provided in August 2014 when the helicopter was acquired. The training was provided by Glenn Uchiyama and included classroom and flight training.

His total time in the AS350B3e was about 100-150 hours.

During training, Uchiyama was careful to point out that they would not get the hydraulic light in the AS350B3e if the switch was in the off position and that there was an expanded checklist to use because of that.

The pilots received the Airbus Helicopters Safety Information Notice regarding hydraulic power and it was posted in their office. He did not recall if they received it before they were trained on the AS350B3e or after. They did receive the notice before the accident. Pilots received it as a message when they logged in to the 411 system that linked them to the notice. If the message was important, the pilot must acknowledge that they read it. He did not recall if they had to

acknowledge receipt of the safety information notice because they received it a while ago. Pilots logged into the 411 system every day they worked to get their flight release.

It was his responsibility as the lead pilot to print important notices and post them which he did for the safety information notice regarding hydraulic power.

Since the accident, there had been changes to the checklist that affected the AS350B3e and AS350B3. He believe they had to acknowledge receipt of the updated checklists. Changes were made to the before start, start, expanded and after landing checklists. The new checklist reduced steps, took out extraneous stuff and the hydraulic check was to be done after shut down. In the AS350B3, they had a caution light if the switch was not in the "on" position. There would be a red light and an aural "gong." There was no equivalent light in the AS350B3e. The AS350B3 always had the caution light.

Pilots received flight training for "hydraulics off" which makes the yaw hydraulics very stiff in the AS350B3. They could not do this training in the AS350B3e because it was a dual hydraulic helicopter and they could not shut the dual hydraulics off. The "hydraulics off" training was performed in the traffic pattern when on downwind. They would do a roll on landing just prior to touchdown.

The AS350B3 was a single hydraulic helicopter. In training, on downwind leg, the instructor would turn the hydraulics off. They would reduce the airspeed to about 40 knots, use the collective hydraulic switch to shut off all hydraulics simultaneously, and at that airspeed which was controllable, they would make a shallow approach just prior to touchdown. The instructor would ensure that the pilot could make a successful landing and then he would terminate the approach. They would climb out and when able would turn the hydraulics back on and terminate the maneuver.

If he had a stuck pedal immediately after liftoff and he was not in a flight regime, he would land immediately. If the helicopter was in a spin, he would roll off the throttle to try to reduce the spin. If he could nose over the helicopter and gain airspeed, he could try to get a streamline but if he was in that situation he would probably try to reduce the throttle and accept the consequences.

If the hydraulic assist switch was off at liftoff, he would expect the pedals to be jammed and the helicopter would spin.

He was not aware of any additional emphasis regarding the hydraulic assist switch since the accident.

He knew the accident pilot, Capt. Mahany, and said Mahany was everything he would like to be. Mahany was a senior pilot, he oriented Peterson when he came into the program and mentored him. He never heard anything negative about Mahany as a pilot.

Peterson had no concerns about flying in and out of the Frisco base. He said he chose to be there.

He had no concerns about switching between single and dual hydraulic helicopters as long as they followed the checklist.

He never went through any training at Airbus Helicopters.

There was simulator training for the AS350B3e.

Asked if he was aware of any differences between the Air Methods checklist and the AS350 flight manual, he said they used the FAA approved checklist for Air Methods. Once they got that checklist, that was what he used.

He had not heard anyone talk about concerns with the Frisco base or flying the AS350B3e. If he had concerns about safety, he would go through the safety channels. If he had a non-safety issue, he would address it "in house." Safety channels available at Air Methods included AIDMOR, ASAP, MSAP, and the silent whistle. Centura had its own safety form.

He had completed an AIDMOR after a mechanical interruption. Most AIDMOR reports were for weather turn downs. After submitting an AIDMOR, you would get an email back from the company indicating it was received. The company wanted to improve weather reporting. There were no consequences for turning down a flight from Air Methods or Centura.

He was not really involved in safety decisions, "just line pilot type stuff." Each month they had base safety meetings where safety issues were brought up. He could not recall off hand what safety issues had been brought up at recent meetings. He thought there was an issues from a concerned medical crew after one base turned down a flight but then another base said they could do the flight. It was an internal Centura issue that they resolved.

He had never taken off with the hydraulic assist switch in the off position. He did not think there was anything in the cockpit environment that could inadvertently move the switch.

Amber caution lights did not have an audio associated with them.

The hydraulic assist switch was on the collective and was guarded so even though the pilot's finger was on the switch it would be difficult to move it from one position to another.

To perform the yaw servo test prior to the accident, the pilot would use his thumb to turn the yaw servo switch located on the collective head to off. That would isolate it and at that time the tail rotor servo and the accumulator were "on its own." There was hydraulic pressure in the accumulator. The pedals would be stiff but movable. Then they would move to the accumulator test button on the panel. The pilot would press it down which emptied the accumulator, and opened the switch that allows the hydraulic from tail rotor accumulator to go back into the system. At that time, the pedals were immovable. Next the pilot would return the accumulator back to the normal position or flush. Nothing would be back there until the pilot put the yaw servo switch on the collective head back to on. At that time the pedals would become movable. He would feel the pedals become moveable as hydraulics were restored. He would move the

pedals prior to taking off. After turning the switch back on, the pedals were movable almost instantaneously.

He did not recall what was said in training about lifting off to a hover. There was nothing in the checklist that told a pilot to ensure all controls were free but that was what he did as a pilot. He would pull up to a hover and make sure he had movements of all controls, that the center of gravity was okay, and that he had enough power to continue the departure.

If there were no hydraulics to the tail rotor because the hydraulic assist switch was off, he did not think the helicopter would be controllable around the yaw axis.

If he took off and began spinning with locked/stuck pedals, he would land immediately. As soon as the skids were off the ground, the aircraft would be turning to left. If he had a stuck pedal out of ground effect, and he could not get forward airspeed to get it to streamline, he would reduce the throttle to control the spin and accept the consequences. If this occurred out of ground effect, he did not think you could get forward airspeed.

If the aircraft was out of ground effect and did not feel you could get forward airspeed to get it to streamline, he would be "roll off" the throttle to control the spin and accept the consequences just like doing an out of ground effect hovering autorotation and hope you had some cushion at the bottom. If the aircraft was out of ground effect, he did not think you could get forward airspeed. He said "where is forward when you are spinning?" He did not think there was anything in the manual about when you could get forward flight without the tail rotor.

Mahany did his orientation. The biggest thing that Peterson took away was Mahany "fussing" at him about the power lines near Old Summit Reservoir. They were not lighted at night and Mahany wanted to make sure that he stayed away from them. During orientation, Peterson thought he flew half the time and then went on ride alongs with Mahany. Mahany was meticulous and light on the controls. They did some high altitude patient pickups. It was "just excellent."

Uchiyama did his last training in the AS350B3, a single hydraulics helicopter. The last time he trained in a dual hydraulics helicopter was during differences training.

He "certainly" had concerns about switching between single and dual hydraulic aircraft. As a former military pilot, he knew where every switch was; but now when they switched things were in different positions, such as the rotor brake and switches. If he did not use the checklist, he could find himself missing stuff.

He never heard a pilot say he would not do the hydraulics check because it was dangerous.

He had not flown an AS350B3e helicopter since the emergency AD was released and the new procedures were released so he did not know if there were any other changes other than the yaw servo switch. He thought the new procedure to perform the yaw servo test post-flight along with the addition of the caution light should resolve the problem. Asked if a spring-loaded switch would help, he said he had never considered that but thought it would help.

Differences training pointed out to the crew that the lack of a caution light was a deficiency and was something they had to pay attention to.

Other conditions that would create yaw after liftoff were a frozen slide valve, a severed drive shaft, the hydraulic switch being off, and a gear box failure, but that would also cause a center of gravity problem.

While a pilot was performing preflight checks, the medical crew was probably talking about the patient. Air Methods had a sterile cockpit policy prior to cruise flight. There was no talking at all from start up, to takeoff, and up to cruise flight, which was when he would call and let the operations center know they were off en route to a patient.

He was informed about the Airbus safety information notices regarding the hydraulic switch shortly after they got the helicopter and also in their morning briefings.

The checklist was completed as a check and verify; nothing was verbalized.

If he was interrupted while completing a checklist, he would go back to the last known check and continue from there.

They parked the helicopter with the tail toward the hanger to assist moving the aircraft, so it would be pointed toward the east. After the runup, he would lift up pointed to the east, then make a 90 degree pedal turn to the north because that was towards the lowest obstacles. As he picked it up and turned it, he knew he had the power, the controls, the tail rotor pedals were working, and as he checked his power he would continue the takeoff to the north then turn east or west depending on where they had to go.

He had never heard of a corkscrew takeoff.

He thought the 90 degree pedal turn after liftoff took about 3-4 seconds to complete.

He was glad to see the changes to the checklist and procedures be implemented. The pilots loved the AS350B3e. The rudimentary autopilot relieved pilot workload.

He did not have anything to add to the interview.

Interviewee:	Staci Renee Brewer, Flight Nurse, Flight For Life
Date/Time:	November 20, 2015, 0820 mst
Location:	St. Anthony Summit Medical Center, Frisco, CO
Representative:	Sarah Karges, Flight for Life
Present:	Katherine Wilson (NTSB), Jennifer Rodi (NTSB), Dennis McCall (Air Methods), Edward Stenby (PHPA Local 109)

During the Interview, Ms. Brewer stated the following:

She was a registered nurse and flight nurse with Flight for Life, Life Guard 2, at the Frisco base and had been with Flight for Life since February 2012. She had not held any other positions with Flight for Life but was briefly located at another base when she first started.

In her role she was responsible for patient care. Specifically as a flight nurse, she was responsible for following the guidelines from the medical directors, primary assessment and monitoring of patients' "ABCs", providing patient care, and administration of medications without a medical doctor's direction.

At the beginning of the shift, the pilots would do their preflight and the incoming crew would brief with the outgoing crew. Following this briefing they would brief with the pilot, the crew would check their gear and pouches within the aircraft, and that might include a walkaround of the aircraft. The pilot's brief would include maintenance information.

Depending on the emergency, the crew was responsible for securing their seatbelts, helmets, and chin straps, putting visors down unless wearing goggles, and also securing equipment and the patient in the cabin. The crew was not trained to assist the pilot during an emergency. On a monthly basis the pilots were required to practice a Code 76 and Code 77. This would be done on the empty leg back to the base and the pilot would say, for example, "we have a Code 76 red" and then the communications center would help locate the helicopter. At the same time, the pilot and medical crew would discuss the emergency, where the emergency procedures were located, what the emergency procedures were, and the emergency frequency, as well as identify their location, what county they were in and the closest road. She felt that the pilot and crew discussed often where they would put the aircraft down especially because they flew over the mountains and there were not many county roads.

When a medical crew first started in their positions they received initial helicopter safety training which included a review of doors, screws, cowlings, fuel shutoff location, rotor brake location, and oxygen location. The crew was trained on basic helicopter safety but nothing specific to the operation of the helicopter such as startup checklists.

She was only concerned about flying out of the Frisco base during the first weekend that she started. She did not have any concerns about the Frisco base, the helicopters (including the B3e), or the pilots since then. If she did have a concern she would discuss it with the pilot first, or the base manager if she did not feel she could discuss it with the pilot. They would then go to the

pilot together or to upper management regarding the concern. She never had an instance where a concern was not resolved.

She knew Capt. Mahany and had flown with him out of the Frisco base since December 2012 until July 2015. She did not recall the last time she had flown with him but it was a "fair amount"; more than once or twice. Professionally, she felt 100 percent safe with Mahany; he put their safety in front of everything. Personally, he was fun, easy to talk to and a father figure; she felt comfortable speaking with him about personal or professional concerns.

She never had a concern flying with Mahany. She would sit on the nurse's side and was responsible for pulling the GPU prior to every flight. Mahany always had the checklist. He would do a briefing at the beginning of the shift, and if nothing changed prior to their flight, he would go through the checklist then they would liftoff. During one night flight with him, they had a chip light when they took off on their way to pick up a patient. They landed and the helicopter was out of service. He handled the emergency well.

She did not recall if Mahany ever expressed a concern about flying out of the Frisco base or flying in the accident helicopter. She was aware of the concern about the lack of a light on the caution panel in the accident helicopter but did not recall if Mahany specifically expressed that concern.

She was not aware of any stressors Mahany might have been dealing with. He was leaving the Frisco base at the end of August. It was a difficult decision for him – it was going to be hard for him to work with another crew – he was going to miss his Frisco crew. He was excited about the move as he was going to live on a lake with his boat, but she thought he was going to miss them. She was also aware that he was on the phone a lot, often regarding the union. He talked on the phone with a friend at Life Guard 1. He was on the phone just when they were sitting around and always left his cell phone on his desk during a flight.

Before a flight, she would receive the disconnect sign from the pilot and then move the GPU box. She would board the helicopter and secure her seatbelt, headset, visor, and goggles (if it was a night flight) and prepare for the full startup. She always sat directly behind the pilot and would ensure that the caution panel was always blank. She did not recall any horns or alarms on any takeoff and was not able to see the hydraulic isolation switch position from her seat.

Since the accident, she did not have any concerns flying out of the Frisco base or flying with any of the helicopters in the fleet. She was not aware of any concerns regarding Mahany, the base or equipment from anyone else. Asked if she would know if she was in a dual or single hydraulic helicopter, she said she just knew that they would not get the hydraulic light during the startup check in aircraft 390; it was something they would have to watch.

She never heard a pilot mention that he would not complete part of the checklist.

Regarding the accident helicopter, Brewer stated that it was an improvement as it came with increased performance and they were hoping to receive it during the summer of 2014 as opposed to September. They were aware that the caution panel was different and they would not receive

an illumination and she characterized this as a possible negative of the dual hydraulic system. They had discussed that difference since the accident and that it was different from aircraft 392.

When asked, Brewer described a standard takeoff where they helicopter would come up, they would turn to the left up over the bike path and depart. She was not sure of the time it took to accomplish this. She was never on board during a corkscrew takeoff – every departure involved an up, half turn, and then up and over to the north.

She would not hesitate to fly with Mahany if he were still alive.

Interviewee:	Edward William Stenby, Jr., Line Pilot and Field Safety Representative, Frisco Base, Air Methods
Date:	November 20, 2015, 0900 mst
Location:	St. Anthony Summit Medical Center, Frisco, CO
Representative:	Declined
Present:	Katherine Wilson (NTSB), Jennifer Rodi (NTSB), Dennis McCall (Air Methods)

During the interview, Capt. Stenby stated the following:

In addition to his positions at Air Methods, he was also an accident investigator for the Local 109 pilot union. He was hired as a line pilot for Flight for Lift for about 4.5 years. Stenby put in his transfer to the Frisco base when Capt. Mahany put in his transfer. He was awarded the position at the Frisco base after the accident. He clarified that he was employed by Air Methods but partly identified himself as a Flight for Life crew. He reported to Rodney Balak, the program aviation manager.

At the time of the accident, he had been the program relief pilot for 3.5 years for Flight for Life. He covered 5 bases and sometimes traveled to other Air Methods bases if needed.

He became a relief pilot and gained exposure to the operation. Mahany was the field safety representative at the time and thought it would be a good idea for Stenby to take over that which he did about 3.5 years ago. As the safety representative, he attended 2 monthly meetings – one was the Air Methods regional field safety representative conference call and one was Flight for Life. Everyone would call in to the Air Methods call and it was run by the regional safety director. They highlighted issues Air Methods were encountering. It was a forum to discuss any issues that they were encountering at their own base, to get feedback from other safety representatives and the regional safety director. He also participated in a monthly meeting at flight for life. They had their own safety committee and safety program. In the meeting, they reviewed a variety of reports and talked about safety occurrences that occurred the prior month. They established policies, procedures and recommendations as a result of both of those meetings for Air Methods and Flight for Life. He thought Air Methods had a more defined process for establishing policies and procedures than Flight for Life as the scope of operations was much larger. It would be run up through the regional safety director through his supervisor. Air Methods would learn from the line pilots and the field safety representatives and then make changes to policies and procedures. On the Flight for Life side, it was a smaller group. Change occurred more often because things were discovered and suggestions made and then changes were made a little more quickly. One process was no better or worse but it was just the nature of the scope.

As the field safety representative, he reported to Jonathan Grunack. He also interacted with pilots in the group. In the relief pilot position, it was much easier to do. It was the nature of pilots. The best information he had about safety had been when he showed up as the oncoming pilot and would talk to the outgoing pilot.

As of July 10, 2015, he was no longer the program relief pilot. In that role, he filled vacancies at Air Methods. There was not a lot of pilot turnover but occasionally there was so he would fill the vacancy until a new candidate was found, and would also fill in for sick calls, vacations, special Flight for Life events such as bike and ski races, and as an extra asset for the pilot group. He also did ferry flights, shuffling of aircraft when out of service, post-maintenance run ups, and returning aircraft to service.

He was a civilian trained pilot although he was a US Navy veteran. He was trained in Denver. Most of his flight time was on the Schweitzer aircraft. He was an assistant chief pilot at a flight school, which became a 141 school when he was there. He then went to Maverick Helicopters in the Grand Canyon flying tours from the South Rim for about 1.5 years. He flew EMS helicopters in New Mexico for about 2 years then was hired by Air Methods in Durango, CO.

He had about 3400 hours total time, all but 10 hours were in rotorcraft. He flew 407s and all variants of the AS350. He had about 1500 hours in the AS350, and about half of that time was in dual hydraulic aircraft. Most of his time at Air Methods was in single hydraulic aircraft.

He took delivery of the AS350B3e when it was released from Air Methods to the program. As the relief pilot, he flew it and also flew it for its 600 hour check prior to the accident. He had under 100 hours in the AS350B3e.

He had no concerns about switching between single and dual hydraulics aircraft but he did have a healthy respect for it. As a relief pilot, he covered all the bases, covering other programs, and doing maintenance return to service flights, so it was his norm to fly different helicopters every day. He had to slow down and be aware of which one he was flying and use the checklist to ensure compliance with safe operations of that aircraft.

He was aware of the Airbus Helicopters Safety Information Notice (SIN) regarding hydraulic power before the accident. The SIN was highlighted in differences training and again in training with Mr. Uchiyama when they got the AS350B3e, but he was already aware of it when it came out. The hydraulic assist switch was also highlighted in training, both in single and dual hydraulics training. They would practice the procedure and discuss it. If hydraulics were lost when flying a single hydraulics aircraft, you would be flying without hydraulics and you tried to prepare yourself with what might go wrong.

There was additional emphasis on the switch since the accident, both within Flight for Life and industry as a whole. Most pilots at Air Methods were aware of the pitfalls associated with the switch. Accidents highlighted those dangers.

He used the checklist for preflight checks including the expanded checklist for the AS350B3e. He could not say if other pilots did the expanded checklist from memory. He had not heard other pilots say they skipped the hydraulics check, but pilots were of the opinion that it was more dangerous than not doing the check. If there were no hydraulics, the aircraft was controllable and they were flying a dual hydraulic variant of it. If both redundant systems failed, the aircraft was still flyable. Performing the check was more dangerous than not doing the check but he did not know about pilots not doing it.

The new checklist distributed to pilots that was the result of the emergency AD highlighted the differences. The checklist was condensed to a more readable and user friendly format. The hydraulic check was done post flight. It was on the preflight checklist to ensure that switches were in the correct position. There was an item specific to the hydraulic system.

In the course of his annual checkride he had training for stuck or jammed pedals but he did not think it was included in every checkride. They did hydraulic off procedure and the pedals were pretty immovable. During his last checkride, they covered stuck pedal procedures and he thought they did four traffic patterns with different levels and pedal inputs. They did a shallow approach and slowed to maybe 15-20 knots before recovering. The procedure to use varied based on which pedal was stuck, the wind conditions, and how much pedal, so he could not answer the question specifically. It had a lot to do with how the helicopter was performing and what controllability you had; it was based on a lot of factors.

If he was in a hover after takeoff and had a stuck pedal, he would get the aircraft back on the ground. Rolling off the throttle might be incorporated or bottoming out the collective to get it back on the ground.

If a pilot were to takeoff with the hydraulic assist switch off, he thought you would experience "near impossible pedals to move and spinning" when you broke contact with the ground.

He received boost to pedals when the switch was turned back on, from his experience performing the check on the ground.

He knew Mahany. He thought he flew with him in the course of ferrying aircraft around; he knew him from working in those types of duties. He could not remember specifically. Nothing stood out as memorable from the flights. He was generally impressed in the course of being a flight instructor [4] and being able to evaluate pilots, he was generally impressed with all Flight for Life pilots when he had the opportunity to fly with them. The program attracted and mandated a higher level of skill set of the pilots given the nature of where they operated.

He never heard anyone complain about flying with Mahany. He was well respected. He had been working with the program for a long time and had knowledge that could only be gained from flying in the area. People sought Mahany out when they had problems flying in the mountains or even interpersonal problems in the program.

He never heard any concerns from Mahany. They talked about the challenges of flying out of the base. Aircraft performance was something they had to be aware of and the weather in the area was dynamic. There was not lot of weather forecasting that was available and accurate.

Mahany did not voice any concerns about flying the AS350B3e. The aircraft had a wider available power margin, had autopilot and was the latest and greatest. He looked at it as an improvement to safety. Mahany was concerned with the hydraulics system but it was something

[4] In an email dated December 4, 2015, Capt. Stenby clarified that he was never a flight instructor.

that pilots always had to be aware of in a dual hydraulic aircraft. All pilots were aware of the dangers associated with that. Overall it was a positive improvement to get that helicopter.

Stenby had the same concerns as Mahany regarding performance issues. They needed a wider margin of safety and appreciation flying out of Frisco.

Most recent safety discussions involved an initiative from Centura to develop an emergency response plan in the event of an accident that included the role of hospital staff in an incident, and training and resources available. They also performed inspections of hospital helipads they frequented while they were there to make sure fire extinguishers were accessible and charged.

Regarding AIDMORs he received where a pilot turned down a flight for weather, he could not think of any event where they said the pilot should have looked at plan B. They did a lot of search and assist and talked about their interactions with the military. Those discussions involved how they interacted with the military and Air Method's role in those scenarios. They made sure they were in compliance with those rules.

Air Methods had an outstanding safety culture. He was fortunate in his travels to visit bases and with the involvement he had with FOQA and the ERC. He thought it was unique to the industry as a whole. He never worked in a place where safety was taken so seriously.

He was the union FOQA gatekeeper and a new member on the ERC for ASAP. They met 2 days – on day 1 they did ASAP and on day 2 they did FOQA.

He attended his first ASAP meeting 2 days before the interview. He was impressed with that meeting. Some stuff came out of that and he was impressed on how they handled the program. It provided insight to managers and corporate managers. One issue was the identification of weight and balance issues. There was a drop down menu that differentiated between the EC135 in which there were 5 different variants. It was a good program to identify areas where they could do better.

Pilots were made aware of recommendations from the ASAP program through the 411 system. There was also the Safety Connect newsletter which was a tool to distribute information. As the field safety representative, there was an agenda to cover at the monthly meeting; they covered 20-30 topics. This would be shared with pilots after both meetings; he would personally attach the minutes to an email. Through the course of the meetings there were things that sparked his interest and he would highlight and add comments on those topics in the email. He had been the safety representative for the entire Flight for Life program but it was now (within the last month) split between two field safety representatives, one for the south state and one for the north state. He and the other field safety representative communicated on a weekly or more basis to discuss what was going on and to make sure they were sending out a consistent message. He was currently assigned the Frisco and Denver bases, and there was the potential for an additional base in Denver if it came online. He distributed the minutes from the meetings to all pilots at all bases, not just his. Communication was an area he tried to do well at. He liked to know what was going in the program and at the company so he tried to reciprocate that and communicate what was

appropriate. The information he sent was to all Flight for Life pilots at 5 bases for a total of 22 pilots.

At the Flight for Life monthly meeting, a variety of people presented reports. It included not just helicopter data but also ground ambulance and fixed wing operations. As the rotor wing field safety representative, when a report was received via AIDMOR, the pilot would also forward him the response from the company. There was a debriefing log to be completed after each flight at Flight for Life. All crewmembers on board had to go to an area and they had to enter a comment. The crew would usually comment that there was no issue but they could report a safety issue. The debrief log was discussed at the safety meeting.

He thought Air Methods responded appropriately to safety concerns. Sometimes those duties were delegated to him. If the issue was not resolved it would remain open. There had to be a plan of action and it had to be resolved before the safety concern was closed out.

He did not receive any training at Airbus Helicopters so did not know if Air Methods training differed.

Asked if he was aware of any differences between the Air Methods checklist and the AS350 flight manual, he said there were none that he could speak of. He knew there were some nuances with flows but it was nothing he could highlight.

He had never taken off in the AS350B3e with the hydraulic assist switch in the off position. When he ran the check, there was a noticeable difference that occurred. He could feel a little, subtle pop through the course of that. He may be put in 10% pressure on the pedals; it was hard for him to quantify how much harder he had to push.

The final thing he did before liftoff was a panel sweep and he would verbally convey everything he was looking at. There was the pretakeoff confirmation list. He would verbalize that the temperatures and pressures were good while looking at those gauges, and would look at the NR gauge and verbalize that it was at 100% RPM; he would make sure that his caution warning panel was clear and that the switches were guarded. The guarded ones were most pertinent to safety of flight.

For the takeoff, he would slowly raise the collective, evaluating how the helicopter was reacting when it came up. He wanted to make sure the center of gravity was right so that the nose was not heavy and he wanted to make sure the pedals were responding. Once he was comfortable with that, maybe it was a 6-7 second evaluation as he was coming up, pausing in a momentary hover. He would verbalize controllability and that the CG was good and then proceeded with the climbout. The best departure was usually at the 9 o'clock position, then he would do a pedal turn, at about 30-50 feet, and start forward progress. He usually initiated a climb then a pedal turn. There was no fence around the helipad, the GPU was off to the right of the helicopter or sometimes a vehicle was parked over there, so it was a hazard to turn the tail in a low hover.

He could not really say what other pilots did for a normal takeoff because he did not observe a lot of departures; he had observed maybe only 20. He had never seen a departure that raised a concern for him.

What he saw on the accident video looked like a nonstandard departure; it was spinning the moment the skids left the ground.

Things that could cause spinning after liftoff would be the hydraulics being isolated, any kind of break in the drivetrain, damage to the tail rotor gear box, or some environmental conditions, but he did not think environmental conditions would cause spinning that the extent seen on the video.

He was asked about the yaw load compensator check and if he recalled the checklist indicating that if the right pedal did not move forward after turning off the switch that the pilot was to push it forward; he said he did. He was also asked if he knew why the checklist stated to call maintenance if the pedals did not return to the center position. He thought because it was an issue with the accumulator and yaw load compensator that needed to be evaluated.

The takeoff technique he used was taught to him from day 1. He had to be cognizant of what was going on from the moment he started pulling in power. Asked if he thought what he was taught was normal, he said as a flight instructor prior to joining Air Methods he had the ability to fly with both military and civilian pilots. Both had strengths and weaknesses inherent to how they were originally taught. Military pilots had much more power available to them and there was a throttle to manipulate which could be a challenge at times. He thought civilian pilots were better at the procedures.[5] Flying in a high altitude environment in a power-limited aircraft highlighted some of those differences in piloting ability.

Asked if the pilot forgot to friction the collective and the hydraulic test was performed if the force was great enough to make the aircraft takeoff, he said yes the collective would rise and there would be an initial upward movement. He had never had that occur on the ground but it was his sense from turning it off in flight and feeling it rise up that that would occur and the aircraft would be in the air unexpectedly.

If the aircraft began to spin after takeoff, his reaction would have been to get it back on the ground immediately. He would like to think he would do a hover autorotation to the ground. Below 10 feet, he would try to get it back on the ground. It was more survivable if the aircraft was near the ground versus climbing. Consequences would increase if altitude was gained. Asked if he would lower the collective, he said it would depend on what was being encountered. It would take extraordinary force to push down the collective. It would be better to roll off the throttle and bring it down. If at 30 feet in the air, he would try to gain forward airspeed. He had never tried to do that. If there was a clear enough area, the pilot could potentially expand the circle to maybe be able to get airflow over the vertical stabilizer to provide some directional

[5] In an email dated December 4, 2015, Capt. Stenby clarified that military pilots rarely had a throttle to manipulate in initial training; only civilian pilots had this. He also believed civilian pilots early on in their career were better at power management and multitasking. He believed military pilots early on in their career were better at procedures and crew resource management (CRM).

stability, but that would be “one hell of a ride.” He thought Dale Hanley was his last instructor. They did some stuck pedal procedures, he thought 4-5 go arounds at the airport. They were playing with wind and airspeeds to get the most controllability out of the aircraft.

They only turned off the collective yaw isolation switch in flight during a checkride when doing hydraulics failure procedures. It was a pilot function to turn off the switch on the collective. They would first receive a red hydraulic warning light on the honeycomb panel and a “gong” in their headset. That would be immediately returned to its proper position and that was just to simulate what you would experience in flight. The pilot was responsible to do the right procedure for the emergency – he would slow the aircraft down and the accumulators allowed the pilot to do that. The AS350 at slow flight with the hydraulics off was manageable. Once below the threshold, they turn off the collective switch to isolate all hydraulics because you did not want to have a partial reinstatement of hydraulic pressure when on final or in a landing zone. It required significant forces and was manageable but he did not want to be in that situation for longer than necessary.

The aircraft they chose to fly up there was appropriate for the area. Although he highlighted potential pitfalls, all aircraft have pitfalls. They would have incidents if they flew an aircraft that did not have the performance capability to fly up there.

Interviewee:	Peter Karl Werlin, Assistant Nurse Manager, Flight For Life
Date:	November 20, 2015, 1120 mst
Location:	St. Anthony Summit Medical Center, Frisco, CO
Representative:	Declined
Present:	Katherine Wilson (NTSB), Jennifer Rodi (NTSB), Dennis McCall (Air Methods), Edward Stenby (PHPA Local 109)

During the Interview, Mr. Werlin stated the following:

He was a registered nurse and the assistant nurse manager at Flight for Life. He had been with Flight for Life for 17 year and had always worked out of Frisco, Colorado, base. For the first 15 months, the base was ground-only ambulance.

His duties included serving as a crewmember, as the assistant nurse manager he served as the representative at monthly clinical meetings; follow up on base crewmember certifications and ensuring everyone was up to date, and as a clinical coordinator (now called nurse manager) he served as a clinical conscious for the base. He served in that role for 6 to 7 years. Originally the Frisco base was not a 24 hour-a-day base. When they expanded their service hours they added 2 pilots and it became its own base so a clinical coordinator was needed. Other than serving on different committees he did not have any other roles or responsibilities at Flight for Life.

Prior to working at Flight for Life he was a volunteer firefighter when he was 18 years old. He had met an individual who became the Chief Flight Nurse at Air Life so that held an interest with him. He earned his nursing masters at San Francisco State in the early 1990s and served as a volunteer flight medic on a police helicopter in the Bay area from 1988 through 1995, when he moved back to Colorado. He then worked as an ICU nurse at Swedish, an ER nurse at University Hospital, was in their flight program as a clinical coordinator in charge of education, and then the interim manager until he went to Flight for Life in 1998.

When the base got notified of a potential flight, everyone received the notification. There were weather issues when flying in that area. They tried to keep it very simple. They had always done a good job to not to identify the patient when asking if they could take the flight – for example a critically injured child. The pilot was always conscious of the crew decision to go or not. It had never been questioned. Capt. Mahany was probably one of the very best at that. He wanted to know right away. If anything, Mahany thought it was important to show that the base in the mountains had the ability to turn down flights if necessary. The crew was familiar with the local weather patterns which made weather decisions a bit easier but they had to have the bigger picture. Once it was decided that they will accept the flight, everyone went out to the helicopter. They made sure security or the ER knew they were leaving. Dispatch would call security. Following the Albuquerque accident, they were concerned that a helicopter could crash on takeoff so they wanted security to know they were departing. If the flight crew was already out at hanger they would not return to the hospital but would make every effort to walk through the lobby if they were in the hospital.

While preparing for the flight, the APU disconnect was done by the flight nurse. Personally Werlin would stand at the pilot's right shoulder, just outside of the helicopter, and when given the go ahead, he would walk to the back and disconnect the APU, check the Tanis heater cover to make sure it was locked, pull out the cord, make sure the APU cover was locked. They were very specific about how they were to walk away from the helicopter – they would walk away to where they park it and then walk back towards the helicopter at a 45 degree angle towards the pilot's right side. It was important to have eye contact with the pilot and when he waved you in then you could go to the right side.

Everybody did a walkaround, especially at a home base because this was where maintenance happened. He was very specific when he taught new people that during the first walkaround of the day, that when you were 10-15 feet from the aircraft was when you were going to see the top cowling latches undone. A short person next to the aircraft would not be able to see those latches. He taught people to see that during the first walkaround before putting on their gear; that was the best time to see something. The walkaround was done prior to the start. They tried to get everybody to do the "last door thing" on the paramedics side, to make sure no straps were in the doors. The long fabric tails could damage the paint job.

They formalized the preflight checks after an APU incident about 10-12 years ago when they took off with the APU attached. They would do the walkaround and then do the preflight checks which included doors, belts, helmets, visors, caution warning panel out, and APU pulled to the side. They would physically turn to where the APU was and ensure that the shoreline was disconnected, at every base even if the APU was never connected. Once on board, Mahany always stated "everybody in, doors, helmets, visors, caution panel warning lights out, shoreline disconnected." He would point with his thumb. Each pilot did it slightly differently but it was done every time by every pilot.

They talked a lot about hydraulic differences and sometimes it was worked in as a specific check. In the AS350B3, the crew would see "hyd" in red but not on the AS350B3e. This difference was a big deal for Mahany. All pilots and crew knew it was different especially after the Albuquerque crash. Mahany would tell everyone they had to pay attention to it.

When describing a takeoff, Werlin commented that the helicopter would lift and the winds could be expected from the lake or Copper Mountain (11 or 7-8 o'clock positions, respectively). They would lift, then turn into the wind, then up, out, and over the meadow.

While practicing emergency procedures, the crew would always secure the cabin. Code 76 and 77 drills were practiced. Code 76 was something like a chip light and they discussed what the light was about. Code 77 reds were the critical things. Everything you can do immediately like turn off oxygen, secure everything that should be secured in the cabin. The crews work extensively on simulated engine failures. The medical crew would assist with landing location if they saw a suitable location.

They talked about engine failures and hydraulic failures. Mahany talked about what to do with a hydraulic failure more than anyone else. They had practiced code 77s for years. Mahany tried to get people to talk about what radio channel to use, what county they were in, what road was that;

he tried to teach good situational awareness. Werlin commented that crews that were here for a while would become very familiar with their location when flying. In a true critical emergency, they had an emergency checklist but he wondered who was going to find the table of contents and get to the correct page before something happened. Pilots were always good with showing the crew the emergency procedures.

The Albuquerque crash had a lot of people upset; it was spinning and completely out of control from the beginning so they wondered what can be done. It was agreed upon that if it happens you were pretty much going for the ride. From what he understood, once the flight had forward airspeed, the pilot could do full run on landings in meadows at 30 knots. They never did those in Frisco but they talked about what that would be like. It was his understanding as a non-pilot that the vertical fin helped you tremendously if you had forward airspeed.

When they got the AS350B3e, the crews knew there was an accumulator test. It confused people but their understanding was you did the hydraulic test. The difference was there was an accumulator switch had to be put back on. If it was not put back on, there was no light on the panel so the pilot could take off with an aircraft that was not ready to go.

Mahany talked about how through his whole piloting life if there were no hydraulics then there would be a light, but this was different and we all had to pay attention to it. It really bothered the crews so they would all try to look and see if the green light was on. He could not see it that well and to this day he was not sure if he would know if it was on or off.

The lack of a caution panel light was an acceptable risk; they just knew they had to do it. In talking with other pilots before the crash, the helicopter had so many good things and overall it was a safety aircraft due to the dual hydraulics. They had to make sure the check was done, but it was a better system.

He had no other concerns about the Frisco base. They always tried to do the little things. He was still just stunned that this happened. He and Mahany always talked about doing things right and not being complacent. Mahany said they had to redouble their efforts to make sure they did not do anything stupid – that was within 45 days of the crash. Mahany wanted to finish his career and walk away and say he did not hurt anyone. They talked about it which Werlin thought helped them to make sure they were not being complacent. They prided themselves at the base at doing the right thing.

When asked about a safety reporting system, he said they had a good debriefing system. They tried to encourage crews to talk about their concerns during the event. They were upfront about talking during the flight and ensuring that everyone was on board with the plan. If the flight got turned around due to weather the plan was to return to Saint Anthony North. As the plan proceeds, if there were questions, one person can stop the flight and have it go back. They encouraged people to talk to the pilot or crew right away, then to use the debriefing form as appropriate. He hoped the crews would come to him as the medical base manager or to John Peterson as the base manager. If the concern needed to go further, it could go up the chain further. It was important to follow the chain of command but make sure the crews talked about it amongst themselves.

As a younger flight nurse, he did not feel intimidated but he also did not know when to put his foot down. That was not the case anymore. He expressed hope that they had encouraged new crew members to speak up. During morning shift briefings, pilots he flew with, especially when the crew was new, would say if something comes up talk to me.

He first met Mahany when he did a debriefing after the Air Life Denver crash on December 14, 1997. Werlin was the interim manager at Life Link who had the same dispatch center and he was invited to a safety briefing where Mahany gave a "pep talk" and talked about how the accident flight had hit wires. Werlin remembered how eloquently Mahany spoke about the responsibility of the pilot to not do something like that.

When Merlin came to work for Flight for Life, Mahany had left as part of the reduction when Life Guard 2 went away. Mahany came back in Spring 1999. Werlin started flying with Mahany from then. He worked a tremendous number of days with Mahany but they had only 37 flights together in last 3 years. His last flight with Mahany was March 5, 2015, because Werlin had vacations in March, April, and June and Mahany had a vacation in May.

There were two pilots that he had flown with that he would describe as "the helicopter is an extension of their body." He felt Mahany was in that category. He had no concerns about flying with him. They did some technical flying in precarious areas they were allowed to fly. Mahany would talk about it, he understood what was happening and he made sure they understood. "He was just good. But he also knew his limitations." As he got older, Mahany knew he had to be more careful.

All pilots were really good about using the checklist and even more so with AS350B3e. The crews were very patient with the new aircraft and newer pilots.

When he saw the accident video it seemed to him that it was an appropriate amount of time spent on the ground, prior to lift, to get everything done – they did not just get in and go.

He could not recall exactly what emphasis Mahany placed on the hydraulic switch prior to a flight; however, when the accident helicopter first arrived he recalled that everyone was curious and he would lean up and over the pilot's shoulder and the pilot would talk through the hydraulic check. He could not recall if he and Mahany talked about it on their last flight together in March, but everyone always said it was on their minds. The accident helicopter had just gone for a 600 hour check in late June prior to the accident and the base had lost it for a month the prior December. Each time it came back from maintenance, everyone would remind each other to watch the hydraulics.

Asked if Mahany had any concerns about flying out of the Frisco base, he said no but that Mahany would say "remember every flight we have is a mountain flight and you gotta know that right off the bat". Werlin sought funding for extra night vision goggles because if they sent a set in, then they would be without enough to equip the entire crew. He had flown without goggles before so he would fly without them, but the new crew members were not comfortable with that. So coming out of Frisco you were already on a "serious mountain flight" and at night on a

"serious serious mountain flight." They would make sure everyone was awake and ready to go and understood the risks of beginning your flight at the "highest face." It was a big deal and still was a big deal. Also the wires along highway 9 always concerned the flight crews. They now had balls on the wires because they did not let it go and finally got it improved. Mahany was also concerned about the water tower at St Anthony North and it was something they had to pay extra attention to.

Regarding any professional stressors for Mahany, he said the union job was a big deal to Mahany because people were calling. Mr. Merlin talked in depth with Mahany about those things, without discussing specific names of people; the union was trying to save people's careers. He did not know if Mahany knew how much work it would be; it was a lot of calls and he suspected it was a bit of a distractor. Mahany's move was likely a stressor too because it was a life change, and although it was positive, it could still be a stressor.

Mahany was overall pretty healthy. His father and brother had passed away in the last year and he lost a friend in an accident in Austin. It had been a tough year for that type of thing. Mahany was devastated by the loss of his colleague and told Werlin to be careful and not to do hoist because he had a family and had done enough. There was no big daredevil in Mahany; he was very risk averse.

Each pilot had a slightly different technique for taking off from the Frisco base. The winds 80% of the time came from Copper Mountain (7-8 o'clock) or off of the lake (10-11 o'clock). Occasionally they would come out of the valley and they would talk about how they would take off over the parking lot. The pilot would bring the helicopter to a hover, one foot or less off of the ground, position the helicopter into wind, and then climb up and over the road. Everyone was "crystal clear" and would not say "we're going to lift up, tail is coming to the right" so we would look and say "clear right." The standard hover would last a maximum of 5 seconds, maybe 10 seconds; he clarified it was probably 5 seconds or less. How the accident flight came up was just not normal. He did not recall any takeoffs that had jerking motions.

He used Uchiyama as an example of a pilot who would hold the hover longer than other pilots, maybe 10 seconds which was double what most pilots did; all pilots did it slightly different.

He was lucky enough to do the "pre-checkoff things a couple of times." While there were some things that could be done cosmetically better, he loved new nice things and was at the Frisco base when the accident helicopter arrived for service. They took good care of it and they had a respect and love for it. He was giddy when the accident helicopter arrived; it did perform better and would never bump the yellow like the AS350B3 would. He was thankful to be in that helicopter versus an older Bell 206; he felt lucky that they had it.

He never experienced a pilot doing a corkscrew takeoff. He would be terrified.

After he saw the video of the Albuquerque accident, he thought Capt. Mahany used the words "this will kill you." People said this was a huge problem and "you were going to wreck stuff." He recalled people saying that "it just doesn't make sense," seems that you could fix the problems with this helicopter.

Sterile cockpit was very well employed. He recalled that Mahany would either hold his hand up or say ‘shut up’. He recalled a flight on March 5, while flying an ILS into Jeffco, he asked the communications center to standby and communicated with the crew that he was doing an ILS approach and was going to need to concentrate. The communications center tried to call him and he told them to wait. He told them to standby to standby. Mahany was really upset; it was a big deal. For sterile cockpit with the medical crew, he could isolate them if they were working on a medical issue. If the medical crew was working on their paperwork in the chart, when coming over the front range and near the Evergreen Wal Mart east, Mahany would tell the crew that they would need to have their eyes up and out, watching for other aircraft and paragliders. Mahany believed there was nothing more important than looking out of the aircraft in certain areas. Merlin taught that ever since to new crews.

Asked how much time he spent doing training above and beyond the basics, Merlin said he got to fly with everyone here. He was a regular line guy; he was not an office guy. They flew a ton. He just felt like he was trying to keep up with the people at that base. He tried to add in when he could. He felt lucky to be there and everyone cared about the stuff. People cared about the base. People have said they could not believe it [the accident] happened to them; that was a recurring theme. They were told that when they got a mission, if their head was not 100% in, then they would not get in the helicopter. They had to leave it at the door. He thought if anything they were more vigilant since the accident.

He did not encounter any emergencies while flying with Mahany; not even a chip light. He never had a fear when flying with Mahany.

Interviewee:	Loren Scott Courtney, Pilot, Frisco Base, Air Methods
Date:	November 20, 2015, 1230 mst
Location:	St. Anthony Summit Medical Center, Frisco, CO
Representative:	Corey Wright, Attorney, Wilson, Elser, Moskowitz, Edelman & Dicker LLP
Present:	Katherine Wilson (NTSB), Jennifer Rodi (NTSB), Dennis McCall (Air Methods), Edward Stenby (PHPA Local 109)

During the interview, Capt. Courtney stated the following:

He had been with Air Methods for about 16 years. Prior to his current position as a pilot, he had been a lead pilot and the assistant chief pilot for the 133 operation. He reported to John Peterson at the Frisco base and Rod Balak for the program.

Prior to being hired by Air Methods, he had retired from the military. He was hired by Air Methods and worked at Vanderbilt University in Nashville, TN, flying BK117 and EC145 aircraft in the IFR program; he was there for 8 years. He then went to Salt Lake City and split his time flying between the Park City and Salt Lake City bases in Bell 430 and 407 aircraft. He had been at the Frisco base for the last 5 years.

He was a pilot in the US Army and was a flight instructor for the UH-60 Blackhawk for 22 years. He had about 9600 hours total time, all rotorcraft. He had about 900 hours in the AS350 and about 250 hours in the AS350B3e. The last time he flew the AS350B3e was July 2.

He received differences training when Air Methods accepted the aircraft in August or September 2014. Capt. Uchiyama emphasized the importance of the position of the hydraulics switch due to past incidents in the AS350B3e. A pilot should never lift off without making sure it was in the right position

He used the checklist for doing preflight checks. For a while he used the checklist, but as he became more familiar with it he did items from memory but would always make sure the switches were where they needed to be.

He would never take off with the hydraulic assist switch in the off position. If it was off, he thought the helicopter would start to rotate immediately after takeoff. His response would be to get it on the ground as quickly as he could.

Other causes of a spin after takeoff would be a tail rotor drive shaft failure, loss of hydraulics although they would still have some pedal control, slide valve failure and a stuck pedal.

Pilots were trained for a blocked pedal at takeoff. They would discuss what would cause a stuck pedal and the emergency procedure. They would isolate the hydraulics, if it was a low or high power setting and whether you would depressurize the system. This occurred both in the classroom and flight. It was done in cruise flight.

He received his last recurrent training in May 2015.

He had no concerns about the AS350B3e. He heard other pilots discuss the issue with the hydraulic switch. He heard rumors that PHI pilots refused to fly until the modification for the caution light was done. He never heard pilots say they would not do the hydraulics check.

He was familiar with the Airbus Helicopters Safety Information Notice regarding hydraulic power through the bulletin board located at the base and also the 411 system. The base safety representative would post important things on the board. He also believed the notice was discussed in differences training.

After the accident on July 3, the SIN was discussed in the pilot's meeting but he did not recall when that meeting took place. That meeting included the four pilots and Rod Balak. He had not looked at the AS350B3e checklist since the revised checklist came out.

He had no concerns about flying in and out of Frisco and did not hear any concerns from others.

To perform the hydraulics check, prior to the accident, he would do an idle check, check the servo, depress the servo and make sure the servo light appeared on the master caution panel, and then isolate the hydraulic cutoff on the collective. The pilot should feel low forces on the pedals, then isolate the compensator by depressing the accu-test switch and feeling the forces in the pedals. When the switch was activated, there should be a light on the switch that was on and depressurized. The pilot would do a pedal test, then turn the accu-test switch off at which time the light would go off, then reactivate the yaw cutoff switch so you can pressurize the system. As soon as the pilot turned on the yaw compensator switch on the collective, pressure would return. He would physically move the pedals.

He would lift off to a 3 foot hover, check the flight controls and center of gravity, make a slow pedal turn into the wind, then apply the collective and cyclic. His hover would last 15-30 seconds.

He never had a spinning yaw after liftoff.

The only time he would not liftoff to a hover was if it was a snow or dust environment where he could experience spatial disorientation.

When he did Capt. Mahany's 133 training, Mahany took everything seriously. He was within standards. The training occurred in July or October 2014. Courtney had no concerns with Mahany. He met the standards and there was no remediation. No other pilots had concerns about Mahany.

Mahany had concerns about the lack of hydraulic caution lights but had no concerns about the Frisco base.

Regarding whether Mahany had any stressors in his life at the time of the accident, Courtney said he was getting ready to move to Missouri. He had bought a house and was waiting for the

closing. Mahany was excited to move but sad to leave. He did not know if Mahany's union position was a stressor because he did not discuss his union position with pilots at the base.

When Courtney flew with Mahany, Mahany always used the checklist.

He had nothing additional to add to the interview.