A Partner of Choice

Accident Investigation Party Submission
NTSB Accident File: CEN11FA599

Operator: Air Methods Corporation
(dba LifeNet in the Heartland)

Model: Eurocopter AS350 B2
Aircraft Number: N352LN

Date of Accident:	August 26, 2011
Location of Accident:	Near Midwest National Air Center Mosby, Missouri
Date:	December 3, 2012
Prepared By:	Dennis McCall Chief Pilot

Table of Contents

ACRONYMS & ABBREVIATIONS

AAIP	Air Methods Approved Inspection Program
AEC	American Eurocopter
AGL	Above Ground Level
AirCom	Air Methods' EMS Communications Center
CBA	Collective Bargaining Agreement
CCE	Certificate Compliance Evaluator
CFR	Code of Federal Regulations
CYA	Conform Your Aircraft
EMS	Emergency Medical Services
FARs	Federal Aviation Regulations
FDM	Field Data Monitoring
FOQA	Flight Operational Quality Assurance
FTD	Flight Training Device
GPS	Global Positioning System
HEMS	Helicopter Emergency Medical Services
HTAWS	Helicopter Terrain Avoidance Warning Systems
KGPH	Midwest National Air Center
KSTJ	Rosecrans Memorial Airport
LOSA	Line Operations Safety Audit
OCC	Operational Control Center
PIC	Pilot In Command
VFR	Visual Flight Rules

1 INTRODUCTION

On August 26, 2011, at 1841 central daylight time, a Eurocopter AS350 B2 helicopter, N352LN, sustained substantial damage when it impacted terrain following a loss of power near the Midwest National Air Center (KGPH), Mosby, Missouri. The pilot, flight nurse, flight paramedic, and patient received fatal injuries. The emergency medical services (EMS) equipped helicopter was registered to Key Equipment Finance, Inc., and operated by Air Methods Corporation, doing business as “LifeNet in the Heartland.” The 14 Code of Federal Regulations Part 135 medical flight departed from the Harrison County Community Hospital, Bethany, Missouri, about 1811, and was en route to KGPH to refuel. After refueling, the pilot planned to proceed to Liberty Hospital in Liberty, Missouri, which was located about 7 nm from KGPH. Daylight, visual meteorological conditions prevailed at the time of the accident, and a company visual flight rules (VFR) flight plan was filed.

The aircraft impacted the ground in an approximately 40° nose-down attitude. There was extensive structural damage to the aircraft with wreckage strewn along an approximately 100-foot-long debris path. Impact signatures were consistent with a low rotor RPM and a high rate of descent at the point of initial impact.

There was no post-impact fire. No evidence of aircraft fuel was observed at the accident site. The fuel tank assembly was found intact. The fuel lines were generally intact. Less than one liter of fuel was found in the fuel tank and lines. Upon examination of the fuel filter system, no fuel was observed in the lines on the engine side of the filter, and only a small, residual amount of fuel was observed in the lines on the tank side of the filter. The evidence is consistent with fuel exhaustion occurring in the final moments of the accident flight.

Federal Aviation Regulations (FARs) place responsibility for proper fuel management on the pilot in command of a particular flight. Air Methods’ operating procedures require compliance with the FARs, to include mandating that Air Methods’ pilots comply with the fuel reserve requirements under the FARs. Such regulations require a certain amount of "reserve" fuel to ensure the aircraft has a sufficient margin of safety in the amount of fuel the aircraft has on board for the intended flight. For the flight in question, that fuel reserve should have permitted an additional 20 minutes of flight beyond the intended destination. Air Methods concludes that amount of reserve fuel was not on board the aircraft at the time the aircraft lifted off from the Harrison County Community Hospital. Air Methods further concludes that the pilot would have received fuel gauge and fuel low level indications of the aircraft's critically low fuel level well before fuel exhaustion. The evidence is consistent with the accident pilot knowingly continuing flight beyond safe fuel levels.

Air Methods believes the following were causal factors[1] leading to the accident:

- The accident pilot initiated the accident flight with insufficient fuel reserves for the intended flight.
- The accident pilot did not immediately terminate the flight upon indications of a low fuel level.

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[1] Air Methods defines a "casual factor" as any action, behavior, omission, or deficiency that if corrected, eliminated, or avoided probably would have prevented the accident.

- The accident pilot continued flight until fuel exhaustion which caused immediate and total loss of power.
- The accident pilot did not successfully perform the emergency procedures for the loss of engine power at low altitude.

Air Methods also believes the following were contributing factors[2] to the accident:

- The accident pilot did not adhere to Air Methods' standard operating procedures related to fuel management, prohibitions against in-flight use of cellular telephones, and prioritization of safety of flight.
- Contrary to established Air Methods' standard operating procedures, the accident pilot prioritized completion of the accident flight above maintaining proper fuel reserves and safety of flight.
- The accident pilot was distracted by his use of a personal cellular telephone during flight activities, which may have detracted from the time available to the pilot for sound analysis of the situation.
- The accident pilot's selection of flying less than 500 feet above ground level (AGL) along the route of flight limited the opportunity to establish a proper autorotation.

Air Methods concluded the following regarding the loss of the aircraft crew and patient:

- The impact forces in the accident were not survivable.

Air Methods proposes the following as the probable cause of this tragic accident:

The probable cause of this accident was that the pilot initiated the accident flight with insufficient fuel reserves for the intended flight, continued the flight with a known low fuel status, and upon loss of engine power did not successfully perform the necessary emergency procedure.

Contributing to the accident was the pilot's inadequate pre-flight preparation of the aircraft, failure to accurately disclose the critically low fuel level to the operational control center or the communications center at the departure hospital, behavior-influenced decision-making that prioritized personal objectives over safety of flight, and demonstrated noncompliance with published company policies and procedures.

2 BACKGROUND

2.1 Air Methods

Air Methods is a commercial, on-demand air taxi operator specializing in helicopter emergency medical services (HEMS). The company was established in 1980 in Colorado, and currently serves 48 states with nearly 4,000 employees. Air Methods received its Title 14 CFR Part 135 Operating Certificate, number QMLA253U, on March 1, 1992. Air Methods is the largest provider of air medical emergency transport services throughout the United States. The company operates 404

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[2] Air Methods defines "contributing factor" as any action, behavior, omission, or deficiency that set the stage for the accident, or increased the severity of the outcome.

helicopters and 20 airplanes out of 310 bases. In 2012, Air Methods is expected to fly close to 161,000 air medical flight hours, and conduct nearly 105,000 patient transports. Air Methods also considers itself to be a healthcare company. Encompassed in this characterization is the fact that Air Methods provides trained healthcare professionals to administer advanced medical care during the transport of patients.

Air Methods has experienced steady expansion and acquired the following helicopter emergency medical service (HEMS) operations over the last 15 years: Mercy Air Service (1997), ARCH (2000), Rocky Mountain Holdings (2002), CJ Systems (2007), and Omniflight (2011).

Air Methods operates in accordance with its FAA-approved Operations Specifications (Ops Spec). The latest Ops Spec at the time of the accident was the revision dated July 18, 2011. Contained in the Ops Spec was authorization to conduct on-demand, single-engine, instrument flight rules, passenger-carrying operations. Air Methods provided an organizational chart which is contained in the NTSB Operations Factual Report.

The company participates in the FAA’s voluntary Safety Management System pilot program and has demonstrated progression through the program since 2008. There are 4 levels of SMS maturation. Air Methods is one of only 8 HEMS operators, out of more than 160 operators HEMS and fixed wing 121 operators participating in the voluntary program, that have reached or exceeded level 3. At the time of the accident, Air Methods had exited Level 2 and anticipates exiting Level 3 during the first quarter of 2013. In the last four years, the company has invested more than $100 million in advancing and incorporating safety programs and technologies into its operations. Examples include use of advanced aviation training devices, including a Level B Full-Motion Simulator; a robust Operational Control Center; implementation of a Line Operations Safety Audit (LOSA) program; ongoing development of a Flight Operational Quality Assurance (FOQA) program; formal fatigue studies; and technologies such as night vision goggles[3], Helicopter Terrain Avoidance Warning Systems (HTAWS), Global Positioning System (GPS) capabilities, Satellite Weather, and Satellite Tracking.

2.2 Mission

The purpose of the air medical inter-facility transport flight was to transport a patient from the Harrison County Community Hospital to Liberty Hospital.

2.3 Precursor Events

Air Methods’ pilot training is often conducted at operational bases and is especially beneficial when a base is co-located at an airport.

Helicopter N101LN was relocated to Rosecrans Memorial Airport (KSTJ) to support the Helicopter Emergency Medical (HEMS) operations during the period of time that N352LN would be used to train pilots in Night Vision Goggle (NVG) flight operations. There are advantages to utilizing a spare aircraft because it dedicates an asset to the training and the other aircraft remains available for HEMS.

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[3] Night Vision Goggles are typically part of a Night Vision Imaging System which ensures aircraft systems and lighting compatibility with the NVGs. Aircrews must be sufficiently trained with the Night Vision Imaging System used, and not simply rely on past training or experience with NVGs.

NVG flight training was being conducted concurrently with HEMS operations at the St. Joseph base in the days prior to the accident. The aircraft dedicated to training was the accident helicopter, N352LN. The medically-configured aircraft N101LN was in-service at the St. Joseph base for HEMS flights.

Maintenance records indicate that on August 22, 2011, the helicopter interior of the accident helicopter, N352LN, was reconfigured to accommodate the NVG pilot flight training.

The accident helicopter was then used for NVG flight training beginning the night of Tuesday, August 23, through early morning Friday, August 26. The last NVG training flight was completed around 0300 on Friday, August 26. On August 26, the accident helicopter, N352LN was reconfigured for HEMS operations. To reconfigure the helicopter required the mechanic based at St. Joseph to remove the copilot's seat, cyclic, collective, and pedals from N352LN, and reinstall the HEMS interior. The helicopter was reconfigured for HEMS flights and was put back into service at approximately 1530.

As a standard practice, the Air Methods CCE who was providing the NVG flight training did not refuel the accident helicopter after the last training flight. The accident aircraft, N352LN was going to be reconfigured for HEMS operations and the fuel load would be determined by the oncoming duty pilot who was the accident pilot. Under Air Methods' standard operating procedures, the EMS duty pilot is required to compute the desired amount of fuel to be placed in the pre-fueled and pre-flighted aircraft and sign the aircraft off as prepared for flight.[4] The oncoming, and ultimately, accident pilot was therefore required to determine the acceptable fuel load based on customary practices for the St. Joseph base and on weight and balance considerations, such as the weight of the pilot and medical crewmembers on that shift.

The NTSB report quoted an Air Methods' employee who stated there was approximately 24% of fuel remaining in the accident aircraft. However, calculations by Air Methods following the accident indicate that the aircraft would more likely have had approximately 36% of fuel on board when it lifted off from the St. Joseph base. Fuel records obtained from the airport manager confirm that the accident aircraft was not refueled on August 26. According to an interview with the St. Joseph base lead pilot, the duty helicopter is typically loaded with a 70% fuel load each day. A 70% fuel load provides about 2 hours of fuel. When the helicopter needs refueling during normal airport hours, the airport services the helicopter with the fuel truck. At night, the on-duty HEMS pilot would refuel the helicopter using the fuel truck.

The accident pilot arrived for duty on the day of the accident flight prior to 0630. According to an NTSB interview with the night shift pilot going off duty, the accident pilot received a briefing from the departing night shift pilot that covered the following: the status of the in-service helicopter N101LN; the training that had been accomplished using the accident helicopter, and that the accident helicopter needed to be reconfigured for medical work when the mechanic arrived; and that the accident helicopter was low on fuel and needed to be refueled before being placed into service. The accident pilot conducted a preflight of N101LN and signed its Daily Flight Log,

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[4] The aircraft would be signed off as preflighted for flight on the Daily Flight Log/Load Manifest. The Air Methods GOM, page C-2, states that "The pilot shall record the preflight/airworthiness check by signing the appropriate section of the Daily Flight Log."

because the accident helicopter, N352LN would remain out of service until it was reconfigured for HEMS flights.

The helicopter mechanic completed the maintenance and required logbook entries to return the accident helicopter, N352LN, to service. Two “Conform Your Aircraft (CYA)” entries were entered into the Aircraft Record of Maintenance by the helicopter mechanic. The accident pilot was required by the GOM to acknowledge the maintenance by initialing the CYA entries. The accident pilot did not initial the CYA entries as required by the Air Methods General Operations Manual (GOM) before flight. The accident pilot also did not sign the Daily Flight Log/load manifest for the accident helicopter, N352LN after the helicopter was put back into service about 1530.

Once the accident helicopter was returned to service, the accident pilot and medical crew transferred the pilot's gear and medical gear from N101LN to the accident helicopter N352LN.

2.4 Accident Flight

A transport request was received by the Air Methods Communications Center (AirCom) at 1719, and the accident pilot was notified at 1720 on August 26. During the initial notification, the accident pilot accepted the flight and the HEMS crewmembers prepared to depart. The accident helicopter N352LN became airborne about 1728. This time from notification to liftoff is close to the Air Methods’ average of just in excess of 10 minutes and is based on the fact the preflight preparation should have already been accomplished and the aircraft placed in an airworthy condition.[5]

About 1730, the accident pilot radioed to the AirCom communication specialist that the accident helicopter N352LN departed KSTJ with 2 hours of fuel and three persons on board with a risk assessment value (B).[6]

Approximately 28 minutes later the accident helicopter landed at the Harrison County Community Hospital helipad to pick up the patient.

Once the accident helicopter was shut down on the hospital helipad, the flight nurse and flight paramedic took their stretcher into the hospital’s emergency room to prepare the patient for flight. The accident pilot stayed in the accident helicopter and, at 1758, contacted the AirCom communication specialist by cellular telephone and notified him that N352LN had landed at the hospital. The accident pilot also reported that about half way through the flight from KSTJ to Harrison County Community Hospital, the accident pilot realized that the fuel level was lower than the accident pilot had originally thought. The accident pilot stated that the fuel the accident pilot reported was from N101LN, and not from the accident helicopter, N352LN.

The accident pilot and communication specialist discussed refueling options since Liberty Hospital was 62 nautical miles (nm) away and would take about 34 minutes en route. The communication specialist and accident pilot checked for availability of Jet-A fuel at nearby airports by reference to

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[5] The Cyclic / Control Yoke Warning Cover Procedure in the GOM ensures the pilot knows whether the aircraft remains airworthy following his preliminary preflight or has subsequently been taken out of service.

[6] Code B is a typical flight - flying under normal circumstances, according to Risk Assessment procedure in the Air Methods GOM. Both the matrix at the time of the accident and the new tool/matrix are located in the Risk Assessment Matrices in the Appendix of this submission.

the Airport Facilities Directory, but the closest airports that reported Jet-A were KSTJ, which was 51 nm away, and at KGPH in Mosby, Missouri, which was 58 nm away.

According to an AirCom recording of the conversation, at one point the accident pilot stated concerning the flight to KGPH, “It looks like it’s going to be about 27 minutes to me, I think.” After the communication specialist informed the pilot that it was 58 nm to KGPH, the pilot stated, “Fifty-eight nautical miles. So it would save me, save me 4 nautical miles and 2 minutes. I think that’s probably where I’m going to end up going.” The communication specialist asked the accident pilot if he was going to depart for KGPH for fuel and then return for the patient pick-up, or if the accident pilot intended to refuel with the patient on board. The accident pilot informed the dispatcher that he would refuel with the patient on board at KGPH. The accident pilot stated, “I don’t want to run short and I don’t want to run into that 20-minute reserve if I don’t have to…;’ and, “We’ll take off. I’ll see how much gas I have when I got and I’ll call you when we’re in the air.”

The communication specialist changed the flight plan for N352LN in the computer to indicate that the route of flight was now from the hospital in Bethany, Missouri, to KGPH instead of to Liberty Hospital.

Neither the accident pilot nor the communication specialist discussed contacting the Air Methods Operational Control Center (OCC) to inform the OCC of the fuel situation or the changed route of flight. There was no requirement to do so under Air Methods’ standard operating procedures in place at the time.

At 1806, the communication specialist briefed the on-coming communication specialist. He briefed the status of all the HEMS helicopters that were currently on transport flights, including the fuel situation with N352LN, and the status of all the HEMS bases that were handled by their sector. Neither the off-going communication specialist nor the on-coming communication specialist made any mention about whether the OCC should be notified concerning the status of N352LN.

Meanwhile, the medical flight crew arrived back at the accident helicopter and loaded the patient onto the accident helicopter’s litter. Two hospital emergency room nurses who assisted the medical flight crew reported that neither medical crewmember mentioned anything unusual about the accident helicopter or about the fuel status of the accident helicopter.

About 1811, the accident aircraft departed from the Harrison County Community Hospital helipad, and the accident pilot contacted the AirCom communication specialist and reported that he had 45 minutes of fuel and 4 persons on board and was en route to KGPH. About 1813, the accident pilot requested that the AirCom communication specialist contact the fixed base operator at KGPH to let them know that the accident helicopter was inbound for fuel. The communication specialist who had just come on duty acknowledged the accident helicopter' radio transmission, and stated that she would notify KGPH that the accident helicopter would be landing for fuel.

About 1815, the communication specialist who went off duty notified the AirCom supervisor that N352LN was low on fuel and would be refueling with the patient on board at KGPH. The supervisor directed him to contact the medical base supervisor at St. Joseph, but the communication specialist informed him that the medical base supervisor was on board the accident aircraft. About 1821, the communication specialist contacted the fixed base operator (FBO) and informed the FBO that the accident helicopter was inbound for fuel and would be arriving in about 19 minutes.

About 1827, the communication specialist notified the accident pilot that the fuel had been arranged for at KGPH. The accident pilot acknowledged the call.

About 1844, the on-duty communication specialist contacted the fixed base operator to determine if the accident helicopter had landed yet. He informed her that the accident pilot had called “a few minutes ago and I’m sitting in my truck looking for him, but I haven’t seen him yet.” The communication specialist tried contacting the accident helicopter by radio but without success. About 1853, the AirCom supervisor notified the Air Methods OCC that accident helicopter was overdue and was low on fuel.

3 FACTUAL SUMMARY

3.1 Aircraft Configuration

The accident aircraft was a Eurocopter AS350 B2 (Registration Number: N352LN / Serial Number: 3728) designed and equipped for VFR and night vision goggle flights. It was powered by a single Turbomecca Arriel 1D1 turbine engine (Serial Number 9872), equipped with three main rotor blades and a skid-type landing gear designed for on or off-airport and unimproved landing operations. Aircraft N352LN was manufactured in 2003, and acquired by Air Methods Corporation in 2005. At the time of the accident, N352LN had logged 3,655 flight hours and the most recent maintenance inspection was completed on August 26, 2011, in accordance with the Air Methods Approved Aircraft Inspection Program. The interior of N352LN was configured for transport and care of a single patient on a traditional litter type system installed on the left side of the aircraft. This traditional, Air Methods-installed emergency medical service interior allows for medical personnel to access the patient while seated in flight.

3.2 Aircraft Examination

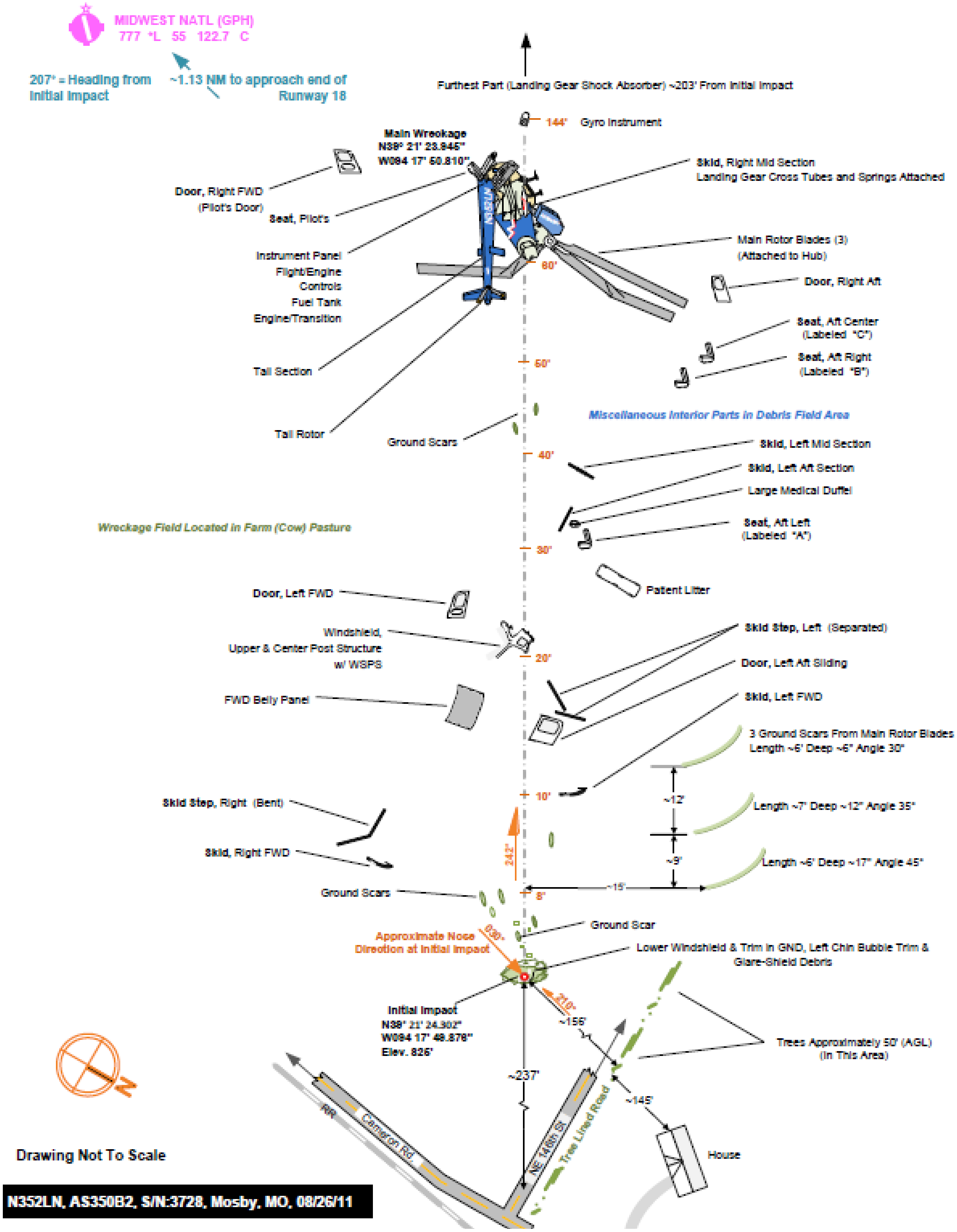
After the initial on-site investigation, Air Methods participated as a party member to several follow-up investigations including an engine tear down at Turbomeca USA in Grand Prairie, Texas, and a detailed fuel system inspection at American Eurocopter, also in Grand Prairie, Texas. The engine inspections revealed damage consistent with an engine spool down at the time of impact. The fuel system test confirmed that both the fuel quantity and low fuel warning systems were working properly. These findings were documented by American Eurocopter in a report titled "Fuel & Performance Report," which was submitted to the NTSB.

3.3 Accident Site Description

The aircraft wreckage was located in a farm field on a direct course line between the Harrison County Community Hospital helipad and KGPH. The initial impact point was located about 1 nm from the approach end of runway 18 at KGPH (See Wreckage Diagram for additional details).

The aircraft structure was heavily fragmented and scattered along the 100-foot-long debris path, which was oriented on a heading of about 242°. All the impact signatures were consistent with a low rotor RPM and a high rate of descent. The impact signatures to the components of the airframe structure were consistent with the initial impact occurring in a 40° nose-low and slight left-bank attitude with the nose of the aircraft pointed about 30° (nearly opposite to the direction of travel). An approximate 2 foot section of the lower right windscreen was found embedded 10 inches deep at the initial impact point at an 80° angle, which, again, corresponds to an approximate nose down aircraft attitude of 40°. The fuselage was broken open separating the patient litter and three rear seats from the aircraft. The pilot's 'Sicma' energy attenuating seat remained attached to the floor mounts and exhibited a near full attenuation and slight displacement to the left.

Three separate main rotor blade strike ground scars were found at the beginning of the wreckage path, to the right of center. The main rotor blades remained attached to the rotor head and mast. Due to the post impact vaulting of the wreckage along the energy path, one blade came to rest bent down and inward more than 90° in a flapping fashion at the root, and the other two blades were relatively straight. Similarly, the two tail rotor blades exhibited little impact damage and were relatively straight, although one blade was partially separated at the blade root.



The on-site examination of the engine revealed that the axial compressor blades exhibited blade rub opposite the direction of travel. Metal shavings were found in the engine bleed air valve. The Module 5 input pinion nut slippage mark was found intact and not misaligned, which was consistent with an engine rotating but not making power at impact.

The fuel tank assembly was found intact and located in the midst of the main wreckage. No fuel was observed at the accident site. Less than 1 liter of fuel was found in the fuel tank or lines, which were generally intact. The airframe fuel filter system was examined and no fuel was observed in the lines on the engine side of the filter, and only a residual amount of fuel was observed in the lines on the tank side of the filter.

The instrument panel was relatively intact and separated from the airframe; however, most of the instruments could be easily read and observed. Many displayed settings towards the low side of measurements; however, the overall impact damage precluded the ability to rely with certainty on their readings. The instrument panel was configured with the NVG lighting and filters. The brightness switch on the caution-warning annunciator panel was found on the low (dim) setting.

3.4 Weather

According to digital screen captures of the METAR provided by the OCC on the evening of the accident, the weather conditions in and around Kansas City and Mosby, Missouri, were reported as VMC at 2353Z. Approximately 21 miles west-southwest of the accident site, the weather reported at KMCI (Kansas City International Airport) was a seven knot wind out of the east with 10 miles of visibility and a broken ceiling at 15,000 feet. The reported temperature was 29° Centigrade with a dew point of 18°. There was no reported precipitation or turbulence.

3.5 Aircraft History

3.5.1 Aircraft Maintenance

The last maintenance inspection was performed on August 26, 2011 in accordance with the Air Methods Approved Inspection Program (AAIP) and the aircraft determined to be in airworthy condition.

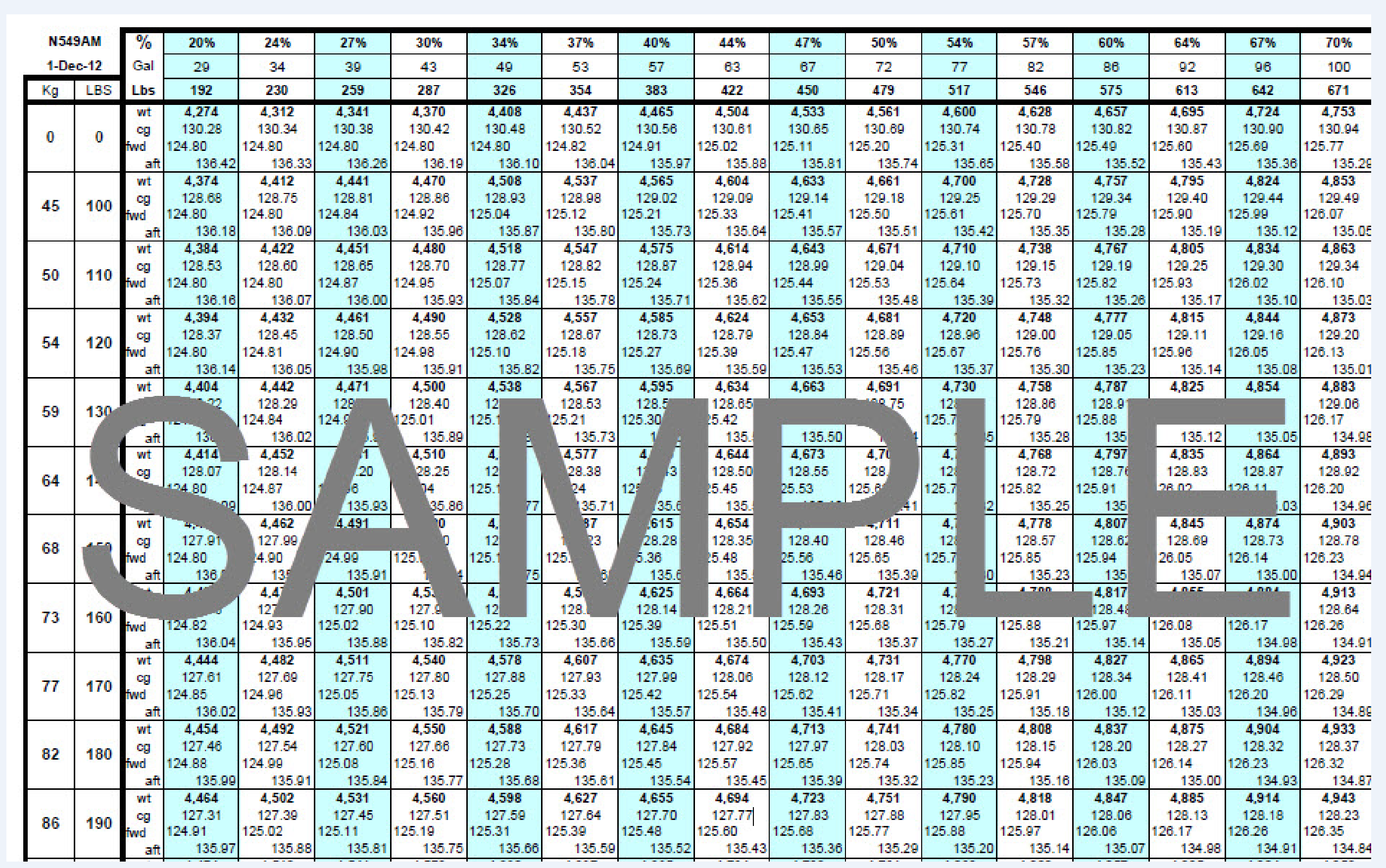
A review of the maintenance records do not indicate any anomaly and confirmed the aircraft was in compliance with the manufacturer's instructions and pertinent FAA regulations at the time of the accident.

Of particular interest to this investigation, the fuel system was found to be operating properly in post accident examination. This is consistent with the aircraft logbook. The fuel system was examined on August 22 in the most recent major inspection prior to the accident flight. Coupled with analysis of the wreckage and forensic investigations, including functional testing of the fuel quantity indicating and low fuel level warning systems, the accident aircraft was found to be in airworthy condition for the accident flight.

3.5.2 Aircraft Weight & Balance

The helicopter’s flight manual lists the maximum gross weight as 4,961 pounds with the center of gravity limitations between 125.1 to 135.8 inches. The operational empty weight listed in N352LN’s weight and balance records was 3,326.7 pounds with a longitudinal arm of 137.2 inches.

Air Methods, standard operating procedure (per the General Operations Manual, Rev 6, Weight and Balance Control) is for the weight and balance calculations to be completed by the pilot, prior to the first flight of the day, utilizing a standardized spreadsheet program that will create a loading chart (sample shown below) that is printed and carried in the aircraft.



N549AM		%	20%	24%	27%	30%	34%	37%	40%	44%	47%	50%	54%	57%	60%	64%	67%	70%
1-Dec-12		Gal	29	34	39	43	49	53	57	63	67	72	77	82	86	92	96	100
Kg	LBS	Lbs	192	230	259	287	326	354	383	422	450	479	517	546	575	613	642	671
0	0	wt	4,274	4,312	4,341	4,370	4,408	4,437	4,465	4,504	4,533	4,561	4,600	4,628	4,657	4,695	4,724	4,753
		cg	130.28	130.34	130.38	130.42	130.48	130.52	130.56	130.61	130.65	130.69	130.74	130.78	130.82	130.87	130.90	130.94
		fwd	124.80	124.80	124.80	124.80	124.80	124.82	124.91	125.02	125.11	125.20	125.31	125.40	125.49	125.60	125.69	125.77
		aft	136.42	136.33	136.26	136.19	136.10	136.04	135.97	135.88	135.81	135.74	135.65	135.58	135.52	135.43	135.36	135.29
45	100	wt	4,374	4,412	4,441	4,470	4,508	4,537	4,565	4,604	4,633	4,661	4,700	4,728	4,757	4,795	4,824	4,853
		cg	128.68	128.75	128.81	128.86	128.93	128.98	129.02	129.09	129.14	129.18	129.25	129.29	129.34	129.40	129.44	129.49
		fwd	124.80	124.80	124.84	124.92	125.04	125.12	125.21	125.33	125.41	125.50	125.61	125.70	125.79	125.90	125.99	126.07
		aft	136.18	136.09	136.03	135.96	135.87	135.80	135.73	135.64	135.57	135.51	135.42	135.35	135.28	135.19	135.12	135.05
50	110	wt	4,384	4,422	4,451	4,480	4,518	4,547	4,575	4,614	4,643	4,671	4,710	4,738	4,767	4,805	4,834	4,863
		cg	128.53	128.60	128.65	128.70	128.77	128.82	128.87	128.94	128.99	129.04	129.10	129.15	129.19	129.25	129.30	129.34
		fwd	124.80	124.80	124.87	124.95	125.07	125.15	125.24	125.36	125.44	125.53	125.64	125.73	125.82	125.93	126.02	126.10
		aft	136.16	136.07	136.00	135.93	135.84	135.78	135.71	135.62	135.55	135.48	135.39	135.32	135.26	135.17	135.10	135.03
54	120	wt	4,394	4,432	4,461	4,490	4,528	4,557	4,585	4,624	4,653	4,681	4,720	4,748	4,777	4,815	4,844	4,873
		cg	128.37	128.45	128.50	128.55	128.62	128.67	128.73	128.79	128.84	128.89	128.96	129.00	129.05	129.11	129.16	129.20
		fwd	124.80	124.81	124.90	124.98	125.10	125.18	125.27	125.39	125.47	125.56	125.67	125.76	125.85	125.96	126.05	126.13
		aft	136.14	136.05	135.98	135.91	135.82	135.75	135.69	135.59	135.53	135.46	135.37	135.30	135.23	135.14	135.08	135.01
59	130	wt	4,404	4,442	4,471	4,500	4,538	4,567	4,595	4,634	4,663	4,691	4,730	4,758	4,787	4,825	4,854	4,883
		cg	[illegible]	128.29	[illegible]	128.40	[illegible]	128.53	[illegible]	128.65	[illegible]	[illegible]	[illegible]	128.86	[illegible]	[illegible]	[illegible]	129.06
		fwd	[illegible]	124.84	[illegible]	125.01	[illegible]	125.21	125.30	[illegible]	[illegible]	[illegible]	[illegible]	125.79	125.88	[illegible]	[illegible]	126.17
		aft	[illegible]	136.02	[illegible]	135.89	[illegible]	135.73	[illegible]	[illegible]	135.50	[illegible]	[illegible]	135.28	[illegible]	135.12	135.05	134.98
64	[illegible]	wt	4,414	4,452	[illegible]	4,510	[illegible]	4,577	[illegible]	4,644	4,673	[illegible]	[illegible]	4,768	4,797	4,835	4,864	4,893
		cg	128.07	128.14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	128.50	128.55	[illegible]	[illegible]	128.72	[illegible]	128.83	128.87	128.92
		fwd	[illegible]	124.87	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	125.82	125.91	[illegible]	[illegible]	126.20
		aft	[illegible]	136.00	135.93	[illegible]	[illegible]	135.71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	135.25	[illegible]	[illegible]	[illegible]	134.96
68	[illegible]	wt	[illegible]	4,462	4,491	[illegible]	[illegible]	[illegible]	[illegible]	4,654	[illegible]	[illegible]	[illegible]	4,778	4,807	4,845	4,874	4,903
		cg	127.91	127.99	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	128.35	128.40	128.46	[illegible]	128.57	[illegible]	128.69	128.73	128.78
		fwd	124.80	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	125.65	[illegible]	125.85	125.94	[illegible]	126.14	126.23
		aft	[illegible]	[illegible]	135.91	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	135.46	135.39	[illegible]	135.23	[illegible]	135.07	135.00	134.94
73	160	wt	[illegible]	[illegible]	4,501	[illegible]	[illegible]	[illegible]	4,625	4,664	4,693	4,721	[illegible]	[illegible]	4,817	[illegible]	[illegible]	4,913
		cg	[illegible]	[illegible]	127.90	[illegible]	[illegible]	[illegible]	128.14	128.21	128.26	128.31	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	128.64
		fwd	124.82	124.93	125.02	125.10	125.22	125.30	125.39	125.51	125.59	125.68	125.79	125.88	125.97	126.08	126.17	126.26
		aft	136.04	135.95	135.88	135.82	135.73	135.66	135.59	135.50	135.43	135.37	135.27	135.21	135.14	135.05	134.98	134.91
77	170	wt	4,444	4,482	4,511	4,540	4,578	4,607	4,635	4,674	4,703	4,731	4,770	4,798	4,827	4,865	4,894	4,923
		cg	127.61	127.69	127.75	127.80	127.88	127.93	127.99	128.06	128.12	128.17	128.24	128.29	128.34	128.41	128.46	128.50
		fwd	124.85	124.96	125.05	125.13	125.25	125.33	125.42	125.54	125.62	125.71	125.82	125.91	126.00	126.11	126.20	126.29
		aft	136.02	135.93	135.86	135.79	135.70	135.64	135.57	135.48	135.41	135.34	135.25	135.18	135.12	135.03	134.96	134.89
82	180	wt	4,454	4,492	4,521	4,550	4,588	4,617	4,645	4,684	4,713	4,741	4,780	4,808	4,837	4,875	4,904	4,933
		cg	127.46	127.54	127.60	127.66	127.73	127.79	127.84	127.92	127.97	128.03	128.10	128.15	128.20	128.27	128.32	128.37
		fwd	124.88	124.99	125.08	125.16	125.28	125.36	125.45	125.57	125.65	125.74	125.85	125.94	126.03	126.14	126.23	126.32
		aft	135.99	135.91	135.84	135.77	135.68	135.61	135.54	135.45	135.39	135.32	135.23	135.16	135.09	135.00	134.93	134.87
86	190	wt	4,464	4,502	4,531	4,560	4,598	4,627	4,655	4,694	4,723	4,751	4,790	4,818	4,847	4,885	4,914	4,943
		cg	127.31	127.39	127.45	127.51	127.59	127.64	127.70	127.77	127.83	127.88	127.95	128.01	128.06	128.13	128.18	128.23
		fwd	124.91	125.02	125.11	125.19	125.31	125.39	125.48	125.60	125.68	125.77	125.88	125.97	126.06	126.17	126.26	126.35
		aft	135.97	135.88	135.81	135.75	135.66	135.59	135.52	135.43	135.36	135.29	135.20	135.14	135.07	134.98	134.91	134.84

The loading chart shows fuel in percentage going from left to right across the top of the page and patient weight from top to bottom on the left side of the page. The pilot can draw an intersecting line from the patient weight to the fuel percentage and obtain the center of gravity information needed for subsequent flights on a particular mission.

The actual weight and balance calculation for the accident flight was not recorded at the home base, and no weight and balance loading chart was recovered from the wreckage.

Based on the reported crew weights, equipment loading, and reverse fuel calculations from the accident site, the accident helicopter weighed 4,541 pounds, of a maximum allowable 4,961 pounds, and likely had on board an approximately 36% (345 lbs.) fuel load when it departed St. Joseph, Missouri. The helicopter's center of gravity (CG) was 129.1 inches at takeoff, which was between the center of gravity limitations of 125.1 and 135.8 inches.

At the point of the accident, the total helicopter weight, including the patient (102 pounds), but without fuel, was 4,195.2 pounds with a center of gravity still at 129.1 inches, which remained within the center of gravity limits.

The Air Methods Certificate Compliance Evaluator (CCE)[7] who flew the previous NVG training mission in N352LN stated during his interview with the NTSB that the fuel gauge indicated there was about 24% of fuel remaining when the aircraft was handed off to the accident pilot. Based on reverse fuel calculations and evidence obtained during the investigation, the aircraft would need at least 36% fuel when it departed St. Joseph, Missouri, to travel to the Harrison County Community Hospital, take off, and then reach the accident site.

3.6 Flight Crew Information

3.6.1 Pilot-in-Command

The pilot, age 34, held a commercial pilot certificate with rotorcraft-helicopter and instrument-helicopter ratings issued on September 22, 2005 by the FAA. He held a second-class medical certificate with no limitations issued on September 1, 2010. Prior to being employed by Air Methods, the pilot flew for the United States Army and previously held the titles of Chief Warrant Officer 2, Tactical Operations Officer and Aviation Safety Officer. This was his first civilian commercial flying position.

The pilot received the Army Commendation Medal, Air Medal and Army Aviation Wings. In the resume that he presented to Air Methods, the pilot indicated that he had a total of 2,071.1 rotorcraft flight hours of which 895.1 were as pilot in command (PIC) and 200 were in an AH-64-D simulator. He had 1,675.4 multi-engine rotorcraft hours, 200 NVG hours, and 73.1 hours of unaided PIC night hours. He was a PIC in the AH-64-D and he also flew 141.7 hours in the Bell 206 / OH-58 A/C aircraft. He indicated that he flew 15 hours in a Cessna 172 and Cessna 210, but he did not hold a private pilot's license in single-engine airplanes.

The pilot accumulated a total of 104 flight hours in the AS350 B2 and 32 flight hours in the AS350 B3 between October 10, 2010, and August 26, 2011. He flew 18 hours within the 30 days prior to the accident and 74 hours within the 90 days prior to the accident.

Air Methods' pilot training records showed no training difficulties and that the pilot started his Basic Indoctrination Training on September 13, 2010. He started his Initial New Hire Training for the AS350 B, BA, and B2 on October 4, 2010, in aircraft N352LN. After receiving 4.2 hours of flight training, he completed the FAR 135.299 Airman Competency/Proficiency Check on October 6, 2010.

All areas of the examination were graded as 'S' (satisfactory)[8] and no discrepancies were noted. Recovery from inadvertent instrument meteorological conditions was tested and an ILS approach arrival was performed. Power failures, autorotations to a power recovery, and oral discussion of hovering autorotations were accomplished[9]. He was assigned to the St. Joseph, Missouri, base and completed his base orientation, which included three orientation flights totaling 5 hours, on October 11, 2010.

On March 7, 2011, the pilot completed NVG Ground training. On March 14 - 16, 2011, he received his initial NVG flight training and recurrent flight training. On March 16, 2011, he received his most

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[7] CCEs assist the Chief Pilot in all pilot record keeping requirements in accordance with applicable FARs and policies.

[8] Grading categories: S-satisfactory, U-unsatisfactory, U/S-Retrained, N/A-Not Applicable.

[9] Actual performance of hovering autorotations was waived by the FAA at the time.

recent annual FAR 135.293 Airman Competency/Proficiency Check and his NVG Proficiency Check. All areas of the examination were graded as ‘S’, and no discrepancies were noted.

On April 12, 2011, the pilot received Differences Training in an AS350 B3. The training was limited to ground training and covered preflight inspections and start procedures.

On May 2, 2011, he transferred to Rapid City, South Dakota, as his new primary base where the base helicopter was an AS350 B3.

Pilot Training Flight and Competency/Proficiency Checks [10]

Date	Event	Aircraft Model	Flight Time (hrs)
4 - 6 Oct 10	Initial New Hire Training	AS 350 B2	4 + 08
10 Oct 10	FAR 135.293 check flight	AS 350 B2	1 + 0
14 – 16 Mar 11	Recurrent + NVG training flight	AS 350 B2	4 + 01
16 Mar 11	FAR 135.293 + NVG check flight	AS 350 B2	1 + 01
Total			**10.2**

The pilot was requested by Air Methods to continue to assist with manning at St. Joseph, Missouri. Since his May 2 transfer to Rapid City, he had performed most of his shifts at St. Joseph. Accordingly, the accident pilot had approximately 10 months of experience with the St. Joseph area.

3.6.2 Medical Crewmembers

The medical crew was experienced in Helicopter Emergency Medical Services (HEMS). The Flight Nurse, who was the base manager, had 8 years in HEMS, and the Flight Paramedic had 6 years in HEMS.

Both medical crewmembers were trained in accordance with the Air Methods’ flight training program and were qualified as crewmembers.

3.7 Human Factors

3.7.1 Schedule and Workover

The accident pilot had just completed five days off duty spending the time primarily in Lincoln Nebraska. He traveled to St. Joseph, Missouri on August 24 and 25, according to NTSB interviews, remaining overnight at a friend's house on August 24. The total driving distance between the two locations is approximately 145 miles with a driving time of approximately 2 hours and 20 minutes. Because the St. Joseph location was not the pilot's assigned duty station, he was authorized to use a company-paid layover hotel in St. Joseph prior to beginning his flight duty day. Accordingly, the accident pilot checked into the layover hotel on August 25 at 1423 in St. Joseph.

The accident pilot participated in scheduled company training on August 25, which consisted of the annual recurrent aircraft ground training. This training typically takes a half day.

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[10] Obtained from Air Methods training records.

On Friday, August 26, the day of the accident, the accident pilot was scheduled to work the day shift, which normally spans 0630 to 1830. He reportedly arrived for work on time, if not early.

The Air Methods' pilot non-supervisory workforce is governed by a Union Collective Bargaining Agreement (CBA). The CBA defines pilot work rules such as scheduling, workover, and base assignment. The pilot union is the Office and Professional Employees International Union (OPEIU), Local 109.

The pilots at each base determine the appropriate schedules of service consistent with the company policies and needs and customer operations. The scheduled shift is defined as twelve (12) hours. The pilots determine the schedule as long as for every day worked there is an equal day off. For example seven, 12-hour day shifts in a row must result in seven days off in a row. Or seven, 12-hour night shifts in a row must result in seven days off in a row. While the accident pilot was assigned to Rapid City, South Dakota, he was scheduled to perform his next series of shifts at St. Joseph. The accident pilot was scheduled for seven (7) (shifts) on, seven (7) (days) off.

The company offers workover when open shifts exist at either the pilot's assigned base or at a different base. The workover is first offered to the pilots at the assigned base where the workover will occur. In the event there are no volunteers at the base where the workover occurs the company can solicit volunteers from bases that are local in nature (in a 50 mile radius). In the event that there are no volunteers that are local in nature, the company can use pilots from any base who have volunteered to perform workover. It is a common practice for pilots to cover shifts at bases other than their assigned base or that are not local in nature.

The accident pilot was not in a workover status on the day of the accident. He had performed the following workover shifts in the months prior to the accident: zero in April, zero in May, one in June, one in July, and three in August.

3.7.2 Sleep and Fatigue

Air Methods has a number of policies in place to minimize the likelihood and effects of sleep loss and fatigue. Pilots will not be scheduled for subsequent shifts unless they are afforded a minimum of 10 hours of off-duty time. This policy is provided in the General Operations Manual, Rev 6, Flight Time and Duty Time and is consistent with FAA regulations. The GOM states:

> *"The pilot will not return to duty until he/she has had a minimum of 10 consecutive hours of uninterrupted rest.*
>
> *Air Methods will not assign, nor may any pilot accept a duty assignment during a required rest period. Pilots will report for duty with the appropriate rest and be capable of performing the functions of a flight crewmember. Additionally, pilots who perform non- Air Methods flying for compensation or hire will ensure that these activities do not interfere with his/her ability to perform his/her duties.*
>
> *Pilots will not plan to exceed the one or two pilot crew flight time limits of 8/10 hours respectively. When the 8/10-hour flight time limit is exceeded during a regularly scheduled 14-hour duty day, compensatory rest, per 135.267(e), must be taken. Each Air Methods pilot shall have at least 13 rest periods, of 24 consecutive hours, during each calendar quarter."*

Additionally, pilots are required to record “Duty-In” and “Duty-Out” in the Air Methods’ 411 system for their shifts, and this automatically verifies that they have had 10 hours off since the end of their last shift. If it has been less than the required 10 hours since the last “Duty-Out”, the 411 system will not allow a pilot to log “Duty-In.” The accident pilot was properly verified in the 411 system for his shift on the day of the accident.

At the time of the accident in August 2011, the standing Air Methods Corporate Safety Policy published by the Chief Operating Officer stated that the, “Company’s culture is founded on the principles of continuous training, vigilance, prevention and open communications.” Additionally, it stated that each division of Air Methods is committed to the following: continuous pursuit of the goal of no harm to people or property, promoting a culture of open reporting of all safety risks, providing a safe working environment and ensuring compliance with all appropriate Federal, State and local regulations. This safety policy was prominently displayed at the time of the accident in the entrance to the Air Methods’ corporate offices, presented to all new hire employees, and available on the Air Methods’ intranet.

Since the accident, Air Methods has made additional concerted efforts to clearly articulate its safety principles and policies through multiple avenues including briefings, code of business conduct, signs, newsletters, carry-along cards and via the Air Methods’ public webpage.

Consistent with this philosophy, Air Methods had at the time of the accident and still has policies addressing an employee’s fitness for duty. One of these includes the Productive Work Environment policy that defines acceptable employee conduct that includes, “reporting to work punctually as scheduled and being at the proper work station, ready for work, at the assigned time." Furthermore, during new hire training, the topics of fatigue and stress and the negative effects of lack of rest are covered during a presentation on Aeromedical Factors. Specifically, pilots are introduced to the FAA’s recommended personal checklist (I’M SAFE) to ensure crewmembers are physically and mentally safe to fly and not impaired by illness, medication, stress, alcohol, fatigue or emotions. These topics are required as part of Air Methods’ FAA-approved pilot training program. The training instructs that any pilot can self-report being fatigued or unfit for their flying shift without employment-related consequences, provided it isn’t habitual. If chronic or habitual, the employee would likely be referred for further evaluation of “fitness for duty” consistent with the Air Methods Union Collective Bargaining Agreement.

The NTSB record indicates that at least one witness in the investigation reported that the accident pilot commented that he had not slept well the evening of August 25 and "felt tired." Cellular telephone records obtained by the NTSB for the accident pilot's personal cell phone indicate that he took a brief call at 0019 on the morning of the accident.

Air Methods also provides accommodations at the workplace where pilots may rest and recuperate over the course of their shifts when not performing work functions. Recognizing the value of restorative sleep and naps, Air Methods’ policy permits pilots to sleep in on-site, company-provided quarters when duties permit.

Again, cell phone records obtained by the NTSB indicate that the accident pilot made multiple telephone calls and sent multiple text messages over the course of his shift which would appear to rule out any extended period of uninterrupted sleep during the workday.

Witnesses reported interacting with the pilot over the course of the workday describing him as "in a normal mood, chipper and ready to go," "his normal, boisterous self," and active in discussing matters over lunch.

There were omissions by the pilot as well as certain violations of policies and procedures during ground duties that might be indicative of fatigue or distraction such as his failing to sign the Daily Flight Log to confirm the pilot's compliance with preflight regulations, and the subsequent failure to recognize the inadequate fuel level of the aircraft before liftoff on the initial flight to the sending hospital.

3.7.3 Use of Cellular Phone

Air Methods' company policies in place at the time of the accident[11] prohibited having cell phones used or turned on during ground operations (including taxi and hover operations), takeoff, enroute, approach, and landing. Use of cellular phones while the aircraft was on the ground, not in motion, was acceptable provided it did not interfere with on board navigation and/or communications equipment. This policy applied to all crew members as well as passengers and was designed to not only protect the aircraft from potential electromagnetic or radio frequency interference, but also to guard against distractions to the aircrew during critical ground and flight operations. The policy applied whether or not a patient was on board an aircraft and was not solely directed toward "personal" cellular phones, but all cellular phones on board the aircraft, to include those provided to crew by the company.

The company does not require aircrew to own and utilize their personal cell phones while on duty. Instead, it provides cellular phones to crew to use in communications with company communications centers, the Operational Control Center, or other personnel for official business. However, those communications are required to take place when the aircraft is not conducting ground operations (including taxi and hover operations), takeoff, enroute, approach, or landing. These company-provided devices must also be off during these phases and any electronic messages or phone calls not addressed until back on the ground and not in motion.

This policy is covered during the initial indoctrination training of all pilots and aircrew as well as published in the general operations manual and emphasized by management. Aircrew are expected to report violations of this and any other policy to appropriate company supervisors should they become aware of any such violations. The company had and still has a non-punitive culture for the reporting of policy violations as outlined in Air Methods' Code of Business Conduct that is endorsed by the Chief Executive Officer. This policy was in place at the time of the accident.

It is clear from the cell phone records for the pilot's personal cell phone that the accident pilot disregarded the company's cell phone policy over the course of the initial outbound flight to the sending hospital as well as during the accident flight.

The company's cell phone policy has accordingly been strengthened subsequent to the accident as will be discussed in the final section of this response. This "zero tolerance" policy now in place

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[11] Both the cell phone policy at the time of the accident and the proposed cell phone policy are included in the Appendix: Cell Phone Policies of this manual.

is designed to further discourage violations of the policy because of the potential for cell phone use to contribute to unsafe situations during ground and flight operations.

3.7.4 Safety Culture

Air Methods strives to create an atmosphere and policy framework for a safe culture in the workplace. The company considers one component of its safety culture to be a non-punitive or "just" culture where there is an atmosphere of trust and in which people are encouraged to provide essential, safety-related information and to base decisions first and foremost on the safety of their activities. Stated simply, an employee who declines a mission, terminates a flight, or stops any other action in the course of their duties because of safety of flight concerns will not suffer adverse employment consequences because of that decision. This policy is articulated in the Code of Business Conduct manual and taught extensively during initial and recurrent training to all aircrew, including during initial pilot indoctrination training. The Code of Business Conduct states:

> *“No adverse action will be taken against any employee for making a complaint or disclosing information in good faith. Any employee who retaliates in any way against an employee who in good faith reports any violation or suspected violation of these policies will be subject to disciplinary action, up to and including termination. Any employee who knowingly and willfully reports false information will be subject to disciplinary action, up to and including termination of employment.”*

For more detail on Air Methods’ safety culture, please see the Safety Culture section of this submission.

Air Methods has reviewed the facts of this case in light of its policies in existence at the time of the accident. If the pilot had admitted the low fuel state at any point and terminated the flight, he could have done so without adverse employment actions being taken by the company. If he had immediately returned to the base following the outbound liftoff, there would have been no consequences. Had he returned to the base at any point during the outbound flight, there would have been no adverse consequences. Had he declined the actual transport flight and instead called for refueling on the ground at the pickup hospital, there would have been no adverse employment consequences. These are consistent with how the issue is taught during aircrew training.

The more challenging part of the sequence of events would be how Air Methods might handle the actual accident flight leg where it appears the pilot knowingly began the flight with less than the required 20 minutes of FAA-mandated fuel reserves. This action would constitute a direct violation of FAA regulations, company policy / procedures, and potentially considered intentional misconduct. Even then, when questioned, company officials believe that the appropriate response would be counseling of the pilot by the company's Chief Pilot, with no adverse employment consequence to the pilot. Complicating the matter, however, would be the likely requirement to report the matter to the FAA with the potential for an adverse certificate action against the pilot. In that situation, a robust company policy to foster a safe culture may have been tempered by the obligation to comply with the FAA's rules and policies.

Regardless, Air Methods has in place written, clearly articulated policies that direct its employees to place the safety of operations over all other concerns and policies that protect employees from adverse consequences should they terminate a flight for safety reasons. After examining the training records of the accident pilot and the company's training syllabus, Air Methods believes the pilot was properly trained on these policies.

4 ANALYSIS (FINDINGS)

4.1 PIC Authority

As directed in previous as well as the current Air Methods General Operations Manual, Duties and Responsibilities section, the Pilot in Command is the, “final authority for the safety of passengers, cargo, and medical personnel, and has operational control for all flights which they initiate.” It further states that the pilot in command exercises second tier operational control as further defined in the Operational Control section of the GOM. This second tier of operational control consists of the operational control the pilot in command exercises as the final authority over the operation of the aircraft.

This section of the GOM continues, “The pilot in command determines whether or not a flight can be accepted, initiated, conducted, or terminated and makes tactical and dynamic in-flight decisions in accordance with the Code of Federal Aviation Regulations, the Air Methods General Operations Manual, and Operations Specifications.”

Only a pilot in command who is a direct employee of Air Methods may exercise this second tier operational control over any Air Methods flight. In the event the pilot in command is unsure whether or not a flight assignment can be conducted in accordance with Federal Aviation Regulations or the Air Methods General Operations Manual and Operations Specifications, the PIC will contact a manager listed in paragraph A006 of the Operations Specifications or the Operational Control Center for additional guidance and input.

The key points regarding the pilot in command’s operational control is the authority to accept, initiate, conduct, or terminate a flight. At any time, the pilot in command can make the decision to discontinue a flight request with regards to any operational issues or if safety is in question. It is the pilot in command's duty and responsibility to ensure the safety of the aircraft, crew, and passengers. These responsibilities are outlined in Air Methods’ manuals, federal regulation, echoed by management, and covered in pilot training events and evaluations.

In exercising his or her authority, a pilot is expected to conduct the flight in accordance with company policy, FAA regulations, and sound safety management principles. Air Methods concludes the accident pilot possessed the authority to conduct the accident flight, but did not do so in a safe manner.

Proposed Finding: The accident pilot did not adhere to Air Methods’ standard operating procedures related to fuel management, prohibitions against in-flight use of cellular telephones, and prioritization of safety of flight.

4.2 Training

The accident pilot was trained and qualified as required by Federal Aviation Regulations and according to the Air Methods approved Pilot Training Program. He successfully completed the Air Methods Basic Indoctrination Training, New Hire Training and all required checkrides. He was provided familiarization training in the operational area in which the accident occurred.

The accident pilot had further flown with the company for roughly 10 months, most from the base out of which he was flying at the time of the accident.

Accordingly, Air Methods believes the pilot's training was more than sufficient for the activities the company was asking him to perform.

4.3 Behavioral Issues

4.3.1 Schedule

The date of the accident was the first day back on shift following an extended, five-day break from work for the accident pilot. The commute from his off-duty location was not demanding, and had actually been completed the day prior to his first day back on duty.

As was standard practice for this type of non-home-base shift, the company provided the pilot the opportunity to arrive the day prior and reside in a company-paid hotel the night before his duty day.

While the pilot's duty day was scheduled as a standard 12-hour day shift, the accident mission was the only mission flown by this pilot on the day of the accident. Admittedly, the accident occurred at the end of this duty day, but at the end of a day in which the pilot had several opportunities to rest in the company-provided crew quarters which are outfitted with private sleeping accommodations.

Accordingly, Air Methods believes the crew scheduling played little if any role in the accident events.

Proposed Finding: The accident pilot's duty schedule was not a factor in the accident.

4.3.2 Sleep and Fatigue

While the pilot reportedly professed to having slept poorly while off duty the night before, others around him stated he appeared upbeat and alert. As mentioned previously, had that not been the case there were multiple opportunities to rest during the course of the day in the company-provided quarters for that purpose.

There were also numerous indications the pilot was alert during the accident flight. Regrettably, during the flight prior and the accident flight, the accident pilot was texting on his personal cell phone quite prolifically. It would appear, then, that he was alert enough to handle multiple tasks, potentially even to the level of distraction as will be discussed in the next section.

Therefore, Air Methods does not believe that pilot fatigue was a factor in the accident.

Proposed Finding: There is insufficient evidence to conclude that pilot fatigue was a factor in the accident.

4.3.3 Cellular Phone Use

Despite clear company policies against the use of personal communications devices while airborne, the evidence appears irrefutable that the accident pilot did use such a device. The record makes clear that the pilot used his personal cell phone extensively over the course of the duty day, and probably did so at the expense of those opportunities for restful and recuperative sleep. Most troubling, according to the records obtained from the accident pilot's cell phone carrier, he sent numerous text messages over the course of the two flights leading up to the accident.

However, Air Methods does not believe the cell phone use "caused" the pilot to misjudge or inaccurately access his fuel state. Air Methods believes the fuel state was clearly recognized by the accident pilot during the first flight to the sending hospital. The pilot was attuned to his fuel state from the time shortly after liftoff on that flight and keenly aware of his fuel level prior to the accident flight, as evidenced by discussions with the communications center while on the ground at the sending hospital waiting for the patient to be loaded onto the helicopter. Air Methods further concludes that he was likely fully cognizant of the declining fuel level throughout the accident flight, and could not have failed to be aware that the fuel indications were dangerously low and, almost certainly, that the low level light had illuminated and remained illuminated for a period of approximately 20 minutes before fuel exhaustion.

Consequently, Air Methods does not believe the pilot's texting somehow misdirected the pilot from his low fuel state or misled him about the potential for fuel exhaustion. While such usage may have demonstrated a noncompliant and complacent attitude toward company policies and procedures, it should not have distracted him from a continuing and immediate awareness of something as a critical as his fuel state.

However, there are indications that the pilot's cell phone use was so pervasive that he very well may have been attempting to read or type a text message at the time of fuel starvation and subsequent engine power loss. This could have increased the "startle" or "surprise" factor caused by the sudden loss of power and delayed or complicated the pilot's attempt to execute the appropriate emergency response.

Therefore, Air Methods believes that cell phone usage may have contributed to the severity of the accident, and may even have directly led to its deadly consequences.

As will be discussed further, Air Methods has determined that its policy against the use of personal communications devices while a flight is underway would benefit from a clearer statement of the policy. The company has also determined that because of the potential difficulty identifying such behavior, there needed to be both a zero tolerance for identified infractions and a method for monitoring against disregard of the policy. The company has implemented a zero tolerance policy with regard to unauthorized use of cellular telephones in flight and is actively pursuing discussions with its union concerning how best to enforce this policy.

Proposed Finding: The accident pilot was distracted by his use of a personal cellular telephone during flight activities, which may have detracted from the time available to the pilot for sound analysis of the situation.

Proposed Finding: The pilot's pervasive use of his personal cell phone during the flight prior and the accident flight likely contributed to the startle response by the pilot and thus contributed to the pilot's unsuccessful execution of the emergency response necessary to safely land the aircraft.

4.3.4 Safety Culture/Just Culture

Air Methods has a well-articulated, non-punitive or "just" culture policy. Individuals who taught this portion of the curriculum for the accident pilot's initial company training recalled his presence and the topic being covered. The Chief Pilot in particular attests to coverage of the subject.

Air Methods has provided the investigative team materials during indoctrination training where the company communicates to its aircrews that a non-punitive company response could be counted on by pilots who resolved an unsafe condition by declining a mission, terminating an unsafe activity, or challenging an unsafe company policy or directive.

Certainly on the initial leg flown to the hospital, the pilot had every opportunity to remedy the circumstances without compromising the safety of flight and without risk to his employment status with the company. As discussed previously, initiation by the pilot of the actual accident flight poses a challenge for the company's just culture policies. Clearly, terminating the accident flight would have posed more significant risks for the accident pilot's professional licensure and his employment status with the company. Even so, the company has provided the NTSB investigation clear confirmation that had the pilot terminated the accident flight, even in a field short of the destination, that decision to prioritize safety would have been supported by the company and no disciplinary action would have been taken against the pilot. In brief, the company has a very broad definition of the circumstances where the termination of unsafe actions by its pilots, even where the pilot set in place the unsafe conditions, will not result in punitive action.

Air Methods thus does not believe that the company's policies contributed to the unsafe decision-making of the pilot, while recognizing that issues such as pride, a desire to return to the home station immediately, or other personal considerations may indeed have prompted the unsafe decisions by the accident pilot. The actions of the pilot did not meet the safety culture expectations of the company or the minimum safety standards expected of its pilots.

Air Methods continues to provide a clear, formal, policy statement about its non-punitive, just culture philosophy. It will again publish such a policy over the signature of the President of its flight operations.

Proposed Finding: Air Methods believes that the company's policies did not contribute to the unsafe decision-making of the pilot, while recognizing that issues such as pride, a desire to return to the home station immediately, or other personal considerations may indeed have prompted the unsafe decisions by the accident pilot.

Proposed Finding: Contrary to established Air Methods' standard operating procedures, the accident pilot prioritized completion of the accident flight above maintaining proper fuel reserves and safety of flight.

Proposed Finding: The accident pilot did not immediately terminate the flight upon indications of a low fuel level.

4.4 Omission of N352LN Preflight

As discussed previously, the pilot omitted a proper preflight and refueling of the accident aircraft before lifting off from KSGP outbound to the Harrison County Community Hospital. There were over two hours between the time N352N was placed back in EMS service and the initial liftoff. Therefore, the pilot was not rushed and there was indeed ample time to perform these tasks.

One explanation for the omission might be that there was a break in the pilot's habit patterns. Preflight would normally be associated with the early stages of a particular shift, with many cues, from the initial briefing to the initial assessment of the aircraft, to perform the preflight and sign the Daily Flight Log. Moreover, the pilot had already performed one preflight, in N101LN, perhaps registering it in his mind as a task completed and one he need not revisit. However, this still does not fully explain why the pilot, after discussions during the day of the need to refuel N352LN, failed to ensure it was done.

The extensive use of the cell phone and other distractions may also explain in part the pilot's forgetfulness. He was using his cell phone to talk and text extensively over the course of the day. He had planned a personal activity that evening. This extensive activity may simply have distracted the accident pilot from the task at hand. Air Methods believes this was a contributing factor to the accident.

Air Methods has therefore recognized the need to reemphasize the importance of preflight activity and the proper completion of the Daily Flight Log in advance preparation of aircraft for the shift, and has done so in initial and recurrent aircrew training.

Proposed Finding: The accident pilot was distracted by his attention to personal matters and extensive use of his personal cell phone and neglected preflight activities.

Proposed Finding: Air Methods concludes the accident pilot was distracted from his duties as evidenced by the following omissions prior to initial takeoff:

- The accident pilot did not take fuel samples for the accident aircraft at the base the day of the accident, as required.
- The accident pilot did not perform the required Conform Your Aircraft (CYA) check and initial for a daily inspection of the aircraft.
- The aircraft logbook indicated three CYA sign-offs were not completed:
    - The Daily/5 hour engine chip detector inspection;
    - The A0001 mechanics airworthiness check; and,
    - The medical interior installation and return of aircraft to medical service.

4.5 Fuel Computation

The investigation revealed that the fuel was exhausted at the accident site near Mosby, Missouri. Working backwards from this point, it is possible to compute the approximate amount of fuel in the helicopter at various points along the last legs of flight with relatively high confidence.

Characteristic of other single-engine turbine helicopters, the fuel consumption generally varies but slightly with differences in loading and environmental conditions. The following calculations are based on a fuel usage of an average of 35% / hour at 105 knots (50 Gal/Hour) as reported on fuel charts from the aircraft's base of operations. None of these calculations take in to account the minimal amount of fuel that would have been consumed during a typical aircraft start and run-up ground sequence.

If the aircraft had zero fuel at the accident site it would have had approximately 27 gallons (19% or approximately 33 minutes) in the fuel tank at departure from the Harrison County Community Hospital with the patient on board. Continuing backwards along the route of flight, the accident aircraft would have had approximately 51 gallons (36% or approximately 62 minutes) of fuel in its tank at departure from the main base of operations at the airport in St. Joseph, Missouri.

These calculations indicate a 36% fuel load was likely on board, contrary to what was recalled and reported during the interview of the CCE by the NTSB referenced earlier, the last pilot and check airman to fly the accident aircraft prior to its initial departure for this patient transport. Air Methods concludes that the more accurate estimate of the fuel load at the time of the initial departure from St. Joseph was 36%.

Accordingly, the pilot should have recognized his fuel state even prior to reaching the Harrison County Community Hospital. Certainly while on the helipad at the hospital and before departure, he must have recognized he did not have the fuel minimums for the intended route of flight. There were thus numerous opportunities for the pilot to recognize the low fuel state and terminate the patient transport or even the accident flight.

Proposed Finding: The accident pilot initiated the accident flight with insufficient fuel reserves for the intended flight.

Proposed Finding: The accident pilot did not immediately terminate the flight upon indications of a low fuel level. (intentionally repeated)

Proposed Finding: The accident pilot continued flight until fuel exhaustion which caused immediate and total loss of power.

4.6 Flight Risk Assessment

In August 2005 the FAA issued guidance (FAA notice 8000.301) to FAA inspectors describing methods an operator might use in assessing preflight risk. The guidance suggested two different methods of assessing preflight risk, procedural or training. The procedural method listed potential risk and assigned a value to each one. Once the assessment was completed, the numbers were totaled and a decision would be made relative to pre-determined numerical categories as to the actions of the pilot: whether the flight could be accepted as is (a lower relative risk value) or further consultation was needed with management (a higher relative risk value). The training method incorporated a risk matrix listing representative examples of potential risks but included substantial risk recognition and mitigation training during basic indoctrination and recurrent training.

Air methods believed at the time the training method would be the more effective method. After completing the Air Methods' preflight risk assessment, pilots were encouraged to consult with the OCC if they believed it necessary.

Proposed Finding: The accident pilot's flight risk assessment did not include fuel status as a listed item.

Proposed Finding: The Air Methods' risk assessment tool at the time of the accident flight did not include fuel status as a listed item.

Proposed Finding: The Air Method's risk assessment did not include a triggering mechanism for the mandatory Operational Control Center (OCC) consultation.

4.7 Air Methods Communications Center and the Operational Control Center

The role of the communications center, which was AirCom in this case, is different from the Operational Control Center. The communications center serves a purpose similar to that of a more traditional dispatcher as related to emergency medical response. In this case, AirCom would have transmitted the transport request to the helicopter flight crew which they would either accept or decline. The ultimate decision to initiate, continue, or terminate the flight would rest with the Pilot in Command. Prior to departure, AirCom would create an electronic flight plan in the Flight Log system which meets the regulatory requirements as part of the Air Methods' approved flight following program. This electronic flight plan would be automatically cross-checked against the various computer systems to ensure compliance with duty day and flight release requirements. Once enroute, AirCom would fill the role of flight following with the assistance of automated GPS flight tracking and hazard checking of the flight operations by the flight management system. All of these automated systems (Flight Log, Pilot 411, Flight Management System, GPS Tracking) are monitored by the OCC to ensure compliance. The OCC is notified by exception if any of the monitored criteria fall outside of predetermined limits on the part of aircrews as well as Air Com. This type of alerting system allows for 24/7 oversight of all Air Methods' flight operations.

In accordance with the Air Methods General Operations Manual, certain criteria require immediate notification of the OCC by the communications center. At the time of the accident, unplanned deviations from the original flight plan would <u>not</u> have triggered an immediate notification.

Proposed Finding: Air Methods Communications Center (AirCom) procedures do not include an explicit escalation procedure for communication specialist 's risk evaluation and elevation of concerns to the Operational Control Center when a risk threshold is recognized.

4.8 Loss of Power

Based on data gathered from the Satellite Tracking System, it suggests that the accident aircraft was traveling an average of 114.8 knots of ground speed during the last 3 to 3 ½ minutes of the flight. During that period, the average rate of descent was 138.7 feet/min. The last data point available shows that the aircraft was at an altitude of 1,200 MSL or approximately 373 feet AGL and was in a slow descent. Each data set is captured by the tracking system approximately 29 to 30 seconds apart.

The accident site was at coordinates -94.2971878°W, 39.3567506°N and at an elevation of 820 feet MSL. The last position recorded in the tracking system for the aircraft was at -94.2896166667°W, 39.3704666667°N. The accident site was approximately 5,440 feet from the last known position of the aircraft. At an average ground speed of 114.8 knots (193.6 feet/sec) the distance between these points would have been covered in approximately 28.1 seconds. In other words the accident occurred nearly simultaneously with the next scheduled data burst from the Satellite Tracking System. This helps explain approximately where the loss of power likely occurred.

Immediately prior to the loss of power, Air Methods estimates that the approximate deck angle during the slow descent was at approximately 6° nose down. The adverse pitch and roll rate of an AS350 B2 is conservatively estimated to be at least 60°/sec. Assuming that it took the pilot approximately 1.25 seconds to react to the loss of power, and with a slightly forward center of gravity, it is likely that the aircraft immediately began to pitch down and roll right at rates of 60°/sec. This would have placed the aircraft in an approximate 81° nose down attitude and in 75° of right bank by the time the pilot reacted to the loss of power. During this 1.25 second period, it is also likely that the aircraft would have lost approximately 131 feet of altitude.

An immediate application of aft cyclic and reduction in collective coupled with perfect application of left anti-torque would have likely begun to right the aircraft and restore main rotor RPM. Impact analysis indicates the aircraft impacted the ground at 40° nose down attitude, perhaps indicating some positive application of control inputs likely occurred.

Section 3 of the AS350 B2 Flight Manual provides information regarding helicopter emergencies, the warnings or alerts associated with a particular emergency, and the procedures to follow once the emergency has been identified.

The first three steps to follow in the event of an engine failure, in flight are

1. Set low collective pitch
2. Monitor and Control RPM
3. Establish approximately 65 kt (120 km/hr -75 mph) airspeed.

If the accident pilot responded to the loss of power by immediately setting low collective pitch, Air Methods believes the aircraft would likely have been unrecoverable.

Using the average descent rate of (138.7 feet/min or 2.3 feet/sec), ground speed (193.6 feet/sec), and distance of the accident site (5,440 feet) from the last known coordinates, and estimating that the aircraft experienced a loss of power 25.8 seconds after the last known position, the altitude of the aircraft was approximately 1,141 MSL which would have put the aircraft at 321 feet AGL. Using a 1.25 second delay before that accident pilot made a control input in response to the loss of power, the aircraft would have most likely been at 190 feet AGL in a severe nose down (81°) and right roll (75°) attitude with deteriorating rotor RPM and a descent rate of at least 176.8 feet/sec. Recognizing that the airspeed would have been increasing during this maneuver, but lacking any specific data, Air Methods chose to use the last known airspeed in estimating the altitude of the aircraft to determine that the last 190 feet of altitude would have been lost in approximately 1.07 seconds. This indicates that the time from loss of power to impact with the ground took approximately 2.32 seconds.

This estimation or rough analysis is only required because of the absence of recording devices sufficient to fully analyze the accident sequence. Even a video recording would have been useful in analyzing the final moments of the accident flight.

Proposed Finding: Air Methods calculates that the pilot was likely flying at an altitude of approximately 323 feet AGL and descending at the time the accident aircraft lost power due to fuel exhaustion.

Proposed Finding: There was no in-flight cockpit video recorder, cockpit voice recorder, or flight data recorder data available for post-accident analysis, and any number of these would have been useful in reconstructing the accident sequence.

4.9 Autorotation

Military and Civilian pilots must demonstrate a level of competency in performing autorotation's before being issued a pilot certificate. The Commercial Pilot—Rotorcraft (Helicopter and Gyroplane) Practical Test Standards (PTS) establish the standards for commercial pilot certification. During annual recurrent training and checking, the pilot must again perform the maneuver to the PTS standard. Below is an excerpt from the PTS for the straight-in autorotation maneuver.

> **VI. AREA OF OPERATION: PERFORMANCE MANEUVERS**
>
> **B. TASK: STRAIGHT IN AUTOROTATION**
> REFERENCE(S): FAA-H-8083-21; POH/RFM.
> **Objective.** To determine that the applicant:
>
> 1. Exhibits knowledge of the elements related to a straight in autorotation terminating with a power recovery to a hover.
> 2. Selects a suitable touchdown area.
> 3. Initiates the maneuver at the proper point.
> 4. Establishes proper aircraft trim and autorotation airspeed, ± 5 knots.
> 5. Maintains rotor RPM within normal limits.
> 6. Compensates for windspeed and direction as necessary to void undershooting or overshooting the selected landing area.
> 7. Utilizes proper deceleration, collective pitch application to a hover.
> 8. Comes to a hover within 100 feet of a designated point.

The FAA Helicopter Flying Handbook (FAA-S-8083-21A) states the following regarding autorotation: "In a helicopter, an autorotative descent is a power-off maneuver in which the engine is disengaged from the main rotor system and the rotor blades are driven solely by the upward flow of air through the rotor. In other words, the engine is no longer supplying power to the main rotor." Regarding the technique for the autorotation, the handbook states that "After entering an autorotation, collective pitch must be adjusted to maintain the desired rotor rpm. Coordinate the collective movement with proper antitorque pedal for trim, and apply cyclic control to maintain proper attitude." Furthermore, it provides that the pilot must "adjust attitude with cyclic control to obtain the manufacturer's recommended autorotation or best gliding speed."

The loss of power that preceded this accident occurred at high speed, low level cruise flight. The purpose of this analysis is to discuss autorotations in that state and what option might have been available to the accident pilot in this scenario. Air Methods believes that the industry would be better served if the emphasis is placed on the importance of the immediate application of aft cyclic in response to a loss of power in cruise flight. If the pilot's hands are on the collective and cyclic then of course he or she would lower the collective in coordination with the cyclic. Of the two controls, there should probably be an understanding that the cyclic is the most important.
Section 3 of the AS350 B2 Flight Manual provides information regarding helicopter emergencies, the warnings or alerts associated with a particular emergency, and the procedures to follow once the emergency has been identified. It reads:

> In the event of an engine failure (flame-out) in flight, carry out autorotation procedure as listed below:
> 1. Set low collective pitch.
> 2. Monitor and control rotor rpm.
> 3. Establish approximately 65 kt (120 km/hr – 75 mph) airspeed.
> 4. Move the fuel flow control lever to the shutdown position.
> 5. According to the cause of the loss of the engine:
>   - Relight the engine [dependent on altitude]
>   - Otherwise: close the fuel shut-off cock, and shutoff generator, alternator if installed, electrical power master switch (if smell of burning).
>   - Maneuver to head the helicopter into the wind in final approach.
>   - At a height of approximately 65 ft (20 m) above the ground, flare to a nose-up attitude.
> 6. At height 20-25 ft (6-8 m) and at constant attitude, gradually apply collective pitch to reduce the sink-rate.
> 7. Resume level attitude before touch-down, and cancel any side-slip tendency.
> 8. Gently reduce collective pitch after touchdown.

The manufacturer's guidance for this aircraft is similar to other manufacturers' guidance where the focus is on manipulating the collective down. Unfortunately, the consequence of reducing the collective pitch is an immediate pitching down of the nose of the helicopter.

The focus should instead be on getting the aircraft into an autorotative glide which requires the air to be flowing through the rotor system. Air Methods believes that the most expeditious way to get the air flowing through the rotor system is by the immediate application of aft cyclic.

The accident investigation team that was led by the NTSB utilized the AEC Level B Full Motion AS350 Simulator to simulate the flight conditions prior to the loss of power. The conditions for the simulation were to approximate the altitude and airspeed of the aircraft, experience a "surprise" or sudden loss of power, and react with collective down, the manufacturer's guidance, or aft cyclic, the Air Methods-recommended technique. In all tests where lowering the collective was the first response, the aircraft impacted the ground within 3.5 to 4.5 seconds, in an attitude similar to the accident aircraft. When aft cyclic was immediately applied instead during these tests, the aircraft gained altitude, flew for an additional 20 to 25 seconds, and was controllable to a successful landing. In one sense, this technique reflects nothing more than buying time by trading kinetic energy for potential energy which can then be translated back to airspeed in a controlled manner.

On a different level, however, Air Methods considers this to be a fundamental part of a manufacturer's flight manual. While this discussion may sound as if it is simply a discussion of what "technique" to apply when performing a manufacturer's recommended "procedure," Air Methods considers this discussion to be more consequential once a manufacturer places in its flight manual the recommended procedure for a particular model of helicopter. If a manufacturer implies that immediate lowering of the collective is necessary to maintain aircraft control and to perform a successful maneuver, then instructor pilots in the aircraft may teach and train to that supposed standard and flight check pilots will likely evaluate to the same standard. Air Methods believes the potential for negative training and the build-up of negative habit patterns exists under the guidance now in place.

Air Methods has updated their FAA approved Training Program to focus more on forced landings and the importance of aft cyclic, consistent with its views as discussed in this submission. The FAA has approved this change.

The accident AS350B2 was properly equipped with a floor mounted fuel flow lever rather than a “twist-grip” style throttle on the collective flight control like some other helicopters. Because of this design, the pilot must remove his hand from the collective flight control in order to alter the engine RPM. Additionally, this floor mounted fuel flow lever does not have an “idle detent” that would normally provide a pilot with a tactile indication or a physical stop at the engine idle point. Without this tactile feedback or physical “stop” it is possible to inadvertently reduce engine RPM below idle and potentially cause the engine to completely stop operating when adjusting the fuel flow below the normal flight position. Due to this design limitation, the aircraft manufacturer has a restriction when conducting engine failure training. This restriction states that a pilot may not reduce the fuel flow levers when conducting autorotation training unless the termination of the maneuver is planned to be on the ground. To reduce the risk of aircraft damage, autorotation training is normally conducted so the aircraft terminates at a hover or performs a “power recovery” which is similar to a go-around.

Because of these limitations, pilots conducting engine failure training in AS350 B2s with floor mounted fuel flow levers must simulate the effects of reduced engine RPM rather than actually reducing engine RPM to the idle position as is performed in other single-engine turbine helicopters like the Bell 407. It has been identified that while simulating the conditions of reduced engine RPM there are potentially several actions that can lead to a negative habit transfer.

For example, when initially reacting to an engine failure in cruise flight, one of the necessary control inputs is to lower the collective flight control in order to maintain rotor RPM. While simulating an engine failure, without actually reducing the fuel flow levers to idle, this type of control input cannot be as aggressive or maintained without risk of exceeding the maximum rotor RPM which is unlikely in an actual engine failure. Because of this, pilots training in the accident aircraft configuration must initially reduce collective as appropriate but typically must immediately increase collective again to prevent aircraft damage in training. This would be contrary to the appropriate response in a typical actual engine failure.

Additionally, it is possible that to effectively simulate the rapidly descending flight profile of an engine failure in an aircraft that does not actually have reduced engine RPM due to manufacturer limitations, the pilot in training may have to make a forward cyclic flight control input initially. This is contrary to the aft cyclic that would be necessary in most actual engine failures in order to maintain sufficient rotor RPM. This effect was demonstrated multiple times to the investigation parties in the full-motion AS350 flight simulator at Eurocopter in Grand Prairie, Texas. There was a notable difference in available reaction time to an engine failure with the only difference in pilot reaction being the initial movement of the cyclic forward instead of aft. This is discussed in further detail in the “Power Loss” section of this response.

Finally, another significant difference between an aircraft training for engine failures with actual reduced engine RPM rather than simulated is the power available to the main and tail rotor. With the engine operating at full RPM, the response of the main rotor and tail rotor flight surfaces is the same as a normally operating aircraft. This significant difference in aircraft response and performance may lead to a pilot in an actual engine failure situation being surprised by the lack of aircraft responsiveness. This difference exists in any aircraft that is training engine failures without actually turning off all fuel flow to the engine but is more pronounced in an aircraft that doesn’t allow reduction of fuel flow to the idle position due to manufacturer imposed limitations.

Proposed Finding: It was successfully demonstrated that a successful autorotation maneuver may have been possible under the accident profile, although such a maneuver would have required timely application of aft cyclic, contrary to the manufacturer’s recommended procedure.

Proposed Finding: The accident pilot did not successfully perform the emergency procedures for the loss of engine power at low altitude.

4.10 Survivability

The impact forces were severe with significant fragmentation of the accident aircraft after impact. The fuselage was broken open. The patient litter and three rear seats separated from the aircraft. The pilot's energy attenuating seats remain attached to the floor mounts, but exhibited near full attenuation.

The impact forces in the accident do not appear to have been survivable.

5 SAFETY CULTURE AND CONTINUOUS IMPROVEMENT

Air Methods is committed to continual systems improvement and enhancing its safety culture. Air Methods’ leadership has reaffirmed its commitment to cultivating a positive and robust organizational safety culture and supporting initiatives that further safety and promote safety throughout all levels of the company. Air Methods is dedicated to supporting the FAA voluntary safety programs and is the only HEMS operation that is participating in 5 of the 6 safety initiatives sponsored by AFS 940. Although those programs were designed for part 121 operations, Air Methods has modified them to more effectively fit HEMS operations.

In an effort to meet the continuous improvement provision of the SMS and identify areas that may need special emphasis, Air Methods is commissioning a comprehensive, scientifically (psychometric) valid Safety Culture Survey to be conducted the 1st quarter or 2013.

5.1 Safety Management System (SMS)

Air Methods recognized the value of System Management Systems (SMS) as a means of improving its aviation quality and safety. As such, Air Methods voluntarily enrolled in the Federal Aviation Administration’s Safety Management System pilot program in April of 2008. Air Methods is projected to conduct a Level 3 Exit Interview with AFS 940 in January 2013, which requires a demonstration of objective evidence the company has a robust system of continuous improvement. To support implementation of the plan and continuous growth of its SMS, Air Methods expanded its safety staff to include the following positions:

- Vice President of Safety
- Director of Flight Safety
- 3 additional Regional Safety Directors
- Field Safety Representatives
- Flight Operational Quality Assurance (FOQA) Audit Manager
- Internal Evaluation Program (IEP) Manager
- Internal Evaluation Program (IEP) Specialist / Risk Data Analyst

5.2 Internal Evaluation Program (IEP)

The IEP is based on the principle that Air Methods is responsible for ensuring that its operations are safe and in compliance with all regulatory requirements as well as its own policies and procedures. The IEP function requires auditing and evaluation of the safety management functions, policymaking, safety risk management, safety assurance, and safety promotion.

In pursuit of this objective, an ongoing process has been established which includes evaluations, Validation Audits and audits of company activities to aid in the assurance of safe and regulatory-compliant operations. Findings encountered during this process are documented, reported to the appropriate individual or individuals for corrective action/protective action (CAPA), and to senior management. These findings and CAPAs are subject to follow-up to ensure that appropriate CAPAs are in progress.

The IEP is mandated by, and its participants answerable to, senior management. Those performing evaluations as part of the IEP operate on behalf of the AMC Safety Department and are independent of the various disciplines within the company while performing this role. The IEP is an essential part of the Air Methods Safety Management System. One of the goals of the program is to enhance AMC’s reactive and proactive safety risk management processes. In addition to the requirements of SMS, the IEP is intended to be a value-added function to the entity being evaluated, providing insight to potential regulatory and non-regulatory problems and or issues before they occur, focusing on Root Cause Analysis (RCA).

The IEP is designed to focus on the 14 CFR part 135 and 145 Air Methods operations. These areas include but are not limited to operations, maintenance, medical, ground support, material control, and communications. Any other area of AMC designated by the director of safety may be included as part of a larger evaluation or may be the subject of a standalone evaluation. This may include vendors, subsidiaries, and joint venture operations.

5.3 Anonymous Reporting

The Air Methods’ AlertLine is a customized website hosted by an independent, third party organization. This tool allows all company employees, customers, and vendors to provide feedback, comments, suggestions and alerts relative to any safety, financial, or human resources concern. And the submitter may remain completely anonymous.

5.4 Aviation Safety Action Program (ASAP)

Air Methods has a fully developed ASAP program. As defined by the FAA, the goal of the Aviation Safety Action Program (ASAP) is to enhance aviation safety through the prevention of accidents and incidents. Its focus is to encourage voluntary reporting of safety issues and events that come to the attention of employees of certain certificate holders including pilots, mechanics, and repairmen.

To encourage an employee to voluntarily report safety issues even though they may involve an alleged violation of company policies or Title 14 of the Code of Federal Regulations (14 CFR), enforcement-related incentives have been designed into the program. An ASAP is based on a safety partnership that will include the Federal Aviation Administration (FAA) and the certificate holder, and may include any third party such as the employee's labor organization.

Additionally, Air Methods is creating a program similar to ASAP for its communications and clinical employees.

5.5 Line Operation Safety Audit (LOSA)

Line Operations Safety Assessment (LOSA) is a proactive and predictive approach to identify and address aviation safety utilizing Threat and Error management methodology. As a voluntary safety program, LOSA collects safety data during normal aviation operations. Air Methods has pioneered the use of LOSA in the HEMS industry by working with the LOSA Collaborative. It was originally designed for flight deck operations and has continued to evolve since its inception. The hazards that threaten the safety of flight deck operations are not unique to that environment. Similar human factors problems are present during maintenance and ramp operations. Air methods has expanded the LOSA approach to view HEMS operations more holistically to include clinical, communications and maintenance components

Managing risks has become increasingly important in modern organizations. The initial identification and interpretation of hazards are some of the most challenging aspects of risk management, since many hazards remain hidden, unnoticed, or misunderstood for long periods of time before an accident. The risks associated with these hazards seem obvious after an accident; however, the early signs pointing to an emerging hazard and its consequent risk are often extremely weak and ambiguous.

Three sources of information may be indicative of emerging safety risks:

- Reactive sources highlight issues after an undesired event has taken place;
- Proactive sources look for precursors to undesired events; and
- Predictive sources capture system performance as it happens in real-time, normal operations.

Since the accident, Air Methods has conducted 150 LOSA observations and continues to expand its scope FOQA Program.

5.6 Flight Operational Quality Assurance (FOQA) Program

FOQA is a voluntary safety program designed to improve aviation safety through the proactive use of flight recorded data. Operators will use these data to identify and correct deficiencies in all areas of flight operations. Properly used, FOQA data can reduce or eliminate safety risks, as well as minimize deviations from regulations. The FOQA program approval process establishes the role of the principal operations inspectors (POI) and Air Methods in monitoring continuing FOQA operations. FOQA is a program for the routine collection and analysis of digital flight data generated during aircraft operations.

FOQA programs provide more information about, and greater insight into, the total flight operations environment. FOQA data is unique because it can provide objective information that is not available through other methods. A FOQA program can identify operational situations in which there is increased risk, allowing Air Methods to take early corrective action before that risk results in an incident or accident.

FOQA must interface and be coordinated with Air Methods' other safety programs, such as the Aviation Safety Action Program (ASAP), Anonymous reporting system, and Voluntary Disclosure Reporting Program (VDRP). A FOQA program would be another tool in the Air Methods' overall operational risk assessment and prevention program. Being proactive in identifying and addressing risk would accordingly enhance safety.

Currently, 10 % of Air Methods' fleet is equipped with flight data monitoring equipment. Air Methods is extensively studying a possible FOQA program that it might introduce as a HEMS operator. Therefore, this initiative is still in the preliminary stages.

6 CONCLUSIONS

6.1 Proposed Findings

6.1.1 The accident pilot's duty schedule was not a factor in the accident.

6.1.2 There is insufficient evidence to conclude that pilot fatigue was a factor in the accident.

6.1.3 The accident pilot was distracted by his attention to personal matters and extensive use of his personal cell phone and neglected preflight activities.

6.1.4 Air Methods concludes the accident pilot was distracted from his duties based on the following omissions prior to initial takeoff:

- The accident pilot did not take fuel samples for the accident aircraft at the base the day of the accident, as required.
- The accident pilot did not perform the required Conform Your Aircraft (CYA) check and initial for a daily inspection of the aircraft.
- The aircraft logbook indicated three CYA sign-offs were not completed:
    - The Daily/5 hour engine chip detector inspection;
    - The A0001 mechanics airworthiness check; and,
    - The medical interior installation and return of aircraft to medical service.

6.1.5 The accident pilot initiated the accident flight with insufficient fuel reserves for the intended flight.

6.1.6 Air Methods believes that the company's policies did not contribute to the unsafe decision-making of the pilot, while recognizing that issues such as pride, a desire to return to the home station immediately, or other personal considerations may indeed have prompted the unsafe decisions by the accident pilot.

6.1.7 The Air Methods’ risk assessment tool at the time of the accident flight did not include fuel status as a listed item.

6.1.8 Air Methods Communications Center (AirCom) procedures do not include an explicit escalation procedure for a communication specialist’s risk evaluation and elevation of concerns to the Operational Control Center when risk threshold is recognized.

6.1.9 The accident pilot did not immediately terminate the flight upon indications of a low fuel level.

6.1.10 The accident pilot did not adhere to Air Methods’ standard operating procedures related to fuel management, prohibitions against in-flight use of cellular telephones, and prioritization of safety of flight.

6.1.11 Contrary to established Air Methods’ standard operating procedures, the accident pilot prioritized completion of the accident flight above maintaining proper fuel reserves and safety of flight.

6.1.12 The accident pilot continued flight until fuel exhaustion which caused immediate and total loss of power.

6.1.13 Air Methods calculates that the pilot was likely flying at an altitude of approximately 323 feet AGL and descending at the time the accident aircraft lost power due to fuel exhaustion.

6.1.14 The pilot's pervasive use of his personal cell phone during the flight prior and the accident flight likely contributed to the startle response by the pilot and thus contributed to the pilot's unsuccessful execution of the emergency response necessary to safely land the aircraft.

6.1.15 The accident pilot was distracted by his use of a personal cellular telephone during flight activities, which may have detracted from the time available to the pilot for sound analysis of the situation.

6.1.16 The accident pilot did not successfully perform the emergency procedures for the loss of engine power at low altitude.

6.1.17 Air Methods concluded and it was successfully demonstrated that a successful autorotation maneuver may have been possible under the accident profile although such a maneuver would have required timely application of aft cyclic, contrary to the manufacturer’s recommended procedure.

6.1.18 There was no in-flight cockpit video recorder, cockpit voice recorder, or flight data recorder data available for post-accident analysis, and any number of these would have been useful in reconstructing the accident sequence.

6.1.19 The accident pilot’s flight risk assessment did not include fuel status as a listed item.

6.1.20 Air Method's risk assessment did not include a triggering mechanism for the mandatory Operational Control Center (OCC) consultation.

6.2 Proposed Probable Cause

The probable cause of this accident was that the pilot initiated the accident flight with insufficient fuel reserves for the intended flight, continued the flight with a known low fuel status, and upon loss of engine power did not successfully perform the necessary emergency procedure.

Contributing to the accident was the pilot's inadequate pre-flight preparation of the aircraft, failure to accurately disclose the critically low fuel level to the operational control center or the communications center at the departure hospital, behavior-influenced decision making that prioritized personal objectives over safety of flight, and demonstrated noncompliance with published company policies and procedures.

6.3 Proposed Recommendations

6.3.1 Encourage the FAA to work with the Air Medical Operators Association (AMOA) in the incorporation of voluntary safety programs in HEMS operations and facilitate ASIAS/MITRE type information sharing activities.

6.3.2 Encourage review of the Eurocopter AS350 loss of engine power emergency procedures, and those of other manufacturers, and the associated EP training to ensure there are no inconsistencies or potentially negative responses being taught (for example, not emphasizing the benefits of immediate application of aft cyclic).

6.3.3 Encourage review of the Eurocopter AS350 emergency procedures which specifically place the power lever and the corresponding RFM restriction out of the fly gate for simulated emergencies training.

6.3.4 Encourage the use of cockpit video recorders to improve safety of flight and accident investigation.

7 POST ACCIDENT IMPROVEMENTS AND SAFETY INITIATIVES

Since the Mosby Missouri accident, the Air Methods Director of Safety conducted an internal safety review of relevant organizational processes and procedures. During the course of the internal review, Air Methods developed comprehensive recommendations to senior management, which are in various stages of implementation. The improvements relative to this accident are included below:

7.1 Air Methods Operations Department

7.1.1 Revised the flight risk assessment tool to reflect more accurately known risks, i.e. fuel loads within 15 minutes of required minimum or changing of flight destination. This was beta tested and accepted by the FAA.

7.1.2 Updated the initial and recurrent training to reflect the components of the new flight risk assessment tool. Included in the revamped training are company expectations for all front line employees and their responsibilities as risk managers. This information has also been incorporated into the Air Methods' employee new hire basic indoctrination.

7.1.3 Assessed the feasibility of co-locating the Operational Control Center (OCC) and Air Methods Communications Center (AirCom) in the same facility. This assessment determined co-locating the OCC and AirCom is not reasonably feasible.

7.1.4 Developed a procedure and training materials for communication specialists to further recognize potential elevated risk situations and when to contact the OCC.

7.1.5 Developed training for managers emphasizing their role in promoting four key culture elements: Reporting, Learning, Flexible, and Just.

7.1.6 Currently assessing the feasibility of implementing the Federal Aviation Administration's (FAA) Advanced Qualification Program (AQP) as outlined in Advisory Circular (AC) 120-54A.

7.1.7 Developed a matrix for use in adjusting the pilot's initial flight training requirement to conform to the applicant's qualifications and experience levels, to begin January 1, 2013.

7.1.8 Increased minimum en-route altitude requirements while remaining in conformance with FAA weather and cloud clearance requirements, with 1,000 feet Above Ground Level (AGL) required when practicable.

7.1.9 Partnered with a leading flight training provider to develop a full motion simulator and training-accredited Flight Training Device (FTD) for autorotation and line oriented flight training, AC 120-35C.

7.1.10 Partnered with American Eurocopter (AEC) to provide training to all Air Methods' AS350 series pilots in their full motion simulators for autorotation and line oriented flight training.

7.1.11 Added immediate Operational Control Center (OCC) notification criteria for fuel related issues and unplanned deviations to the list used by the communications centers.

7.1.12 Air Methods developed increased training and awareness of minimum fuel reserve requirements and reporting for their communication specialists. They are now directed to immediately notify the OCC for further guidance and possible intervention when reported fuel reserves do not appear sufficient for the reported enroute flight time.

7.1.13 Revised flight operations Risk Assessment to include specific triggers for inadequate fuel reserves.

7.2 Air Methods Safety Department

7.2.1 Air Methods has budgeted for a comprehensive psychometrically valid Safety Culture Survey to be conducted the first quarter of 2013.

7.2.2 Developed a risk based plan to address survey results in cooperation with Air Methods' System Improvement Roundtable (Safety Council).

7.2.3 Developing and implementing a Flight Data Monitoring (FDM) program in accordance with AC 120-82.

7.2.4 Hired a Flight Operational Quality Assurance (FOQA) Audit Manager to develop a program in accordance with AC 120-82.

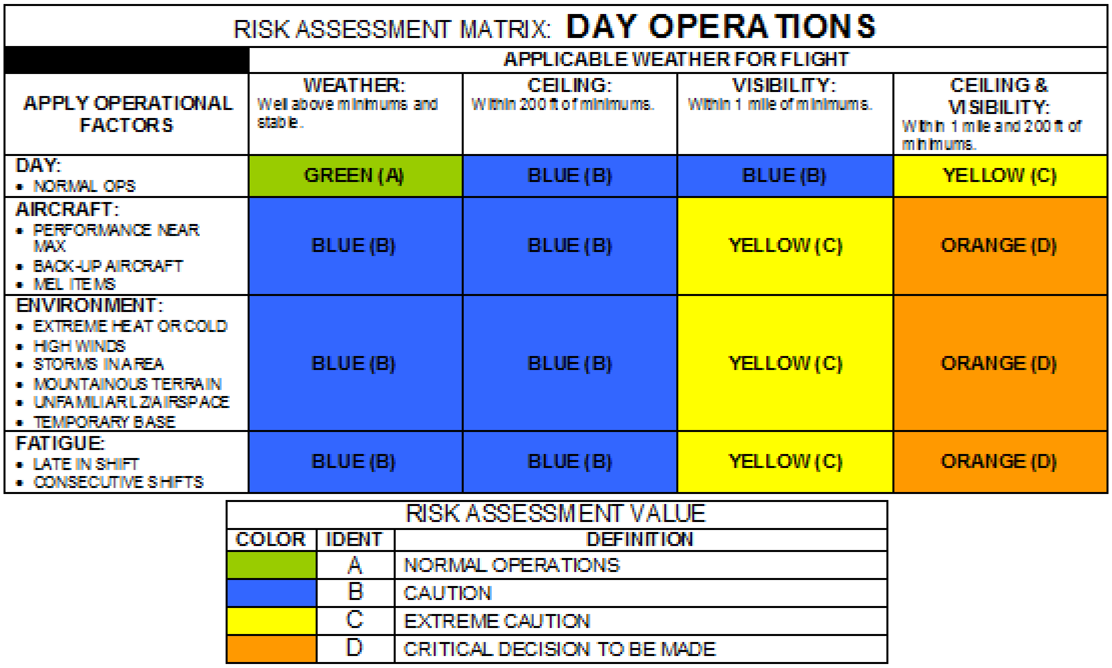
7.2.5 Comparing flight data recorders having the capability to interface with the OCC via satellite communications to notify the OCC of critical in-flight parameters.

7.2.6 Developing the Flight Data Monitoring (FDM) plan to ensure that it is appropriate for phased implementation and takes in to consideration the scalability of the recorder for analog and digital data acquisition.

7.2.7 Published an article in the Air Methods' newsletter "Safety Connect" reiterating the company policy on "In-flight cell phone use".

Appendix A: Risk Assessment Matrices

Flight Assessment Risk Matrix at the Time of the Accident
Operations Manual, Rev 6, 8/1011

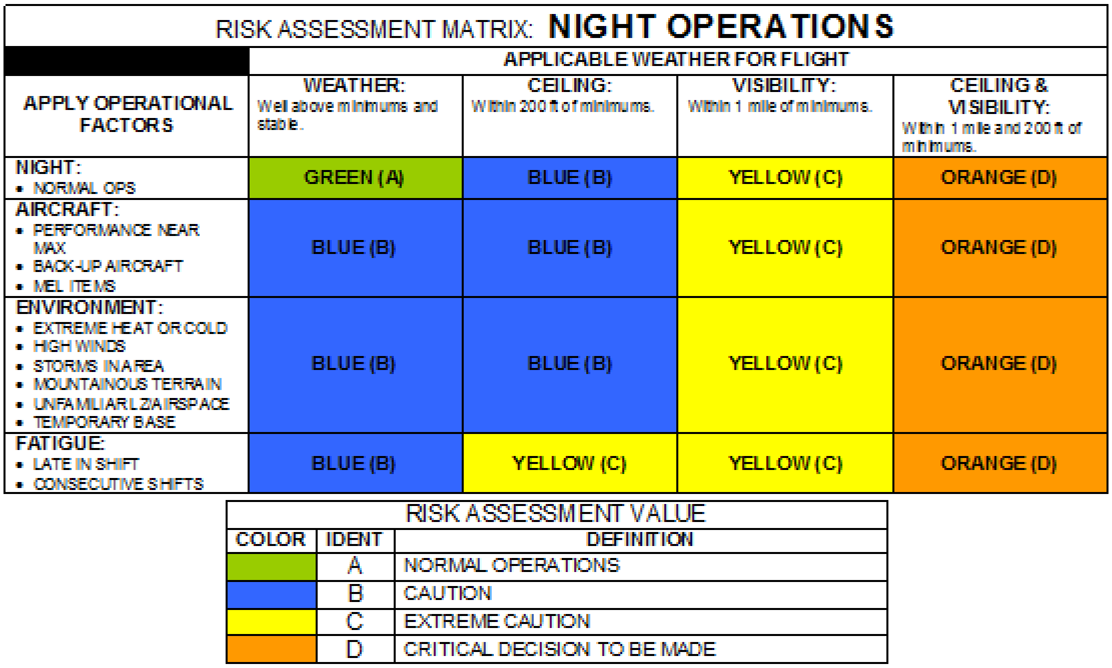


RISK ASSESSMENT MATRIX: **DAY OPERATIONS**

	APPLICABLE WEATHER FOR FLIGHT			
APPLY OPERATIONAL FACTORS	**WEATHER:** Well above minimums and stable.	**CEILING:** Within 200 ft of minimums.	**VISIBILITY:** Within 1 mile of minimums.	**CEILING & VISIBILITY:** Within 1 mile and 200 ft of minimums.
DAY: • NORMAL OPS	GREEN (A)	BLUE (B)	BLUE (B)	YELLOW (C)
AIRCRAFT: • PERFORMANCE NEAR MAX • BACK-UP AIRCRAFT • MEL ITEMS	BLUE (B)	BLUE (B)	YELLOW (C)	ORANGE (D)
ENVIRONMENT: • EXTREME HEAT OR COLD • HIGH WINDS • STORMS IN AREA • MOUNTAINOUS TERRAIN • UNFAMILIAR LZ/AIRSPACE • TEMPORARY BASE	BLUE (B)	BLUE (B)	YELLOW (C)	ORANGE (D)
FATIGUE: • LATE IN SHIFT • CONSECUTIVE SHIFTS	BLUE (B)	BLUE (B)	YELLOW (C)	ORANGE (D)

RISK ASSESSMENT VALUE

COLOR	IDENT	DEFINITION
🟩	A	NORMAL OPERATIONS
🟦	B	CAUTION
🟨	C	EXTREME CAUTION
🟧	D	CRITICAL DECISION TO BE MADE



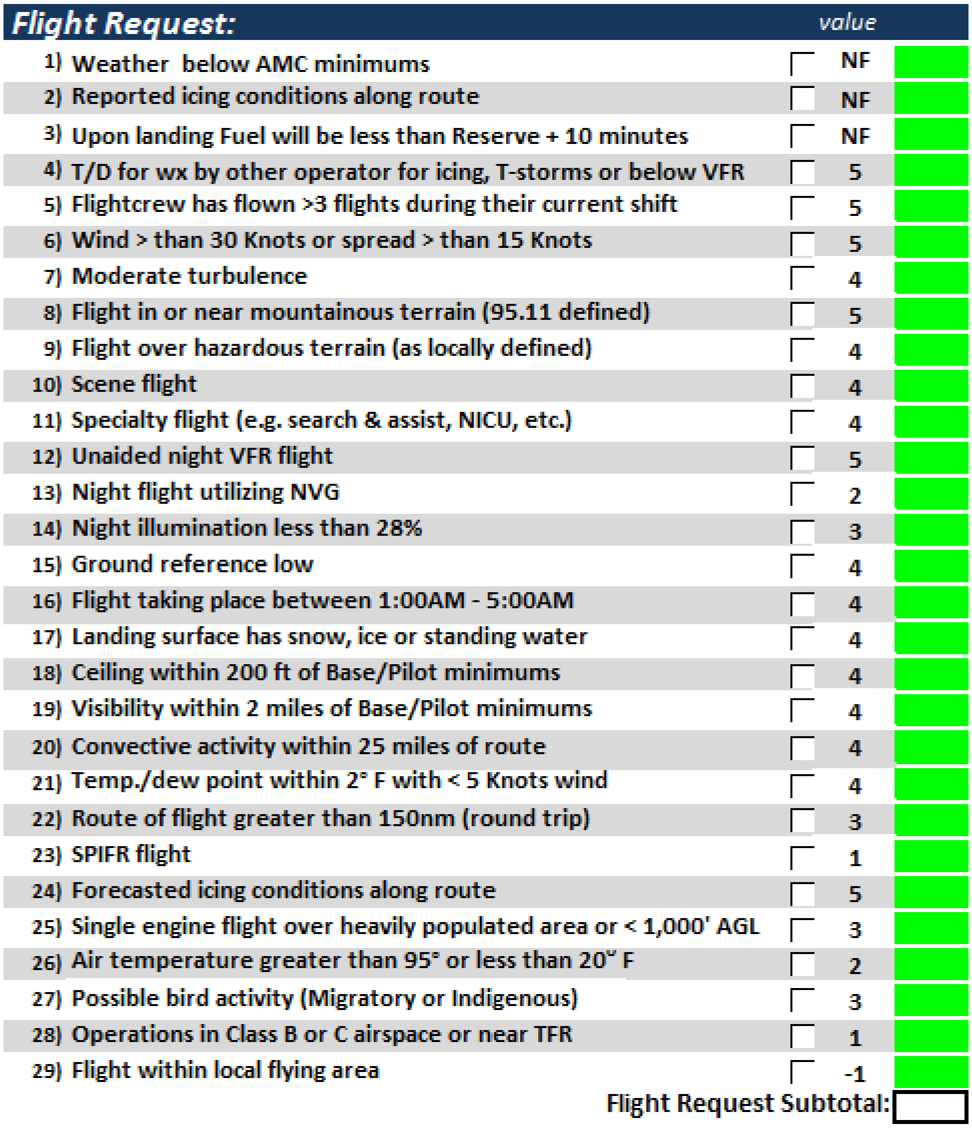
RISK ASSESSMENT MATRIX: **NIGHT OPERATIONS**

	APPLICABLE WEATHER FOR FLIGHT			
APPLY OPERATIONAL FACTORS	**WEATHER:** Well above minimums and stable.	**CEILING:** Within 200 ft of minimums.	**VISIBILITY:** Within 1 mile of minimums.	**CEILING & VISIBILITY:** Within 1 mile and 200 ft of minimums.
NIGHT: • NORMAL OPS	GREEN (A)	BLUE (B)	YELLOW (C)	ORANGE (D)
AIRCRAFT: • PERFORMANCE NEAR MAX • BACK-UP AIRCRAFT • MEL ITEMS	BLUE (B)	BLUE (B)	YELLOW (C)	ORANGE (D)
ENVIRONMENT: • EXTREME HEAT OR COLD • HIGH WINDS • STORMS IN AREA • MOUNTAINOUS TERRAIN • UNFAMILIAR LZ/AIRSPACE • TEMPORARY BASE	BLUE (B)	BLUE (B)	YELLOW (C)	ORANGE (D)
FATIGUE: • LATE IN SHIFT • CONSECUTIVE SHIFTS	BLUE (B)	YELLOW (C)	YELLOW (C)	ORANGE (D)

RISK ASSESSMENT VALUE

COLOR	IDENT	DEFINITION
🟩	A	NORMAL OPERATIONS
🟦	B	CAUTION
🟨	C	EXTREME CAUTION
🟧	D	CRITICAL DECISION TO BE MADE

<u>Current Flight Assessment Risk Matrix</u>



Flight Request:		value	
1) Weather below AMC minimums	☐	NF	🟩
2) Reported icing conditions along route	☐	NF	🟩
3) Upon landing Fuel will be less than Reserve + 10 minutes	☐	NF	🟩
4) T/D for wx by other operator for icing, T-storms or below VFR	☐	5	🟩
5) Flightcrew has flown >3 flights during their current shift	☐	5	🟩
6) Wind > than 30 Knots or spread > than 15 Knots	☐	5	🟩
7) Moderate turbulence	☐	4	🟩
8) Flight in or near mountainous terrain (95.11 defined)	☐	5	🟩
9) Flight over hazardous terrain (as locally defined)	☐	4	🟩
10) Scene flight	☐	4	🟩
11) Specialty flight (e.g. search & assist, NICU, etc.)	☐	4	🟩
12) Unaided night VFR flight	☐	5	🟩
13) Night flight utilizing NVG	☐	2	🟩
14) Night illumination less than 28%	☐	3	🟩
15) Ground reference low	☐	4	🟩
16) Flight taking place between 1:00AM - 5:00AM	☐	4	🟩
17) Landing surface has snow, ice or standing water	☐	4	🟩
18) Ceiling within 200 ft of Base/Pilot minimums	☐	4	🟩
19) Visibility within 2 miles of Base/Pilot minimums	☐	4	🟩
20) Convective activity within 25 miles of route	☐	4	🟩
21) Temp./dew point within 2° F with < 5 Knots wind	☐	4	🟩
22) Route of flight greater than 150nm (round trip)	☐	3	🟩
23) SPIFR flight	☐	1	🟩
24) Forecasted icing conditions along route	☐	5	🟩
25) Single engine flight over heavily populated area or < 1,000' AGL	☐	3	🟩
26) Air temperature greater than 95° or less than 20° F	☐	2	🟩
27) Possible bird activity (Migratory or Indigenous)	☐	3	🟩
28) Operations in Class B or C airspace or near TFR	☐	1	🟩
29) Flight within local flying area	☐	-1	🟩
		Flight Request Subtotal:	☐

Appendix B: Maintenance Background

Maintenance accomplished on N352LN
Total aircraft time of accident: 3655+10

Logbook entries before the accident:

8/26/2011
ACTT: 3649 + 34 Engine TT: 3649 + 34
5 Hour engine chip detector inspection: C/W no defects.
Accomplished by Kevin Coulter A&P-Log Book Page 718972

Airworthiness check
Accomplished by xxx A&P -Log Book Page 718972

Removed Copilot's seat, cycle, collective and seat rails installed medical floor, base plate, trolley
Accomplished by xxx A&P -Log Book Page 718972

AD 2003-22-06 Para 9a) dated 12-03, visually inspect T/R P/C link rod ends
By Pilot Peter Pelayic -Log Book Page 718972

8/25/2011
ACTT: 3646 +54 Engine TT: 3646 +54 -718970
5 Hour daily engine chip detector inspection: C/W no defects
Accomplished by xxx A&P -Log Book Page 718970

Airworthiness check
Accomplished by xxx A&P -Log Book Page 718969

AD 2003-22-06 Para 9a) dated 12-03, visually inspect T/R PIC link rod ends
By Pilot xxx -Log Book Page 718969

8/24/2011
ACTT: 3644 + 22 Engine TT: 3644 + 22
AD 2003-22-06 Para 9a) dated 12-03 visually inspect T/R PIC link rod ends
By mechanic xxx Log Book page #718966

Airworthiness check
Accomplished by mechanic xxx

5 Hour engine chip detector inspection: C/W no defects
Accomplished by mechanic xxx Log Book# 708967

AMC AS350 B2 AAIP 30 HR A23INT
Accomplished by mechanic xxx

AMC AS350 R B230 Engine inspection
Accomplished by mechanic xxx Log Book page #718968

30Hr Inspection B0230 AAIP C/W at ACTT: 3644+30/ cycles 1000
Inspect engine and reduction gear box.

08/23/2011
5 Hour engine chip detector inspection C/W no defects
Accomplished by mechanic xxx Log Book# 718964

R&Rd N1 Tach generator
by mechanic xxx Log Book #718965

AD 2003-22-06Para 9a) dated 12-03, visually inspect T/R PIC link rod ends
By Pilot xxx -Log Book Page 718963

Airworthiness check accomplished
by mechanic xxx Log Book Page #718963

08/22/2011
R&Rd Nl Tach generator
by mechanic xxx 718962

Hour engine chip detector C/W no defects
Accomplished by mechanic xxxx Log Book Page 718961

Removed loading system, floor, installed copilot seat, cyclic, collective, pedals.
By xxxx Log Book Page 718961

Appendix C: Cell Phone Policies

Cell Phone Policy at the Time of the Accident
Operations Manual, Rev 6, 8/1011

CELL PHONES/PORTABLE ELECTRONIC DEVICES - UTILIZATION

[135.144]

In compliance with FCC regulations, the PIC shall not allow cellular phones to be used or turned on during ground operations (including taxi and hover operations), takeoff, enroute, approach, and landing. Use of cellular phones while the aircraft is on the ground, not in motion, is acceptable provided it does not interfere with on board navigation and/or communication equipment.

The PIC will not allow portable electronic devices, such as personal data assistants (PDAs), laptop computers, etc. to be operated on board their aircraft unless an **EMI/RFI Flight Test Profile**, developed by Air Methods, has been conducted and completed successfully. Contact the Director of Maintenance for a copy of the EMI/RFI Flight Test Profile.

Current Cell Phone Policy

Cell Phones / Portable Electronic Devices – Utilization

[135.144]

In compliance with FAA regulations and to prevent distractions, the PIC shall not allow cellular phones/portable electronic devices to be used or turned on during ground operations including taxi and hover operations, takeoff, enroute, approach, and landing.

The PIC will not allow portable electronic devices, such laptop computers, iPads, etc. to be operated on board their aircraft unless an **EMI/RFI Flight Test Profile**, developed by Air Methods, has been conducted and completed successfully. Contact the Director of Maintenance for a copy of the EMI/RFI Flight Test Profile. Electronic devices may be used in cruise flight in airplane mode.

In the interest of safety, this is a zero tolerance policy. This includes use of cellular phones and/or electronic tablets for verbal communications, sending or receiving electronic communications such as email, instant messages, or text messages while in flight and aboard an aircraft owned or operated by Air Methods.