NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

November 27, 2019

Specialist's Factual Report

HUMAN PERFORMANCE

CEN18FA149

A. ACCIDENT

Operator:	Air Methods
Location:	Hazelhurst, WI
Date:	April 26, 2018
Time:	2250 central daylight time (CDT)[1]
Aircraft:	EUROCOPTER AS 350 B2
Registration:	N127LN

B. SPECIALIST

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C. SUMMARY

On April 26, 2018, about 2250 central daylight time, a Eurocopter AS 350 B2 helicopter, N127LN, impacted trees and terrain during cruise flight near Hazelhurst, Wisconsin. The pilot and two crewmembers were fatally injured. The helicopter was destroyed during the impact. The helicopter was registered to and operated by Air Methods Corporation as a Title 14 *Code of Federal Regulations* Part 91 repositioning flight. Night visual meteorological conditions were reported in the area about the time of the accident, and the flight was operating on a company visual flight rules flight plan. The flight originated from the Dane County Regional Airport-Truax Field (MSN), near Madison, Wisconsin, about 2104 and was destined for the Howard Young Medical Center Heliport (60WI), near Woodruff, Wisconsin.

[1] All times are based on a 24-hour clock and are in CDT unless otherwise noted. Time of the accident is approximate.

D. DETAILS OF THE INVESTIGATION

The Human Performance Investigator was assigned to the investigation on October 1, 2018. Investigative activities included conducting interviews, gathering relevant documentation, and reviewing training and guidance materials. Information relevant to the pilot's pre-accident activities and health and company policies and procedures are contained in this factual report.

1.0.Pilot information

The pilot information was documented through interviews[2], FAA records, company records, and cellular telephone records.

The pilot, age 34, lived in Hazelhurst, Wisconsin, and was based in Woodruff, Wisconsin. He was hired by Air Methods on December 8, 2008. He completed initial training on January 11, 2009, and his most recent recurrent flight training and proficiency check were completed on January 5 and 7, 2018. He was a pilot-in-command and also the base lead pilot[3]. He was current and qualified for VFR day and night (including use of NVGs[4]) operations. He had about 3,432 hours total time including 1,534 hours in the AS350B2, and 562 hours of night flying. Prior to the day of the accident, he last flew for Air Methods on April 18, 2018. According to an email received from Air Methods on November 26, 2019, a review of employee records did not reveal any disciplinary actions against the pilot.

His most recent FAA 2nd class medical, dated May 31, 2017, had no limitations and no medications were listed on the application. The pilot's most recent visit to see his primary care physician was in April 2016 for a normal exam; a review of those medical records did not reveal any medical conditions or medications.

1.1. Recent activities

The accident pilot was off duty from April 19, 2018, until the day of the accident. According to his wife, the family spent a week in Florida on vacation and returned the day before the accident. His wife did not recall specific activities of each day but thought he went to sleep about 2200 EDT and woke up about 0700 EDT during the vacation. The pilot did not have any problems falling asleep or staying asleep.

Cellular telephone records were obtained to document the pilot's sleep opportunity in the days preceding the accident. Except for the night of April 19, in which his sleep opportunity was 7 hours and 50 minutes, the pilot had a sleep opportunity of more than 9 hours in each of the 6 nights before the accident.

[2] See Attachment 1 – Interview Summaries to this report.
[3] See Attachment 2 – GOM Excerpts to this report for additional information.
[4] Night vision goggles.

On April 25, 2018, the pilot traveled from Florida to Milwaukee. His wife did not recall when he woke up but thought their flight departed early, about 0800 or 0900 EDT. They had lunch in Milwaukee before making the 4-hour drive home. Cellular telephone records indicated activity[5] beginning at 1655 until 2038 with two extended breaks in activity of greater than 60 minutes from 1658 until 1801 and 1802 until 2011. His wife thought he went to bed about 2100-2130.

On April 26, his wife was not sure what time he woke up, but cellular telephone records indicated activity beginning at 0725 until 2057 with three extended breaks in activity greater than 60 minutes from 923 until 1118, 1431 until 1556, and 1741 until 2040. Prior to going on duty, his wife said he would drop off their kids at daycare around 0800 and then rest during the day; he would also sleep during the day. His wife, who was also a pilot at Air Methods and based in Woodruff, was on duty the day of the accident and worked the day shift. She saw him when he arrived at work. They did the shift change together but they did not talk about his rest. There was nothing unusual about her husband when she saw him. His wife thought he arrived about 45 minutes early for his shift to fly the accident trip. Company flight logs showed the pilot departed 60WI at 1759 and arrived at Merrill Municipal Airport (RRL) at 1819. The flight departed (RRL) at 1832 and arrived at UW Hospital and Clinics Heliport, Madison (WS27) at 1937. The flight departed WS27 at 2028 and arrived the Dane County Regional Airport – Truax Field, Madison (MSN) at 2037. The accident flight departed MSN for 60WI at 2104.

2.0. Medical and pathological information

Toxicology tests performed by the laboratory at FAA Forensic Sciences on specimens from the pilot tested negative for a wide range of drugs, including major drugs of abuse.

3.0. Air Methods

3.1. Organization Overview

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. They have over 450 helicopters and fixed wing aircraft. It is the largest provider of air medical emergency transport services throughout the United States. Air Methods flies approximately 150,000 air medical flight hours and conducted 100,000 patient transports each year.[6]

3.2. Operational Control

In accordance with 14 CFR 135.619, Air Methods operated an Operational Control Center (OCC), which is based in Englewood, Colorado. The Air Methods General Operations Manual

[5] Cellular telephone activity is considered outbound telephone calls or text messages, and inbound telephone calls in duration greater than 30 seconds.
[6] www.airmethods.com/about-us [accessed November 7, 2019]

(GOM), rev. 11, section 2 “Flight Operations-General”, subsection 2.1 “Operational Control”, stated, in part:

> Air Methods utilizes a two-tier system of operational control. The first tier consists of managers and directors listed in Operations Specifications Paragraph A006, the Air Methods 411 Pilot computer system, trained fight followers, and the Operational Control Center (OCC). Satellite tracking allows real-time position reports for flight locating requirements.
>
> The 411 Pilot computer system verifies a pilot meets flight and rest requirements in addition to being properly trained and qualified through a pilot-submitted flight release. Upon validation of pilot requirements, the 411 system issues an electronic flight release valid for the duration of the pilot’s shift.

The Air Methods General Operations Manual (GOM), rev. 11, section 8 “Operational Control Center Guidance”, subsection 8.1 “General”, stated:

> The Operational Control Center (OCC) is committed to safe, professional air medical transport. Our initiatives and programs are dedicated to enhance safety by monitoring significant safety of flight issues relating to hazards, weather conditions and airspace restrictions. The goal is to protect assets and increase safety by supporting pilots and Communication Centers therefore increasing the awareness of possible adverse weather or other in-flight hazards. In addition, the Operational Control Center serves as a 24/7 staffed element for Flight-monitoring and assistance as well as a coordination center for Air Methods during normal, night, and holiday hours.

The Air Methods General Operations Manual (GOM), rev. 11, section 8 “Operational Control Center Guidance”, subsection 8.2 “Purpose” stated:

> The Operational Control Center is an Agent for Air Methods Corporation assisting with Operational Supervision and Control. The OCC is primarily responsible for flight surveillance while providing Advisory/Alert information affecting Air Methods aircraft. Advisories/Alerts may include, but are not limited to, flying in the vicinity of marginal or deteriorating weather conditions, temporary flight restrictions (TFR), ground proximity or any other significant possibility that could become a hazard to flight. All alerts will be communicated to the pilot or the appropriate Communication Center responsible for Flight Following.

For additional information on Air Methods operational control and flight following, see Attachment 2 to this report.

3.3. Air Methods Pre-Flight Risk Analysis Program

In accordance with 14 CFR 135.617 Air Methods had a pre-flight risk analysis program. The Pre-Flight Risk Analysis Program manual, Rev. 2, section 1 “Pre-Flight Risk Analysis (PFRA) – Helicopter Operations”, stated its purpose was “to assist in reducing incidents and accidents”

and "to assist pilots in identifying, assessing, managing risks and ensuring they are mitigated, accepted or declined. The Pre-Flight Risk Analysis Tool is designed to provide the Pilot and the OCC with a robust method of assessing the risk for each flight." Air Methods pilots used an iPad to perform the PFRA. All pilots conducting helicopter HAA medical flights were required to submit a PFRA to the OCC and receive an "approval" prior to conducting the flight.

Information (risks) inputted to the PFRA by the pilot related to (1) pilot and crewmember, such as pilot experience as single pilot, at current base/program, and using night vision goggles; (2) aircraft, such as MELs and aircraft weight within 200 lbs of max HOGE; and (3) flight request, such as if crew had flown more than 3 flights during the shift, weather and turbulence, flight taking place between 0100 and 0500, planned completion time of flight will take more than 4 hours and planned completion time of flight past 12th hour of duty day. Each risk was weighted and factored into the overall score and OCC response. Once the PFRA was completed, the pilot would submit it for review by the OCC. According to the PFRA Program manual, "The OCC will open the Pre-Flight Risk Analysis submitted by the pilot and verify all sections and line items. Once all PFRA sections are verified, the OCC specialist will check the weather associated with the flight request. After a final review of the Pre-Flight Risk Analysis and Weather by the OCC, one of three responses will be relayed back to the pilot via the IPAD. 'Approved-OCC' 'Call OCC' or 'Not Approved-OCC.'" A response of "Approved-OCC" indicated the pilot could proceed with the flight without any delay; the flight can be conducted safely. A response of "Call OCC" indicated the pilot must call the OCC for a follow up conversation; this could be due to a need to mitigate risks or for corrections. A response of "Not Approved-OCC" indicated the flight was terminated; this could be due to a safety of flight concern or a risk that could not be mitigated with the OCC.

The OCC Policy and Procedures Manual, sub-section 2.12 "Pre-Flight Risk Analysis Support", stated:

> The OCC participates in the pre-flight risk analysis required under §135.617 to include the following:
>
> - Ensure the pilot has completed all required items on the pre-flight risk analysis worksheet
> - Confirm and verify all entries on the pre-flight risk analysis worksheet
> - Assist the pilot in mitigating any identified risk before takeoff; flight considerations, human factors and weather
> - Acknowledge in writing, specifying the date and time, that the preflight-risk analysis worksheet has been accurately completed and that, according to their professional judgement, the flight can be conducted safely
>
> The OCS[7] should ensure the requested flight has not been turned down by any other air medical service. If in doubt the OCS should clarify the situation before approving the risk analysis.

[7] Operational Control Specialist

Independent of the PFRA, the on duty OCC supervisor will support the pre-flight risk mitigation for flights that reach a high level of risk as outlined in the Air Methods' Pre-Flight Risk Analysis Program.

The PFRA for the accident flight had a total score of 6 (low risk) and received an "Approved-OCC" response at 1727 on April 26, 2018.

3.4. Duty and Rest Requirements

The Air Methods GOM, section 2 "Flight Operations-General", subsection 2.24 "Flight Time Limitations and Rest Requirements: Unscheduled One and Two Pilot Crews", defined a scheduled duty period as "12 scheduled consecutive hours that may be extended to 14 hours" and a rest period as "10 scheduled hours of rest that are consecutive, known in advance and free from all restraint." The section further stated, in part, "Pilots and certificate managers are responsible for ensuring compliance with the flight time limitations and rest requirements. Pilots will report for duty with the appropriate rest and be capable of performing their assigned flight crewmember duties. At any time a flight crewmember becomes medically or physically unfit for duty they shall vocally notify the appropriate aviation manager, self-ground and comply with the requirements of CFR 61.53." For additional information, see Attachment 2 to this report.

3.5. Fatigue Guidance

The winter 2017 edition of Air Methods "Safety Connect"[8] publication included a special in-depth feature titled "Drained: Examining the Causes & Remedies of Fatigue". The publication discussed, in part: factors that increase fatigue including dim lighting, limited visual acuity, high temperatures, high noise, high comfort, tasks over long periods of time and long, repetitive, monotonous tasks; maintainer fatigue and fatigue risk management which included information contained in FAA Advisory Circular 120-115 "Maintainer Fatigue Risk Management"[9]; and lifestyle changes to fight fatigue such as replacing white LED lights with yellow lights near where you sleep, eating the right foods, getting exercise and vitamin D, and avoiding caffeine within 6-8 hours of bedtime.

For additional information, see Attachment 3 to this report.

3.6. Safety Program

The GOM, rev. 11, section 7 "Safety Program", subsection 7.1 "Safety Policy", stated:

[8] The Air Methods Policy Manual, rev. 2, dated 11/10/14, section 5. "Safety Promotion", subsection 5.2.1 "Safety Connect" described the publication as "an Air Method's news magazine. It is published bi-monthly and focuses on corporate safety stories including program updates, seasonal safety tips, and "Atta Boys" (reports that summarize an event in which an employee performed safety measures particularly well). This newsletter is required reading material by all employees."

[9] Available at https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_120-115.pdf [accessed November 1, 2019]

Air Methods is committed to the attainment of the highest level of safety in the accomplishment of our corporate mission. It is our goal to provide a safe and healthy working environment for all of our team members and, in doing so, to support state and federal laws regarding safety. Our intention in making this strong commitment is to eliminate injuries to our employees and accidental damage to equipment and/or property. It will be understood that team members of all levels of the company will be safety committee members.

The scope of the Air Methods' safety program includes all aspects of company practice including in flight, in the performance of maintenance, on the ramps, on the helipads, in our offices, in fire prevention, and in every environment in which we work.

Responsibility for implementing the safety program rests with the Air Methods safety director, program safety officers, regional safety directors, field safety representatives, base and aviation safety managers, and managers / supervisors at every level. That responsibility brings with it the obligation and authority to actively promote the safety program company-wide.

The GOM, subsection 7.2 "Program Elements", stated:

The following items comprise the core elements of the Air Methods' Safety Program. Programs will be added, deleted or changed to meet current organization and operational mission requirements.

- Air Methods' SMS Policy Manual
- Management-leadership commitment
- Risk Management (Hazard identification, reporting, evaluation and control)
    - The primary means of reporting an aviation safety event is the AIDMOR, (Accident, Incident, Damage, Malfunction, and Operations Report).
- "Y or Z" work order costs
    - Costs shall include but are not limited to; labor hours, components (purchase, repairs or rentals), equipment rental, shipping, and relocation of aircraft.
- Base safety audits
- Accident and incident reporting
- Accident and incident investigation
- Safety communications and awareness

3.6.1. Safety Management System

Air Methods elected to join the FAA's SMS (Safety Management System) Pilot Project and voluntarily implemented a Safety Management System. The system was documented in the Air Methods SMS Processes and Procedures, rev. TR IR, dated December 2, 2012, and SMS Policy Manual, rev. 2, dated November 10, 2014.

The SMS Policy Manual, section 2 "Safety Policy and Objectives", subsection 2.1 "Air Methods Corporate Safety Policy" stated, in part:

Air Methods is committed to the creation of an environment designed to facilitate a culture founded on the principles of continuous improvement through managing the everyday risk and being vigilant and accountable to one another.

As Defenders of Tomorrow Air Methods is committed to:

- The growth, maturation and continuous improvement of our safety and risk management systems.
- Creating and nurturing a Just Culture that empowers all employees to report openly on any and all safety hazards free from the risk of retaliation.
- Developing effective safety, environment, and health management policies within the framework of a Safety Management System.
- Promoting and supporting safety training and safety awareness programs.
- Facilitating a Culture that includes a focus on safety assurance by educating all levels of management and all frontline employees as frontline risk managers educated in the art of risk based decision making.
- The certification of functional areas' declaration of compliance with company policy and procedures, Federal, State and local laws and regulations through the use of internal and external audits and evaluations.
- Sharing best practice methods, risk based data and lessons learned with our employees, customers and across the industry as well as monitoring industry activity to ensure best safety and risk mitigation practices are incorporated at Air Methods.
- Demonstrating to customers and stake holders a clear commitment and unwavering dedication to transparency, quality and continuous improvement.
- Providing the necessary resources in all areas to support this policy.

3.6.2. Safety Reporting

The Air Methods SMS Policy Manual, rev. 2, section 3 "Systems Risk Management", subsection 3.1.3 "Reporting Hazards" stated the following:

> Hazards will be reported utilizing one or more of the employee reporting mechanisms established and/or adopted by Air Methods. These are explained in more detail in the Employee Reporting and Feedback Systems section of this manual and throughout our safety processes and procedures and include:
>
> - Accident, Incident, Damage, Malfunction, Operations Report – for mandatory accident/incident reporting.
> - Aviation Safety Action Program and the Maintenance Safety Action Program - for voluntary reporting.
> - AlertLine – for anonymous reporting.
> - The Air Methods Medical Application – for medical services reporting.
> - Direct reporting – email, telephone call, meeting.
> - Base self-assessments
> - Base audits.

Section 4.1.5 “Employee Reporting and Feedback Systems” of the SMS Policy Manual stated:

> There are several vehicles for gathering safety data at Air Methods. In addition to the main reporting systems listed below, we also utilize our Operations Control Center, Reliability Program, the Root Cause Analysis Review Board, Customer Service Reports, the 411 and Ramco software applications, Mechanical Interruption Summaries, Mechanical Reliability Reports, Service Difficulty Reports, and Letters of Investigation.
>
> 4.1.5.1 Aviation / Maintenance Safety Action Programs (ASAP / MSAP)
>
> The ASAP / MSAP programs encourage employees to voluntarily report safety information critical to identifying potential precursors to incidents and accidents. ASAP is for pilots and operations issues and MSAP is for maintenance issues.
> For more information on the ASAP/MSAP Programs, please see the ASAP/MSAP section of the SMS Processes and Procedures Manual located on FlightDeck > Resources > Corp Pubs > Safety Publications > Safety Programs and Procedures.
>
> 4.1.5.2 AlertLine
>
> The Air Methods AlertLine is a customized website hosted by Global Compliance, Inc. Global Compliance, Inc. is an independent, third party organization specializing in anonymous reporting.
>
> This tool is to be utilized for safety, internal audit (Sarbanes-Oxley), and human resource concerns. It allows all company employees, customers, and vendors to provide valuable feedback, comments, suggestions, and alerts. This tool allows the submitter to remain completely anonymous, if that option is selected. For more details on the AlertLine tool and process, please see the corporate AlertLine Policy located on FlightDeck > Resources > Corp Pubs > Corporate Based Stand Alone Policies.
>
> 4.1.5.3 Accident, Incident, Damage, Malfunction, Operations Report (AIDMOR)
>
> The AIDMOR is one of the company’s tools to help identify and reduce potential hazards to safe operations (medical, maintenance, communications, operations and general office). The AIDMOR is a key part to our SMS and is a mandatory report for any accident or incident that falls into one of the categories listed in the report tool (located on the Safety page of FlightDeck). ANY unforeseen or unplanned event occurring during a shift ***must*** be reported by an AIDMOR submission. Determine actions to be taken as follows:
>
> - Determine if an event has occurred, including an accident, incident, damage, malfunction or any other situation that may be noteworthy or may generate FAA involvement (aircraft or otherwise) and that falls into one of the report’s categories.
>
> ***NOTE:*** *At this time, submitting an AIDMOR does not satisfy the Part 135 Certificate requirement of submitting a Mechanical Interruption Summary (MIS) or a Service Difficulty Report (SDR). The AIDMOR is in addition to these forms and serves as the tool*

for hazard/error tracking and trending. (Also to note: Following our SMS process does not, at this time, constitute compliance with the FAA Voluntary Self-Disclosure Program (VDRP).

- If warranted, telephone the regional aviation director or the chief pilot (e.g. safety of flight violation, or endangerment of property/equipment/personnel).
- Complete the AIDMOR form.
- Identify and list possible causes of the accident, incident, or hazard using the narrative section of the form.
- Analyze, to the best of your ability, the corrective measures to prevent or reduce the accident, incident, or hazard from recurring.

4.1.5.4 The Air Methods Medical Application (TAMMA)

The TAMMA system was developed and launched as an internal tool. TAMMA has many benefits, but for the most part, TAMMA is an issue management system focused on quality improvement built with three main objectives:

- Quick and simple online mission and non-mission issue reporting.
- Quick discovery and proper issue assignment to management for review.
- Follow up and automatic crew loop closure of issue reported.

In addition to its issue management system, TAMMA also serves as a medical application with the following main objectives:

- Data repository for clinical and medical continuing education.
- Complete and comprehensive QA system for providing thorough review of patient care.
- Measuring tool to help identify weaknesses and strengths in clinical care competencies.

The company's community-based services (CBS) division has been using TAMMA for more than two years and it has become the core medical application used by field management across the country.

For CBS program management, it helps communicate with flight crews by streamlining communication regarding issues discovered on and off the mission.

It is an effective loop closure component designed to wrap around all communication and provide good closure back to the flight team or author who reported the issue.

The SMS Processes and Procedures manual, section 2 "Risk Management", subsection 2.1 "Hazard Identification and Analysis" stated in part:

2.1.1 Analyze Systems

One of the first steps in reducing risk is to actively anticipate and analyze potential hazards in our systems, operations, and environment and then establish controls to prevent or mitigate them. At Air Methods, our Systems Improvement Roundtables regularly review

systems/operations and possible hazards. Once analyzed, a mitigation plan is put into place. For detailed procedures on the Systems Improvement process, please see the Systems Improvement section of this manual.

2.1.2 Identify Hazards

All employees are responsible for identifying and reporting hazards. A few examples of potential hazards are listed below. Keep in mind, many more exist throughout the different areas of the company.

- Unfamiliar terrain
- Foreign Object Damage
- Unbalanced hoisting, jacks, tracking
- Loose cords
- Old / outdated procedures
- Bloodborne Pathogens
- Changing weather conditions
- Radiation
- Crew endurance
- Inaccurate records
- Implementing new software
- Addition of new policy / procedure
- Limited planning time
- Uncontained fumes
- Flammability during fueling and defueling
- Worker inexperience
- Ordering / using the wrong parts
- Darkness / poor lighting
- Poorly equipped environment
- Hazardous materials (paint booths, etc.)
- Electro Static Discharge
- Unclear or closed communications
- Sudden loss of employees
- Elimination of existing policy / procedures

In addition, the SMS Processes and Procedures, section 2 “Risk Management”, subsection 2.1.3.1 “Reporting Tools: Quick Reference Matrix” described the various reporting tools, who should use it and when (see table 1).

Reporting Tool	Manager/Admin	Who Should Use It	When to Use It
AIDMOR	Risk Data Manager / Department Management	All employees	This is mandatory for any incident or accident that falls into one of the categories listed in the actual reporting tool (on the Portal under the Safety banner click AIDMOR to see the report and the categories). Any of the events listed in the *Reportable Events* section of the AIDMOR ***must*** be submitted.
ASAP	ASAP/MSAP Program Manager	Pilots	To report safety concerns, Standard Operating Procedure (SOP) violations, Federal Aviation Regulation violations, or other safety risk related events resulting in a decrease in safety margins
MSAP	ASAP/MSAP Program Manager	Mechanics, United Rotorcraft Engineers and Repairmen	To report safety concerns, Standard Operating Procedure (SOP) violations, Federal Aviation Regulation violations, or other safety risk related events resulting in a decrease in safety margins
TAMMA	TAMMA System Administrator	Medics, Nurses, Pilots, Communication Specialists	To report issues discovered on and off the mission - post flight debrief.
AlertLine	AlertLine Managers	All Employees, Customers, and Vendors	To report concerns related not only to safety but Sarbanes-Oxley and human resources concerns and violations as well. This tool allows the submitter to remain completely anonymous.
Base Self Assessment	Management	All Departments, Bases	Quarterly or Annually, depending upon the area procedures.
Base Self Assessment Validation Audit	IEP Manager	IEP Staff	The Base Validation Audit Schedule is posted on the Portal.
VDRP	Director of Maintenance	The Company (DOO, DOM, Chief Pilot)	Any time there is potential for a regulatory violation (at the discretion of the accountable manager).
In Person, Call, Email	N/A	Any Employee	Any time

Attachments

1.) Interview Summaries
2.) Air Methods GOM Excerpts
3.) Air Methods Safety Connect Fatigue Excerpt