September 29, 2011

WRP10FA371 N509AM
Mr. Van McKenny
Investigator-in-Charge
National Transportation Safety Board
Gardena, CA 90248

In accordance with 49 CFR 831.14, which provides the parties an opportunity to submit to the Board, findings and recommendations that are drawn from the evidence produced during the investigation, please find herein the Air Methods Corporation (Air Methods) submission through which we hope to assist the Board in arriving at its factual findings, conclusions, determination of probable cause, and recommendations that may be concluded from the investigation of this accident.

The undersigned assisted the NTSB investigation as a "party status" member of the above helicopter accident investigation during the initial on site and subsequent off site follow up investigations conducted at the Marana, Arizona Airport, and Phoenix, Arizona (Air Transport's salvage yard) and at Turbomeca's facility in Grand Prairie, Texas. The investigative team was managed by the NTSB investigator in charge, Mr. Van McKenny IV and consisted of parties representing, the FAA, Air Methods, American Eurocopter, Turbomenca USA and OPEIU Local 109. The following reports were reviewed.

OPERATIONS GROUP CHAIRMAN'S FACTUAL REPORT, WPR10FA371
AIRWORTHINESS GROUP CHAIRMAN'S FACTUAL REPORT, WPR10FA371
MAINTENANCE RECORDS GROUP CHAIRMAN'S REPORT, WPR10FA371

Pictures and diagrams in this report have been copied from the above documents.

Please let me know if you believe anything contained within this letter requires further explanation or documentation.

Dennis McCall, Chief Pilot
Michael Koenes, Corporate Safety Manager
Don Lambert, Director of Technical Services

PROPOSED FINDINGS OF FACT:

1. On July 28, 2010, at 1342 Mountain Standard Time, an American Eurocopter AS 350 B3, N509AM, descended rapidly and collided with terrain in an urban area of Tucson, Arizona. The helicopter was operated by Air Methods, as LifeNet 12, on a repositioning flight, under the provisions of 14 *Code of Federal Regulations* Part 91. The commercial pilot and two medical flight crewmembers were killed. The helicopter was substantially damaged, and consumed by a post impact fire. There is evidence that two of the crewmembers survived the initial impact and perished in the post impact fire. Visual meteorological conditions prevailed, and a company flight plan had been filed. The non-revenue repositioning flight originated at Marana Regional Airport, Tucson, Arizona at 1332, and the intended destination was Douglas, Arizona.

2. Witnesses reported seeing the helicopter flying steadily in a southeast direction when it started to descend rapidly and enter a left-hand turn. Witnesses also stated that the helicopter made some unusual 'whump, whump' sounds, and rapid intermittent popping sounds, which was followed by unusual quietness as the helicopter descended. As the helicopter turned and got closer to the ground its flight trajectory became increasingly vertical. The helicopter impacted a six foot high concrete wall and was consumed by a post impact fire.

3. The post-crash fire likely originated from the ignition of fuel that was released when the helicopter's fuel tank ruptured after the helicopter impacted the ground.

4. Radar data indicated that, prior to entering the rapid descent, the helicopter was on a steady southeast course, at 131 knots ground speed, and 900 feet above ground level (agl). The pilot did not transmit a radio distress call.

5. External examination of the engine at the accident site revealed that the fuel union had become detached from the flange on the compressor case. According to a Turbomeca representative, if this fuel line becomes disconnected, fuel starvation to the engine occurs. The fuel supply line remained attached to the union and the hydro-mechanical unit (HMU). The intermediate gasket was located in the fuselage debris, directly below the fuel union (See photo 1 Engine at Accident Site and illustration 1).

Photo 1 engine at accident site, fuel union had become detached from the flange on the compressor case

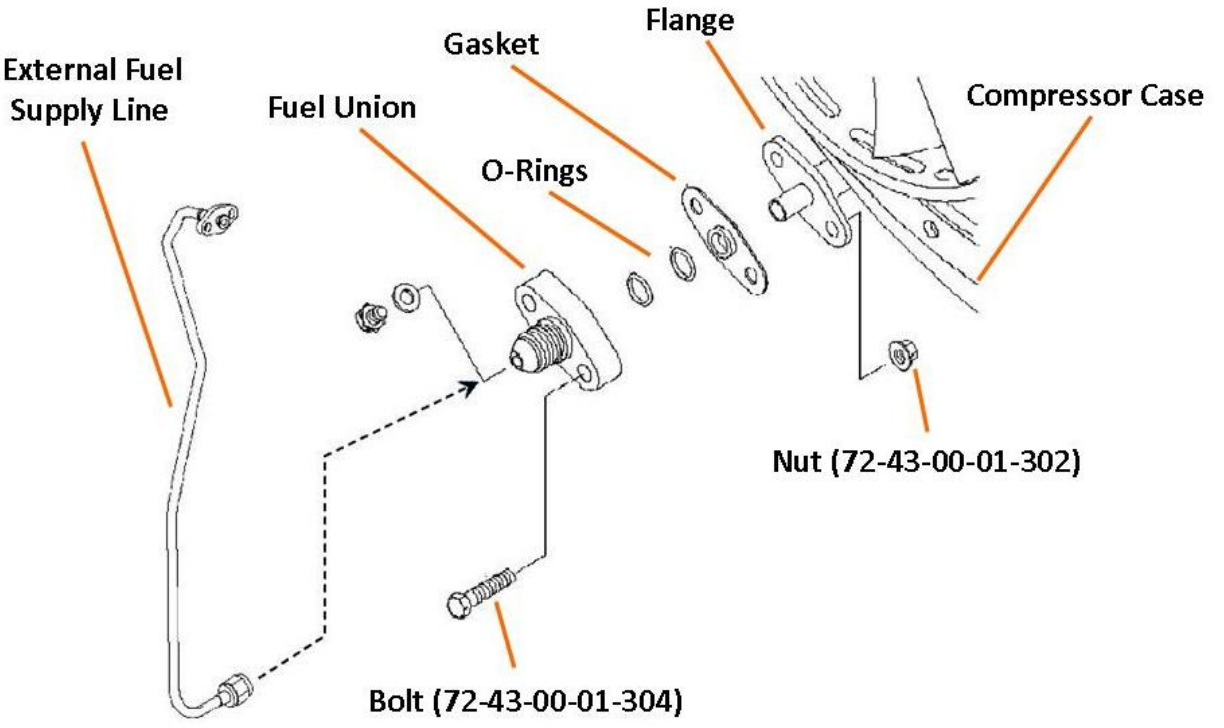

Illustration 1

6. Air Methods has a maintenance hangar at the Marana Regional Airport. Aircraft maintenance that requires special tools, hoists or shelter is performed there on the helicopters that operate in Air Methods Southern Arizona Operation Area. The accident helicopter (N509AM) was positioned at the Marana Regional Airport on July 24, 2010 to undergo engine maintenance related to a fuel coking problem.

7. The accident helicopter's engine was removed, and the fuel manifold was removed and replaced. This process involved removing all the external engine piping and harnesses, separating the engine modules, removing and replacing the fuel manifold, and reassembling the engine.

8. The repair of the engine required level three, deep maintenance that could not be performed by Air Methods maintenance personnel. Air Methods maintenance personnel are authorized to perform level one and two maintenance.

9. Air Methods used an approved third party vendor, Helicopter Services of Nevada (HSN) who sent their Director of Maintenance to perform the level three maintenance.

10. In the previous 12 month period the HSN Director of Maintenance had performed this level three maintenance procedure on two engines. One was from the accident aircraft SN 46268 and the other was SN 23366 that was also at the Marana maintenance facility with a suspected coking issue. According to the procedures outlined in Turbomeca's Maintenance Technical Instruction (MTI) X292M13032Rev4 it would have required the removal and reinstallation of the fuel inlet union from the boss on the compressor case. The Maintenance Records Group Chairman's Report stated the following-

"In the MTI guidance, it states the following.

- Removal of the jet union (Refer to Figure 501) (Detail C)
- Remove the nuts (72-43-00-01-304) (x2).
- Remove the screws (72-43-00-01-302) (x2).
- Remove the jet union (72-43-00-01-300).
- Remove and discard the special seal (72-43-00-01-340).
- Remove and discard the preformed packings (72-43-00-01-330) (x2).
- Remove the screw (72-43-00-01-350) and discard the seal (72-43-00-01-360).
- For reinstallation, it states the following:
- Installation of the jet union (Refer to Figure 1006)
- Lubricate and install the preformed packings (72-43-00-01-330) (x2) on the jet union (72-43-00-01 -300).
- Install the special seal (72-43-00-01-340) on the flange of the intermediate casing (72-43-00-02-170).
- Install the jet union assembly (72-43-00-01-300) on the flange of the intermediate casing.
- Attach with the screws (72-43-00-01-302) (x2) and the nuts (72-43-00-01-304) (x2).
- Install the screw (72-43-00-01-350) with its seal (72-43-00-01-360) on the jet union (72-43-00-0 1 -300).
- Torque the nuts (72-43-00-01-304) (x2) and the screw (72-43-00-01-350) to 0.24 daN.m.

As installed, the jet union is visible when looking at the exterior of the engine. No torque striping is required."

11. If the hardware is reused and finger tight it would look very similar to the picture shown (see photo 2).

12. As discussed in Airworthiness Group Chairman's Factual Report. "A used nut and bolt were similarly tightened, resulting in an exposed bolt shank length of about 13.5 millimeters. The threaded end of the used bolt was also observed to extend beyond the end of the nut by about half a thread. Comparative dimensions taken from an exemplar engine installation revealed that with the nuts and bolts installed and tightened to the specified torque on the union flange, approximately 1.5 threads were exposed beyond the nut, resulting in a bolt shank length of about 13 millimeters." If the hardware is reused the visual difference between a properly torqued bolt and a hand tightened bolt is .5 millimeters shaft length and 1 thread (see photo 3).

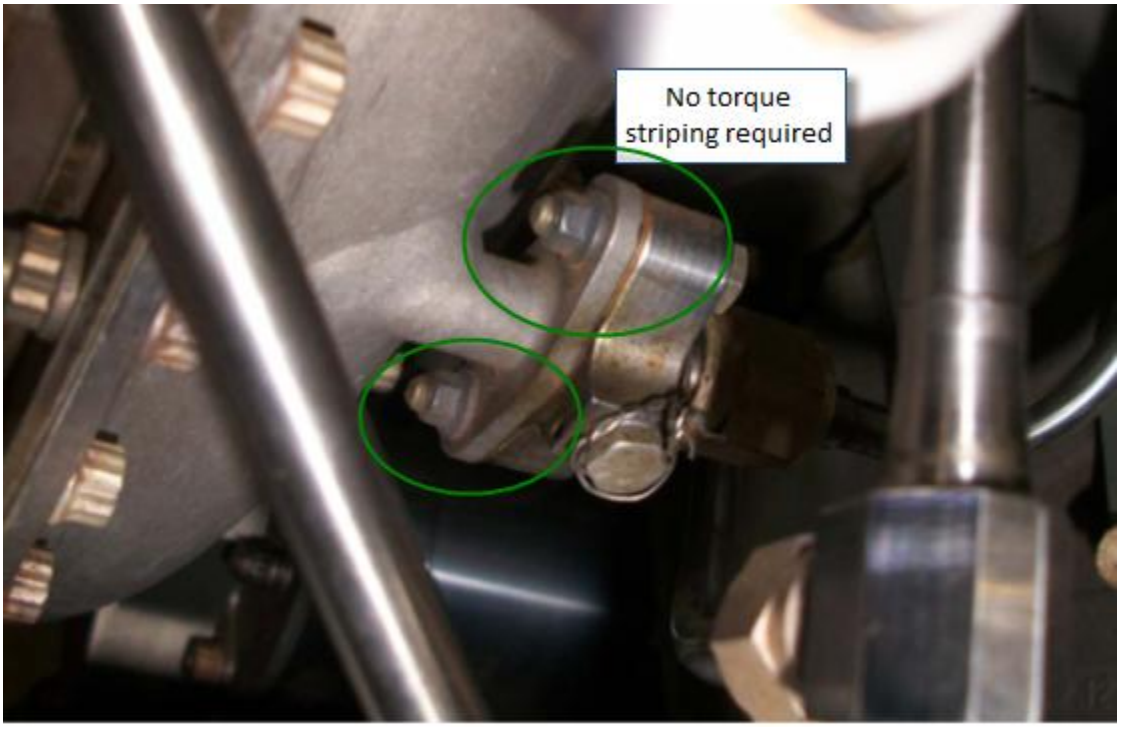

Photo # 2

Photo 3 new and used union attachment nuts and bolts, with the nuts tightened by hand.

13. The engine was reinstalled on the evening of July 27, 2010. The Marana duty pilot who performed the post maintenance operational check stated during his interview that "I did a close up inspection and usually find something that needs to be addressed by the mechanics before the flight, but this time I didn't find any discrepancies." The Marana duty pilot and the base mechanic performed a 7.5-minute post maintenance check flight.

14. As a precautionary measure Air Methods grounded the aircraft with engine SN 23366 which and been worked on by the same technician from Helicopter Services of Nevada. This is discussed in the Maintenance Records Group Chairman's Factual Report-

"Following the accident, a Turbomeca Technician from the Turbomeca USA facility examined engine SN 23366. The Technical Maintenance Report stated as follows:
"During disassembly flexible pipe PN 95301962070 had 16 mm hardware installed on the module 4 side instead of 14 MM. This allowed the bolts to appear torque but hardware was too long, so the flange on the pipe was loose….module 3 had an unacceptable crack on the inner hub of the PT Nozzle. Module 3 had one unacceptable crack on the swirl plate.""
15.

16. The Marana duty pilot stated that he had not received any training specific to post maintenance check flights and that any Air Methods pilot qualified in model can perform a maintenance check flight. He uses the AS350B3 pilot operating handbook, section 8.3 to determine which post maintenance checks have to be done. He and the mechanic would look and decide which checks were appropriate, and "not necessarily sticking strictly to the matrix provided in section 8.3." Once they decide what events need to be completed, the mechanic will fly with the pilot during the post maintenance checks.

17. Based on the crew weights, equipment loading, and the pilot's 2+55 endurance calculation (the helicopter had a 90% (860 pounds) fuel load), would put the helicopter inside the weight and balance envelope at 5,182 pounds at takeoff.

18. The rotor rpm gauge is a dual gauge representing engine free turbine speed (NF) and rotor rpm (NR) displayed using LED bars along the arc of the gauge. The gauge itself is approximately 2 inches in diameter and resides in the lower left portion of the pilot's instrument panel. (see photo 4).

19. The pilot was properly certificated and qualified in accordance with title 14 *Code of Federal Regulations* Part 135.

20. Pilot training records provided by Air Methods documents that he received AS 350 pilot transition training from Aerospatiale, and was qualified as pilot- in-command on February 10 , 1989.

21. The pilot received his most recent annual FAR 135.293 and FAR 135.299 Airman Competency/Proficiency Check on Sept 14, 2009. All areas of the examination were graded as 'S' (satisfactory) and no discrepancies were noted. Power failure, autorotation to a power recovery, and hovering autorotation's were performed. The pilot was authorized to operate the AS 350 B2, AS 350 B3 2B, and AS 350 B3 2B1.

22. The term semi-annual flight training was removed from Air Methods pilot training program to accommodate Advanced Aviation Training Device's (AATD) purchased from Aero Simulators.

23. An Air Methods pilot who knew the accident pilot stated that the accident pilot was "particularly good in doing autorotation's".

Photo4 – N509AM NF/NR gauge indicated by red arrow.

24. In the vicinity of the accident location, there was an open area that was free of obstacles. This open area was about 570 feet from the final radar return, and about 300 feet from the point of terrain impact, in line with the final flight path trajectory of the helicopter (see photo 5).

25. There were very few suitable landing sites other than the area depicted by the yellow circle in photo 5. The pilot was likely headed for the open area and encountered a set of wires that were perpendicular to his flight path and immediately west of the accident site (see photo 6). The pilot likely traded airspeed and used collective pitch to climb over and avoid the wires which resulted in low rotor RPM which could severely reduce controllability of the helicopter (see photo 7 likely flight path over wires, photo 8 eyewitness photo seconds before impact). This would have likely resulted in an uncontrollable helicopter and high rate of descent terminating in a hard landing (see photo 9, at accident site).

Photo 5 showing possible landing area free of obstacles

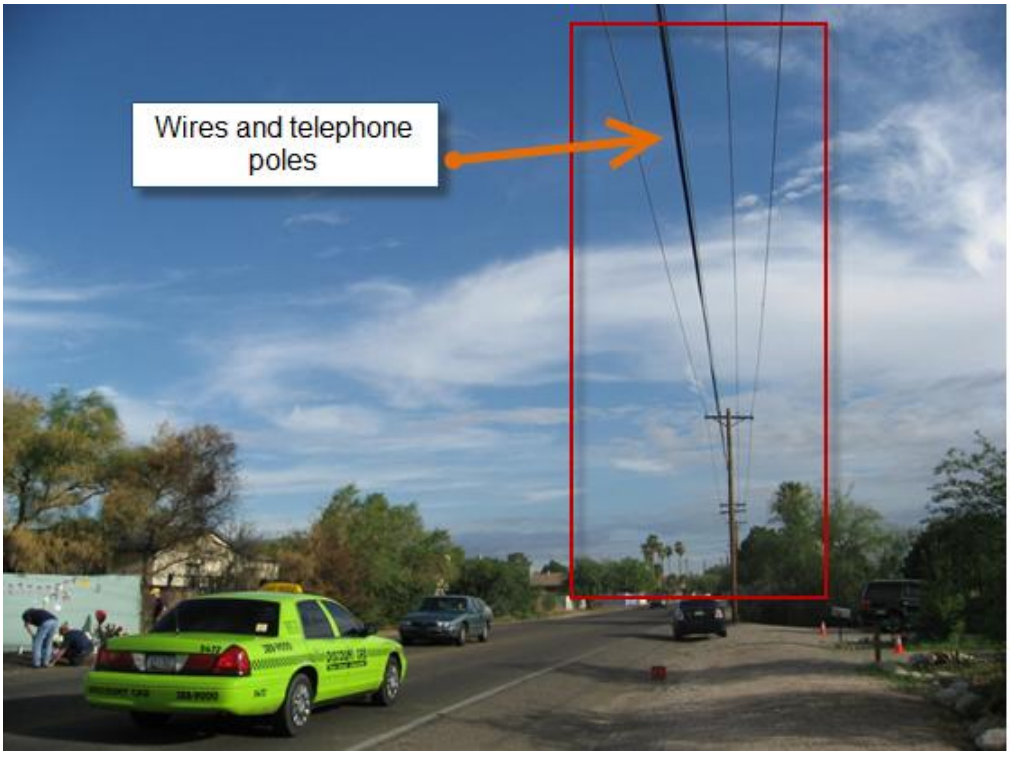

Photo 6 wires on west side of street

Photo 7 likely flight path to avoid wires

Photo 8 Eye Witness photo seconds before impact

Photo 9 Aircraft at accident site

CONCLUSIONS:

The maintenance records group report was drafted by the chairman, Kristi Dunks of the NTSB and provided to the undersigned for comments in January of 2011. Air Methods submitted nine specific comments in writing to Ms. Dunks on February 24, 2011. Two of these suggestions were incorporated in the final version dated May 5, 2011.

It is our opinion that the sequence of events that caused this accident was initiated by improper level three deep engine maintenance performed by third party vendor Helicopter Service of Nevada (HSN) which led to a sudden loss of power in flight over a densely populated location that provided limited opportunities to perform a successful power off landing.

Specifically, the main fuel inlet jet union to the engine which HSN had removed during engine disassembly was not reinstalled utilizing the required hardware resulting in fuel starvation. This particular area of disassembly would not have been a routine inspection area for the Air Methods mechanics to inspect as part of the normal engine removal and reinstallation process. This engine was presented to Air Methods and signed off under an HSN FAA approved repair station as an “Airworthy” component or engine and it was not safe for flight.

The pilot was properly trained and well qualified in the aircraft. The evidence and witness statements indicate that the pilot had a long history of being proficient and skilled in autorotation’s. It is unlikely that he would have had any difficulty performing this maneuver. The manufacture did not provide a specified airspeed to achieve the best angle for maximum distance during a power off glide. That information would have given the pilot a better chance of reaching the open area.

The pilot performed the emergency procedure as outlined in the rotorcraft flight manual. He did not cause this emergency nor did his actions contribute to the accident.

Air Methods is not only the largest helicopter air medical provider in the United States, with 340 aircraft operating from more than 250 bases in 43 states, but it is the industry leader in using and proving the merits of safety management systems (SMS) in Part 135 air medical service. At the time of the accident, Air Methods was the only HEMS part 135 operator participating in the FAA SMS Trial Project and has since exited level 2. Currently the following SMS elements are in place: non-punitive safety event reporting (AIDMOR), internal evaluation program (IEP), a root cause analysis committee, a technical safety review board, and an anonymous safety reporting system (Silent Whistle).

Air Methods received FAA approval for its Aviation Safety Action Program (ASAP) and Maintenance Safety Action Program (MSAP); it was the first large Part 135 air medical operator to receive this distinction. The program became effective on July 15, 2009. Air Methods is working with the LOSA Collaborative to develop Line-Oriented Safety Audits (LOSA) methodology specific for HEMS operations. In progress are efforts to begin Flight Operations Quality Assurance (FOQA). Air Methods and the Flight Safety Foundation have partnered in the HEMS FOQA project. Flight Data Recorders have been installed in 30 aircraft.

The Board will recall that Air Methods was one of the industry leaders who testified at and was a party to the NTSB public hearing on helicopter EMS safety.

Air Methods has voluntarily adopted and implemented many of the Board's recommendations to include,

- Enhanced Operational Control Center with flight monitoring procedures that include up-to-date weather information and assistance in flight risk decisions.
- Formalized dispatch procedures and flight following procedures
- Radar Altimeters for all night operations
- Specific, additional scenario-based training targeted at IIMC recovery and instrument skills using a Flight Training Device
- Developed Flight Risk evaluation programs with people trained in EMS flight operations
- Night Vision Goggles, 95% of fleet is completed.
- XM Weather in the cockpit
- Wire Strike Protection
- CRM/AMRM
- SMS System
- Flight Operations Quality Assurance (FOQA)
- Terrain Avoidance Systems- HTAWS
- Collection and distribution of HEMS flight data to FAA and other researchers for analysis
- HEMS Tool

Safety Recommendations and corrective actions

The following corrective actions have been taken by Air Methods:

- August 3, 2010, an Air Methods Quality Alert Notice was distributed to all regional maintenance directors, area maintenance managers, and all aircraft model bases of operation, emphasizing that all operational check flights are required to follow manufacturer requirements. "Some Manufactures have specific checks to follow including specific documents/checklists to complete. If a Manufacturer has these requirements; they must be followed, the documents/checklists completed and submitted with the log book entry. The entry must include a reference to the specific checks that were performed. "

- September 15, 2010, a maintenance memo addressing outside vender maintenance was distributed to all field maintenance personnel. The memo states “If a vendor travels to an Air Methods base and intends to “remote” their 145 Repair Station, including signing off the work on a work order, they must bring at least 2 individuals, a technician and an inspector. “ Additionally it states that all such maintenance will be inspected by a company A&P mechanic as soon as the aircraft returns to base.

- September 24, 2010, a maintenance memo addressing maintenance records carried on board aircraft was distributed to all field maintenance personnel. The memo states, “The current aircraft log book, aircraft short term due report and deferred discrepancy log shall remain in the aircraft whenever it is flown. These are the only original maintenance records that may be carried on board an aircraft. If other maintenance records need to be carried with an aircraft, copies must be made. All original maintenance records must be shipped through standard shipping methods.”

- As a precautionary measure, Air Methods grounded the aircraft with engine SN 23366 which and been worked on by the same technician from HSN. This is discussed in the Maintenance Records Group Chairman’s Factual Report.

Safety Recommendations:

- Require the use of torque striping on the bolts that attach the fuel union to the flange.

- Require all helicopter manufactures to provide a critical airspeed which would provide for maximum glide distance during an autorotation. The pilot had no reference airspeed for maximizing the distance travelled after experiencing the engine failure.