September 27, 2011

SUBJECT: ACCIDENT OF N509AM (NTSB WPR10FA371) ON JULY 28, 2010

To the NTSB and all of Interested Party Status

The following attached report of Capt Larry Grandy has been accepted and approved as the official position for recommendations from OPEIU Local 109 regarding the subject accident. This recommendation is to be handled in the same fashion as any official accident investigation material as to access and confidentiality.

Respectfully,

Dan McDade
President
OPEIU Local 109
(815) 218-8449
dmcdade@amcpilots.com

After the accident of N509AM (NTSB WPR10FA371) on July 28, 2010 OPEIU Local 109 requested permission of the National Transportation Safety Board to participate in the accident investigation with Party Status. The pilot in command of the accident helicopter, Alex Kelley, was an employee of Air Methods Corporation and a union member. The IIC for the investigation granted that status and Mr. Larry Grandy was designated as the union's representative. Mr. Grandy participated in the investigation in Phoenix and Tucson, Arizona from 30 July to 1 August, 2010 and in Dallas Texas on 8 and 9 September, 2010. Along with numerous other documents he has reviewed draft reports and provided inputs and corrections. He has reviewed the following completed reports:

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

Based on his knowledge of the circumstances surrounding the accident, thorough review of the above reports and participation in the investigation, OPEIU Local 109 submits the following proposed inputs to the National Transportation Safety Board. Several included pictures and diagrams have been copied from the above reports.

PROPOSED FINDINGS OF FACT:

1. On July 28, 2010 at 1342 MST N509AM, an American Eurocopter AS 350 B3 collided with terrain in an urban area of Tucson, AZ. The pilot and both medical crewmembers were killed. There was substantial damage to the helicopter during the collision and follow on fire. The flight was operated under FAR Part 91, and was repositioning from Marana Regional Airport to Douglas AZ. The helicopter departed Marana at approximately 1332.

2. N509AM was the helicopter normally assigned to the Douglas LifeNet Base. It had been flown to Marana Airport in late July for engine maintenance due to suspected fuel coking. The Douglas Base was currently flying in the spare aircraft, N106LN. Due to the required level of maintenance, the engine maintenance was completed by a mechanic from an approved vendor, Helicopter Services of Nevada. The maintenance involved removal of the engine, removal and replacement of the fuel manifold, separating engine modules and disconnecting of external wiring and piping. The maintenance was completed, engine reassembled and installed on the aircraft on 26 July. Ground runs were performed revealing a fuel leak from the HMU. The fuel leak was fixed and a post maintenance check flight was completed on 27 July by the duty pilot for the Marana Base. N509AM was returned to service on 27 July at approximately 1800. During the post accident examination of the engine the two bolts and nuts that secured the fuel union to the fuel inlet flange could not be found. The fuel union, which was connected to the external fuel supply line, was found disconnected from the fuel inlet flange on the compressor case. The separation of the fuel union from the fuel inlet flange resulted in fuel starvation and engine flameout (See **FIGURES 1 & 2**). It is suspected that during reassembly the two bolts that secure the fuel union to the fuel flange were only hand tightened into the nuts.

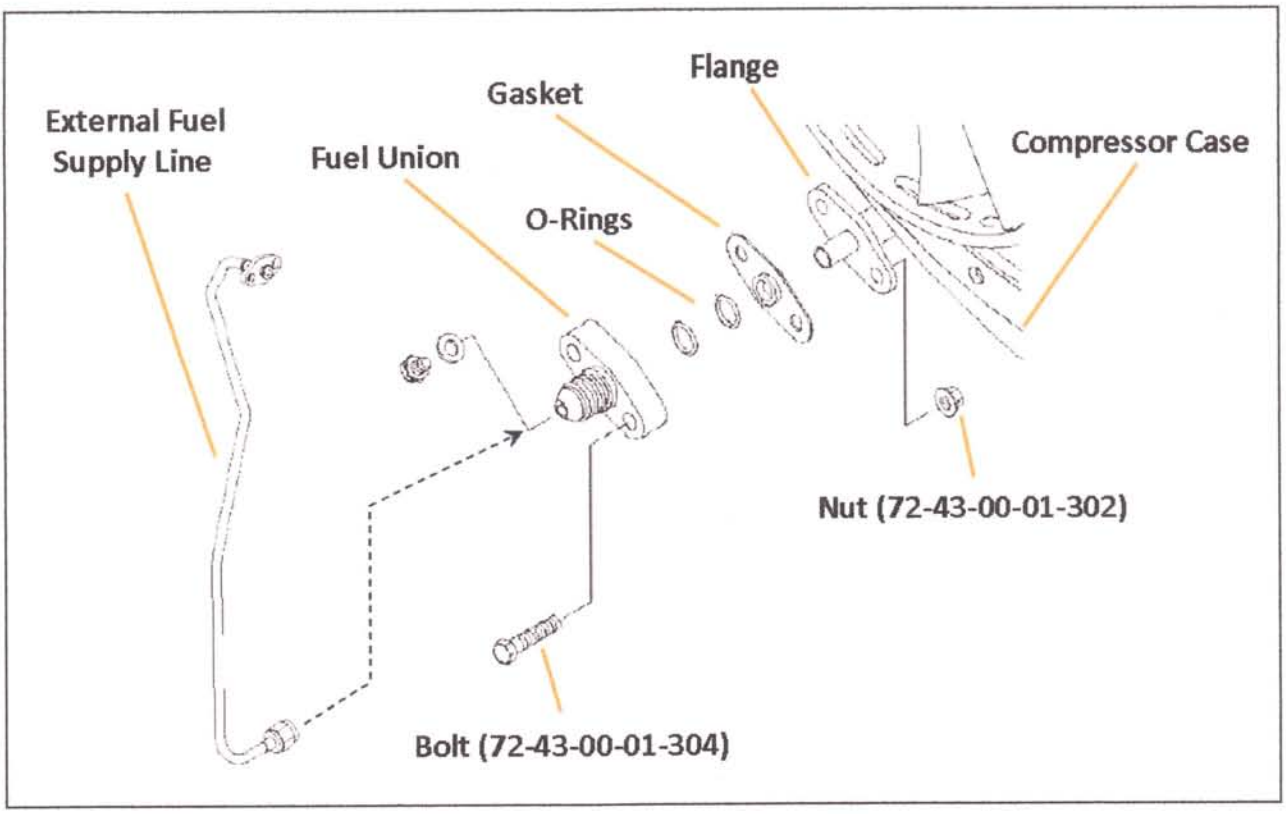

FIGURE 1.

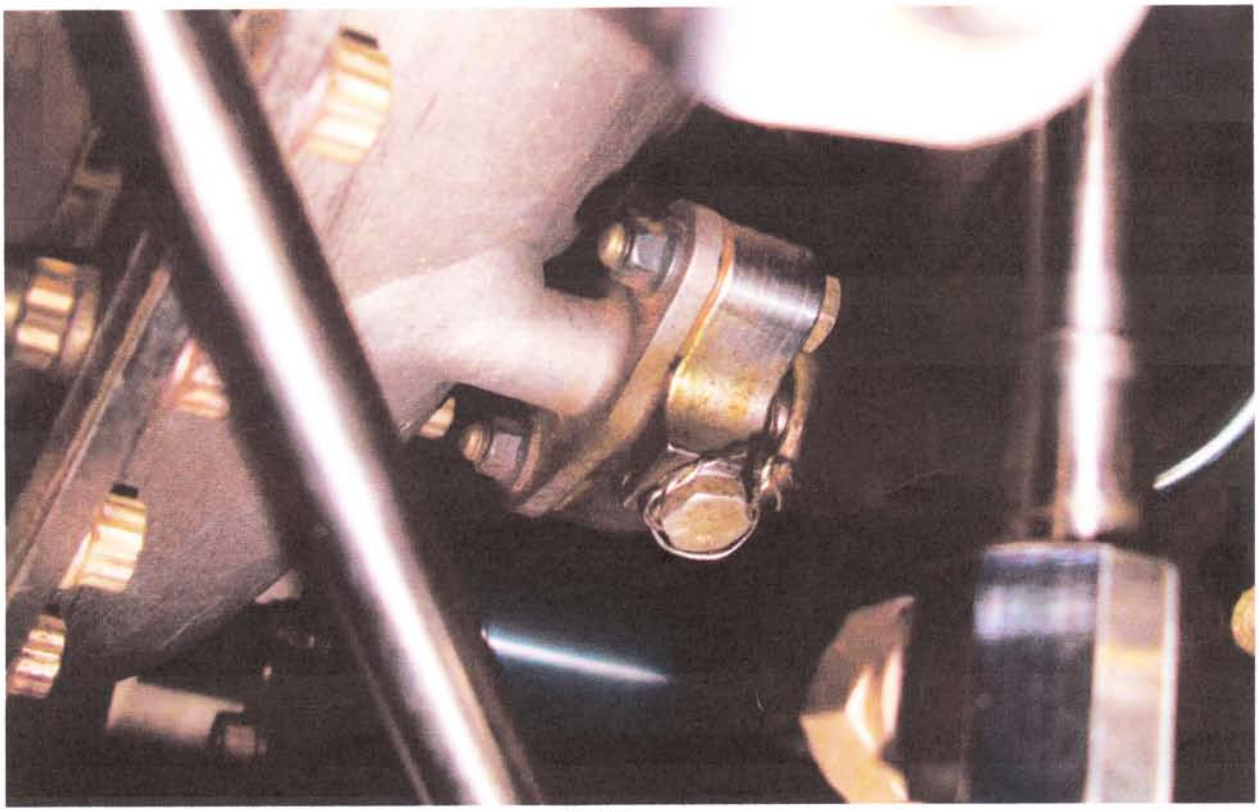

FIGURE 2.

3. At 1132 on 28 July, 2010 Pilot Alex Kelley (PIC) and the Medical Flight Crew, landed at Marana to switch out of N106LN and into N509AM. PIC Kelley commenced preflight, and medical gear switch out

was completed and N509AM departed Marana for Douglas at 1329. Appropriate radio calls were made to Comm Center and Tucson TRACON. The aircraft weight at departure was 5,182 lbs, 43 lbs less than the maximum gross weight of 5225. The helicopter climbed to 3200 feet MSL and maintained a track of 120° (± 5°). Terrain elevation along the track is 2,300 feet MSL. Radar returns indicate that N509AM started a rapid descent at 1341:23, descending to 2,400 feet MSL at approximately 1341:33. At this point radar contact was lost in the vicinity of the accident site (32°15'21.78"N, 110°57'23.93"W). Engine flameout, followed quickly by the rapid descent (autorotation) occurred at approximately 13:41:23 MST (See FIGURE 2). Mr. Grandy believes that PIC Kelley initiated an autorotation very soon after engine failure and was attempting to land at an area depicted in **FIGURES 3 & 4** below (GOOGLE Earth Images). The last five radar hits and the accident scene are on **FIGURE 3**. It is estimated that there were no more than 25 seconds between engine failure and contact with the ground.

FIGURE 3.

FIGURE 4..

As indicated in both images, there were few suitable emergency landing areas in this urban environment. Inspection of the area revealed numerous power lines and closely placed houses. As Kelley continued toward a possible landing area (depicted by a yellow circle on **FIGURE 4**) it is believed he saw a set of five wires that ran north and south across the flight path on the west side of the accident scene street (See **FIGURE 5**). At this point he flared the aircraft and applied up collective to clear the wire obstacle. This maneuver may have bled the RPM to a very low level that provided reduced controllability. Consequently the helicopter developed a high rate of descent, marginal directional control, possibly coupled with left yaw. This resulted in the aircraft landing very hard, on top of a six foot high brick wall rather than in the street. The main and tail rotors were rotating very slowly, and there was a slight left drift (See **FIGURE 6**). Post impact fire destroyed much of the helicopter. The accident site was on the extreme right east side of a residential street oriented north and south. As indicated above, electrical power lines were connected to wooden poles on the west side of the street.

FIGURE 5.

FIGURE 6.

4. Section 3.2 of the AS-350 B3 Rotorcraft Flight Manual (RFM) lists procedures for an Engine Flame Out. NR is to be maintained in the "Green Arc" and recommended airspeed is Vy (65 KIAS). What is not discussed in this section is the best indicated airspeed (IAS) for maximum glide distance. Normally helicopters have two critical airspeeds when the engine quits. The first is Vy (65 KIAS for the AS-350B3) which gives Minimum Rate of Descent, and therefore the maximum opportunity to find a safe place to land and still have the energy to flare, reducing forward airspeed and vertical descent. The second critical airspeed is Vbg ("best glide" is what one book calls it) which provides the maximum glide distance. That speed is usually 20% more than Vy in most helicopters. We can find no reference to a "maximum range" airspeed figure in the AS-350B3 RFM. Is there such a speed designated for the AS-350B3? Using the last five radar hits we can calculate N509AM's approximate groundspeed to be 120K with a rate of descent in excess 2000 FPM.

5. Weather at Davis Monthan Air Force Base (7 NM southeast of the accident site) was winds 270° at 8 knots, 10 miles visibility, few clouds at 10,000 feet. Temp 34 C°, dew point 18.

6. PIC Kelley was a highly experienced aviator with over 14,000 total flight hours, approximately 9,500+ in rotary wing and 4,500 in fixed wing. He had received AS 350 pilot transition training from Aerospatiale and had flight experience with that aircraft since 1989. During his previous career with the US Border Patrol he conducted full-down autorotations in different helicopters every six months and power recovery autorotations on a routine basis. He was also an experienced EMS pilot, having flown that mission since 2002. He had flown 86.9 hours since 1 January, 2010 and 7.5 hours in the 30 days prior to the accident. He been off duty since 24 July and 27 July was his first duty day of a series. He held a Second-Class medical, obtained in January, 2010. He received his most recent annual FAR 135.293 and FAR 135.299 Airman Competency/Proficiency Check on 14 September, 2009. Power failure, autorotation to a power recovery, and hovering autorotations were performed. He had conducted no autorotations of any type (full down or power recovery) since September, 2009, a period of 317 days prior to the accident. He was authorized to operate the AS 350 B2, AS 350 B3 2B, and AS 350 B3 2B1 helicopters.

7. In February 2010, Air Methods changed training policy. This eliminated semi-annual training flights which normally included (at request of the pilot or decision of the company instructor) power recovery autorotations. That change in policy meant that pilots would only receive autorotation training and evaluation during recurrent training that was coincidental with the annual FAR 135.293 evaluation check ride. Consequently, the last autorotation training and evaluation that PIC Kelley experienced was 317 days prior to the actual autorotation he conducted on 28 July, 2010.

8. Manufacturer cockpit instrumentation for the AS-350 B3 is depicted in **FIGURE 7**. The small gage immediately to the left of the Attitude Indicator is a combination Power Turbine Speed (NF) and Main Rotor Speed (NR) indicator. The NR is not indicated by an analog needle. It is represented by the LED segment lights that go around the inner portion of the gage. Similarly, the NF has LED segment lights that go around the outer portion of the gage. This means that one of the most important indicators (Main Rotor RPM) is arguably the smallest gage in the cockpit. A night vision goggle filter is in place on

the combination gage. During daylight operations this filter may decrease the visibility of those LED segment lights due to light reflection.

FIGURE 7.

9. Air Methods Corporation is the holder of Supplemental Type Certificate (STC) **SR00617 DE-D**. This STC was developed under Designated Alteration Station (DAS), **DAS-635841-NM**. The DAS was obtained in October, 2005 and permits the Products Division of AMC to approve modifications and repairs to aircraft that it currently supports under its FAA Certified Repair Station, using the Supplemental Type Certification method of approval with only minimal involvement from the FAA. The STC **SR00617 DE-D** is for "Installation of Reduced Instrument Panel, Pedestal and Optional Avionics Systems" for AS350 Models B2 and B3. One of the changes to the AS-350 B3 cockpit instrumentation contained in this STC is the repositioning of the NF/NR gage discussed in Paragraph 8 to a location above the pilot's left knee. This relocation places it in a position that is not in his peripheral view when looking forward and outside, and removes it further from his view when he is looking outside to find a suitable area during an actual engine-out autorotation. Pilots interviewed by Mr. Grandy complained about the gages location and reflectivity during daylight operations(See **FIGURE 8)**.

FIGURE 8.

PROPOSED CONCLUSIONS:

1. The engine on N509AM flamed out due to fuel starvation. During reassembly of the engine modules on 26 July, the two sets of bolts and nuts that secure the fuel union to the fuel flange were only hand tightened. Subsequently, the bolts backed out of the nuts causing the fuel union to disconnect from the fuel flange. This soon resulted in a flameout.

2. The pilot was a fully qualified and highly experienced PIC who had over 3,500 flight hours in the AS-350 airframe and many more thousands of hours in other helicopters. During previous employment with the US Border Patrol he had conducted high numbers of full landing and power recovery autorotations in the AS-350, maintaining a high level of proficiency.

3. The aircraft he was flying was at approximately 95% of MGW when the engine quit.

4. PIC Kelley encountered an Engine Flame-Out at 800-850 feet AGL.

5. Suitable locations for an autorotative landing where the engine failure occurred were few and far between.

6. PIC Kelley had not conducted an autorotation of any kind in the last 317 days.

7. There is no published Maximum Range IAS for the AS-350B3.

8. The main rotor RPM gauge in this cockpit was poorly located and hard to discern.

9. Alex Kelley did not cause this accident to occur, nor did his actions as PIC contribute to the tragic outcome. He was faced with minimal AGL altitude, a heavy helicopter, and few suitable areas to land.

PROPOSED RECOMMENDATIONS:

1. Air Methods Corporation to reevaluate the February, 2010 Training Policy change. Semi-annual training to include straight in, 180° and hovering autorotations should be reinstituted for single-engine pilots (BHT-407, AS-350, EC-130, etc.). Although this training should be primarily oriented towards autorotations, it could also include other emergency procedures as required. Engine out autorotation flying skills are perishable but, unfortunately, necessary.

2. EUROCOPTER review the display method and size of the AS-350B3 NF/NR gage depicted in **FIGURE 7.** The traditional "steam gage" display with analog needles for NF & NR has worked well for many years. Developing a display that is difficult to read and interpret is quizzical.

3. EUROCOPTER publish an "engine out" maximum range airspeed for the AS-350 B3.

4. STC **SR00617 DE-D** receive thorough review. The current location and size of this are far from best. The gage is at the bottom of the instrument panel, above the pilot's left knee. During an actual autorotation pilot's reference to that gage is difficult at best. This gage presents extremely important information to the PIC. It should be in a prominent position and easy to read.