

**NATIONAL TRANSPORTATION SAFETY BOARD**  
**Office of Aviation Safety**  
**Washington, DC 20594**

**Airworthiness Group Field Notes**  
**July 9, 2008**

**DEN08MA116A/B**

**A. ACCIDENT**

**Location:** Flagstaff, Arizona

**Date:** June 29, 2008

**Time:** 1547 mountain standard time

**Aircraft:** N407GA, Bell 407  
Air Methods Corporation

N407MJ, Bell 407  
Classic Aviation Services

**B. AIRWORTHINESS GROUP**

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## **C. SUMMARY**

On June 29, 2008, at 1547 mountain standard time, a Bell 407 emergency medical service (EMS) helicopter, N407GA, and a Bell 407 EMS helicopter, N407MJ, collided in mid air while approaching the Flagstaff Medical Center helipad (3AZ0), Flagstaff, Arizona. Both helicopters were destroyed. N407GA's commercial pilot, flight nurse, and patient sustained fatal injuries; and N407MJ's commercial pilot, flight paramedic, flight nurse, and patient sustained fatal injuries. N407GA was operated by Air Methods Corp., Englewood, Colorado, and registered to Flagstaff Medical Center, Flagstaff, Arizona. N407MJ was operated by Classic Helicopter Services, Page, Arizona, and registered to M&J Leisure, L.L.C., Ogden, Utah. Visual meteorological conditions prevailed, and company flight plans were filed for the Title 14 Code of Federal Regulations Part 135 air medical flights. N407GA's flight departed the Flagstaff Pulliam Airport (FLG), Flagstaff, at 1544, and N407MJ's flight departed the Grand Canyon National Park Service South Rim helipad, Tusayan, Arizona, at 1517.

## **D. DETAILS OF THE INVESTIGATION**

The on-scene investigation was conducted beginning on June 30, 2008 and concluded on July 3, 2008. Both helicopters were recovered to Air Transport facilities in Phoenix, Arizona, on July 3, 2008. The aircraft examinations were conducted on July 8 and July 9, 2008 at Air Transport facilities.

### **Accident Site Description**

The accident site was located approximately 1/4 mile east of the Flagstaff Medical Center (FMC) helipad. The helipad elevation was approximately 7,080 feet. The Air Methods Corporation helicopter, N407GA, came to rest on level, sparsely wooded terrain at 7,057 feet elevation. The Classic Helicopter Services helicopter, N407MJ, came to rest on sloping, wooded terrain at 7,021 feet elevation; about 300 feet west of the Air Methods helicopter. A rocky embankment, about 25 feet in height, separated the two helicopters.

According to global positioning system (GPS) data, the Air Methods helicopter main wreckage was positioned 0.26 nautical miles (nm) from the FMC helipad on a 073-degree

magnetic bearing. The Classic helicopter main wreckage was positioned 0.22 nm from the FMC helipad on a 081-degree magnetic bearing.

## Helicopter Damage Assessment<sup>1</sup>

### N407GA – Air Methods Corporation

#### *General*

The Air Methods Corporation helicopter, N407GA, was destroyed by a post impact explosion and fire. The helicopter impacted terrain subsequent to the mid-air collision. Burned vegetation and trees surrounded the wreckage. The helicopter came to rest upright, with the fuselage oriented on an approximate magnetic heading of 060 degrees.

The fuselage, engine, main rotor transmission, and rotor mast were involved in the post accident fire. The engine, transmission, and rotor mast were positioned to the right of and adjacent to the main fuselage. The aft fuselage and tail boom were separated from the main wreckage. They came to rest about 15 feet east of the fuselage, and were oriented approximately 90-degrees relative to the main fuselage orientation. The aft fuselage exhibited damage consistent with the post impact fire, with the damage decreasing aft. The tail boom itself did not exhibit fire damage.

#### *Fuselage*

The cockpit, cabin, and aft fuselage were discolored and soot covered consistent with the effects of a post impact fire. The fire had consumed the top and sides of the fuselage, and the cockpit and cabin areas were exposed. The aircraft also exhibited damage consistent with impact forces. The roof beam structure remained intact and was attached to the main rotor transmission. The vertical tunnel (broom closet) was located in its proper position between the cockpit/cabin area and the roof beam structure. The tunnel structure exhibited sheet metal fractures. The lower wire strike guide, normally attached to the nose of the aircraft, had separated from the fuselage at the base of the guide. It was imbedded into the ground forward of the nose section in a manner consistent with a relatively vertical impact.

A section of the lower right fuselage nose, including the pitot tube, was separated from the remainder of the fuselage. It came to rest in the debris path about 150 feet southeast of the main wreckage.

The flight controls were damaged consistent with impact forces and post impact fire. The cyclic and collective controls were present in the cockpit area. Both were separated at the base fittings. The throttle was in the “Fly” position when observed at the accident site. The splines at the base of the collective appeared intact. Co-pilot controls were not installed. The cyclic and collective control tubes in the cockpit floor area appeared intact to the base of the vertical tunnel. Within the vertical tunnel (broom closet), the flight control tubes were fractured in a manner consistent with overload failures. Control tube rod ends were also bent and fractured.

The main rotor servo actuators remained partially attached to the servo support on the helicopter roof. The units were damaged consistent with impact forces and were discolored due to involvement in the post impact fire.

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<sup>1</sup> Directions related to component damage/deformation are given with respect to an intact airframe unless otherwise noted.

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The on-board medical oxygen bottle was observed in two pieces. An end fragment came to rest about 75 feet northeast of the fuselage. The second piece, which contained the valve and pressure gauge, remained with the fuselage. Both pieces exhibited discoloration and sooting consistent with fire damage. The stretcher was separated from its mount and came to rest about 25 feet from the north-northwest of the fuselage.

#### *Main Rotor System*

The main rotor blades remained attached to their respective yoke flexures on the main rotor hub. The rotor hub, mast, and main transmission, with the transmission mount attached, came to rest as a unit, adjacent to the fuselage. The main rotor blades were deformed. The components exhibited sooting and discoloration consistent with involvement in the post impact fire. The main rotor transmission mount was fractured along the left, aft support. The remaining supports were deformed, but they did not appear fractured.

The pitch change horns appeared intact with some discoloration due to the post impact fire. The pitch change links remained attached to the horns at the rod ends. All the links were fractured, with the appearance of the fracture surfaces consistent with overload failure. The opposing pitch change link rod ends remained attached to the rotating swashplate, with the exception of one of the links. One swashplate attachment arm was separated, along with the mating portion of the pitch change link. The non-rotating portion of the swashplate appeared intact. The control links remained attached to the swashplate at the rod ends; however, the links themselves were fractured.

The main transmission was intact. Partial rotation of the main drive shaft produced corresponding rotation of the main rotor mast. The main drive shaft was fractured aft of the transmission. The K-flex coupling between the drive shaft and the transmission remained intact. The K-flex coupling at the aft end of the first drive shaft segment was fractured. Appearance of the fracture surfaces was consistent with overload failures. Rotational continuity was observed between the main rotor and tail rotor drive shafts, through the engine gearbox and freewheeling unit.

The four main rotor blades remained attached to the yoke flexures at the rotor mast. The blade bolts appeared intact and properly installed. All four blades exhibited fire damage at the inboard ends of the blades. The blades were arbitrarily numbered 1 through 4 for identification purposes. The corresponding color designation of the blades could not be determined due to the fire damage.

Blade 1 exhibited discoloration and delamination along the inboard approximately 4-1/2 feet of the blade. The trailing edge was damaged with skin delamination in the vicinity of the trim tab. A triangular area about 4 inches by 4 inches had separated from the outboard aft corner of the blade tip. The adjacent area exhibited delamination. Blue and red chordwise marks consistent with paint transfer were observed on the leading edge over an approximate length of 5 inches, beginning about 4 inches from the end of the blade. The tip weight remained securely attached to the blade.

Blade 2 sustained impact and thermal damage. About 1 inch of the leading edge abrasion strip was missing at the tip. In addition, a section of skin and core material behind the abrasion strip was also missing to a maximum distance of approximately 14 inches from the tip (measured at the trailing edge). Blue chordwise marks consistent with paint transfer were observed on the

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leading edge, approximately 2 inches in length, beginning about 11 inches from the tip. The inboard 5-1/2 feet of the leading edge abrasion strip was separated from the blade and recovered about 150 feet south of the fuselage. The blade sustained extensive fire damage from the root to within about 3 feet of the tip. The blade root block common to the mounting bolts appeared intact, although discolored. The fire consumed the blade structure outboard of the root block to about mid-span, with only composite fibers remaining. The composite matrix over the inboard one-half of the blade had been completely reduced. From mid-span to approximately 3 feet from the tip, the blade structure exhibited thermal damage with discoloration and delamination across the entire width of the blade.

Blade 3 exhibited fire damage along the entire length of the blade. The root block was discolored, but appeared otherwise intact. Sections of skin and core structure were missing from the tip to about 24 inches inboard. A second section of missing blade structure extended from the root to about mid-span. The blade spar was exposed. It was discolored, but appeared otherwise intact. The composite fibers over the remainder of the blade were exposed and delaminated. The inboard section of the leading edge abrasion strip, about 8 feet in length, was delaminated from the blade. Approximately 21 inches of the outboard length of the abrasion strip was separated and not recovered. Identification of any leading edge transfer marks was precluded by the fire damage.

Blade 4 exhibited fire damage along the entire length of the blade; with the exception a section about 3 feet in length near mid-span. The blade root hub was discolored but appeared intact. The blade spar was partially exposed. The composite matrix was reduced by the thermal exposure, and the composite fibers were exposed over both the inboard and outboard damage areas. Additionally, within these areas sections of blade structure was missing. A 3-foot section of leading edge abrasion strip at the blade tip was separated and not recovered. Discoloration due to fire damage prevented identification of any leading edge transfer marks.

### *Engine*

The engine came to rest adjacent to the main rotor mast and the fuselage as noted previously in this report. The engine assembly was oriented vertically with the inlet facing downward towards the ground. The entire engine was discolored consistent with involvement in the post-impact fire.

The compressor section appeared intact with minor external impact damage. The compressor impeller was intact; however, several impeller blades exhibited leading edge nicks and gouges. Sections of impeller blades were missing and not recovered. Abrasion and scrape marks were observed on the compressor support. The impeller disc could not be rotated.

The power turbine and gas producer sections appeared intact. A segment of fuel line from the hydromechanical unit (HMU) to the fuel nozzle and igniter lead was separated. The combustion housing and engine exhaust stack were deformed. The fuel nozzle exhibited carbon deposits when removed from the engine. No determination could be made as to whether the carbon deposits preceded the post impact fire.

The engine gearbox housing was intact, with the exception of a section approximately 2 inches square. The lower chip detector was separated and not recovered. The upper chip detector was missing the magnetic portion of the plug. The fuel and oil filters were separated from the gearbox. Fragments of both the fuel and oil filter elements were observed at the accident site.

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The Engine Control Unit sustained damage consistent with a fire. In addition, the unit housing was fractured in several places exposing the components. The unit was retained for further examination. (A summary of this examination is included in the Airworthiness Group factual report.)

A 7-inch section of the left aft engine mount was separated from the engine. It was recovered from within the debris area, about 300 feet south-southeast of the main wreckage. Appearance of the fracture surfaces was consistent with overload failure. Damage to the mount did not appear consistent with that of a blade strike. The remaining engine mounts were located with the engine. All of them were deformed, but appeared otherwise intact.

#### *Tail Boom/Tail Rotor*

The tailboom and a section of the aft fuselage separated from the remainder of the airframe. The tailboom remained securely attached to the aft fuselage segment. As noted previously, this structure came to rest approximately 15 feet east of the fuselage and was oriented about 150 degrees magnetic. The aft fuselage section and forward portion of the tailboom exhibited discoloration consistent with fire damage. The remainder of the tailboom did not exhibit any thermal damage.

The tailboom was fractured about 21 inches aft of the tailboom-to-fuselage attachment point. The skin was buckled adjacent to the fracture. The aft fuselage section came to rest on its right side. The tail boom aft of the fracture came to rest upright. The tail rotor drive shaft and pitch control rod were continuous across the fracture. However, the tail rotor pitch control rod was bent in the vicinity of the fracture. Rotation of the tail rotor drive shaft resulted in a corresponding rotation through the oil cooler unit to the forward drive shaft segment.

The remainder of the tailboom was intact, including the tail rotor drive shaft, gearbox, and pitch change links. However, the forward flange of one driveshaft segment was fractured. Rotation of the drive shaft aft of the fractured flange produced a corresponding rotation of the tail rotor blades, without binding. Both tail rotor blades remained attached to the hub. One blade exhibited an area of skin delamination near the trailing edge about mid-span consistent with impact damage. Otherwise, the blades exhibited only minor abrasions and scratches.

The vertical fin stabilizer separated from the aft end of the tailboom at the attachment screws. It came to rest immediately adjacent to the tail boom consistent with separation at the time of impact. The lower half of the stabilizer was buckled and the skin was wrinkled consistent with an upward impact load on the lower end of the assembly. The upper half of the stabilizer was intact and appeared undamaged.

The right horizontal stabilizer and end cap were separated from the tailboom about 7 inches outboard of the tailboom. The separated portion of the horizontal stabilizer and end cap came to rest adjacent to the tailboom. The end cap remained attached to the outboard end of the horizontal stabilizer. However, the upper end cap and outboard edge of the stabilizer were fractured adjacent to the mounting angle. In addition, the lower end cap was fractured about one-third of the span below the stabilizer. The end cap sections remained attached to each other by the fiberglass facing (skin).

The left horizontal stabilizer remained securely attached to the tail boom. The upper and lower sections of the end cap were separated from the stabilizer, and from each other, at the

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outboard end of the horizontal stabilizer. Both end cap sections were recovered from the debris path. The upper end cap came to rest in the burned area of the debris field.

#### *Landing Gear/Skids*

All landing gear (skid) components came to rest with the main wreckage, and were lying in proper position relative to the airframe. The left skid was fractured and separated forward of the forward crosstube saddle. The right skid was fractured in several places. Both the forward and aft crosstubes were fractured on the right side approximately 7" above the saddles. The landing gear crosstubes were deformed downward (flattened) on both the left and right sides. The extent of deformation was greater on the right side. The right flight step had separated from the crosstubes and was lying underneath the wreckage. There was no flight step installed on the left side of the aircraft. Appearance of all fracture surfaces was consistent with overload failures. Damage to the landing gear was consistent with a right side low, vertical impact.

### **N407MJ – Classic Helicopter Services**

#### *General*

The Classic Helicopter Services helicopter, N407MJ, was destroyed due to the mid-air collision and subsequent in-flight collision with trees and terrain. No fire damage was observed on the Classic Aviation helicopter.

The main wreckage consisted of the fuselage, engine, transmission, and main rotor hub and blades. Three trees located approximately 35 feet east of the fuselage were broken off approximately 25 to 40 feet above ground level. Multiple tree branches and limbs exhibiting fresh breaks were located on the ground in the vicinity of the fuselage. The tail boom was separated from the fuselage. It came to rest about 73 feet east of the fuselage.

#### *Fuselage*

The fuselage was fragmented into three sections. The forward (cockpit) section came to rest inverted, nose down at an angle of about 45-degrees relative to the terrain against two trees. The mid (cabin) section of the fuselage was separated from the forward section. It came to rest on its left side adjacent to the forward section. The engine, main rotor transmission, and rotor mast were also on their left side, in position relative to the mid (cabin) section. The aft fuselage section came to rest on its left side, nearly inverted, against a tree. A 12-inch section of the tail boom remained attached to the fuselage. The fuselage nose was crushed aft. The left side of the fuselage was separated completely, exposing the cockpit and forward cabin areas. The recording hour meter indicated 2,142.6 hours when observed during the aircraft examination.

The flight controls were damaged consistent with impact forces. The cyclic and collective controls were present in the cockpit area. Both were separated near the base. Co-pilot controls were not installed. The cyclic and collective control tubes in the cockpit floor area appeared intact to the base of the vertical tunnel. The control tubes within the vertical tunnel (broom closet) were bound due to airframe deformation. They could not be moved but appeared otherwise intact. Control tube rod ends were intact. The anti-torque pedals were present. The control rod was severed about 6 inches inboard of the bellcrank. The rod end remained attached.

The main rotor servo actuators remained attached to the servo support on the helicopter roof. The units were damaged consistent with impact forces. The control rods were bent but appeared otherwise intact.

*Main Rotor System*

The main rotor blades remained attached to the rotor hub. The rotor hub, mast, and transmission remained secured to the fuselage roof beam structure by the transmission mounts. They came to rest with the engine and the remainder of the fuselage.

The transmission housing and mounts appeared intact. The main drive shaft segment remained securely attached to the transmission at the K-flex coupling. The main drive shaft segment was intact, but it exhibited circumferential scoring along its length. The K-flex coupling at the aft end of the main drive shaft was fractured in a manner consistent with overload. The transmission exhibited continuity through the unit. Rotation of the forward end of the main drive shaft produced corresponding rotation of the main rotor mast.

The main rotor mast, blade mounting yokes, and pitch change horns appeared intact. One pitch change link was intact. The remaining three pitch change links were fractured. The ends of the links were still attached to the horns and rotating swash plate via the rod ends, with one exception. One clevis on both the rotating and non-rotating halves of the swash plate was fractured. Appearance of the fracture surfaces on the swash plate and the pitch change links was consistent with overload failures. Flight control linkage to the non-rotating portion of the swash plate remained attached and was intact. One control rod was deformed. The support brackets common to the linkage bellcranks were fractured.

The four main rotor blades remained attached to the yoke flexures at the rotor mast. The blade bolts appeared intact and properly installed. The blades were arbitrarily numbered 1 through 4 for identification. The corresponding color of each blade is also included for reference.

Blade 1 (blue) was fragmented, dented and deformed consistent with impact damage. The blade tip separated from the remainder of the blade approximately 148 inches from the root – approximately a 38-inch blade section. The blade exhibited blue paint transfer marks over a 5-1/2 inch length on the upper and lower leading edge surfaces beginning about 138 inches from root. Green and white paint transfer was observed near the leading edge about 166 inches from the blade root. The blade was dented along the leading edge inboard of the area of paint transfer.

Blade 2 (orange) was also fragmented and dented consistent with impact damage. The blade tip separated from the blade about 151 inches from the root – approximately a 35-inch blade section. The leading edge spar was fractured about 91 inches from the blade root. The skin was delaminated over the outboard portion of the blade. A tree branch about 1/2-inch in diameter was imbedded into the upper blade skin near mid-chord approximately 32 inches from the root. A 3-inch wide area of white paint transfer marks along the leading edge was located approximately 144 inches from the blade root. Chordwise scratches were observed between the paint transfer and point of tip separation.

Blade 3 (red) was fragmented. The blade tip separated approximately 151 inches from the root – about a 35-inch blade section. The leading edge exhibited white paint transfer marks over a 3-inch wide area, beginning about 144 inches from the blade root, similar to blade 2. The blade also exhibited chordwise scratches on the upper and lower surfaces near the area of paint transfer.

Blade 4 (green) was intact. However, the blade did exhibit leading edge denting and paint transfer. Specifically, the leading edge was dented about 48 inches from the root. Blue paint transfer was observed on the upper and lower surfaces of the leading edge over a 7-inch

width, about 164 inches from the root – 22 inches from the blade tip. A small leading edge dent was located in the area of the blue paint transfer.

### *Engine*

The engine remained secured to the airframe by the engine mounts. It came to rest in a partially inverted, forward (inlet) end downward orientation. The forward engine mount was intact. The aft engine mount was separated from the airframe and deformed. The left engine gearbox bipod mount was intact. The right bipod mount remained secured to the gearbox, but had separated from the airframe.

The engine and airframe mounted fuel filters were intact. Upon examination, both filters appeared to be free of debris. Likewise, they both contained a small amount of fluid consistent in odor and appearance to aircraft jet fuel.

The compressor section appeared to be intact. However, the discharge tubes were deformed. The compressor impeller disc was intact; however, the blades exhibited leading edge gouges. Scrape marks were observed on the compressor front support consistent with impeller rotation at the time of impact. The impeller disc exhibited resistance and binding when rotated by hand. Continuity to the starter-generator was observed during rotation.

The turbine section remained securely attached to the mating engine section. The combustion housing and exhaust stack were deformed, but appeared otherwise intact. The nozzle appeared unobstructed. The air shroud exhibited slight carbon accumulation. The fourth stage turbine wheel appeared intact, although a complete visual examination was not possible. The turbine wheel rotated and exhibited continuity to the output shaft.

### *Tail Boom/Tail Rotor*

The tail boom separated from the airframe about 12 inches aft of the tail boom-to-fuselage joint. It came to rest about 73 feet east of the fuselage. The forward 12-inch section of the tail boom remained attached to the fuselage. The skin was deformed, twisted and torn at the separation point.

The tail rotor gearbox, and vertical fin stabilizer had separated from the aft end of the tail boom. They came to rest adjacent to the tail boom. The tail rotor pitch control tube remained attached to the pitch control linkage at the aft end of the tail boom. The control tube was bent and fractured. The appearance of the fracture surface was consistent with overload failure. The pitch control linkage remained attached to the gearbox.

The tail rotor gearbox appeared intact. The tail rotor mast and tail rotor blades remained attached to the gearbox. The gearbox exhibited continuity when the rotor mast or input drive shaft was rotated. The pitch control links were bent but appeared otherwise intact, and the pitch control mechanism appeared functional.

The tail rotor drive shaft segment<sup>2</sup> immediately forward of the gearbox (#1) remained attached at the flexible Thomas coupling; although the coupling was fractured. The forward end

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<sup>2</sup> This report references tail rotor drive shaft and hanger bearing numbers as beginning from the aft end of the tail boom. Drive shaft segment #1 is connected to the tail rotor gearbox at the aft end. Drive shaft segment #4 is connected to the oil cooler blower assembly on the forward end. Hanger bearings #1 through

of the drive shaft exhibited rotational scoring. The mating drive shaft collar also exhibited rotational scoring. Hanger bearings #1 and #2 remained attached to the tail boom and appeared intact. Drive shaft segments #2 and #3 remained attached to the tail boom. They were bent and dented. The flexible Thomas coupling at the forward end of drive shaft segment #3 was fractured consistent with overload. Hanger bearing #3 was separated from the tail boom. The bearing support bracket was fractured; however, the bearing itself appeared intact. Drive shaft segments #4 and #5 had separated from the airframe. The #4 bearing hanger was common to the forward 12-inch section of tail boom, which remained attached to the fuselage. The support bracket was fractured. The bearing remained with the forward segment of the tail rotor drive shaft. The #4 drive shaft segment had separated from the mating segments.

Both tail rotor blades remained secured to the tail rotor hub assembly and mast. One tail rotor blade exhibited leading edge crushing damage over the inboard portion of the blade, and deformation along the outboard trailing edge. The skin was delaminated over portions of the blade. Blue and red paint transfer marks were observed on the face of the blade and on trailing edge near mid-span. Black transfer marks were observed on the leading edge near mid-span. The second tail rotor blade exhibited leading crushing damage over approximately the inboard one-half of the blade span. Blue paint transfer was observed in this area. The inboard 5-1/2 inches of the blade leading edge exhibited black transfer marks.

The horizontal stabilizers and end caps were fragmented. The outboard two-thirds of the right horizontal stabilizer had separated from the airframe. The remaining inboard portion of the assembly remained securely attached to the tail boom. The separation was oriented forward-aft, parallel to the longitudinal axis of the aircraft. The right end cap was intact and remained securely attached to the separated section of the horizontal stabilizer.

The left horizontal stabilizer was separated into three fragments. The inboard section remained attached to the tail boom. This section was approximately 18-inches in length at the leading edge and oriented at a 27-degree angle relative to the longitudinal axis of the aircraft. The second fragment of the left horizontal stabilizer was about 6-inches in length. The stabilizer exhibited a distinct upward bend adjacent to the fracture surface consistent with an impact from below. The third fragment consisted of the remainder of the stabilizer, with the end cap attached. Additionally, a section of the left end cap was separated from the remainder of the assembly. The fragment consisted of the upper-aft portion of the end cap, above the horizontal stabilizer. The skin adjacent to the separation was bent inboard.

The horizontal stabilizer and end cap fragments were distributed along the top edge of the embankment in the vicinity of the Air Methods aircraft.

The tail boom exhibited a cut through the lower skin in the area below the horizontal stabilizer. This cut was oriented at an approximate angle of 38 degrees relative to the longitudinal axis of the aircraft. The carry-through structure of the horizontal stabilizer was deformed upward but appeared otherwise intact. This deformation continued to the inboard portion of the horizontal stabilizer. The horizontal stabilizer vane had separated from the airframe; however, it also was deformed consistent with the adjacent damage.

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#4 are installed on the tail boom. Hanger bearings #5 and #6 are installed on either side of the oil cooler blower assembly on the main fuselage.

The tail boom was creased on the left side at the forward end near the separation from the fuselage. It was oriented upward at an angle of about 37 degrees relative to the ground reference. The forward portion of the deformation exhibited blue transfer marks. The skin was torn through along an approximate 1-inch length at the lower-forward end of the crease. The crease was sharp and distinct at the lower-forward end, and became shallower as it progressed upward and aft.

*Landing Gear/Skids*

The landing skid assembly separated from the airframe and was located adjacent to it at the accident site. The right skid was intact. The left skid was fractured at two locations between the forward and aft crosstube saddles. The forward cross tube was fractured above both the left and right saddles. Both the left and right steps had separated from the cross tube legs. The left leg of the aft crosstube was deformed inboard about 60 degrees. Both the forward and aft crosstube legs on the right side of the aircraft were deformed outboard approximately 30 degrees. Fracture surfaces were consistent in appearance with overload failures.