NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

June 24, 2016

SURVIVAL FACTORS

Survival Factors Group Chairman's Factual Report

CEN15MA290

A. ACCIDENT

Operator:	Air Methods Corporation
Location:	Frisco, Colorado
Date:	July 3, 2015
Time:	1339 mountain daylight time
Aircraft:	Airbus Helicopters AS350 B3e [N390LG]

B. SURVIVAL FACTORS GROUP

Emily Gibson, Group Chairman
National Transportation Safety Board
Washington, DC

Kristin Poland, Member
National Transportation Safety Board
Washington, DC

C. SUMMARY

On July 3, 2015, at 1339 mountain daylight time, an Airbus Helicopters AS350 B3e helicopter, N390LG, impacted the upper west parking lot 360 feet southwest of the Summit Medical Center helipad (91CO), Frisco, Colorado. A post-impact fire ensued. Visual meteorological conditions prevailed at the time of the accident. The helicopter was registered to and operated by Air Methods Corporation and the flight was conducted under the provisions of 14 *Code of Federal Regulations* Part 135 on a company flight plan. The airline transport pilot was fatally injured and two flight nurses were seriously injured. The public relations flight was en route to Gypsum, Colorado.

D. DETAILS OF THE INVESTIGATION

A survival factors group was formed on February 18, 2016. Documentation of the accident site and photographs of the wreckage were provided by the Airworthiness Group. Interview summaries of the Flight Nurse and Air Methods personnel were provided by the Human Performance Group. Operations manuals and maintenance records were also reviewed. Additionally, an examination of the partially consumed pilot seat was conducted on June 23, 2016 at Beegles Aircraft Service, Inc., in Greeley, CO.

1.0 Aircraft Configuration

Photograph 1- *A delivery photograph showing the accident helicopter.*

The aircraft was equipped with four occupant seating positions and one patient litter. The pilot seat was located at the front, right side of the cabin. There were three forward-facing medical crew seats positioned at the aft bulkhead behind the pilot seat (see figure 1). The aircraft was installed with an Emergency Medical System in accordance with STC SR00528DE-D issued to Air Methods Corporation, Englewood, Colorado, on September 5, 2003.

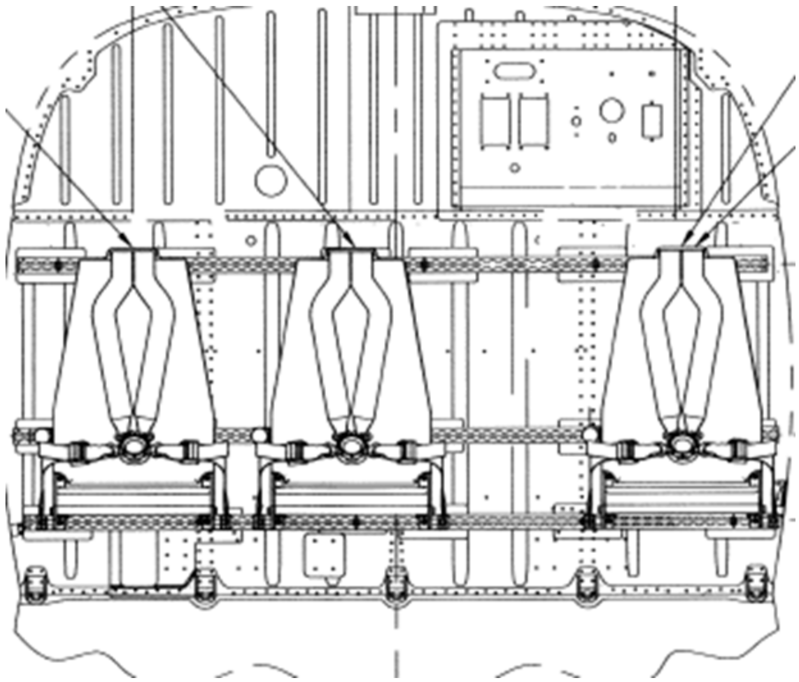


Figure 1- *Interior diagram of N390LG showing aft seat positon locations.*

There was a litter adjacent to the pilot's seat next to an emergency exit door on the left side of the helicopter (figure 2). If a patient was being transported, the patient was loaded through a sliding door on a litter, which slid and locked into a floor-mounted fixture.

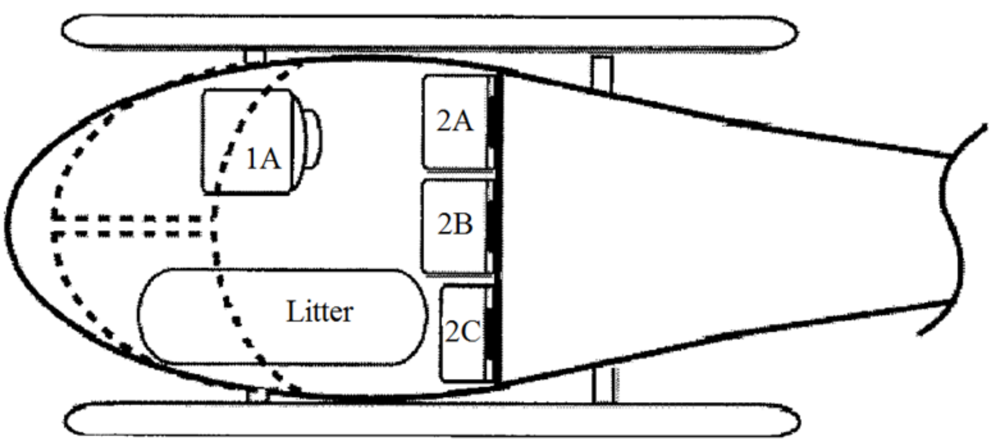


Figure 2- *Diagram showing seat positon locations.*

1.1 Seats and Restraint Systems

1.1.1 Pilot Seat

The accident helicopter was equipped with a pilot seat installed on the right side of the cockpit. The seat, manufactured by Zodiac Seats France (formerly Sicma Aero Seat) was designed to comply with Technical Standard Order (TSO) C127a, "Rotorcraft, Transport

Airplane, and Normal and Utility Airplane Seating Systems." The seat was attached to seat tracks mounted to the cockpit floor. The seat was adjustable in the fore and aft direction. The seat was certified based on standards in 14 *Code of Federal Regulations* 27.561 and 27.562. See section 3.0 for Seat Load and Design Requirements.

Delivery photographs showed the pilot seat had an integral four-point inertia reel restraint with rotary buckle. The combined lap/shoulder belt latch on this restraint enabled a one-click latch procedure. According to maintenance records the pilot's seat inertia reel had been removed and replaced on January 19, 2015. The part number was 2000115-101. Delivery photographs showed the pilot seat had an additional seat back pouch affixed to the back of the seat[1].

Photograph 2- *A delivery photograph showing the pilot seat and location.*

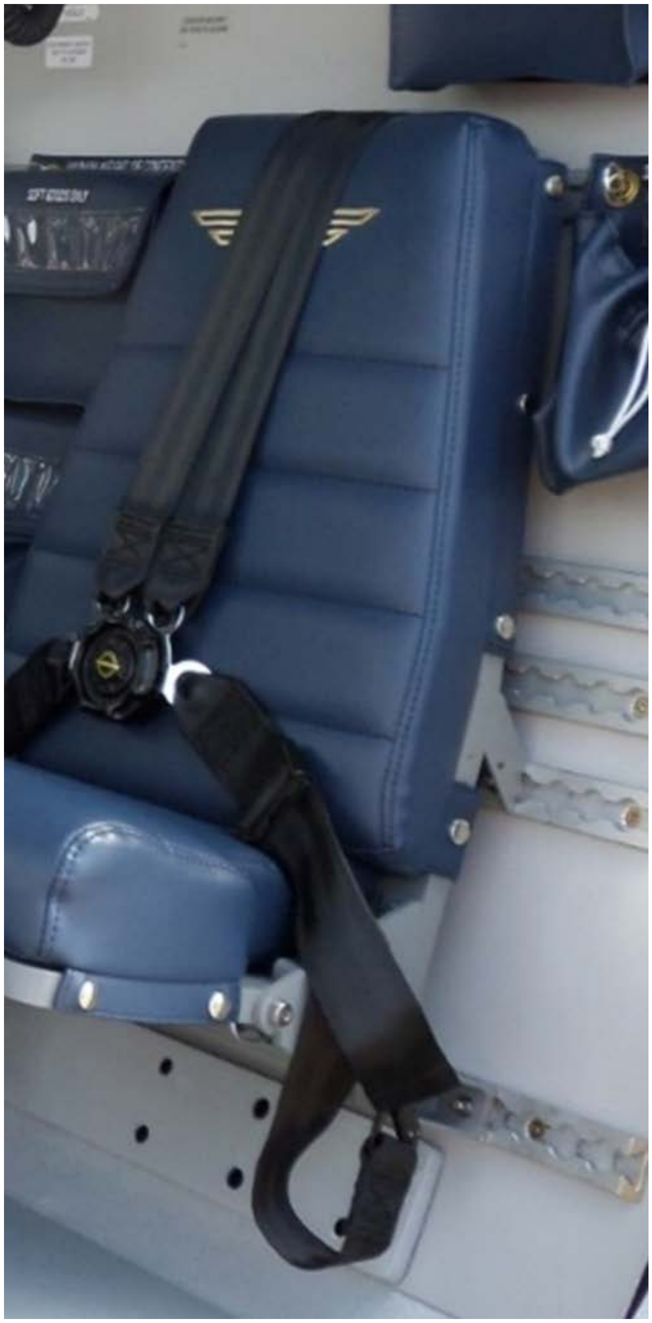
[1] The pilot seat back storage structural substantiation was provided by Laz-Tec, LLC Document LT-14503 Rev A dated March 21, 2014 and FAA form 8110-3 Seq #14JF047AM dated May 29, 2014.

1.1.2 <u>Medical Crew Jumpseats</u>

The accident helicopter was equipped with three forward facing, aft wall-mounted medical crew seats. The seats folded up to increase available cabin space and were removable without tools. The seats could be moved laterally on a track, allowing medical crews to accommodate equipment for specialty transports (i.e. pouches or components). These seats were each fitted with a four-point restraint system and did not have a headrest.

The two jumpseats on the right side (2A and 2B in Figure 2) were the utility crew version with a full length seat pan (P/N 108-1161). The jumpseat on the left side, behind the litter, was a short utility crew version (P/N 108-1163) (2C in Figure 2). The aft jumpseats were installed in accordance with a STC SR00534DE issued to Air Methods Corporation, Englewood, Colorado, on December 5, 2003. Photograph 3 shows the installation of these three medical crew jumpseats in the accident helicopter. The seatpan cushion was affixed to the seat frame with three snaps on each side for the full length jumpseat and with two snaps on each side for the short jumpseat.

Photograph 3*- A delivery photograph showing the three Air Methods medical crew jumpseats in the accident helicopter at the time of helicopter delivery.*



Photograph 4*- A close-up delivery photograph showing the seat track fitting holes and the two lower mounting points on the left side of the short medical crew jumpseat.*

According to the Air Methods Corporation (AMC), instructions for Continued Airworthiness AMMS 050-0336 for Model AS350 Series Rotorcraft Aft Jump Seat Installation (revision B, dated 12/12/07), additional structure including brackets and seat tracks were added to the aft cabin bulkhead to support the jumpseats. These jumpseats were mounted to the seat tracks that were attached to the cabin bulkhead. Five horizontal seat tracks were positioned along the aft cabin wall and are visible in photograph 4. According to the AMC Instructions for Continued Airworthiness AMMS-050-0336, this design allowed the installation of up to three jumpseats on the aft cabin wall. Instructions for installing the aft jumpseats showed attachment upper, middle, and lower brackets with one retainer knob near the middle attachment bracket.

To install the jumpseat on the seat tracks (figure 3), a spring-loaded retainer knob was first pulled forward ¾ inch and held. The jumpseat was then positioned over the notched seat track to allow the stanchion fittings to drop into the guides on the seat tracks. Next, the jumpseat was slid laterally ½ inch until the retainers on the stanchions engaged securely in the seat tracks. The instructions emphasized that all six stanchion fittings must be engaged in the seat track. Finally, the retainer knob was released to lock the seat in place. To remove the seat, the above steps were performed in reverse. Photograph 4 shows two of the lower outboard attachment brackets for the short medical crew seat.

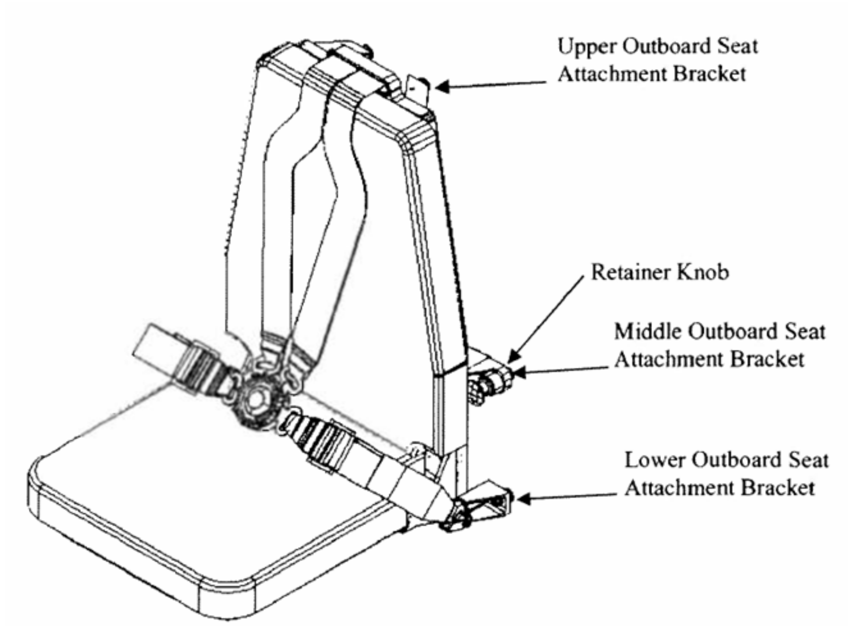
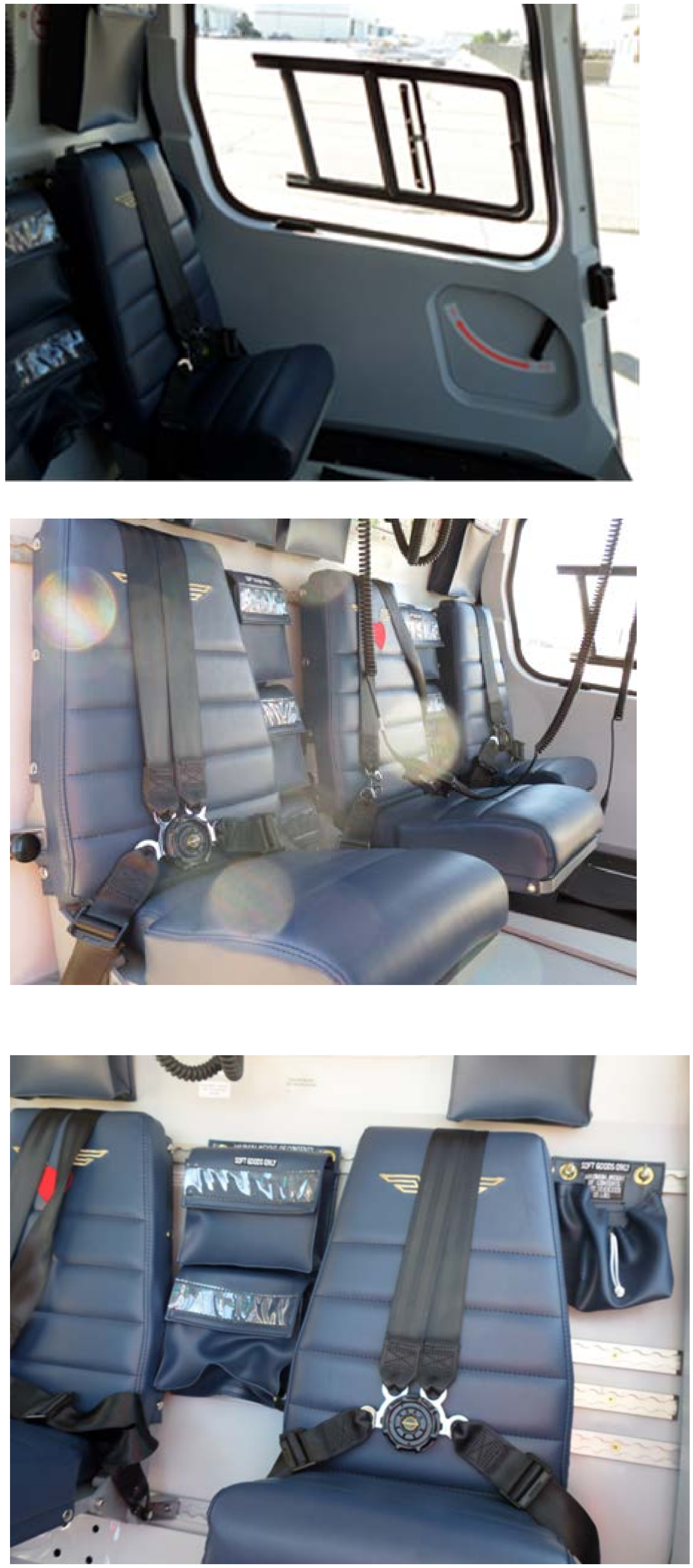


Figure 3- *Diagram showing aft jumpseat installation.*

Each seat contained a four-point restraint. The lower two restraint points were attached to the seat bottom mounting bracket, which attached to the seat back structure. The upper two restraints were routed over the top of the seat back to an inertial reel housing that was mounted to the lower mounting plate, which attached to the seat back structure.



Photograph 5- *Interior photographs showing seat restraints.*

1.1.3 Patient Loading System

The litter loading system was located on the left side of the helicopter and was positioned to allow a medical crew member to be seated at the patient's head. The litter loading system swiveled out the left-hand passenger door of the aircraft (see photographs 6). The litter had a four-point shoulder harness and three lap belts. Figure 4 shows the configuration of the litter restraint system as displayed on a placard inside of the accident helicopter[2]. The litter loading system was installed in accordance with STC SR00582DE-D issued to Air Methods Corporation, Englewood, Colorado, on June 3, 2005.

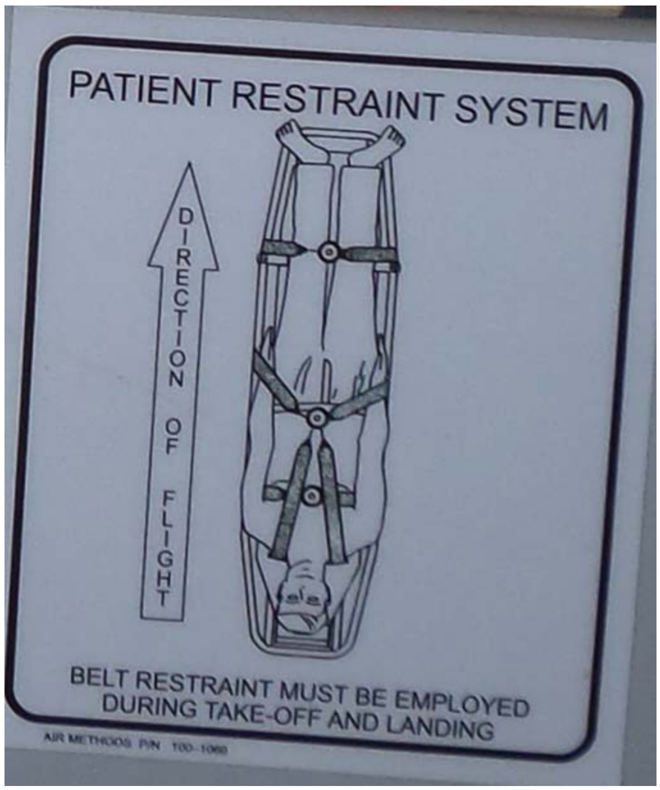


Figure 4- *A placard of the litter restraint configuration.*

[2] The label shows a four-point shoulder harness and two lap belts however the litter had a four-point shoulder harness and three lap belts.

Photographs 6*- Delivery photographs showing showing the Litter Loading System*

2.0 Doors

The helicopter was equipped with four cabin doors. On the left side of the helicopter, adjacent to the litter, the forward door was hinged at points on the forward edge and rotated open toward the front of the helicopter. This door was equipped with two separate window regions: an upper region and a lower region. Both forward doors were manufactured with an emergency exit jettison handle located at the forward section of the lower window region. When this handle was pulled the hinge pins were removed and the door would fall off. The aft door on the left side was a sliding door mounted on upper and lower rails on the side of the fuselage and this door slid aft toward the tail of the helicopter. This door was equipped with a single upper window. On the right side of the helicopter, there was the pilot's door which was hinged on the forward edge and rotated open toward the front of the helicopter. This door was also equipped with an upper and lower window region. The aft door on the right side was hinged on the aft edge and only opened once the forward door was opened.

Photograph 7- *A delivery photograph showing the left side doors with two separate window regions: an upper region and a lower region and the aft left door equipped with a single upper window.*

3.0 <u>Seat Load and Design Requirements</u>

14 *CFR* 27.561 through 27.563 contained certification criteria for emergency landing conditions for normal category rotorcraft. The original certification requirements of §27.561(b)(3), effective February 1, 1965, for occupant safety during emergency landing conditions included the following ultimate inertial load factors:

- 1.5g upward
- 4.0g forward
- 2.0g sideward
- 4.0g downward, or any lower force that will not be exceeded when the rotorcraft absorbs the landing loads resulting from impact with an ultimate descent velocity of five feet per second at design maximum weight.

Amendment 27-25, effective December 13, 1989, modified §27.561(b)(3) to increase the ultimate inertial load factors to the following:

- 4g upward
- 16g forward
- 8g sideward
- 20g downward, after the intended displacement of the seat device

Amendment 27-32, effective June 11, 1996, added a rearward ultimate inertial load requirement of 1.5g to §27.561(b)(3).

Further, FAR Part 27.562 specified dynamic testing with a 50th percentile adult male FAA dummy (170 lbs) as specified below:

- Downward test at 30g (pitched at 30^{o}) with a minimum impact velocity of 30 feet/second
- Forward test at 18.4g (yawed at 10^{o}) with a minimum impact velocity of 42 feet/second

The pilot seat for the AS350B3 was certified to meet the requirements of §27.561(b)(3) at the load factors specified by amendment 27-25, and were tested to meet the dynamic testing requirements of §27.562.

Based on the AMC structural substantiation for the STC aft jumpseat installation, the medical crew seats within the AS350 B3 were not required to meet the ultimate inertial load factors introduced by Amendment 27-25 and onward, nor were they required to undergo dynamic testing in accordance with §27.562.[3] Therefore, the medical crew seats were certified to the original requirements of §27.561(b)(3), effective February 1, 1965. The analysis contained in the structural substantiation report documented the load conditions for the aft jumpseats and the backup structure, including the seat tracks and doubler plates, for the aft jumpseat installation. The analysis further documented a change that increased the load on the upper jumpseat attachments, reduced the load on the middle attachments, and changed the seat back bending profile.

3.1 Stroking Pilot Seat

For the pilot seat to meet the dynamic requirements of §27.562 in the downward direction, the seat structure was designed to stroke and absorb vertical energy in order to minimize the load applied to the occupant. Energy absorption was achieved through two regions of deformation at the seat base and at the seatpan support beam. According to the seat manufacturer, the maximum seat stroke was 130mm (approximately 5.1 inches); and when the seat structure was intact, the stroke that occurred in an event could be measured. However, the manufacturer stated that if the seat was burned or melted due to fire heat, deformations in the aluminium seat structure and the composite seat bucket would preclude reliable measurements of the amount of stroke to document the energy absorption.

[3] Air Methods Technical Document AMTD 040-1235, "Structural Substantiation: Eurocopter AS-350 After Jump Seat Installation (Multiple STC), June 27, 2003.

4.0 Aircraft Wreckage Documentation

The survival factors group did not travel to the accident site. The on-scene documentation was performed by the Airworthiness Group. The Airworthiness Group Chairman's Factual Report contains a description of the helicopter and accident site.

4.1 Photographic Observations

The survival factors group reviewed the available photographic evidence to document the postcrash condition of the fuselage, the pilot's seat, and the medical crew seats as they relate to survivability.

The majority of the main fuselage was consumed or severely damaged by the postcrash fire. A portion of the bottom structure was not consumed by the postcrash fire. Excluding the forward right door, the majority of the canopy and doors were consumed by the postcrash fire. The majority of the tailboom was also consumed by the postcrash fire. Two, four-point harness buckles were found loose among the burned wreckage, with the belt webbing mostly consumed by fire. The two lateral buckles of each were still intact to the buckle. Three other conventional type of restraint buckles were also found loose among the wreckage (Photograph 8).

Photograph 8- *Photograph of restraint buckle found loose among the wreckage.*

4.1.1 Pilot Seat Observations

The pilot's seat was severely damaged by the postcrash fire, as shown in photograph 9. Damage to the floor and surrounding structure did not enable measurements or documentation of the pilot’s vertical seat position relative to the helicopter floor structure postcrash. (Photograph 9-13).

Photograph 9*- The red box indicates the on-scene photograph of the pilot seat back and seatpan.*

Photograph 10*- On-scene photograph of the right side of the pilot seat back.*

Photograph 11*- Close up on-scene photograph of the seat bucket of the pilot seat.*

Photograph 12- *Photograph of the top of the right side pilot seat.*

Photograph 13*- Photograph of the top of the left side pilot seat.*

4.1.2 On-Scene Seat Medical Crew Seat Observations

Due to the postcrash fire and the extensive damage to the fuselage, the location and condition of the two full length medical crew jumpseats could not be documented. Photographic evidence showed that the third short jumpseat was located in front of the RV and the seat pan cushion was located near a tree in the same region (see photograph 14-16). This seatpan cushion appeared not to be damaged by fire and the two snaps on each side to affix the seat cushion to the seat frame were visible. The seat frame was twisted and appeared to be damaged by fire.

Photograph 14- *Photographs of the short aft jumpseat cushion.*

Photograph 15- *Photograph of the short aft jumpseat, which was located in front of the RV.*

Photographs 16- *Photograph of the short aft jumpseat, which was located in front of the RV.*

4.1.3 <u>Pilot Seat Examination</u>

On June 23, 2016, the survival factors group chairman conducted an examination of the pilot seat at Beegles Aircraft Service Inc., in Greeley, CO.

A portion of the pilot seat was still attached to the airframe. A small section of the right seat track was visible. The seat had extensive fire damage. The right side seat frame was present and intact. The left side seat frame was missing. A piece of the seat bucket was present but extensively damaged by fire. Two cross tubes behind the seatback were attached to the right seat frame. Both cross tubes were bent and sheared at the left side. The seat pan was consumed by fire. The seatpan and seatback cushions were consumed by fire. The restraints were not identified. Due to the extent of the fire damage, no measurement of seat stroke was possible.

Photograph 17- *Photograph of the right side of the pilot seat as found at Beegles Aircraft Recovery.*

Photograph 18*- Photograph of the back side of the pilot seat with cross tubes bent and sheared at the left side as found at Beegles Aircraft Recovery.*

4.2 Civil Rotorcraft Design

In the early 1990's, the FAA initiated a civil rotocraft research program to investigate crash resistant design technology.[4] The program focused on the crashworthiness of the landing gear, fuselage, seating systems, and fuel systems. In general, the program found that occupant survivability in the then-current civil helicopter fleet was most affected by the vertical impact velocity with 30 feet/second being the transition velocity from potentially survivable to unsurvivable. The program also addressed longitudinal and lateral impact types and found that significant reductions in occupant injuries could result if civil rotorcraft were designed for impact velocities of 26 feet/second vertical (downward), 50 feet/second longitudinal (forward), and 10 feet/second lateral (sideways). Further, the program indicated that the criteria established were consistent with the current seating system regulations specified in 14 *CFR* Parts 27 and 29.

The review found that vertical impacts on hard surfaces resulted in the most severe impacts because there was no energy absorption by the non-deforming ground. The authors further stressed that this vertical impact condition necessitates energy absorption in the landing gear, fuselage, and the seats such as shown in the diagram in figure 5. Survivability envelopes based on longitudinal and vertical impact velocities were also presented and are shown in figure

[4] Coltman JW, Rotorcraft crashworthy airframe and fuel system technology development program. US Department of Transportation, Federal Aviation Administration, DOT/FAA/CT-91/7, October 1994.

6. (The review found that lateral impact velocity did not have as large an effect on survivability as the longitudinal and vertical velocities.)

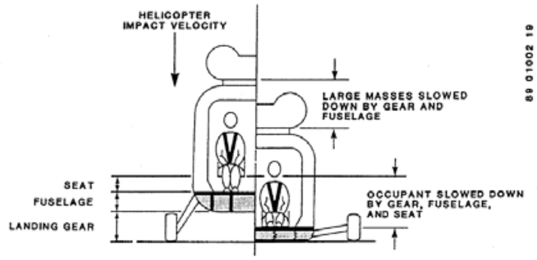


Figure 5- *Potential energy management system as depicted in Coltman (1994).*

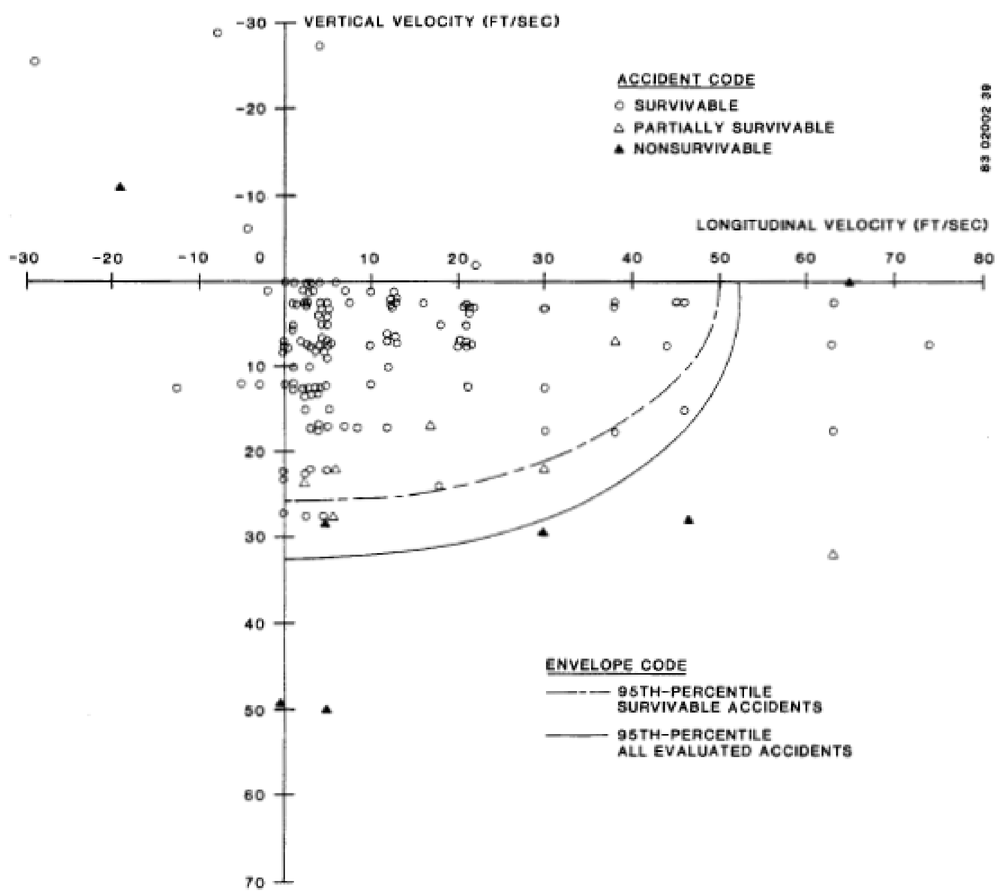


Figure 6- *Survivability based on longitudinal and vertical impact velocity depicted in Coltman (1994).*

4.3 Military Rotorcraft Design

Military rotorcraft are designed to meet minimum crashworthiness requirements defined in MIL-STD-1290A (AV), "Light Fixed- and Rotary-Wing Aircraft Crash Resistance".[5] This

[5] Military Standard, MIL-STD-1290A(AV), Light fixed- and rotary-wing aircraft crash resistance, Department of Defense, Washington, DC 20301, 26 September 1988.

standard was first published in 1974, revised in 1988, canceled in the mid-1990s, and reinstated without change in 2006. MIL-STD-1290A is based on the design guidance developed in the Aircraft Crash Survival Design Guide.[6]

The military standard identified the need for aircraft crash protection from impact conditions and associated velocity changes in order to protect the occupants, as shown in table 1. Further the standard stated that deformation must be controlled so that crash forces applied to the occupants were within tolerable levels.

Condition Number	Impact Direction (aircraft axes)	Object Impact	Velocity Change Δv (ft/sec)
1	Longitudinal (cockpit)	Rigid Vertical Barriers	20
2	Longitudinal (cabin)		40
3	Vertical*	Rigid Horizontal Barriers	42
4	Lateral , Type I		25
5	Lateral 1, Type II		30
6	Combined high angle *Vertical	Rigid Horizontal Surface	42
	Longitudinal		27
7	Combined low angle *Vertical	Plowed Soil	14
	Longitudinal		100
*For the case of retracted landing gear the seat and airframe combination shall have a vertical crash impact design velocity change capability of at least 26 ft/sec.			

Table 1- *The MIL-STD-1290A (AV) crash impact design conditions with landing gear extended.*

Focusing on vertical impacts, MIL-STD-1290A required the designer to demonstrate that the aircraft systems are able to withstand vertical impacts with impact speeds of 42 feet/second onto a rigid horizontal surface with the landing gear extended. Further, the height of the cockpit and passenger/troop compartments could not be reduced by more than 15% during the impact and the occupants could not experience injurious accelerative loading. If the landing gear was retracted, the aircraft was to withstand impacts of at least 26 feet/second with the same

[6] S. Desjardines et al. Aircraft Crash Survival Design Guide, USAAVSCOM, December 1989.

constraints as described above. The standard further discussed design techniques for accomplishing the crash impact goals. These techniques included locating high mass components in a manner to avoid intrusion into the occupant space, providing cockpit and cabin strength to prevent structure collapse, providing crash-force attenuating structure under the cockpit and cabin flooring and in other necessary regions, including energy absorbing landing gear, and providing energy absorbing crew, troop, and passenger seats.

Pilot, co-pilot, cabin seating systems and litters also needed to conform to military standards. The pilot and co-pilot seats had to conform to MIL-S-58095A (AV), “Seat System: Crash-Resistant, Non-Ejection, Aircrew”, which specified that occupant survival shall be a primary consideration in seat design.[7] MIL-S-58095A also required a variable load-limiting vertical energy absorption device, which covered a range of occupant weights from 140 to 250 pounds. The minimum load factors during dynamic testing in various impact directions were also specified, as shown in figure 7. During these dynamic tests, the seat had to retain the dummy occupant within the restraint system, limit the accelerations to within human tolerance limits for injury, and show no loss of structural integrity. The vertical velocity change was defined as 42 feet/second for tests 3 and 4 and the minimum acceptable seat stroking distance was 9.5 inches.

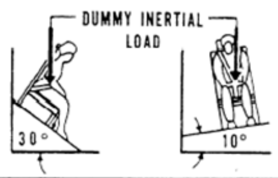
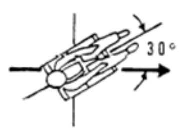
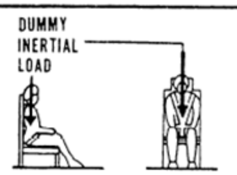
TEST	CONFIGURATION	PARAMETER	LIMITS
1		t_1 SEC t_2 SEC G MIN G MAX △ V MIN, FT/SEC (M/SEC)	0.043 0.061 46 51 50 (15.2)
2		t_1 SEC t_2 SEC G MIN G MAX △ V MIN, FT/SEC (M/SEC)	0.066 0.100 28 33 50 (15.2)
3 & 4		t_1 SEC t_2 SEC G MIN G MAX △ V MIN, FT/SEC (M/SEC)	0.036 0.051 46 51 42 (12.8)

Figure 7- *The MIL-S-58095A (AV) dynamic test requirements for pilot and co-pilot seats.*

The forward, side, and rear facing cabin seats had to conform to MIL-S-85510 (AS), which specified design requirements for crashworthy seats used by troops and passengers in helicopters. MIL-S-85510 (AS) required the seat to prevent occupants, ranging in weight from 166.6 pounds to 242.2 pounds (including equipment), from experiencing injurious vertical decelerations when subjected to defined crash pulses and also disallowed structural failure of the seat. The standard required vertical energy attenuation to enable human tolerance of vertical

[7] Military Standard, MIL-S-58095A(AV), Seat System: Crash-resistant, non-ejection, aircrew, Department of Defense, Washington, DC 20301, 31 January 1986.

impacts and specified a minimum seat stroking distance (14 inches measured from the occupant's center of gravity). The dynamic test requirements for these seats are shown in figure 8.

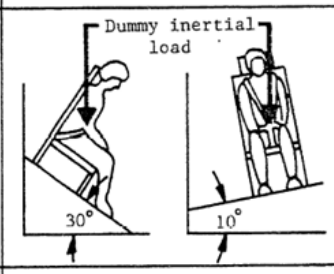
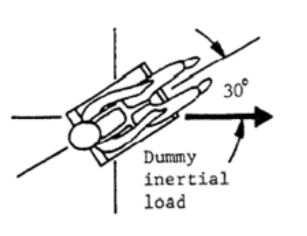
Test	Configuration 1/	Parameter	Cabin seats	
			Qualification	R&D
1		t_1 sec	0.059	0.034
		t_2 sec	0.087	0.087
		G min	32	32
		G max	37	37
		Δv min, ft/sec	50	50
2		t_1 sec	0.081	0.046
		t_2 sec	0.127	0.127
		G min	22	22
		G max	27	27
		Δv min, ft/sec	50	50

Figure 8- *The MIL-S-85510 (AS) dynamic test requirements for forward, side, and rear facing cabin seats.*

The strength of the litters was defined in MIL-STD-1290A (AV). The litters needed to withstand loads without failure of 25g downward, 8g upward, 20g forward, and 20g sideward. Litter loads were based on a 250 pound occupant weight.

5.0 <u>Crew Helmets and Flight Suits</u>

Air Methods General Operations Manual (Rev 8: 3/11/14) stated crewmembers "…will utilize all safety equipment issued, furnished, or installed in the aircraft for all flights when operating an Air Methods aircraft. Examples of these would include flight helmets, flight suits…"

According to an interview with the flight nurse, Air Methods provided crew helmets and full body, long sleeve, Nomex flight suits.

Item Type	Part Numbers/Manufacturers	Source
Flight Suits	Mfg: Nomex flight suits Supplier: Aureus Part Number: FS10NV	Clinical: Provided by the program Aviation: Provided by Air Methods
Helmets	Mfg: Gentex Supplier: Government Sales or Paraclete Part Numbers: PHX01/NVG, GA023 or GB023	Clinical: Provided by the program Aviation: Provided by Air Methods
Gloves	Mfg: Nomex Supplier: Gibson & Barnes or Aureus International Part Numbers: EGN or GL10	Not typically provided.
Boots	N/A	Boots are not provided to the clinical or the aviation staff.

Table 2- *Information on personal safety gear provided and available to aviation and clinical crew.*

6.0 Emergency Equipment

According to Air Methods General Operations Manual (Rev 8: 3/11/14), fire extinguishers were installed in accordance with applicable FARs. Survival kits, appropriate for the season and area of operation, were also carried. Due to the postcrash fire, the location and condition of some of these items were not documented. A fire extinguisher was observed in photograph 11 of this report.

7.0 Surveillance Video

A surveillance video camera recorded the last second of the helicopter's flight and ground impact, followed by the actions of the helicopter occupants and several bystanders. The NTSB Vehicle Recorders Division analyzed the video and estimated that the helicopter's ground impact speed was 58±5 feet per second.[8] At that time, the pitch and roll angles were small. The video study also noted that before the fuselage impacted the ground, the skid landing gear impacted the ground and collapsed. Due to the low frame rate of the video, impact accelerations could not be calculated. For additional details of the surveillance video study, see the video study report.

The survival factors group viewed the video and identified events regarding occupant survivability which are contained in table 2 below.

Time (sec)	Event

[8] Airbus Helicopters also evaluated the surveillance videos and determined that the vertical impact speed of the helicopter center of gravity was 42 feet/second. Accounting for the pitch rate immediately prior to impact, Airbus Helicopters calculated that the vertical impact speed at the forward seat location was 59 feet/second.

0.00	First image from the surveillance camera.
0.67	First contact between the helicopter tail and the recreational vehicle (RV).
0.93	Impact with the ground.
1.93	Helicopter in final rest position (1.0 second after impact with ground; 1.26 seconds after contact with RV).
3.67	Liquid consistent with fuel first visible under helicopter on the pavement near the right side of helicopter (2.74 seconds after ground impact).
3.93	Fire first visible (3.00 seconds after ground impact).
10.17-59.77	Movement is observed near the cockpit region of the helicopter and near left side door region of the cabin.
24.50-26.67	Left side door panel lifted upward from the ground. Flipped toward the front of the helicopter.
26.93-31.10	Occupant engulfed in flames, stood up in area where door panel was located. Occupant ran away from helicopter, toward right side of frame.
34.27	First bystander arrives.
59.93-67.93	2nd occupant climbed out of left side door region and fell to the ground
97.10	Second bystander began to pull a 3rd occupant away from helicopter cockpit area, the 3rd occupant rolled away from the helicopter area and a bystander used a fire extinguisher to put out fire around and on the occupant.

Table 3- *Key events from surveillance video showing the accident.*

8.0 Medical and Pathological

For detailed medical and pathological information, please see the medical factual report in the accident docket.

8.1 Injury Information

For detailed injury data information, please see the injury factual report, available in the accident docket.

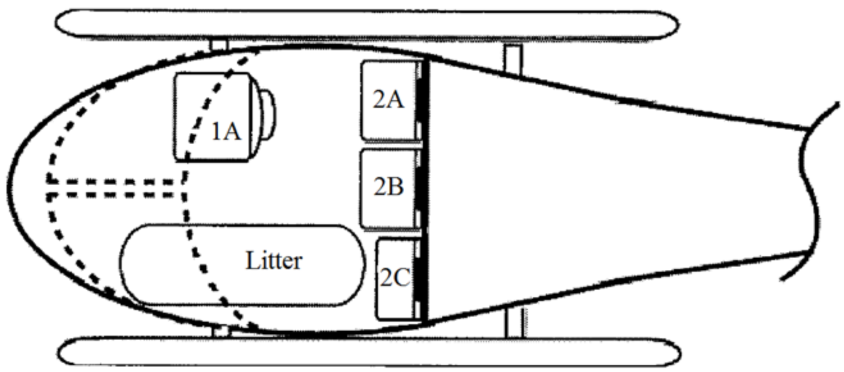
8.2 Occupant Information

8.2.1 Injury Table

	Flight Crew	Flight Nurse	Passengers	TOTAL
Fatal	1	0	0	1
Serious	0	2	0	2
Minor	0	0	0	0
None	0	0	0	0

8.2.2 Occupant Seating Location

According to an interview with the flight nurse, the pilot was seated in the pilot seat and the flight nurses were seated on the right and left most sides aft of the pilot seat (figure 9).



Position	Occupant
1A	Pilot (64-year old)
2A	Flight Nurse (32-year old)
2C	Flight Nurse (45-year old)

Figure 9*- This seating chart shows occupant position and age.*

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