

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

SURVIVAL FACTORS SPECIALIST'S FACTUAL REPORT

June 13, 2019

I. ACCIDENT

Operator	:	Papillon Airways, Inc.
Airplane	:	Airbus Helicopters EC130 B4 [N155GC]
Location	:	Peach Springs, AZ
Date	:	February 10, 2018
Time	:	1719 mountain standard time (MST) ¹
NTSB #	:	WPR18MA087

II. SURVIVAL FACTORS SPECIALIST

Specialist	:	Jason T. Fedok National Transportation Safety Board Washington, DC
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III. SUMMARY

On February 10, 2018, about 1719 mountain standard time (MST), an Airbus Helicopters EC130 B4 helicopter, N155GC, was destroyed when it impacted a canyon wash while on an approach to land at Quartermaster landing zone near Peach Springs, Arizona. The commercial pilot and one passenger sustained serious injuries and five passengers were fatally injured. The air-tour flight was operated by Papillon Airways, Inc. under the provisions of 14 Code of Federal Regulations Part 136. The helicopter departed Boulder City Municipal Airport, Boulder City, Nevada at 1642 MST and had intended to land at Quartermaster landing zone, a group of unimproved landing pads within Quartermaster canyon. Visual meteorological conditions prevailed, and a company flight plan had been filed.

IV. DETAILS OF THE INVESTIGATION

1.0 Accident Site

The accident occurred in the Grand Canyon as the helicopter was on approach to land at the Quartermaster landing zone on the Hualapai Indian Reservation. (see figure 1.)

¹ All times are reported in local time unless otherwise noted.



Figure 1. Google Earth image showing the relative locations of the accident site, Quartermaster landing zone (with arrow), and the Colorado River.

2.0 Helicopter Information

The Airbus Helicopters EC130 B4 was equipped with a left-sided pilot seat and seven passenger seats. (see figure 2.) The flight manifest provided by Papillon indicated passenger seat #1 was unoccupied for the accident flight and that seats 2-7 were occupied by six adult passengers. For the purposes of this report, the six passengers will be identified as passengers #2-#7, based on their seating locations from the flight manifest.

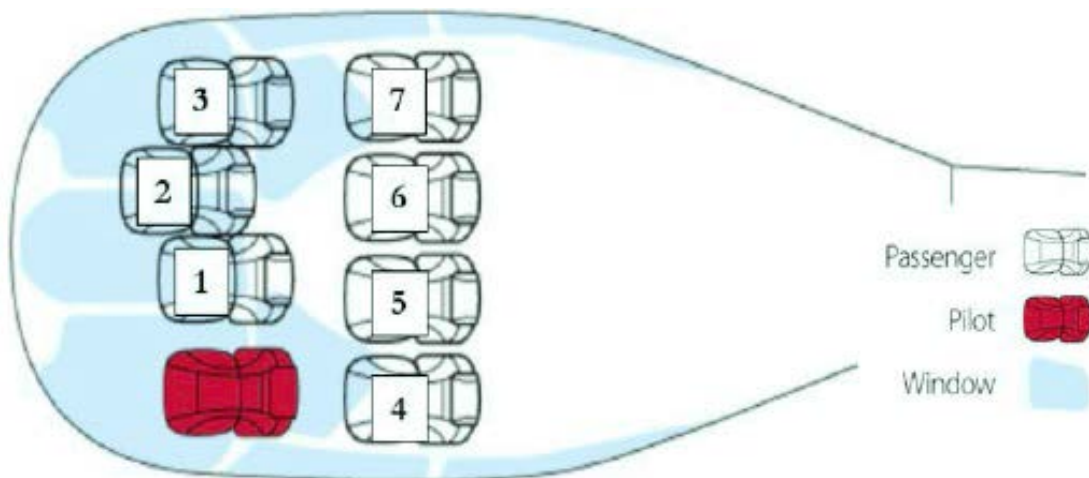


Figure 2. Interior seating configuration of N155GC.

3.0 On-scene Documentation

The helicopter came to rest on rocky terrain in a ravine approximately 800 feet from the Quartermaster landing zone. There was an immediate postcrash fire which consumed the entire helicopter except for the tail boom (with fenestron), which remained unburned.



Photo 1. Overhead view of accident site.



Photo 2. View of the accident site facing south (away from Colorado River).

3.1 Seats

The helicopter was equipped with 8 single-occupant seats manufactured by Zodiac Seats France. The pilot seat was part number 15917-18-32 and the seven passenger seats were part number 15917-18-33. Both part number seats were designed and certified to the standards contained in EASA ETSO C127a.



Photo 3. An exemplar Papillon helicopter with the same seating configuration as N155GC.

The NTSB's airworthiness group responded to the accident site and documented the portions of seats and restraint systems that could be identified. All of the seats were heavily fire damaged. The bottom portion of the pilot seat aluminum frame was found in its normally installed location. The left aluminum frame webs were not fractured and were still attached to remnant floor track and airframe. The right aluminum frame was melted.



Photo 4. Pilot seat's left frame.

One seat was found to the front right of the wreckage, over a line of boulders and adjacent to a small tree. (see photos 5, 6, and 7.) The carbon fiber seat was mostly whole but was thermally damaged. Both left and right seat frames had separated from the floor track. The left side webs were not fractured but the right side webs were both fractured. The right-side vertical track's forward end was fractured and missing and thermally damaged, but the right side of the seat was displaced partially down vertical track.



Photo 5. Thermally damaged seat found near a small tree.



Photo 6. Close-up of the thermally damaged seat found near a small tree.



Photo 7. Right-side seat frame from seat found near small tree.

Another seat frame was found immediately to the front-right of the helicopter. Remnant loose carbon fiber pieces from the seat were attached to both left and right aluminum frames. The right-side webs were both fractured. The left side aft web was partially fractured and the front web was fully fractured. Both left and right frames had separated from the floor track. (see photos 8 and 9.)



Photo 8. Thermally damaged seat found immediately to the front right of the helicopter (left and right frames visible).



Photo 9. Left frame of seat found immediately to front right of helicopter (front web was fractured; aft web was partially fractured).

The aft left seat was found immediately behind the pilot seat. (see photos 10, 11, and 12.) The carbon fiber seat was mostly whole but thermally damaged. Remnant seat track and airframe was attached to the left frame. Both webs on the left side were intact. The left side of the seat was about 3.5 inches down the vertical track (along which the seat strokes) but the seat was loose and could be moved by hand. The right side of the frame was fractured along the vertical track but both webs remained intact. All pieces exhibited thermal damage.



Photo 10. Aft left seat.



Photo 11. Left frame of aft left seat.



Photo 12. Left frame of aft left seat.



Photo 13. Right frame of aft left seat.

The lower portion of the aft right seat frame was found melted to a portion of melted airframe and skid crosstube. The forward cabin's "three passenger frames," made of aluminum and to which the front three passenger seats' frames normally attach, was found loose in the wreckage and was thermally damaged and partially consumed by the postcrash fire. One of the forward attachments for the forward crosstube was found as a whole assembly and loose in the recovered wreckage. Only a portion of the second forward crosstube forward attachment was found loose in the wreckage. Numerous other portions of seat frames and legs were found in the wreckage, some of which were fractured.

3.2 Restraints

Each seat was equipped with a 4-point Pacific Scientific rotary buckle restraint. All eight rotary buckles were recovered. Seven were found loose in the wreckage and one was stuck within resolidified metal. Thirteen loose insert tabs were identified. One buckle had all four tabs inserted, while another buckle had three tabs inserted.² (see photo 15.)

² One tab was permanently affixed to each rotary buckle.



Photo 14. An exemplar 4-point Pacific Scientific rotary restraint identical to those on N155GC.



Photo 15. Rotary seatbelt buckles, insert tabs, and adjusters identified in the wreckage.

4.0 Emergency Equipment

Figures 3 and 4 shows both sides of Papillon's safety information card for the EC130-B4. A copy of Papillon's passenger safety briefing video is included in the docket as attachment 1.



Figure 3. Papillon passenger briefing card (front)
from GOM Appendix C Revision XXVII dated 10/19/2015.

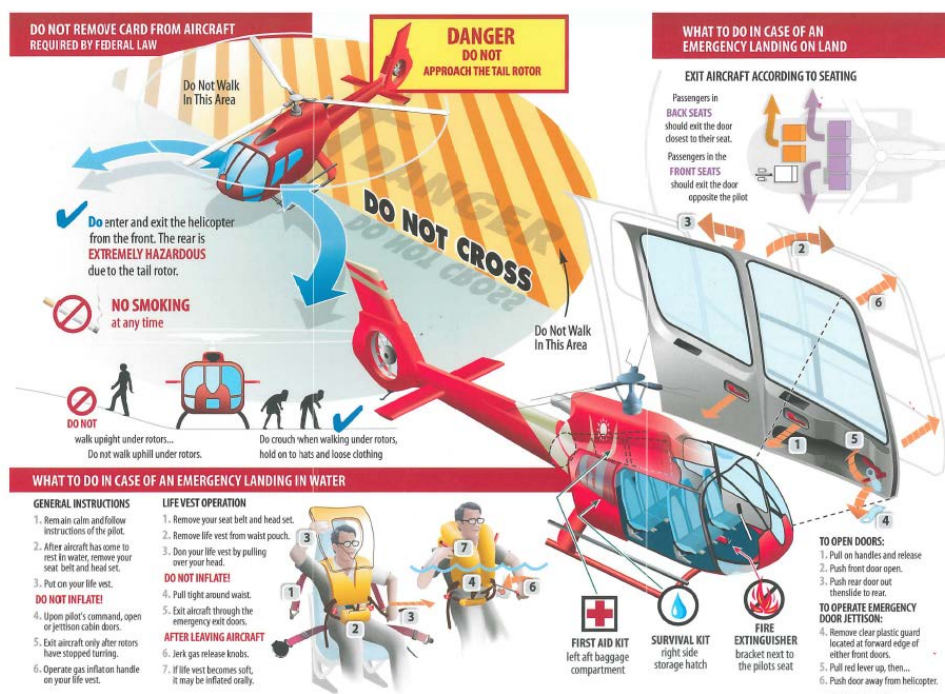


Figure 4. Papillon passenger briefing card (back)
GOM Appendix C Revision XXVII dated 10/19/2015.

A charred fire extinguisher was found in the wreckage. It was normally stowed in a bracket on the floor between the pilot seat and passenger seat #1. (see photo 17.) Portions of several burned or partially burned life vests were found near the wreckage.



Photo 16. Burned fire extinguisher found in the wreckage.



Photo 17. Stowage location of fire extinguisher on Papillon's EC130 B4.

5.0 Medical and Pathological

5.1 Injury Table

Type of Injury	Flight Crew	Passengers	Total
Fatal ³	0	5	5
Serious ⁴	1	1	2
Minor	0	0	0
None	0	0	0
Total	1	6	7

5.2 Injury Information

Three passengers (#2, #6, and #7) did not evacuate the helicopter prior to being overcome by the postcrash fire and smoke. Autopsies performed by the Mohave County Medical Examiner's Office noted that all three individuals had 100% body area burns with soot in their airways. No blunt force injuries were noted. Toxicology samples obtained during the autopsies were deemed "unsuitable for analysis" for carboxyhemoglobin by the laboratory at FAA Forensic Sciences. The cause of death was reported as "multiple injuries due to helicopter crash" for all three passengers.

The pilot and three passengers (#3, #4, #5) sustained severe burns. Passengers #3 and #4 died at University Medical Center in Las Vegas, Nevada from their burn injuries on February 25th and 22nd, respectively. In addition to their burn injuries, the pilot sustained an open fracture of his left lower leg and passenger #5 sustained a spinal fracture. For more detail about their injuries see attachment 2.

6.0 Emergency Response Summary

The NTSB received numerous digital photographs of the Quartermaster landing zone and surrounding area taken by witnesses prior to and just after the accident. Two photographs taken from an approaching helicopter showed the accident site just after the accident occurred. The first photograph, taken at 1718:49⁵, showed white smoke and/or dust at the accident site while a second photograph taken 7 seconds later showed flames and black smoke at the accident site.

³ 49 CFR Part 830.2 defined "fatal injury" as any injury which results in death within 30 days of the accident.

⁴ 49 CFR Part 830.2 defined "serious injury" as any injury which: (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date of the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, muscle, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface.

⁵ Times were obtained from metadata extracted from the digital photographs.



Photo 18. Cropped view of a photograph taken by a passenger from an approaching helicopter showing white smoke or dust at the accident site. Metadata embedded in the digital file indicated the photo was taken at 1718:49 on 2/10/18.



Photo 19. Cropped view of a photograph taken by a passenger from an approaching helicopter showing flames at the accident site. Metadata indicate the photo was taken at 1718:56 on 2/10/18.



Photo 20. Quartermaster landing zone and picnic tables.

Numerous individuals at the Quartermaster landing zone and adjacent wedding venue either saw the helicopter lose control, heard the impact, or saw black smoke rising from the ravine where the accident occurred. Several Papillon pilots and bystanders, including four members of the Royal Australian Air Force (RAAF), retrieved first aid kits from helicopters at the landing zone and responded to the accident site. They encountered difficult, rocky terrain and it reportedly took about 20 minutes to reach the accident site. The first individuals who arrived reported seeing a burning helicopter, the seriously injured pilot, and three seriously passengers (2 females and 1 male) outside the helicopter. All were conscious but had severe burns; only the female passengers were ambulatory. The pilot had open leg fractures of his left leg and burns all over his body.⁶ One female (identified as passenger #5) was dressed only in undergarments and was bleeding badly from her left forearm and feet. She had red, burned skin on her arms and lower limbs.⁷ The other female (identified as passenger #3) had burns on one side of her face and head and cuts to her hands and ankles. She told several of the responders that “she had trouble getting her seatbelt off and out of the helicopter.” The male passenger (identified as passenger #4) was naked and sitting down with blistering burns all over his body and minor cuts to his hands and forearms. He was calm but said he could not see.

⁶ During his NTSB interview, the pilot stated that he did not recall how he got out of the helicopter - only being 50 feet away with his pants on fire. He also stated that he provided the passengers with a “standard” preflight safety briefing that included information about how to operate the seatbelts. He did not recall the accident passengers having any difficulty with the seatbelts prior to the accident.

⁷ Numerous requests to interview the surviving passenger #5 (through her family) were unsuccessful. A note in the passenger #5’s medical records stated that she denied loss of consciousness but had no memory of the accident.



Photo 21. View of the accident site from the Quartermaster landing zone.

More first aid equipment was needed so one of the RAAF members returned to the landing zone and had to “smash open” the locked first aid box⁸ there because no one knew the combination. He retrieved some additional equipment and a veterinarian and anesthetist accompanied him back down into the ravine and assisted with first aid.

⁸ According to Papillon, the locked first aid box was provided by the Hualapai Nation for use by their first responders and Papillon had not been provided with the lock’s combination.



Photo 22. Postaccident photograph taken by a witness from the Quartermaster landing zone.



Photo 23. Postaccident photograph taken by a witness from the Quartermaster landing zone.



Photo 24. Bystanders assisting with initial triage.

The helicopter was equipped with an Artex C406-N HM (TSO C126) emergency locator transmitter (ELT). While it was later consumed in the postcrash fire, the ELT activated during the accident and transmitted an alert notification and location information to the Air Force Rescue Coordination Center (AFRCC).⁹ Information from AFRCC indicated the alert was received at 1719:42, about 53 seconds after passenger photograph #1 was taken.¹⁰ The beacon was registered to Papillon and AFRCC immediately called Papillon to confirm whether the alert was an actual distress situation. While initially told that they believed the aircraft was flying, Papillon confirmed within about 20 minutes that they were unable to reach the pilot and AFRCC informed them that FAA air traffic controllers had contacted them to report that the helicopter may have crashed. By 1813 Papillon reported to AFRCC that they had been in contact with the Arizona Department of Public Safety (DPS) and they were responding with at least one helicopter.

⁹ The initial coordinates received by AFRCC in the beacon detection were 36 00.00N 113 45.00W, approximately 2.2 nautical mile NE of the accident site.

¹⁰ TSO C126 ELTs were designed to transmit the first digitally encoded data burst about 50 seconds after initial beacon activation.



Photo 25. Initial areas of triage for pilot and passengers.

While those communications were occurring Hualapai Nation Police Department (HNPD) had received a phone call from a security officer at Grand Canyon West Airport (1G4)¹¹ that there was a helicopter down in the canyon with an unknown number of occupants. HNPD officers responded to the airport and set up an incident command post with Fire Chief Rudy Barboa as incident commander. Medical helicopters in the area began rerouting to 1G4 to provide assistance and HNPD dispatch directly called Classic Air Medical (Classic) for additional assistance. Classic put two helicopters (09 in Fort Mohave, Arizona and 02 in Kanab, Utah) on standby just after 1800.

¹¹ 1G4 was, a publicly owned FAA Part 139 Class III (Index A) airport owned by the Hualapai Nation Indian Tribe, that was located approximately 3 miles northwest of (and about 3300 feet elevation higher than) the Quartermaster landing zone.



Figure 5. Locations of Grand Canyon West Airport (1G4) and Quartermaster landing zone.

Meanwhile, Papillon began repositioning helicopters to assist. At 1735 Papillon #37 landed at 1G4, picked up Hualapai medical personnel, and dropped them off at the Quartermaster landing zone a short time later. It was likely the first emergency responders reached the accident site at about 1805, about 45 minutes after the accident. Prior to it becoming dark, one the RAAF responders stated that they “received word that boats and helicopters were at the bottom of the ravine and we would have to walk out if we were going to get rescued.”¹² Passengers #3 and #4 were assisted by several responders about 100 meters down the ravine toward the river, until they reached terrain they could no longer navigate and waited for additional assistance.

Classic 02 launched from Kanab at 1838 and arrived at Quartermaster landing zone about 1915. Classic 09 launched from Fort Mohave at 1850 and, after a short stop for fuel arrived at 1G4 at 1945. After a short briefing at the incident command post Classic 09 loaded supplies and dropped them off at the Quartermaster landing zone. Shortly thereafter, Classic 09 began shuttling passengers up to 1G4 and continued to deliver personnel and supplies to Quartermaster. At 2108 Classic 09 dropped off the Mohave County Sheriff’s Office volunteer rope team leader, who arrived at the accident site at about 2130 and was tasked with establishing an extraction plan. Classic 02 also transported some stranded Papillon passengers at Quartermaster to 1G4 and returned with more SAR rope team volunteers at 2149. The rope team leader devised a plan to use a technique known as “steep angle raising” to lift the injured to the top of the ravine in baskets, using a system of ropes and pulleys. However, the pilot of Classic 02 notified the rope team via radio that if some of the larger rocks were removed from a flat location upwash of the accident site he could probably land there and pick up patients. Upon hearing this information, the rope team leader had his team begin clearing rocks from a “gravel bar” about 100 yards upwash from the accident site.

¹² Sunset in the Grand Canyon on February 10, 2018 was 1805.



Figure 6. Locations of Quartermaster landing zone, main wreckage, and extraction location used by Classic 02 and Ranger 58.

Two DPS helicopters (Ranger 56 and 58) were also dispatched to assist with the rescue efforts. Between 2000 and 2100 the AFRCC SAR log indicated that discussions were taking place between the AZ SAR coordinators, DPS and other organizations about whether the DPS helicopters would be able to extract the injured given the location, weather conditions, and dark-of-night conditions. At 2023, after a request from the AZ state SAR coordinator, the 563rd Rescue Group (563 RQG) at Davis-Monthan Air Force Base, Arizona was notified of the accident by AFRCC. The group controlled the rescue squadrons at Nellis Air Force Base, Nevada and stated that they would check on the availability of night-vision-qualified crews and call back within an hour. At 2126 563 RQG called back and stated that they were getting crews together while Nellis AFB personnel were in discussion with AZ SAR personnel. At 2226 the 563 RQG accepted the mission for trauma patients and launched two helicopters to the accident site.

After some discussion with other pilots at Quartermaster about the winds and weather conditions, the pilot of Classic 02 decided to attempt to land at the location upwash of the accident site that he had observed earlier and which had subsequently been cleared of

large rocks by the rope team volunteers.¹³ Ranger 58 took off and flew “overwatch” in order to observe his approach and landing, in hopes to duplicate it subsequently. The accident pilot was packaged on a backboard, carried to the extraction location, and Classic 02 landed and loaded him about 2315. He was flown back to the Quartermaster landing zone and transferred to Classic 09 for transport to University Medical Center. He arrived there at approximately 0055.

Medical personnel then packaged passenger #3 (who had returned to the accident site after earlier walking toward the river) and carried her to the helicopter extraction location. Ranger 58 landed about 2340 and flew her to 1G4 where she was transferred to a waiting medical transport (Mercy 21) who flew her to UMC. She arrived about 0100. Classic 02 returned to the extraction point for a second time and lifted passenger #5 about 0010. She was flown directly to UMC and arrived about 0105.

The final injured occupant to be extracted was passenger #4 who was still downwash from the accident site after being carried there earlier in the evening. He was hoisted from that location by a U.S. Air Force Blackhawk helicopter (AR006) and flown directly to UMC, arriving about 0128.



Photo 26. The hoist of passenger #4 by a USAF Blackhawk helicopter (AR006).

Shuttle flights for stranded Papillon passengers at the Quartermaster landing zone continued until pilot fatigue became an issue. At that point flights ceased, and several passengers spent the night sheltering in helicopters at Quartermaster. Similarly, some members of the volunteer rope team also spent the night at Quartermaster sleeping on the picnic tables there. The passengers and rope team members were flown out of Quartermaster after daybreak on February 11.

¹³ See the NTSB Meteorological Group Factual report for more detailed weather information.

When asked for his assessment of the rescue operation, the rope team leader stated that there was “no time spent waiting for helicopters” after he arrived on scene and the decision was made to attempt to fly the passengers out of the ravine. It took a while to package the patients on backboards and then there was a considerable walk using a “caterpillar traverse” over technical terrain to reach the extraction location. The helicopters stayed “hot” after landing and while they were loading the patients. By the time they walked back to the other patients, packaged them and got back to the extraction location, another helicopter was either waiting or arrived shortly thereafter. He said the rescue was as timely as it could have been given the conditions they were facing on the ground. Had the helicopters not landed in the ravine the only other extraction method would have been the “steep angle raising” option up to the plateau. Ultimately, he believed the helicopters landing in the ravine was much faster.

During multiagency debriefings after the rescue there was discussion that poor communication operability between the accident site and the incident command post created problems and confusion about the number of victims and stranded passengers. It was noted that the satellite phone stored at Quartermaster did not work well – the batteries had died, coverage was not good, and pilots were not trained how to use it.¹⁴ After the accident, Papillon purchased new satellite phones with improved coverage (and an SOS button) and spare batteries with instructions on how to use them. All Papillon pilots were required to train and show proficiency in using the phones and would now bring these phones to each landing site daily. Additionally, Papillon purchased a collapsible stretcher and trauma kit/first aid which were stored in unlocked (but sealed) metal boxes, readily available for medical crews. Finally, Papillon provided pilots with first aid training and developed procedures to check the equipment quarterly to ensure all items were up to date. For more detailed information about the rescue, see the interview summaries, statements, and timeline in attachments 3 and 4.

Summary of Victim Extraction¹⁵

Pilot

Extracted by Classic 02 - 2315

Transferred to Classic 09 at Quartermaster - 2330-0000

Departed Quartermaster for UMC – 0010

Arrived UMC – 0055

Passenger #3

Extracted by Ranger 58 - 2340

Arrived 1G4 – 2349

¹⁴ Subsequently, Papillon advised the NTSB that the satellite phone batteries were replaced regularly, the phone was regularly tested and there were quick access check lists on the operation of the phones. Papillon’s Director of Operations provided photographs of the quick reference instruction card and phone numbers that were kept with the phone. He also provided phone records showing one-minute phone calls placed from the phone on 4/24/17, 5/9/2017, 7/2/2017, 12/19/17, and 2/11/2018 at 0054 (the night of the accident).

¹⁵ All times approximate and based on multiple information sources.

Transferred to Mercy 21 – 2350-0015
Mercy 21 departed 1G4 for UMC – 0020
Arrived UMC – 0100

Passenger #5

Extracted by Classic 02 – 0010
Arrived UMC – 0105

Passenger #4

Hoisted from accident site by AR006 – 0054
Arrived UMC – 0128

Jason Fedok
Survival Factors Investigator

Attachments

Attachment 1 – Papillon Passenger Safety Video
Attachment 2 – Injury Chart
Attachment 3 – Interview Summaries and Statements
Attachment 4 – SAR Timeline