



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

May 27, 2022

Specialist's Report

SURVIVAL FACTORS

WPR21FA143

A. ACCIDENT

Location: Palmer, AK
Date: March 27, 2021
Time: 1835 Alaska daylight time (AKDT)¹
0235 Coordinated universal time (UTC)
Airplane: Airbus Helicopter AS350B3, N351SH, Soloy Helicopters, LLC

B. SURVIVAL FACTORS SPECIALIST

Specialist: Jason Fedok
National Transportation Safety Board
Washington, DC

C. DETAILS OF THE INVESTIGATION

The survival factors specialist did not travel to the scene of the accident but instead documented and gathered information pertaining to the survival aspects of the accident and the search and rescue that followed.

D. FACTUAL INFORMATION

1.0 Helicopter Configuration

The accident helicopter was configured in a standard 6-place AS350 seating configuration (as shown in figure 1). The pilot sat in the front, right seat and one of the Third Edge Heli guides (front, left passenger) sat in the front, left seat. The second guide (aft passenger 1) sat on the aft, far left seat. The other passengers (aft passengers 2, 3, and 4) sat from left to right across the back of the helicopter. The only surviving occupant was aft passenger 3.

¹ All times are Alaska daylight time (AKDT) based on a 24-hour clock, unless otherwise noted. Actual time of accident is approximate.

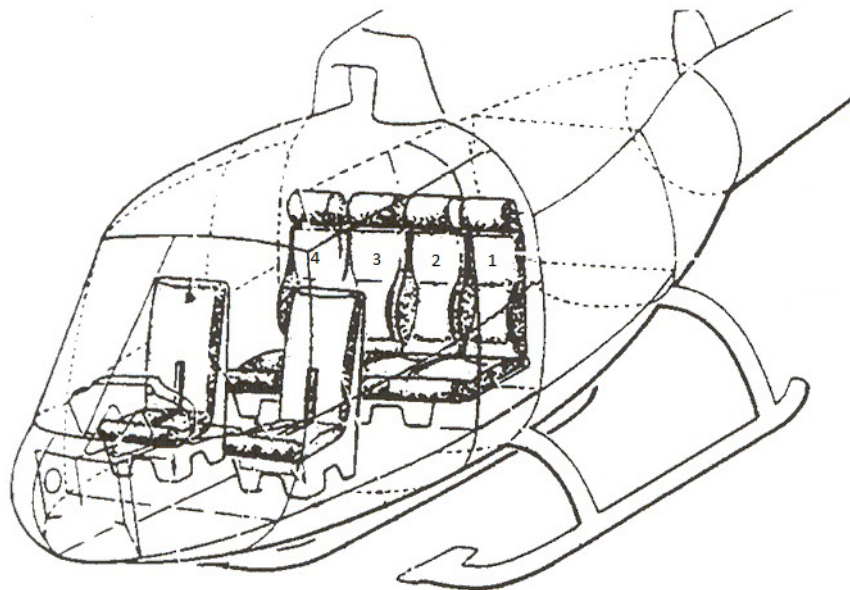


Figure 1. Interior configuration of accident helicopter N351SH.



Figure 2. Cabin interior of N351SH.

2.0 Post-Recovery Wreckage Examination

2.1 Seats And Restraints

The Airworthiness Group conducted the post-recovery wreckage examination of the airframe and detailed information can be found in the group's factual report. Additionally, the group noted that the two front seats each had a 4-point AmSafe Technical Standard Order C22f restraint system with a pull-tab release. The buckles were both manufactured by Autoflug.



Figure 3. The front seat lap belts (pilot belt on the right).

The pilot (front, right) seat base (bucket) remained attached to the airframe via its sliding track, and the seat back was fractured and separated just above the inertia reel housing but remained connected to the seat back via the shoulder harness. The back cushion was separated from the seat back. The bottom cushion was present on the seat base. The entire four-point restraint system was present. All points of the restraint system were unclashed, and the buckle remained attached to the left lap belt. The left and right lap belts remained connected to the floor anchor points. Both shoulder harnesses remained connected to the (single) center inertia reel. There was no evidence of webbing separations on any of the restraints. The inertia reel functioned normally but a portion of the belt was twisted and folded on itself in the reel. A gel lumbar support cushion was observed on the pilot seat.

The front, left seat base remained attached to the airframe via its sliding track, and the seat back was fractured and separated just above the inertia reel housing. The shoulder harness restraint had an unfrayed linear separation at the inertial reel housing, and the left lap belt had an unfrayed linear separation about 10 inches from the buckle. The length of the shoulder harness from its buckle tangs to the unfrayed linear separation (near the inertia reel) was about 5' 2" in length. No portions of the restraint system were missing. Only the left and right lap belts remained connected to the buckle; the two shoulder harnesses were not connected to the buckle. The left and right lap belts remained connected to the floor anchor points. The left side of the seat bucket was impact-damaged and a portion of it was missing. The seat back and bottom cushion remained attached to their respective portion of the seat structure.

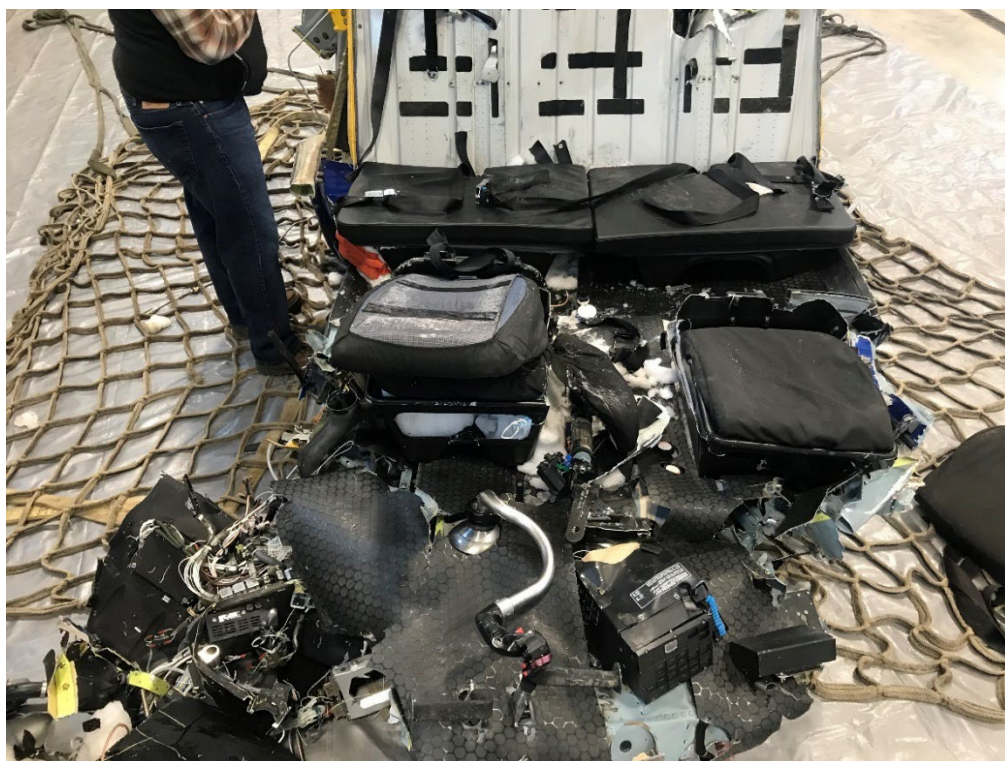


Figure 4. The two front seats of N351SH.

The four rear seats each had a 3-point restraint system. The two rear seat benches remained installed on the airframe. The seat cushions remained attached to the benches. The rear bar (pivot for the bench) remained attached to the airframe. The seat back cushions were not recovered with the wreckage.

Aft-left outboard seat (#1) restraints (buckle on left lap belt): The buckle was clasped but the right lap belt had an unfrayed linear separation about 4 inches from the belt loop (on the belt tang). The shoulder harness clasp remained attached to the fitting on the right lap belt. The shoulder harness had an unfrayed linear separation about 3 inches from the belt loop. A 3' 2" length segment of the shoulder harness remained routed through the belt pulley fitting on the upper wall, with unfrayed linear separations at both ends. On this 3' 2" segment, overload-type damage was observed on the outboard edge of the belt, about 9 inches from the inertia reel side. The remainder of the shoulder harness was outside of its aft bulkhead routing channel to the bottom of the channel. The inertia reel remained installed on the aft cabin bulkhead. A portion of the outboard side of the shoulder harness channel was peeled downward, consistent with the shoulder harness pulled out from the channel. The left and right lap belts remained attached to their respective floor anchor points. The inertia reel could not be functionally tested due to the shoulder harness being stuck within the channel.

Aft-left inboard seat (#2) restraints (buckle on right lap belt): The buckle was clasped but the right lap belt had an unfrayed linear separation about 8.5 inches from the buckle (there was a 5 inch "tail" from the buckle). The shoulder harness was not attached to the fitting on the left lap belt. The shoulder harness remained routed through the belt pulley fitting on the upper wall, with an unfrayed linear separation at the inertia reel end. From the shoulder harness tang to the unfrayed linear separation, the segment was about 3' 1" long. The shoulder harness channel was peeled downward and the channel was partially separated from the aft cabin bulkhead. The remainder of the shoulder harness was not visible on the aft cabin bulkhead. The left and right lap belts remained attached to their respective floor anchor points. The inertia reel for the shoulder harness could not be functionally tested due to the belt being retracted into the reel.



Figure 5. The lap belts for aft passenger seats #1 and #2.

Aft-right inboard seat (#3) restraints (buckle on the left lap belt): the buckle was not present in the recovered wreckage. There were cuts on both the left and right lap belts that extended from their floor mounts. The left and right lap belts remained attached to their respective floor anchor points. The shoulder harness was present and routed through its belt pulley fitting and through the channel (on the aft cabin bulkhead). The shoulder harness webbing was twisted between the pulley and the channel. An upper portion of the channel was fractured but remained retained via adhesive on a strip of Velcro. The inertia reel functioned normally.

Aft-right outboard seat (#4) restraints (buckle on the right lap belt): the buckle was clasped and there was no evidence of unfrayed linear separations on the lap belt. The right belt webbing exhibited damage about 8-10 inches from the belt loop on the buckle (there was about a 5.5" tail on the right lap belt at the buckle). The shoulder

harness was not attached to its buckle attachment. The left side of the lap belt was at its fullest extension. The left and right lap belts remained attached to their respective floor anchor points. The shoulder harness was present and routed through its belt pulley fitting and through the channel on the aft cabin bulkhead. The inertia reel functioned normally. An upper portion of the channel was fractured and partially separated.



Figure 6. The lap belts for aft passenger seats #3 and #4. The upper buckle belongs to the restraint system for aft passenger seat #2.

The fire extinguisher mount was on the back side of the pilot seat. The fire extinguisher was not present.

2.2 Emergency Locator Transmitter (ELT)

On the aft side of the aft cabin bulkhead, a Kannad 406 MHz AF-Compact ELT was installed on the upper-right side of the right baggage compartment. (The right baggage compartment was packed with snow.) The ELT remained secured to its airframe mount via a Velcro strap.



Figure 7. The ELT and portable antenna, as found in the right baggage compartment.

The antenna coaxial cable and remote cockpit control wiring remained connected to the ELT. The ELT switch was in the "ARM" position. After removal from the wreckage, the ELT switch was moved to the "OFF" position. During manipulation of the ELT switch, a beeping sound was heard momentarily, likely due to the switch inadvertently and temporarily being moved to the "ON" position. The ELT's portable antenna was found in the packed snow next to the ELT. The ELT and portable antenna were retained by the investigation group. The antenna had been fractured from its mount and was not located. The antenna mount and antenna coaxial cable were removed from the airframe and retained.



Figure 8. The ELT antenna mount on the upper left side of the tailboom.

The wiring from the “RC” port on the ELT was physically continuous and routed aft from the ELT to the tailboom-to-fuselage bulkhead, across (transverse) along the bottom side of the tailboom-to-fuselage bulkhead, then forward underneath the floor of the left baggage hold. The wiring continued forward underneath the cabin floor and was continuous to the instrument panel wiring bundle, but the back side of the instrument panel ELT rocker toggle (where the wires connect) was separated from its the button housing. The instrument panel ELT toggle was in the armed position. The instrument panel ELT toggle was able to be toggled to the “ON” and the “RESET/TEST” positions.

2.3 ELT Teardown

The ELT (part number S1840501-01, serial number LX1100445796, HEX ID ADC6499005DD255) and its portable antenna were shipped to the French Bureau d'enquêtes et d'Analyses (BEA). It was examined at an Orolia² facility on April 26, 2022. The ELT was found to be working properly. The examination report stated that the battery voltage was found to be low due to the fact that the ELT functioned during the

² Kannad Aviation is a business of the Orolia Group.

accident and transmitted for 178 hours (12884 bursts at 50-second intervals). See attachment 1 for the complete teardown report.

3.0 Search and Rescue (SAR) Summary

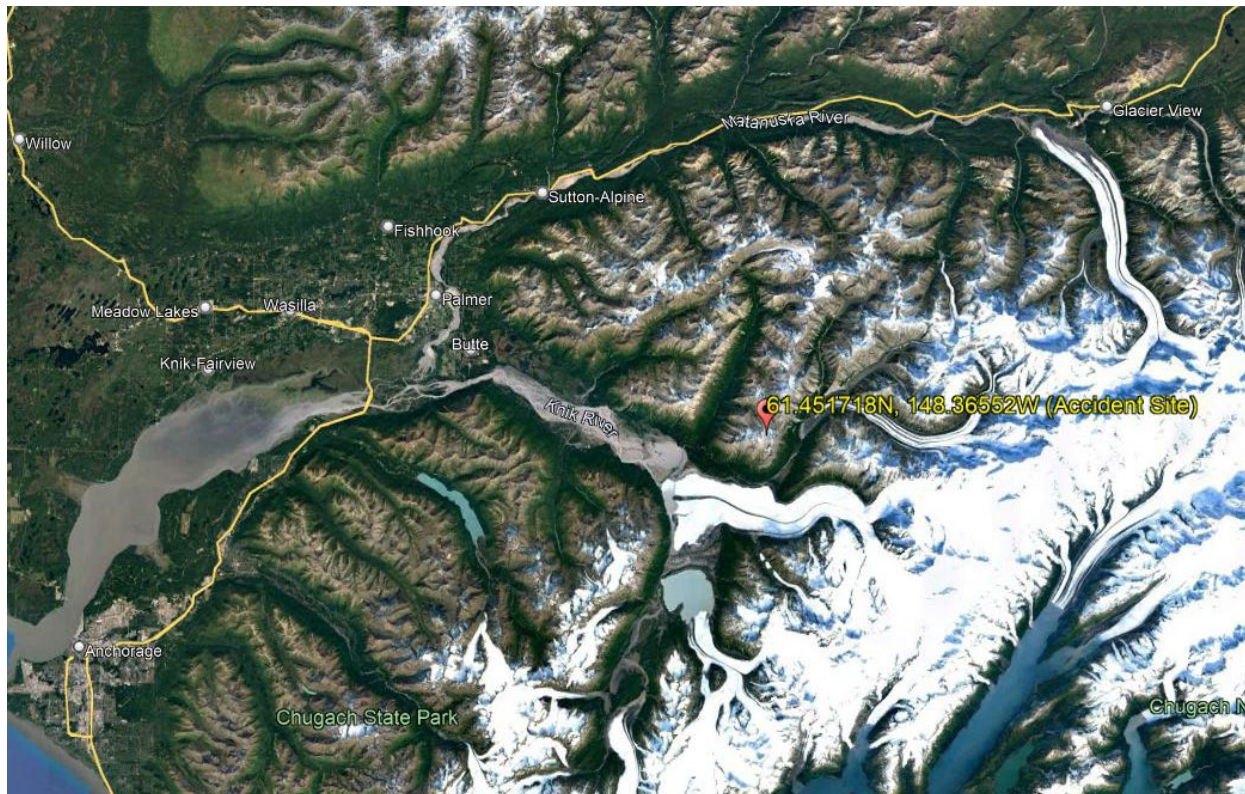


Figure 9. Accident site location of N251SH.

As noted in the NTSB's Operational Factors/Human Performance Group Chairmen's Factual Report, two helicopters from Alpha Aviation had begun an ad hoc search for the accident helicopter about 2050, after it had not been responsive to numerous attempted communications. The first notification about the accident to Alaska SAR authorities was a phone call made from Soloy Helicopters to the Alaska Rescue Coordination Center (AKRCC)³ about 2110, roughly two and a half hours after the accident.⁴ The caller stated that N351SH was nonresponsive and two hours

³ Located at Joint Base Elmendorf-Richardson, the AKRCC operated 24 hours a day, seven days a week. The center directly tied into the Federal Aviation Administration's alerting system and the U.S. Mission Control Center to automatically receive notifications from emergency locator transmitters (ELTs). It was manned by Alaska Air National Guardsmen and the AKRCC director reported to 176th Wing leadership. Representing Alaska's federal inland search and rescue coordinator, AKRCC served as the single agency responsible for coordinating on-land and aviation federal SAR activities in the mainland of Alaska.

⁴ The AKRCC call log noted the call at 2110; however, it is likely the call occurred several minutes earlier as the recorded log time was based on when the controller enters the information into the computer system, not when the call was actually answered. All times in this report are based on the

overdue. He reported that the helicopter's flight tracker showed a last known position (LKP) of 61.4515N 148.3915W in the vicinity of Metal Creek.⁵ This phone call was followed in quick succession by two phone calls at 2112 and 2119 from Third Edge Heli who confirmed the information from Soloy and stated that they were concerned and were "getting [their] crews moving."

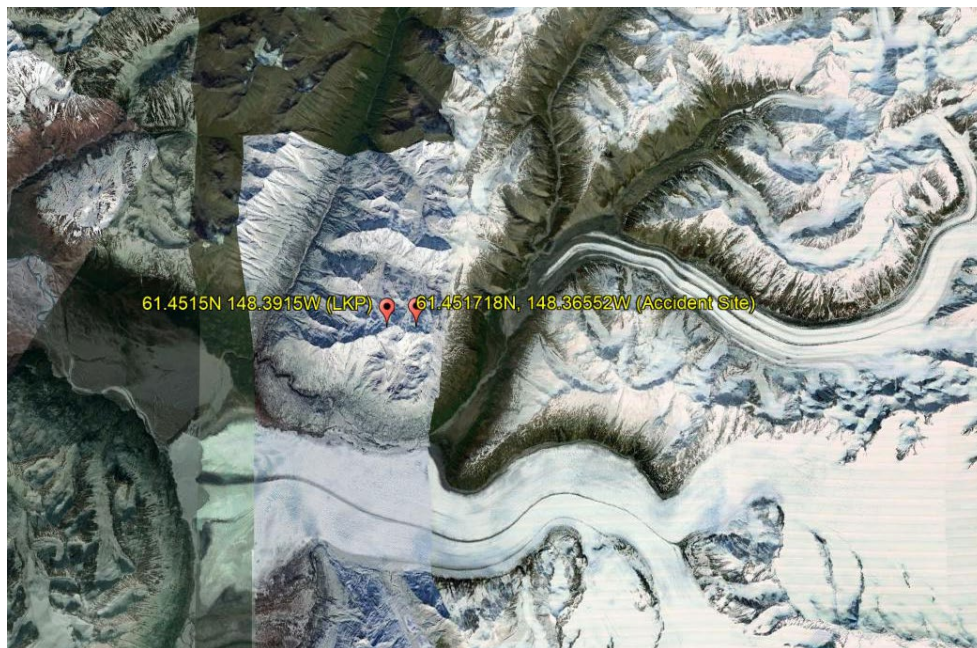


Figure 10. Locations of the original LKP and accident site.

The SAR duty officer (SARDO) of the 210th Rescue Squadron of the Alaska Air National Guard (AKANG)⁶ was immediately notified and wanted to talk to his helicopter crews about a potential response. He asked whether the Alaska State Troopers (AST) had been notified, which they had not. At 2132 Soloy reported to AKRCC that there were six occupants and multiple communication devices on board, including both satellite phones⁷ and Garmin inReach communicators. He stated that the last ping from the inReach communicators was at 1856. At 2137 the SARDO contacted AKRCC and reported he was observing an aircraft (N383AK) orbiting the LKP on his ForeFlight App. He also reported that he had spoken to the HH-60 pilot on duty and that they wanted to wait to find out what the aircraft was prior to launching. At 2144 Third Edge Heli called for an update and was told it would be "roughly an hour" to launch. Third Edge Heli confirmed that the orbiting aircraft was their helicopter.

AKRCC log, except where noted.

⁵ The accident site was 0.86 miles due east of the originally reported LKP.

⁶ The 210th Rescue Squadron was a unit of the AKANG 176th Wing located at Joint Base Elmendorf-Richardson, Anchorage, Alaska.

⁷ The Airworthiness Group recovered a satellite phone from the wreckage and turned it on to confirm it was functional.



Figure 11. Locations of Joint Base Elmendorf-Richardson and the accident site.

At 2202 Third Edge Heli called AKRCC and informed them that their helicopter had located the wreckage on the “Knik [glacier] side of the ridge.” AKRCC responded that a helicopter would be enroute to the wreckage coordinates of 61 26 50.70N 148 23 28.26W, which was approximately 50 miles NE of Elmendorf Air Force Base. As the helicopter crew prepared to launch AKRCC continued to make and field calls from Soloy, Third Edge Heli, and AST updating each entity as necessary. About 2258 AKRCC notified AST that the crew was “spinning up” about to takeoff and about 2325 the AKANG HH-60 helicopter (AFR069) was on scene searching. The wreckage was located about 20 minutes later and, according to the pilot, it was a clear night but the winds were at least 20+ knots at the top of the mountains. The site was “in a bowl” with swirling winds. It took the helicopter about 30 minutes to dump the necessary fuel and descend to a hover over the site and hoist down two parajumpers (PJs) who arrived at the wreckage about 0015.

The team leader PJ reported doing a sweep for victims and found one deceased male (aft passenger 4) about 30 feet downhill from the main wreckage. Within about 10 minutes of being on the ground the other PJ heard muffled groaning from the wreckage and realized there was at least one survivor (aft passenger 3). The team leader arrived at the wreckage and identified that the front seat occupants were deceased and that there was a deceased occupant on top of the survivor. They had accounted for 5 of the 6 occupants and prioritized extracting the survivor over a further search due to the limited time (about 1 hour) they had on the ground prior to the helicopter needing to leave for additional fuel.⁸ They used shovels to extricate the deceased occupant and the victim (who was still in his seatbelt) leaving only about 15

⁸ The 6th occupant was discovered buried under the survivor during his extrication.

minutes of on-scene time remaining.⁹ The helicopter crew hoisted down a litter and medical supplies which they used to secure the patient. Two hoists were required to remove the victim and both PJs which used the entirety of their available time on site. At 0115 the helicopter reported to AKRCC that they were en route to Providence Alaska Medical Center with one patient who was critical, and that they were 15 minutes out. The helicopter at the hospital arrived shortly after 0130.

4.0 Injury Information

Of the six occupants on board the helicopter, five were fatally injured and one passenger (aft passenger 3) was seriously injured. The cause of death for all of the fatalities involved blunt force trauma. For a detailed description of the injuries, see the NTSB medical officer’s Injury Factual Report. According to information from the PJs who were first on-scene, one passenger (aft passenger 4) was ejected from the helicopter) while the other five occupants were found in the cabin wreckage. The survivor was still wearing his seatbelt which had to be cut for him to be extricated.

The Alaska Mountain Rescue Group participated in the extraction of the 5 fatally injured victims on March 28, 2021. They reported the locations¹⁰ of the victims as follows:

- #1: Located 20-30-ft downhill from the nose of aircraft, head uphill, lying on back.
- #2: Prone, front left of aircraft, feet forward
- #3: Underneath #2, in similar position
- #4: Back left of aircraft
- #5: Underneath #4

	Flight Crew	Cabin Crew	Passengers	TOTAL
Fatal	1	0	4	5
Serious	0	0	1	1
Minor	0	0	0	0
None	0	0	0	0
TOTAL	1	0	5	6

Table 1. Injury Chart

⁹ The survivor’s lower body was buried in snow as a small avalanche (created by the accident) partially filled the cabin with snow after it came to rest.

¹⁰ The numbering system used by AMRG to identify the victims does not correspond to seating position within the helicopter.

E. LIST OF ATTACHMENTS

Attachment 1: ELT teardown report

Attachment 2: SAR timeline

Submitted by:

Jason T. Fedok

Survival Factors Investigator