NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

June 21, 2022

Specialist's Report

SURVIVAL FACTORS

ANC22FA041

A. ACCIDENT

Location: Kalae, Hawaii
Date: June 8, 2022
Time: 1726 Hawaii standard time (HST)
0326 Coordinated Universal Time (UTC)
Helicopter: Bell 407, N402SH

B. SURVIVAL FACTORS SPECIALIST

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National Transportation Safety Board
Washington, DC

C. DETAILS OF THE INVESTIGATION

A survival factors investigator was assigned to this case on June 10, 2022. On-scene documentation of the fuselage, seats, and restraints took place on June 14, 2022. The wreckage was transported to a hangar at Ellison Onizuka Kona International Airport (KOA) on the island of Hawaii. Additional documentation of the recovered wreckage occurred on June 15, 2022, at a hangar on the airport. The U.S. Coast Guard Joint Rescue Coordination Center (JRCC) situation report, the operator dispatch logs, and the Hawaii County fire incident report were reviewed to create a timeline of the search and rescue. Records of conversation with the passengers and pilot were used to create a summary of the accident and evacuation.

D. FACTUAL INFORMATION

1.0 Helicopter Configuration

The helicopter was equipped with two forward-facing pilot seats in the cockpit, and two aft-facing and three forward-facing passenger seats in the cabin (see figure 1). The copilot (left-hand) seat could be used for an additional passenger during tour operations by removing the cyclic. There was a pilot and five passengers on board the accident flight. Passengers were seated in the copilot seat (passenger 1), both aft-facing seats (passengers 2 and 3), and the two outboard forward-facing seats (passengers 4 and 5).

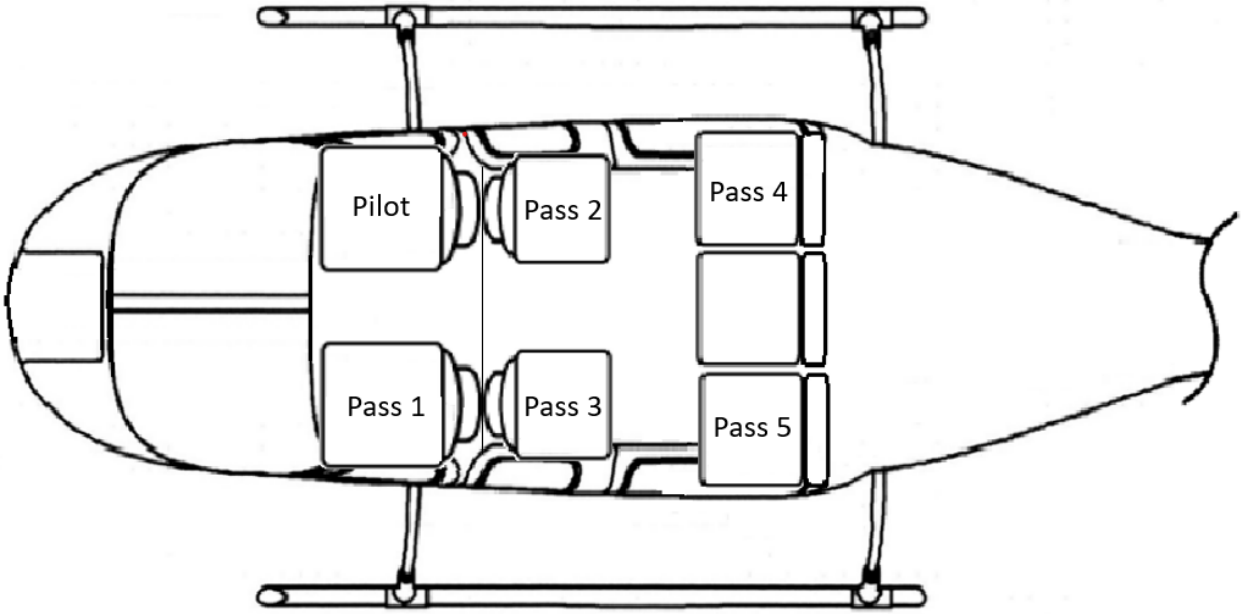

Figure 1. Diagram showing the seating position locations of N402SH.

Figure 2. Photo from paradisecopters.com showing the accident helicopter.

2.0 Post-accident Overall Volume

The helicopter was found lying on its left side with significant damage to the cockpit (see figure 3). The cabin had crushing that compromised the occupiable volume on the left side (see figure 4). The right-side cabin door came open during the impact sequence and remained held opened by the pneumatic assist until the recovery crews detached it. The tail boom was separated and located 762 feet from

the main wreckage site. For details of the wreckage layout see the Airworthiness Group Factual Report.

Figure 3. Top view of the accident helicopter N402SH.

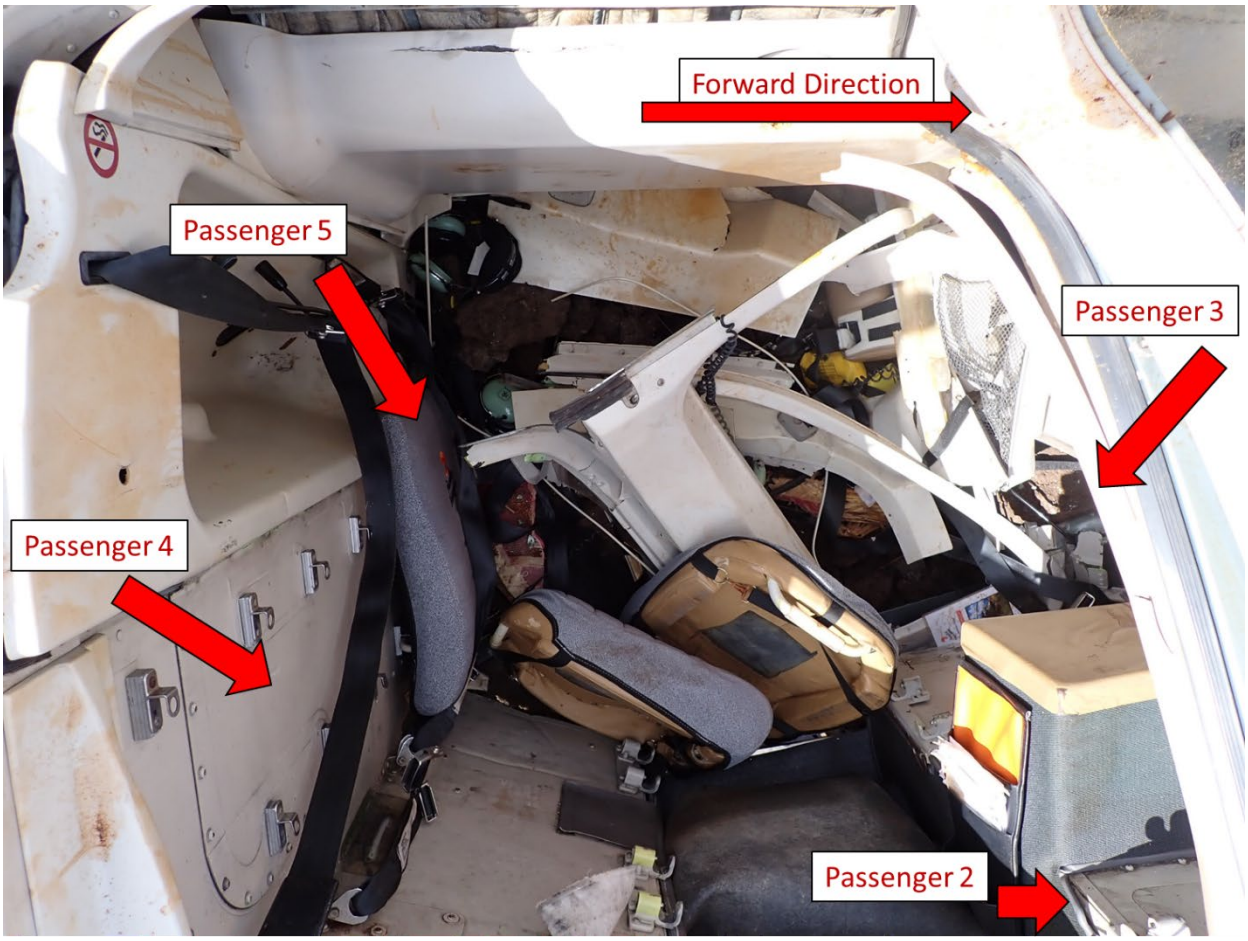

Figure 4. On-scene view from the right side of the helicopter looking down into the cabin interior.

The cabin area was measured for length, width, and height, then compared to a sister ship N808PH (see table 1). The length was measured from the aft to the forward door frame structure (see figure 5). The height was from the center of the box structure of the aft forward-facing seat behind the pilot to the overhead structure. The width was from the door frame on the left to the right across the middle of the aisle between the passenger seats.

Table 1. Table comparing measurements of accident and exemplar helicopters.

	Accident Helicopter (N402SH)	Exemplar Helicopter (N808PH)
Length (inches)	58.75	60
Width (inches)	47	46.5
Height (inches)	42	41

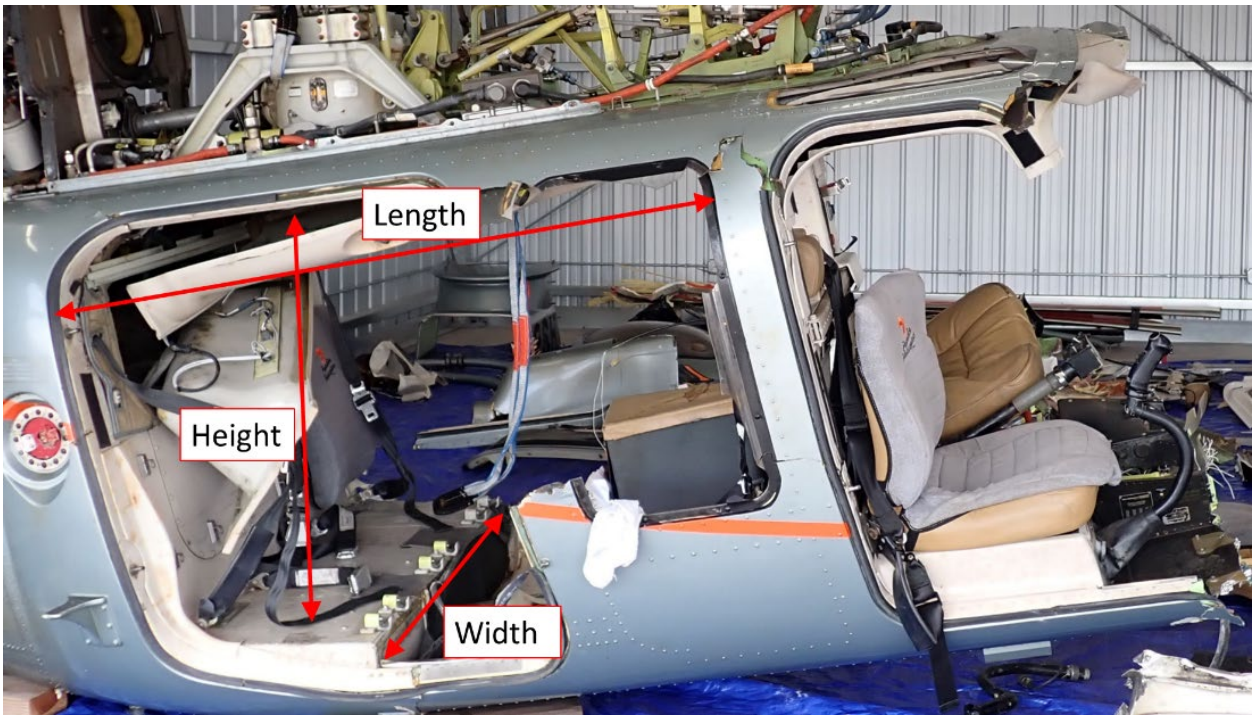

Figure 5. Measurements of the cabin volume of the accident helicopter.

The structure around the copilot seat was compromised when the helicopter came to rest in the lava field. There was a large piece of lava rock that was penetrating approximately 13 inches into the cockpit area adjacent to the front passenger seat (see figure 6).

Figure 6. Photograph of lava rock that penetrated the cockpit area.

3.0 Seats and Restraints

All seats were original equipment manufacturer (OEM) seats that were delivered with the helicopter. The seats were composed of a seatback and seat bottom cushion each attached to a tubular frame with fabric and adhesive (see figure 7). No labels were found on any of the cushion assemblies. The bottom cushion frame was secured to a box structure that was integrated into the fuselage. The seatback cushion frame for the pilot, copilot, and both aft-facing seats were secured to structure that separated the cockpit and the cabin. The forward-facing seatback cushion frames were secured to the aft bulkhead of the cabin.

Figure 7. Seat bottom cushion found at the wreckage site.

3.1 Pilot and Passenger 1 Seats

The pilot seat was located on the right-hand side of the cockpit, and had both cushions still secured to the seat structure (see figure 8).

Figure 8. Pilot seat as found at the wreckage location.

Passenger 1's seat was on the left-hand side of the cockpit. The structure located behind the occupant was destroyed during the impact and the seatback cushion was not found. The boxed structure under the seat bottom cushion, was deformed upward at the forward left-hand corner (see figure 9). The cyclic was

removed prior to the accident flight because a passenger was to be seated in that position.

Figure 9. Co-Pilot seat which was occupied by passenger 1.

The pilot and passenger 1's restraints were a four-point yoke style belt manufactured by Schroth Safety Products. They were composed of two sides and secured with a rotary buckle. The right-hand side had a lap belt and shoulder belt that were permanently affixed to a buckle tang. The left-hand side had a lap belt and a shoulder belt affixed to a buckle tang which was permanently secured in the rotary buckle (see figure 11). All four segments had adjusters. The webbing was in good condition and the restraints were found unbuckled when investigators arrived. The inertia reel and buckles functioned normally. No labels were present on the webbing, and the inertia reel could not be accessed to get any identifying information.

The pilot seat restraints were mostly undamaged, except for upper portion of the torso restraint yoke, which had ripped stitching (see figure 10). The pilot seat

rotary buckle was labeled: Schroth Safety Products GmbH – Arasberg/Germany, Type SL 15.6A, DATE 49/12.

Figure 10. The pilot torso restraint with ripped stitching.

The passenger 1's right lap belt attachment point was separated from the anchor point. During recovery operations the shoulder belts were cut to facilitate removal of loose structure. The rotary buckle was labeled Schroth Safety Products GmbH – Arasberg/Germany, Type SL 15.7A, DATE 50/11.

Figure 11. Pilot and passenger 1 restraint system.

3.2 Aft-Facing Passenger Seats 2 and 3

Passenger seat 2 was aft-facing in the cabin located behind the pilot. No cushions were found attached; however, the seating support structure was intact and showed no deformation (see figure 12). The surrounding structure was damaged but still present on-scene, including the right-side door.

Figure 12. Passenger 2 seat at the accident location.

Passenger seat 2's webbing was in good condition and the restraints were found unbuckled when investigators arrived. There was a fabric label on the shoulder belt that read:

AmSafe Inc. Phoenix, AZ
F/A 504096-405-2396
P/N 504096-221-2396
Cust P/N 407-370-721-119
Cust F/A 407-370-721-105
Model No. 501661-2
CAA AR-162
Date of Mfg. A0996
Rated Strength 1100
Webbing replaced per PS-01
Date 03/08 by
AmSafe Aviation, Griffin, GA

Repair Station S29R29J

There was a fabric label on the lap belt that read:

AmSafe Inc. Phoenix, AZ
F/A 504096-405-2396
P/N 504096-221-2396
Cust F/A 407-370-721-105
Cust P/N 407-370-721-113
Model No. 501661-2
CAA AR-162
Date of Mfg. A0996
Rated Strength 1500 Lbs.
Conforms to F/AA TSO C-22f
Webbing replaced per PS-01
Date 03/08 by
AmSafe Aviation, Griffin, GA
Repair Station S29R29J

Passenger seat 3 was aft-facing located behind the passenger 1. No cushions were found attached; however, the bottom seating support structure was intact and showed no deformation (see figure 13). The structure behind the occupant had detached from the helicopter but was still contained in the cabin wreckage on-scene.

Figure 13. Passenger seat 3, aft-facing located behind passenger 1's seat.

Passenger seat 3 restraints were three-point belts manufactured by Amsafe with a lift latch buckle. The shoulder belt was routed over the occupant's outboard shoulder down to an inertia reel which was secured to the airframe. The inertia reels and buckles functioned normally. The buckles were labeled with PAT NO 5,088,160.

Passenger seat 3's shoulder belt, and right lap belt had been cut by passengers to help passenger 1 evacuate the helicopter, according to passenger 2. The left portion of the lap belt was intact, with no damage to the webbing or buckle. The shoulder belt and the right lap belt webbing were attached to structure that fell away when the wreckage was lifted (see figure 14). There was a fabric label on the lap belt that read:

AMSAFE
AmSafe Inc.
1043 W 47th Ave
Phoenix, AZ 85043
PNR 900096-40112396
Mfr 35FBO. DMF 04/10/14
ASSY
S/A

M/Num 50 1661.2
C/PNR 407-370-281-101
S/N (illegible)
Conforms (illegible)
(The rest of the tag was illegible)

The inertia reel was labeled:
AMSAFE
1043 W 47th Ave
Phoenix, AZ 85043 USA
P/N 7360191-A91
Calib 1.5 +/-.5g
Date 01/07/15
Rework by AmSafe only

Figure 14. Passenger seat 3 shoulder belt and lap belt webbing attached to structure that was damaged in the accident. The webbing was cut by passengers to help passenger 1 evacuate.

3.3 Forward-Facing Seats 4 and 5

Passenger seats 4 and 5 were forward-facing seats located in the aft portion of the cabin. Seat 4 was located behind the pilot and 5 behind the copilot. Only the seatback cushion for seat 5 was found still attached. The bottom boxed support structure was intact and showed no deformation (see figure 15).

Figure 15. Passenger seats 4 and 5 located in the aft part of the cabin after recovery back to the airport.

The restraint was a three-point belt manufactured by AmSafe with a lift latch buckle. The shoulder belt was routed over the occupant's outboard shoulder and then to an inertia reel secured to the airframe behind a piece of trim. The restraints were intact with no damage to the webbing or buckle. Lap belt attachment points were in good condition. The inertia reels and buckles functioned normally. The lift latch was labeled with PAT NO 5,088,160 and there were fabric labels on the shoulder belts that read:

AMSAFE
AmSafe Inc.
1043 W 47th Ave
Phoenix, AZ 85043

PNR 504095-401-2396
Mfr 35FB9 DMF 10/21/16
ASSY
S/A
M/Num 501661-2
C/PNR 407-370-720-101N
S/N
Conforms To:
CAA AR-162
PHYS CHG 00
Rates 1100 LBS.
Repair by AmSafe Only

There were fabric labels on the lap belt that read:

AMSAFE
AmSafe Inc.
1043 W 47th Ave
Phoenix, AZ 85043
PNR 504095-401-2396
Mfr 35FB9 DMF 10/21/16
ASSY
S/A
M/Num 501661-2
C/PNR 407-370-720-101N
S/N
Conforms To:
FAA TSO-C22f
CAA AR-162
PHYS CHG 00
Rates 1500 LBS.
Repair by AmSafe Only

4.0 Emergency Equipment

4.1 Passenger Briefing Card

Multiple passenger briefing cards were found in the debris around the lava field. They contained instructions in graphical form (see figure 16 and 17). The cards included information about:

- Location of survival equipment.
- Location and operation of the fire extinguisher.
- Operation of doors.

- Safe approach and exit areas for the helicopter.
- How to don and inflate the life vests.
- Approved electronic devices and no smoking.
- How to buckle and unbuckle seat belts both lift latch and rotary.
- Emergency bracing position.

Figure 16. Passenger briefing card found in debris.

Figure 17 Back of the passenger briefing card found in debris.

4.2 Life Vests

Each passengers had a life vest secured around their waist prior to being loaded in the helicopter (see figure 15). According to passenger interviews all life vests remained attached through the accident and evacuation.

Figure 18. Passengers with life vests attached prior to boarding the accident flight.

4.3 Fire Extinguisher

A single fire extinguisher was found in the debris around the helicopter in the lava field. It was normally stowed in a cradle to the left of the pilot about head height. According to passenger 3 it was secured in the stowage location before the passenger removed it for use.

4.4 First Aid Kit

A first aid kit was found in the debris field. According to passenger statements they were able to locate, remove and use the kit for first aid of the injured passengers.

4.5 Emergency Location Transmitter (ELT)

An Emerging Lifesaving Technologies 406 MHz ELT was found secured in the tail section of the helicopter in its cradle with the switch still in the “ARM” position. It had a data label affixed to the top (see figure 19). On the back side of the ELT was the battery information which included a part number 217-406-001, weight 1.2, and expiration date of 2/24/2027.

Figure 19. ELT data label.

5.0 Accident Narrative

The passengers arrived at Paradise Helicopters around 1615 for a 1700 sunset flight around the island. Upon arrival they were checked in and weighed, then taken to a separate room for a safety briefing by Paradise Helicopter personnel. The PowerPoint and verbal briefing included entering and exiting the helicopter, use of the headphones, door operation, how to wear the life vests and don in the event of a water landing, and seat belt operation. During the briefing the passengers observed the helicopter land, the pilot exit, and walk around the exterior of the helicopter prior to coming into the briefing room. Passengers did not feel that the brief was rushed and estimated it was about 15 minutes long. The pilot introduced himself and described his experience with more than 3,000 hours in that type of helicopter. At this point the passengers, with help from Paradise Helicopter staff, secured the life vests around their waists and were led to the helicopter. Once everyone was loaded and seat belts secured, the flight took off.

After about 30 minutes of flight toward the south point of the island, passengers reported feeling the helicopter roll upside down. The pilot was able to stabilize the helicopter for a moment before it began to spin. The helicopter had a slight nose down tilt about "10-20 degrees," so that while they were spinning "the nose would be pointed down, then up, then down again as it went around." They estimated that it took about 15 seconds from the initial roll to impact.

The helicopter impacted the lava field on its left side. During the impact the right cabin door came open but remained attached to the helicopter (see figure 3). Passenger 3 evacuated first followed by passengers 4 and 5. Passenger 2 unbuckled his seat belt and was standing up trying to get passenger 1 out. Passenger 2 evacuated the helicopter to help passenger 4 get away from the helicopter. He then went back to the helicopter where passenger 1 and the pilot were still trapped.

Passenger 1 was conscious and screaming in pain. It appeared her head was caught between the seatback and the rock below. Her feet appeared to be tucked under her and the fuselage. Passengers 2 and 3 lifted some wreckage off her feet so they could move her which also freed her head. The damaged cockpit structure prevented them from getting her out through the front or the pilot side. Instead, they worked to take her out rearward through the cabin. Passenger 2 found a seat belt cutter lying in the debris and used it to cut webbing material to free her. He also removed sheet metal and debris. He was able to pull her rearwards into the cabin area and lift her up to passenger 3. He held her until passenger 2 was able to get out and help carry her away from the wreckage.

Passengers 2 and 3 then went back to get the pilot out. He was unable to evacuate himself. They carried him away from the helicopter but only about half the distance they had taken passenger 1 due to his weight and the pain levels. Passenger 2 stated the pilot did not lose consciousness but was in shock. The pilot would not respond to commands, and was repeating himself, apologizing and asking if everyone was out of the helicopter. The pilot was complaining of pain in his back, shoulder, arm, and ribs.

After getting everyone away from the helicopter passengers 2 and 3 looked for a first aid kit, fire extinguisher, and a flare gun. They were able to locate the fire extinguisher and first aid kit. Passenger 3 felt like the kit was “severely lacking.” During this time passenger 5 called 911, and passenger 3 climbed up on the rocks to help signal the rescuers.

6.0 Search and Rescue (SAR)

6.1 Hawaii Fire Department (HFD)

HFD was primarily responsible for fire protection and suppression, pre-hospital emergency medical services, land and sea search and rescue, hazardous materials response, ocean safety, and fire prevention and public education for the County of Hawaii. There were 20 full time fire stations and 24 volunteer fire stations.

To support search and search and rescue efforts HFD has two helicopters housed at two separate fire stations on the island, as well as engines and medical

vehicles. Five of the 20 stations participated in the SAR efforts, with equipment described below:

Station 2 Waiakea:
Chopper 1, MD 500, rescue helicopter
Fuel truck 2, 2010 Ford F-550

Station 6 Captain Cook:
Medic 6, 2015 Ford F-350

Station 7 Kailua-Kona:
Rescue truck 7, 2009 Ford F-550

Station 14 South Kohala:
Chopper 2, Bell 206L3, medical transport helicopter
Fuel truck 14, 1993 Ford F-350

Station 20 Oceanview:
Engine 20, 2020 Pierce Arrow XT
Medic 20, 2015 Ford 350

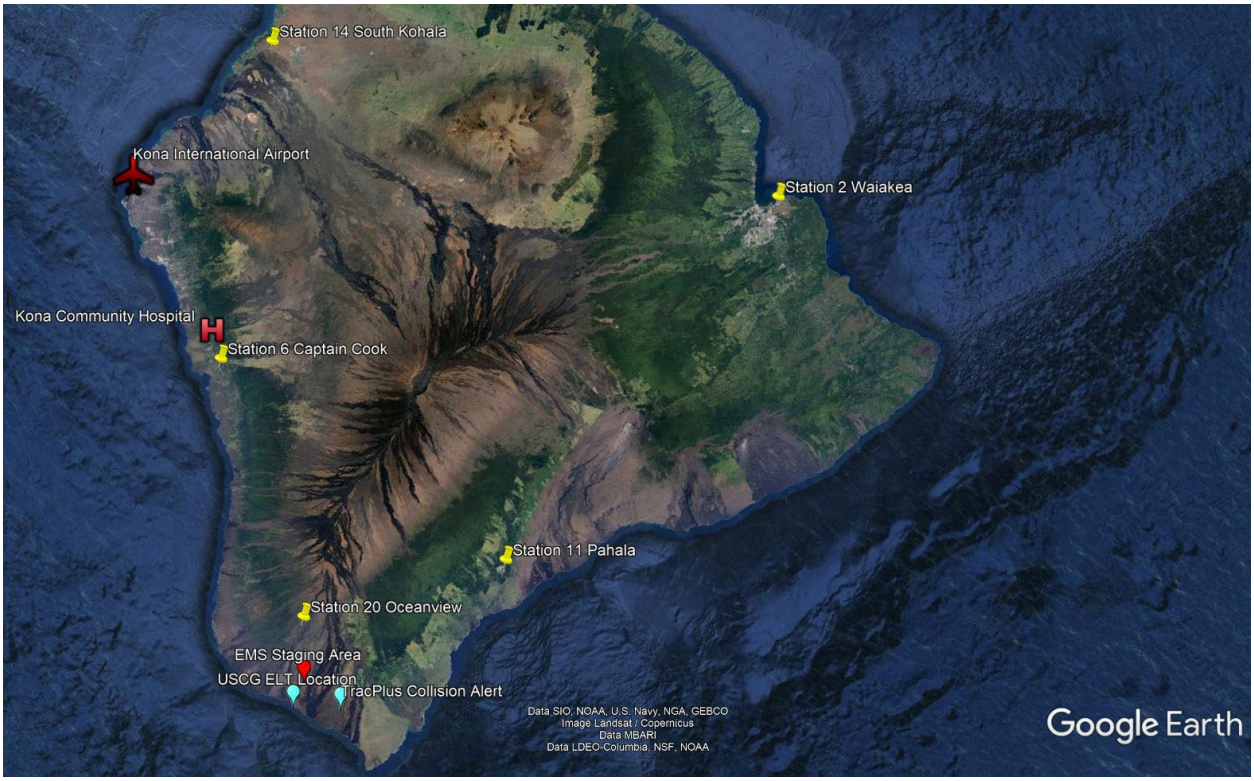

Figure 20. Google Earth view of the island, with fire stations, ELT location, airport, and hospital.

7.0 SAR Summary

On June 8, 2022, about 1728, the U.S. Coast Guard (USCG) Honolulu Joint Rescue Coordination Center (JRCC) received an emergency locator transmitter alert with a location of 18°59’54” N, -155°47’36” W. About the same time, according to call logs, a passenger contacted 911. About four minutes later the Hawaii County Fire Department (HFD) alarm was sounded, and between 1737 and 1745 HFD dispatched Medic 11 and both chopper 1 and chopper 2.

Chopper 1 was outfitted for rescue and chopper 2 for medical operations. About 1815 chopper 1 arrived at the scene using the ELT location and information from passengers to locate the wreckage. About the same time medic 11 arrived at a staging area about 4.5 miles away. Chopper 1 was first to land about 100 feet away from the accident helicopter and dropped off a paramedic and a rescuer to assess the scene. The paramedic stayed with the pilot and passenger 1, who were the most seriously injured. The rescuer helped load passengers 2, 3, 4, and 5 into the chopper 1fire department helicopter which then took them to the EMS Staging Area at Hawaii Ranchos Estates. The passengers were put into ambulances where they were triaged.

Chopper 2, which was a medivac helicopter, arrived at the scene about 1817. After chopper 1 departed, chopper 2 picked up passenger 1 first as she was the most seriously injured. Both patients required a backboard for transport and chopper 2 could only take one at a time. About 1851 medic 6 was dispatched to the scene. Passenger 1 was flown to the staging area and dropped there for triage while chopper 2 returned to pick up the pilot for transport to the staging area.

At the staging area it was determined that passenger 1 was the most seriously injured requiring rapid transport to a hospital. The pilot was loaded into an ambulance and passenger 1 was loaded back into chopper 2 for transport to Kona Community Hospital (KCH). The pilot and other passengers were transported to KCH via ambulance. About 1915 both medic 11 and chopper 2 were enroute to the KCH, followed later by medic 6 about 1938. Chopper 2 arrived at KCH with passenger 1 about 1933, and medic 6 and medic 11 about 2010 with the pilot and remaining passengers.

A more detailed timeline of events was constructed from the U.S. Coast Guard (USCG) Honolulu Joint Rescue Coordination Center (JRCC) situation report, the Hawaii County Fire Department (HFD) logs, passenger call logs and the Paradise Operations TracPlus data. and is included as attachment 3 of this report.

8.0 Injury Information

All occupants were transported to Kona Community Hospital for initial treatment for injuries. These consisted of lacerations, bruises, and abrasions, with

some occupants sustaining fractures. The pilot and passenger 1 were later transferred to Queen's Medical Center in Honolulu, Hawaii for additional treatment. Details of the injuries are in attachment 5 of this report.

8.1 Injury table

Type of injury	Crew	Passengers	Total
Fatal	0	0	0
Serious	1	2	3
Minor	0	3	3
None	0	0	0
TOTAL	1	5	6

E. LIST OF ATTACHMENTS

Attachment 1: Pilot interview transcript
Attachment 2: Passenger record of conversations
Attachment 3: Hawaii County Fire Department pilot record of conversation.
Attachment 4: Timeline of events.
Attachment 5: Injury table

Submitted by:

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