Aviation Investigation Final Report

Location:	Palmer, Alaska	**Accident Number:**	WPR21FA143
Date & Time:	March 27, 2021, 18:36 Local	**Registration:**	N351SH
Aircraft:	Airbus Helicopters AS350-B3	**Aircraft Damage:**	Substantial
Defining Event:	Loss of visual reference	**Injuries:**	5 Fatal, 1 Serious
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled		

Analysis

A local lodge had contracted with the helicopter operator to transport passengers from a private residence to a heli-ski area at a nearby mountain. The surviving passenger stated that, before the last ski run of the day, the pilot attempted to land on a ridgeline but that the helicopter lifted off for an attempted second landing. The passenger also stated that, during the second landing attempt, the snow was “real light” but that the helicopter became “engulfed in a fog which made it appear like a little white room.” The helicopter subsequently began “going backward real fast” and impacted the ridgeline and rolled backward down the mountain.

Postaccident examination of the airframe and engine revealed no preimpact mechanical malfunctions or failures that would have precluded normal operation of the helicopter. The passenger’s recollection of the conditions just before the accident was consistent with whiteout conditions caused by rotor wash while the helicopter was hovering near the ridgeline. Thus, the pilot likely experienced whiteout conditions during the second landing attempt, which caused him to lose visual reference with the ridgeline and resulted in the helicopter impacting terrain.

Title 14 *Code of Federal Regulations* Part 135 required flight-locating for the helicopter in case it was overdue so that information about the helicopter’s location could be reported to a Federal Aviation Administration (FAA) or a search and rescue facility. The helicopter operator stated that it had delegated the responsibility for flight-locating to the local lodge. However, this delegation was not documented in the company’s FAA operations specifications or general operations manual, as required by Part 135.

On the day of the accident, the local lodge was providing flight-following for the accident helicopter, which, unlike flight-locating, was not required by Part 135. The helicopter was expected to depart the heli-ski area for the principal operations base once all the ski runs had

been completed. The flight-follower informed his supervisor that 40 minutes had elapsed since the helicopter moved from its last recorded position and that there had been “no positive comms” with the ski guide during the last 1.5 hours; this notification was made 41 minutes after the last “ping” from the helicopter. However, the remote area in which the accident flight was operating had limited communication capabilities, and no clear evidence indicated that an accident had occurred.

The flight-follower’s supervisor contacted another heli-ski company to help determine the status of the helicopter. The heli-ski company considered the flight to be “ops normal” and expected that the last lift would occur shortly. The supervisor instructed the flight-follower to “keep an eye on” the accident helicopter; however, the lodge’s emergency response plan stated that a search and rescue facility should be contacted “if communication with the helicopter is not established by the end of the prearranged [time] or 30-minute grace period.” Therefore, it would have been reasonable for the lodge to activate its emergency response plan at this point given that the helicopter’s location was unknown at the time.

The flight-follower continued to try to reach the helicopter but was unsuccessful. About 90 minutes after the last flight-following “ping” for the helicopter, the lodge received erroneous information from the heli-ski operator that the accident helicopter was “inbound” for the private residence; however, lodge personnel did not realize that this information was not accurate and that the accident had occurred immediately after the last ping. This incorrect information likely played a role in the lodge’s further delay in activating its emergency response plan.

About 1 hour and 50 minutes after the accident (and the last flight-following ping), the heli-ski operator notified the accident helicopter operator about the overdue aircraft. Five minutes later, the lodge notified the helicopter operator that it was activating its emergency response plan. About 2 hours after the accident occurred, the helicopter operator activated its emergency response plan. About 17 minutes later, the helicopter operator notified the Alaska Rescue Coordination Center. The director of operations for the helicopter operator stated that the search and rescue notification did not occur before that time because he had been “working through the information that was provided” about the helicopter.

The helicopter wreckage was located about 3.5 hours after the accident. Rescue personnel launched within 1 hour of notification and arrived on scene less than 30 minutes later (about 5 hours 40 minutes after the accident). The surviving passenger was transported via helicopter to a local hospital. Upon arrival at the hospital, the surviving passenger had hypothermia and severe frostbite. A shorter exposure to the cold would likely have decreased the severity of the surviving passenger’s injuries. However, a faster emergency response time (and thus shorter exposure to the cold) could only have occurred if the notification to search and rescue personnel had been timelier. Thus, because the lodge and the helicopter operator did not activate their emergency response plans sooner, the initiation of search and rescue operations was delayed.

Given the circumstances of this accident, the investigation considered three types of training

that the pilot should have received: inadvertent instrument meteorological conditions (IIMC) training; controlled flight into terrain-avoidance (CFIT-A) training, during which instruction in whiteout conditions would be conducted; and ridgeline training. Review of the operator's pilot training program showed that ridgeline training was not provided for the make and model of the accident helicopter (or the previous helicopter in which the accident pilot had been trained).

Further, IIMC training was a part of CFIT-A training, and the CFIT-A manual stated that pilots were required to complete IIMC training annually. However, the chief pilot for the helicopter operator stated that the related test for pilots (to demonstrate understanding of the subject) was only administered when a pilot was first hired, and the director of operations stated that the company's only IIMC flight training involved recovery from unusual attitudes. In addition, review of the accident pilot's flight training records found that he completed IIMC training 14 months before the accident (which was about 1 year after he began working for the operator), but the records did not reflect the specific IIMC training that the pilot received. Based upon the information provided by the operator, it could not be determined if the accident pilot had fulfilled the training requirement.

The director of operations reported that the helicopter operator did not accomplish flight training as part of its CFIT-A training; however, flight training was not required for that subject, and the pilot received CFIT-A ground training. The CFIT-A manual stated that, if inadvertent whiteout conditions were encountered, the pilot was to rely on flight instruments and carefully attempt to maneuver the helicopter away from obstacles and terrain.

Additional review of training records revealed that, during competency checks, the helicopter operator was not evaluating several requirements of 14 *CFR* 135.293, including recovery from IIMC, navigation, air traffic control communication, and instrument approach flying. Paragraph (c) of the regulation required a pilot to demonstrate the ability to maneuver the helicopter into visual meteorological conditions after a simulated encounter with IIMC, a skill that was needed during the accident flight. The operator stated that it did not have any instrument-flight-rules (IFR) aircraft capable of IFR approaches, but the GPS model installed on the accident helicopter had IFR capabilities with instrument approach procedures in its database. Thus, given the deficiencies in the operator's pilot training program and Part 135 checkrides, particularly regarding IIMC, it is likely that the pilot did not meet the qualification standards to be the pilot in-command of the accident flight.

The FAA principal operations inspector (POI) for the operator failed to ensure that the company's operations specifications (specifically, paragraph A008) contained the operational control information required by 14 *CFR* 119.7 and 135.77. (Flight-locating was part of operational control.) The company's operations specifications did not describe who would be responsible for the safe operation of company flights and how those flights would be operated to meet requirements; thus, the operations specifications were incomplete. Although the company should have noticed this omission before the operational specifications were signed, the POI was ultimately responsible for ensuring that the operations specifications contained all

the required information.

FAA Order 8900.1, paragraph 3-1255, discusses helicopter flight training maneuvers that "must be conducted for satisfactory completion of each category of flight training." The order also stated that all helicopter pilots operating under Part 135 "must be trained on procedures for the avoidance and recovery from IIMC" and that inspectors were required to ensure that operational procedures for recovery from IIMC are incorporated into the certificate holder's training curriculums. Thus, the POI failed to ensure that the operator's training program contained all required elements, which also included ridgeline training, before approving the training program. In addition, the POI was also unaware that the operator was not conducting competency checks in accordance with section 135.293(c) and that its checkrides were only assessing a pilot's recovery from unusual attitudes.

From 2011 to 2013, the POI was the chief pilot for the accident operator; from 2001 to 2011, she worked at another helicopter company with the person who later became the president of the accident operator. The POI started her employment with the FAA in 2016 and, 2 years later, became the POI for the accident operator. The available evidence for this investigation was insufficient to determine whether the POI's previous employment history was a factor in the inadequate oversight of the accident operator.

Toxicology testing of specimens from the senior lead ski guide identified two central nervous system stimulant drugs: amphetamine and cocaine. Given the drug levels measured in his blood, the senior lead ski guide was likely impaired by drug effects at the time of the accident. Toxicology testing of specimens from the other lead ski guide identified delta-9-tetrahydrocannabinol (THC), the primary psychoactive component in cannabis. The low THC level measured in his blood indicates that he was not likely experiencing significant impairment from THC effects at the time of the accident. Although ski guides are not considered crewmembers according to the *Federal Aviation Regulations*, they have safety-related responsibilities during heli-ski flights such as coordinating with pilots about landing and pickup zones and assisting pilots with hazard and pickup zone identification. However, the investigation was unable to determine whether the senior lead guide's illicit drug use played a role in the accident.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's failure to adequately respond to an encounter with whiteout conditions, which resulted in the helicopter's collision with terrain. Contributing to the accident was the (1) operator's inadequate pilot training program and pilot competency checks, which failed to evaluate pilot skill during an encounter with inadvertent instrument meteorological conditions, and (2) the Federal Aviation Administration principal operations inspector's insufficient

oversight of the operator, including their approval of the operator's pilot training program without ensuring that it met requirements. Contributing to the severity of the surviving passenger's injuries was the delayed notification of search and rescue organizations.

Findings

Environmental issues	Whiteout - Contributed to outcome
Personnel issues	Use of equip/system - Pilot
Personnel issues	Decision making/judgment - Pilot
Personnel issues	Total instruct/training recvd - Pilot
Organizational issues	Emergency proc training - Operator
Organizational issues	Initial training - Operator
Organizational issues	Recurrent training - Operator
Organizational issues	Oversight of operation - FAA/Regulator
Organizational issues	Oversight of operation - Operator
Organizational issues	Oversight of operation - Other institution/organization
Personnel issues	Qualification/certification - Pilot
Organizational issues	Adequacy of policy/proc - Operator

Factual Information

History of Flight

Landing	Loss of visual reference (Defining event)
Landing	Collision with terr/obj (non-CFIT)

On March 27, 2021, about 1836 Alaska daylight time, an Airbus Helicopters AS350-B3, N351SH, was substantially damaged when it was involved in an accident near Palmer, Alaska. The pilot and four passengers were fatally injured, and one passenger was seriously injured. The helicopter was operated under Title 14 *Code of Federal Regulations* (*CFR*) Part 135 as an on-demand air charter flight.

Representatives from the operator, Soloy Helicopters, reported that the helicopter was under contract to Tordrillo Mountain Lodge (TML) to transport passengers from a private residence on Wasilla Lake, Wasilla, Alaska, to the Chugach Mountains to conduct heli-ski operations. (The Organizational and Management section of this report provides additional information about Soloy Helicopters and TML.) According to Heli Ski US (HSUS), which is a trade association that promotes helicopter skiing safety and provides support, heli-ski operations involve a “helicopter [that] is utilized to provide up-hill transportation for participants” of “guided winter recreation activities including, but not limited to skiing.”

GPS data showed that the helicopter arrived at the Wasilla Lake residence about 1450. About 53 minutes later, the helicopter departed the residence and flew toward the Chugach Mountains. The surviving passenger recalled “nice” but “kind of creepy weather” in the mountains, which delayed the departure for the ski trip. The helicopter arrived at the intended operating area about 19 minutes later and subsequently flew multiple runs between about 1612 and 1807.

GPS data showed that the helicopter departed for the last run of the day at 1827:05 on a northwest heading and climbed to about 5,900 ft mean sea level (msl). The helicopter's final movements began about 1833 over a ridgeline at an altitude of 6,266 ft msl (about 14 ft above ground level) and at a groundspeed of 1 knot. The helicopter maintained its low altitude and groundspeed as it maneuvered over the ridgeline. The data track ceased at 1836:42 near the location of the accident site, which is shown in figure 1.

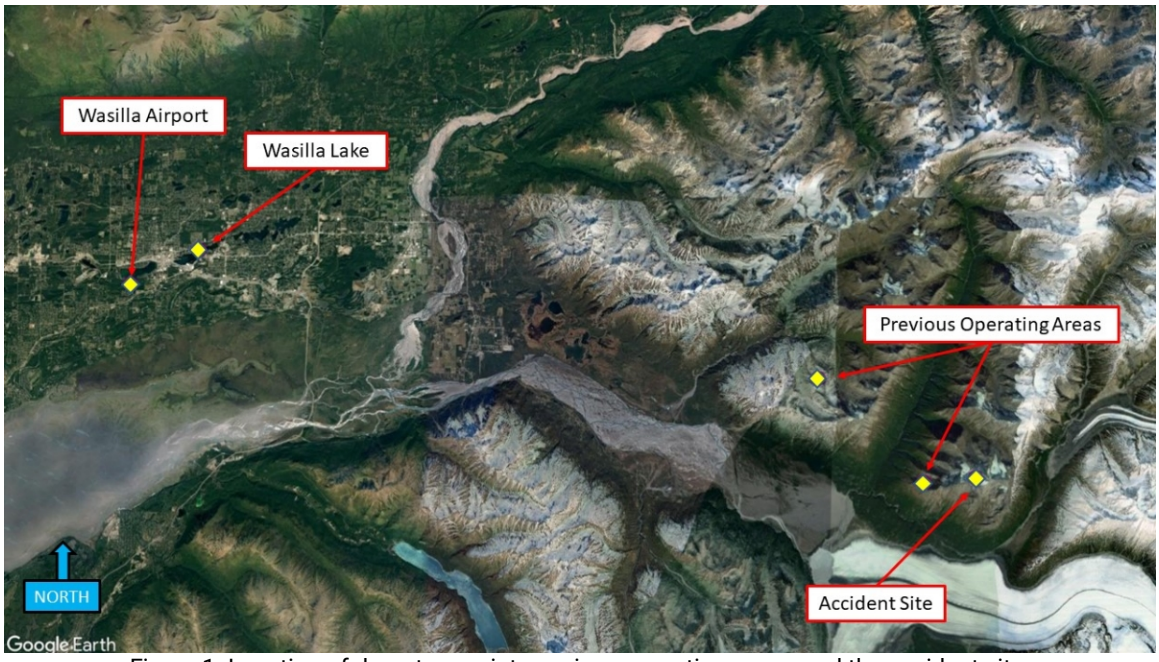

Figure 1. Location of departure point, previous operating areas, and the accident site.

The surviving passenger stated that the passengers had completed five or six runs and that the accident occurred while the helicopter was relocating for the last run of the day. The surviving passenger also stated that the pilot first attempted to land the helicopter normally on the ridgeline but that the helicopter subsequently "went up to try to get into the right position." The surviving passenger further stated that the snow was "real light" and that, while the pilot was attempting to land a second time, the helicopter was "engulfed in a fog, which made it appear like a little white room." The passenger recalled that another passenger yelled "don't do it" three times just before the helicopter "began going backward real fast and impacted the rocky mountainside several times."

Pilot Information

Certificate:	Commercial	**Age:**	33,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	5-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter; Instrument helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	February 10, 2021
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	January 21, 2021
Flight Time:	3286.4 hours (Total, all aircraft), 1505.8 hours (Total, this make and model), 3230.1 hours (Pilot In Command, all aircraft), 78.2 hours (Last 90 days, all aircraft), 46 hours (Last 30 days, all aircraft)		

A review of the pilot's training records indicated that he completed recurrent training on January 21, 2021, including a pilot competency check and a line check, as required by 14 *CFR* 135.293 and 135.299, respectively. In addition, the pilot completed CFIT-A ground training in January 2021 and IIMC flight training in January 2020. Records showed that the IIMC flight training lasted 1 hour and covered "T/R [tail rotor] failures, autorotations, emergency ops." The records did not indicate the specific IIMC training that the pilot received, and no other record was found showing IIMC flight training for the pilot. The IIMC flight training also included pinnacle landings and slopes and heli-ski and snow operations.

Aircraft and Owner/Operator Information

Aircraft Make:	Airbus Helicopters	**Registration:**	N351SH
Model/Series:	AS350-B3	**Aircraft Category:**	Helicopter
Year of Manufacture:	2008	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	4598
Landing Gear Type:	Skid	**Seats:**	6
Date/Type of Last Inspection:	March 3, 2021 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	24.2 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	5675.2 Hrs as of last inspection	**Engine Manufacturer:**	TURBOMECA
ELT:	C126 installed, activated, did not aid in locating accident	**Engine Model/Series:**	ARRIEL 2B1
Registered Owner:	DELAWARE TRUST CO TRUSTEE	**Rated Power:**	747 Horsepower
Operator:	Soloy Helicopters LLC	**Operating Certificate(s) Held:**	Rotorcraft external load (133), On-demand air taxi (135)

The accident helicopter was equipped with a Garmin Aera 660 GPS, which was certified for visual flight rules (VFR) flight but had the capability to display IFR procedures and maps. The helicopter was also equipped with a Kannad 406-MHz AF Compact emergency locator transmitter (ELT) that was installed on the upper right side of the right baggage compartment.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PAAQ,230 ft msl	**Distance from Accident Site:**	23 Nautical Miles
Observation Time:	18:53 Local	**Direction from Accident Site:**	293°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots / None	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	330°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.89 inches Hg	**Temperature/Dew Point:**	1°C / -12°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Wasilla, AK	**Type of Flight Plan Filed:**	
Destination:	Wasilla, AK	**Type of Clearance:**	None
Departure Time:	14:53 Local	**Type of Airspace:**	Class G

At 1600, the Anchorage, Alaska, upper air sounding wind profile indicated light surface wind from the north above the surface with little directional variation with height and increasing wind speed. At an altitude of about 6,000 ft, the wind was from 350° at 21 knots with a temperature of -17°C. The sounding was characterized as conditionally unstable below 6,000 ft and stable above that level.

The Universal Rawinsonde Observation analysis program sounding supported light turbulence below 8,000 ft and mountain wave activity. The northerly wind south of the ridgeline (the accident location) would have resulted in a general downslope wind flow near the accident site.

A pilot operating on Knik Glacier (near the accident site) a few hours before the accident reported light surface wind with stronger wind at altitude. This pilot indicated that it “was windy as heck at altitude but dead calm on the valley floor.” A snowmobile tour operator at Knik Glacier reported that, during the morning and afternoon tours on the day of the accident, he noticed large plumes of snow blowing off the nearby mountain peaks, and he estimated the wind to be between 30 to 40 miles per hour from the west.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	4 Fatal, 1 Serious	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	5 Fatal, 1 Serious	**Latitude, Longitude:**	61.451718,-148.36552(est)

Aerial assessment of the accident site on the day after the accident revealed that the helicopter impacted terrain about 15 to 20 ft below the top of the ridgeline. The main wreckage came to rest on its right side about 500 ft downslope from the initial impact area, as shown in figure 2. The debris field extended about 900 ft downslope from the top of the ridgeline.

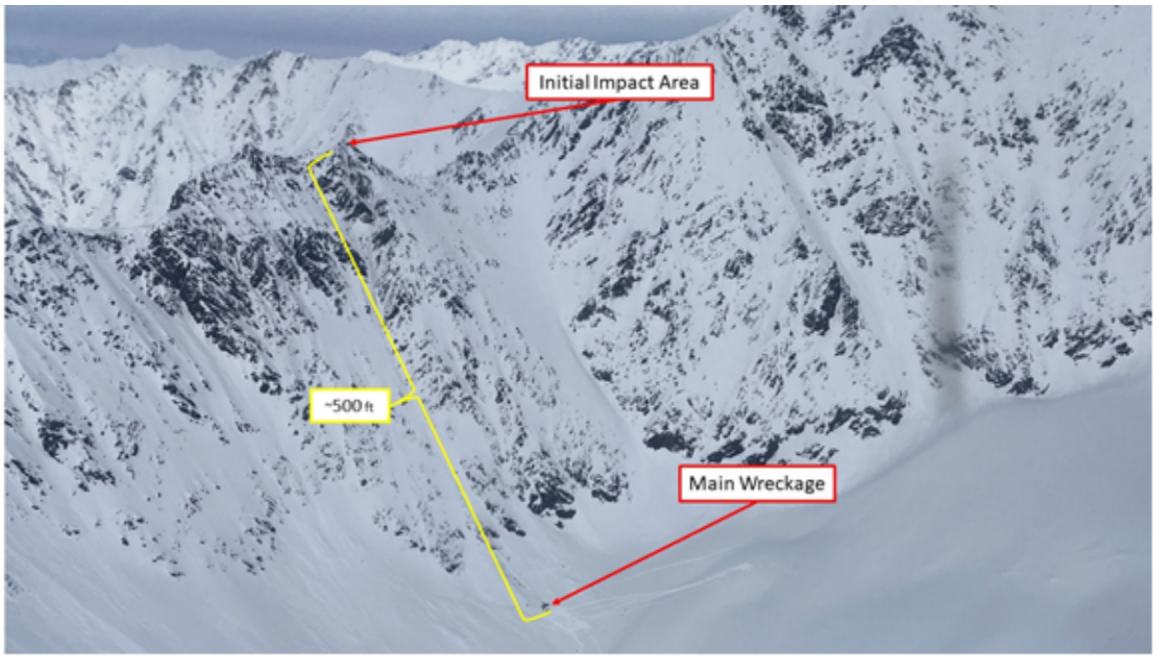

Figure 2. Accident site (Source: Alaska State Troopers).

Postaccident examination of the airframe and engine revealed no preimpact mechanical malfunctions or failures that would have precluded normal operation of the helicopter.

The ELT's installed location (the upper right side of the right baggage compartment) was found packed with snow. The ELT remained secured to its airframe mount via a velcro strap. The ELT's antenna coaxial cable and remote cockpit control wiring remained connected. The ELT switch was found in the ARM position. The external antenna had been fractured from its mount and was not located. Postaccident testing of the ELT found that it was working properly and that the ELT had transmitted during and after the accident sequence for 178 hours (12,884 bursts at 50-second intervals).

Medical and Pathological Information

Pilot

The State of Alaska Medical Examiner's Office in Anchorage performed an autopsy of the pilot. His cause of death was multiple blunt force injuries. Toxicology testing performed by the FAA's Forensic Sciences Laboratory detected no tested for substances.

Ski Guides

According to the autopsy inspection report (which comprised an external examination only) issued by the State of Alaska Medical Examiner's Office, the senior lead guide's cause of death was blunt force head injury. Toxicology tests performed by NMS Labs identified the following in the senior lead guide's blood specimen: amphetamine at 96 ng/ml, cocaine at 52 ng/ml, and the inactive cocaine metabolite benzoylecgonine at 1,000 ng/ml.

The autopsy inspection report for the other lead guide showed that his cause of death was multiple blunt force injuries. Toxicology tests of the lead guide's blood specimen performed by NMS Labs identified delta 9-tetrahydrocannabinol (THC), the primary psychoactive component in cannabis, at 1.1 ng/ml.

Amphetamine is a central nervous system stimulant drug that is available by prescription for the treatment of attention deficit disorder and narcolepsy. It carries a boxed warning about its potential for abuse and has warnings about an increased risk of sudden death and the potential for mental health and behavioral changes. In some preparations, a prescription drug is metabolized to amphetamine; commonly marketed names include Adderall, Dexedrine, and Vyvanse. Amphetamine may also be produced and used illicitly.

Cocaine is another central nervous system stimulant drug. Initial effects of cocaine use include euphoria, excitation, general arousal, dizziness, increased focus, and alertness. At higher doses, effects can include psychosis, confusion, delusions, hallucinations, fear, antisocial behavior, and aggressiveness. Late effects, beginning within 1 to 2 hours after use, include depression, agitation, nervousness, drug craving, fatigue, and insomnia. Additional performance effects would be expected after higher doses, with chronic ingestion, and during drug withdrawal, including agitation, anxiety, distress, inability to focus on divided-attention tasks, inability to follow directions, confusion, hostility, time distortion, and poor balance and coordination.

THC's mood-altering effects include euphoria and relaxation. Also, THC can cause alterations in motor behavior, perception, cognition, memory, learning, endocrine function, food intake, and body temperature regulation. Specific performance effects may include a decreased ability to concentrate and maintain attention. In addition, impairment in retention time and tracking, subjective sleepiness, distortion of time and distance, vigilance, and loss of coordination in divided-attention tasks have been reported. Significant performance impairments are usually observed for at least 1 to 2 hours after marijuana use, and residual effects can occur for up to 24 hours. THC may be detected at low levels in the blood for days or weeks after use.

Survival Aspects

The helicopter was configured with the pilot's seat in the front right seat position. Passenger seats were located in the front left seat position and a bench in the cabin with four seating positions. Figure 3 shows the helicopter seating configuration. The senior lead guide was in the left front seat; the other lead guide was in aft seat No. 1. The deceased passengers were in aft seat Nos. 2 and 4; the surviving passenger was in aft seat No. 3.

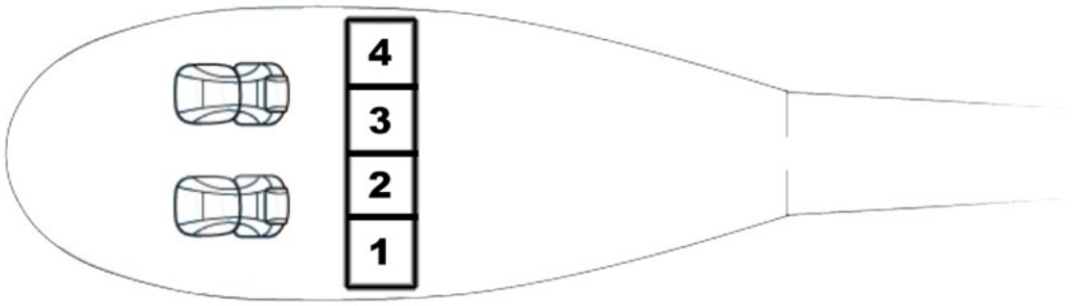

Figure 3. Simplified drawing of the accident helicopter showing seating positions with rear bench seat position numbers annotated.

Surviving Passenger Account

According to the surviving passenger, when the helicopter came to rest, he was still inside the helicopter with his body stuck in snow and lodged between two other occupants. He observed one of the other passengers (later identified as the occupant in aft seat No. 4) sitting in the snow outside the helicopter and heard thumping sounds from the bottom of the helicopter. The surviving passenger and the passenger who had been in aft seat No. 4 verbally communicated with each other using short messages. The surviving passenger noted that the passenger then began to move downslope in a seated position (the surviving passenger was

unsure what that passenger was doing) and that he (the passenger who had been in aft seat No. 4) eventually stopped responding.

The surviving passenger recalled that he eventually saw the light of a helicopter, which appeared to have left the area before coming back and hovering over the accident site. The passenger did not recall anything else until he woke up in a hospital. Upon arrival at the hospital, the passenger had a recorded internal temperature of 82°F along with extensive frostbite damage to both hands.

Flight-Following and Search and Rescue Efforts

A TML heli-ski guide (who was not aboard the accident helicopter) reported, during a postaccident interview, that he was "on radio communications and flight following" for the lodge on the day of the accident, and the TML radio/event log for that day showed that the flight-follower was in communication with a guide aboard the accident helicopter during the flight. The flight-follower stated that his "main source of communication" with the helicopter would be "via inReach, which is a Garmin satellite device." The flight-follower also reported that the ski guide "was checking in every hour via inReach with a written message" and that inReach had an automated tracking system that sent a "ping" that the flight-follower tracked on his computer. The flight-follower further reported that he also used a flight-following website that depicted where the helicopter was operating.

The TML flight-follower's last communication with the ski guide (acknowledging that an inReach interval was received) occurred about 1824. About 10 minutes later, the last flight-following ping from the helicopter was received. About 1915, TML's flight-follower notified a TML supervisor that there had been "no positive comms" with the ski guide within the last 1.5 hours and that "flight following indicates no movement" of the helicopter in the last 40 minutes. The supervisor contacted another heli-ski operator in the area, Third Edge Heli, to find out the status of the accident helicopter (Third Edge Heli's operation base was closer to the helicopter's last known location than TML's operations base).

During a conversation between representatives from TML and Third Edge Heli, the Third Edge Heli representative considered the flight to be "ops normal" and expected that the last lift would occur about 1940. The TML supervisor then instructed the flight-follower to "keep an eye on" the accident helicopter. The TML radio/event log showed that the flight-follower continued attempting to reach the helicopter through 1949 with no success.

About 2004, Third Edge Heli mistakenly reported to TML that the accident helicopter was "inbound" for the Wasilla Lake residence. About 2025, Third Edge Heli notified Soloy Helicopters that the helicopter was overdue. About 2030, TML notified Soloy that it was activating its emergency plan. About 2032, Soloy Helicopters activated its emergency response plan. About 2034, Third Edge Heli requested that one of its helicopters attempt to locate the accident helicopter.

About 2052, the Soloy Helicopters director of operations arrived at the company office and notified the Alaska Rescue Coordination Center (AKRCC) about the overdue helicopter. (The AKRCC, which logged this notification about 2110, was responsible for coordinating on-land and aviation federal search and rescue activities in Alaska.) About 2112, Third Edge Heli contacted the AKRCC about the overdue helicopter. About 2136, the wreckage was located by an Alpha Aviation Helicopter, which was under contract with Third Edge Heli. About 2202, Third Edge Heli called the AKRCC to relay that the wreckage was located on the "Knik [Glacier] side of the ridge." The AKRCC responded that a helicopter would be en route to the coordinates where the wreckage was located.

While the helicopter crew prepared to launch, AKRCC updated Soloy Helicopters, Third Edge Heli, and the Alaska State Troopers. About 2258, the AKRCC told the Alaska State Troopers that the crew was about to take off. About 2325, an Alaska Air National Guard (ANG) helicopter was on scene searching for the wreckage, which the crew located about 2333. According to the Alaska ANG helicopter pilot, it was a clear night, but the wind was at least 20 knots or more at the top of the mountains. It took about 30 minutes for the helicopter to dump the amount of fuel that would allow it to descend to a hover over the accident site and hoist down two pararescue personnel. They arrived at the wreckage site about 0015, about 5 hours 40 minutes after the accident and about 2 hours after TML and Soloy Helicopters activated their emergency response plans.

The cause of death for the passengers in aft seats No. 2 and 4 was blunt force injuries. (The causes of death for the pilot and ski guides were discussed in the Medical and Pathological Information section of this report.) According to information from the first on-scene responders, the passenger who had been in aft seat No. 4 was ejected from the helicopter, and the other five occupants were found in the cabin wreckage. The surviving passenger was still wearing his seatbelt, which had to be cut before he could be extricated.

About 0115, the Alaska ANG helicopter pilot reported to the AKRCC that the helicopter was en route to a hospital in Anchorage with one passenger, who was in critical condition. The Alaska ANG helicopter arrived at the hospital about 0136.

During postaccident interviews, the Soloy Helicopters director of operations was asked what time the accident flight was due back to the principal operations base; he stated that he did not have that information but that TML was providing the flight-locating. The director of operations was then asked how Soloy was able to conduct flight-locating if the company did not know when the accident flight was due back. The director of operations responded that TML was responsible for determining if the helicopter was overdue. When the Soloy Helicopters' director of operations was asked about the delay between being informed that the helicopter was overdue (about 2025) and notifying the AKRCC (about 2052), he stated that he was "still working through the information that was provided" about the helicopter.

Soloy Helicopters

Soloy Helicopters is a Part 135 air carrier that conducted rotorcraft on-demand operations. At the time of the accident, Soloy Helicopters operated 17 helicopters and employed about 20 pilots, some of whom were seasonal. In addition, Soloy Helicopters conducted operations under Parts 133 (rotorcraft external-load operations) and 137 (agricultural aircraft operations).

Pilot Training Program

Soloy's CFIT-A training manual, dated December 12, 2016, outlined the company's CFIT-A policies, procedures, and training requirements and stated that CFIT-A training was required as part of initial and recurrent training. Training topics included whiteout conditions, flat-light conditions, deteriorating visibility, IIMC, advanced aircraft systems, and normal and abnormal/emergency procedures. Some of the training was conducted with a desktop computer. The CFIT-A training manual also stated the following:

> *If inadvertent white out conditions are encountered it is important to rely on instrument indications and carefully attempt to fly away from obstacles and terrain until visible references can be re-established. If visible references cannot be reestablished then proceed as inadvertent IMC.*

According to Soloy Helicopters' chief pilot, as part of CFIT-A training, the company administered a test to newly hired pilots to ensure mastery of the subject matter, but subsequent training was discussion-based only. The director of operations stated that the company did not accomplish flight training for CFIT-A (which was not required). Further, other than the instruction included in the CFIT-A training manual, Soloy Helicopters' training program contained no specific IIMC training module.

The company's training program contained a module titled "Abnormal and Emergency Procedures." This module comprised the following elements: maneuvering by instruments (for aircraft equipped with navigational radios), controlled flight by reference to instruments, intercepting and tracking a course, and recovery from unusual attitudes.

In addition, the AS350 maneuvers guide, which was also part of the company's training program, had a module titled "Maneuvering by Reference to Instruments." The objective of the module was "to provide practice in the methods and procedures of maneuvering the aircraft by instruments and to recognize and recover from unusual attitudes." The training applied to cruise flight, straight-and-level flight, standard rate turns, navigation, and unusual attitudes.

The company's director of operations stated that IIMC flight training consisted only of unusual attitude training.

Soloy Helicopter's pilot training program for the AS350 and Hughes 500 (the two helicopters for which the accident pilot was qualified) did not include training in unprepared site operations involving ridgelines. The pilot's records also did not show any documented training specifically for ridgeline operations.

Flight Checks

The Soloy Helicopters director of operations indicated that the only IIMC training that was typically part of the competency check involved recognition of and recovery from unusual attitudes. The chief pilot stated that only unusual attitudes were assessed as part of the flight check required by 14 *CFR* 135.293(b) because the company did not have any IFR aircraft capable of IFR approaches.

Title 14 *CFR* 135.293(b) stated in part the following:

> *The competency check may include any of the maneuvers and procedures currently required for the original issuance of the particular pilot certificate required for the operations authorized and appropriate to the category, class and type of aircraft involved…. For the purposes of this paragraph, type, as to a helicopter, means a basic make and model.*

Paragraph (c) of 14 *CFR* 135.293 states the following:

> *Each competency check given in a rotorcraft must include a demonstration of the pilot's ability to maneuver the rotorcraft solely by reference to instruments. The check must determine the pilot's ability to safely maneuver the rotorcraft into visual meteorological conditions following an inadvertent encounter with instrument meteorological conditions. For competency checks in non-IFR-certified rotorcraft, the pilot must perform such maneuvers as are appropriate to the rotorcraft's installed equipment, the certificate holder's operations specifications, and the operating environment.*

According to postaccident interviews and operator documentation, Soloy Helicopters used FAA form 8410-3 (issued in 1981) to conduct pilot competency checks. The form did not include all training requirements, so flight instructors documented those requirements within the remarks section of the form.

Heli-Skiing Guidance

Soloy Helicopters provided pilots with Standard Operating Guidelines for heli-skiing operations. These guidelines, dated March 1, 2012, stated the following:

> *Whenever possible the guidelines outlined within this document should be followed. Deviations from these guidelines should only be considered when operational circumstances occur that necessitate changes due to safety, unforeseen circumstances or the impracticality of any written procedure.*

Section 600 of the guidelines, Operational Concerns, stated, in part, the following:

> *Operations will not be conducted unless the pilot has positive visual reference during all phases of flight* [emphasis in original]*…. All landings should be to previously staked areas or areas that have adequate visual reference to determine slope, surface, snow conditions, hazards, touchdown spot, abort flight path, etc. Considerations should be paid to: 1) Approaches and departures; 2) Proximity to hazards, avalanche chutes, cornice build-up, down flowing etc. 3) Prevailing wind.*

Section 800, Passenger Briefing discussed, in part, the following:

> *It is the responsibility of the pilot-in-command to ensure every guest is given a comprehensive briefing prior to initial flight. Briefings may be given by another designated and trained person (i.e. guides) or a combination video/practical method, provided all aspects of a briefing are covered.*

The section also stated that "guides are essential to the briefings," and the guidelines discussed the topics that were required to be provided during an initial safety briefing, including the operation of all doors and emergency exits, use of seat belts at all times, procedures in case of accident, and location and use of the ELT and first aid kit.

Operational Control for Flight Operations

According to 14 *CFR* Part 1, operational control regarding a flight refers to the exercise of authority over initiating, conducting, or terminating a flight. The certificate holder is required to have an operational control system that includes all the elements of operational control. In addition, 14 *CFR* Part 135 requires operators to have a system and/or procedures for the control of flight movements.

Review of Soloy Helicopters' Operations Specifications, paragraph A008, Operational Control, which was valid at the time of the accident, showed that the specifications had been digitally signed by the FAA POI and issued to the operator on February 8, 2019. The intent of paragraph A008 was to ensure a mutual understanding between an operator and the FAA concerning the operational control system and/or procedures used by the operator. Paragraph A stated the following:

> *The [operational control] system described or referenced below in this subparagraph must be used by the certificate holder that conducts operations under 14 CFR Part 135 to provide operational control for its flight operations. The*

> *essential elements of operational control…must be included or described in that system.*

Soloy Helicopters' operational control system was not described or referenced in the operations specifications. Title 14 *CFR* 119.7 states, in part, that each certificate holder's operations specifications must contain the authorizations, limitations, and procedures under which operations are to be conducted. Title 14 *CFR* 135.77, Responsibility for Operational Control states, in part, the following: "each certificate holder is responsible for operational control and shall list…the name and title of each person authorized by it to exercise operational control."

Review of Soloy's GOM revealed that, in section 1, management personnel were listed by name and included the director of operations, chief pilot, and director of maintenance. Only the director of operations had operational control as a listed duty, responsibility, or authority. Section 2 showed that only the director of operations had operational control. No chain of command or other list of authorized personnel appeared in section 2.

During a postaccident interview, the director of operations stated that he was the only company individual with operational control. The director of operations added that he could delegate that responsibility to the chief executive officer, even though this transfer was not listed in the GOM or operations specifications.

Soloy Helicopters' operations specifications did not indicate that the company had delegated the responsibility for flight-locating to TML. The company's GOM stated, under the Flight Assignment Procedures heading, that "a qualified Flight Locator may accomplish…flight assignment tasks either by delegation from the DO [director of operations] or in the temporary absence of the DO." The term "flight locator" was not defined in the GOM, and no personnel names were associated with this position.

Overdue Aircraft Procedures

The Soloy Helicopters GOM stated that an aircraft would be considered overdue when it was 60 minutes beyond the latest estimated time of arrival. The Soloy Helicopters emergency response plan stated that an aircraft would be considered overdue "30 minutes Beyond Camp or FAA flight plan." The Soloy Helicopters safety management system manual stated that the emergency response plan should be initiated due to, among other things, "an overdue or missing Soloy Helicopters aircraft." The manual continued, "a Soloy Helicopters aircraft is considered overdue if it is more than 60 minutes" beyond its estimated time of arrival or agreed-upon reporting time and that "personnel in the field should use 30 minutes as a guide to begin referencing" the plan.

Federal Aviation Administration Oversight

Principal Operations Inspector for Operator

The POI for Soloy Helicopters at the time of the accident had been employed with the Anchorage Flight Standards District Office since 2016 and became the POI for Soloy Helicopters in 2018. She was also responsible for the oversight of six other Part 135 certificates. Before her employment with the FAA, she was the chief pilot at Soloy (between 2011 and 2013), and she worked at another helicopter operator (from 2001 to 2011) with the person who would later become the president of the Soloy Helicopters.

The POI stated that she visited Soloy Helicopters about 1 year before the accident, possibly for a check airman observation. The POI also stated that she conducted a flight operations observation in December 2020 and an operational control inspection, which included flight-locating, during the third quarter of 2020.

Review of FAA safety assurance system records beginning March 2018 (3 years before the accident) revealed that, from September 11, 2018, to June 16, 2021, 13 surveillance assessments of Soloy Helicopters were completed, 12 of which had been closed with no issues or findings. The record of the other assessment indicated a minor nonregulatory issue and had a status of "closed pending action." During the same timeframe, six surveillance assessments had been automatically closed because they were overdue and not in an "ready status." Additional records showed that the POI visited Soloy on November 14, 2019, and October 30, 2020, to conduct check airman surveillance and line checks.

During a postaccident interview, the POI stated that she had not observed any heli-ski operations in her current position. (The POI stated that she had observed those operations while she was employed by Soloy Helicopters.) In addition, the POI did not recall making any recommendations to Soloy for changes to its manuals or procedures (in her capacity as the POI for Soloy certificate). The POI further stated that she had asked other FAA inspectors to conduct checkrides at Soloy on her behalf because she was not medically qualified for that responsibility.

According to the POI, flight-locating was a part of operational control, and the list of company personnel with operational control was in the company's GOM. The POI also stated that the lodge personnel who would be performing flight-locating tasks did not need to be named in the company's Operations Specifications paragraph A008 or its GOM.

Regarding CFIT-A training, the POI stated that the training was conducted "in the mountains, in bad weather" and that she did not normally observe that training. The POI also stated that she had observed some ground training "probably" in 2019. The POI thought that IIMC recovery was not a required training item.

Federal Aviation Administration Order 8900.1

FAA Order 8900.1, Flight Standards Information Management System, is "the repository of all Flight Standards policy and guidance concerning aviation safety inspector job tasks." The order was primarily intended for "Flight Standards aviation safety inspectors, their managers and supervisors, and other operational and administrative employees." Operators can use the order as a reference.

Paragraph 3 1255 of the order, Part 135 Pilot-in-Command/Second-in-Command Flight Training (All Training Categories) – Helicopters, listed certain maneuvers that "must be conducted for satisfactory completion of each category of flight training." The order stated that pilots in command must complete each training event listed in the paragraph, which included "unprepared site operations: ridgelines." The paragraph stated that a POI should ensure that the certificate holder's flight training emphasized operations in various environments, including mountainous areas.

Paragraph 3-1256, IIMC Training, stated that all pilots operating helicopters under Part 135 must be trained on procedures for avoiding and recovering from IIMC and that inspectors would evaluate the certificate holder's operational procedures for this training and ensure that these procedures were incorporated into the certificate holder's initial, transition, upgrade, and recurrent training curriculums. The order further stated that "training should emphasize the identification of circumstances likely to lead to IIMC encounters and encourage the pilot to abandon a planned flightpath or route to avoid continued VFR flight into deteriorating conditions."

Paragraph 3-1256 also stated the following:

> *Recovery from IIMC is an emergency maneuver since the pilot would be operating under VFR prior to the IIMC. The recovery from IIMC must include attitude instrument flying, recovery from unusual attitudes, navigation, ATC [air traffic control] communications, and at least one instrument approach, if the helicopter is appropriately equipped…. IIMC training should include visual cues and unusual conditions, which should prompt pilot action to avoid an IIMC encounter and pilot reaction plans to divert, land, or initiate an emergency transition to IFR as appropriate to the situation.*

Table 3-71 in the order showed the requirement for helicopter IIMC recovery. A note to the table stated, "this event must include attitude instrument flying, recovery from unusual attitudes, navigation, air traffic control (ATC) communications, and at least 1 instrument (if aircraft is so equipped) approach appropriate to circumstances." Soloy Helicopters had not incorporated each training subject into its training program, and no record was found that showed that either Soloy Helicopters or the FAA had requested a deviation or waiver from this requirement for approval of Soloy's training program.

FAA Order 8900.1 also contained guidance for determining the acceptability of a certificate holder's flight-locating procedures. The order required the operator's notification of an overdue or missing aircraft to be at least as prompt as notifications provided by FAA procedures and

facilities (30 minutes). Further, paragraph 3-2023 of the order stated that, when operations were conducted in an area where radio contact cannot be maintained with ATC, the individual authorized to exercise operational control must be provided with the location, date, and estimated time at which the pilot-in-command would re-establish radio or telephone communications. The order indicated that operators should maintain sufficient records to show compliance with these requirements.

In addition, paragraph 3-2023 of the order stated that Part 135 operators could contract with other operators or organizations to perform direct operational control functions but that the operator would remain fully responsible for ensuring compliance with applicable regulations, the GOM, and safe operating practices. The name of each contractor employee authorized to perform these functions for the operator must be listed in the operator's GOM. The order also stated that operators were responsible for ensuring that individuals authorized to exercise operational control are adequately trained to perform their assigned duties and are knowledgeable of, and have access to, appropriate sections of the operator's GOM while performing their assigned duties.

Soloy Helicopters had not incorporated these requirements into its flight-locating procedures. No record was located during the investigation that showed that either Soloy Helicopters or the FAA had requested a deviation or waiver from these requirements for acceptance of the GOM.

Tordrillo Mountain Lodge

TML's emergency response plan stated that a search and rescue facility (specifically, the 210th Rescue Squadron of the Alaska ANG located at Joint Base Elmendorf Richardson in Anchorage) should be contacted "if communication with the helicopter is not established by the end of the prearranged or 30 minute grace period."

In September 2021, TML provided the NTSB with a written summary about its drug and alcohol policy for its pilots and guides, which was included in the TML employee handbook, dated July 2020. TML's summary stated the following:

> *Pilots must follow the policies of Soloy Helicopters. Guides are not permitted to be under the influence of recreational drugs or alcohol while heli-ski guiding. Although there is not an employee handbook that specifically states how a breaking of this or any other rule will be handled, offences [sic] are not taken lightly and infractions of any rule, especially serious ones, will be dealt with individually and can result in termination.*

Additional Information

Heli-Ski Guides

Two passengers aboard the accident flight were heli-ski guides who TML contracted for the accident flight. Guides provide a critical safety role during a flight, and their responsibilities can include loading and unloading passengers, understanding surface snow conditions, and coordinating with pilots about landing and pickup zones. The HSUS operating guidelines specify duties for guides during the approach and landing, which include assisting the pilot with hazard and pickup zone identification, confirming clearances to terrain features on short final, and ensuring passenger safety after landing. TML offered annual training to heli-ski guides working at its operation each season, which the accident guides attended in January 2021.

TML was listed on the HSUS website as a member at the time of the accident. HSUS designated the accident guides as lead guides. According to HSUS, a lead guide is "an individual designated by an Outfitter to supervise the activities of one or more Groups and who meets the recommended qualifications for that position as established in the Guide Qualification Guidelines." One of the accident guides was designated as the senior lead guide for the flight.

Flight-Locating Information

Soloy Helicopters had delegated flight-locating responsibilities to TML. The NTSB requested that the FAA provide a definition or clarification for the term "flight locating" given that the *Federal Aviation Regulations* did not define that term. The FAA acknowledged that "flight locating" is not defined but stated that 14 *CFR* 135.79, Flight Locating Requirements, stated that procedures were required to be established for locating each flight for which an FAA flight plan is not filed. The regulation specified the following procedures:

> *1. Provide the certificate holder with at least the information required to be included in a VFR flight plan.*
>
> *2. Provide for timely notification of an FAA facility or search and rescue facility, if an aircraft is overdue or missing.*
>
> *3. Provide the certificate holder with the location, date, and estimated time for reestablishing communications, if the flight will operate in an area where communications cannot be maintained.*

The regulation also required that flight-locating information be retained at the certificate holder's principal place of business, or at another place designated by the certificate holder in its flight-locating procedures, until the completion of each flight.

Flight-following was not defined for Part 135 operations and was not required for aircraft operating under Part 135. The term “flight follower” generally refers to personnel who perform various flight support duties.

Administrative Information

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The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties … and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available here.