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Exhibit No. 2 A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

Operational Factors Specialist's Factual Report

(32 Pages)

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

August 16, 2017

Specialist's Factual Report

OPERATIONAL FACTORS

ANC17MA001

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A. ACCIDENT

Operator: Hageland Aviation Services, Inc.
Location: Togiak, Alaska
Date: October 2, 2016
Time:[1] 1157 Alaska Daylight Time (ADT)
Airplane: Cessna 208B Grand Caravan, N208SD

B. PARTICIPANTS

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[1] All times are Alaska Daylight Time unless otherwise noted.

C. SUMMARY

On October 2, 2016, about 1157 Alaska daylight time, a turbine-powered Cessna 208B Grand Caravan airplane, N208SD, sustained substantial damage after impacting steep, mountainous, rocky terrain about 12 miles northwest of Togiak, Alaska. The airplane was being operated as flight 3153 by Hageland Aviation Services, Inc., dba[2] Ravn Connect, Anchorage, Alaska, as a scheduled commuter flight under the provisions of 14 *Code of Federal Regulations* (CFR) Part 135 under visual flight rules (VFR). All three people on board (two commercial pilots and one passenger) sustained fatal injuries. Visual meteorological conditions prevailed at the Togiak Airport, Togiak, and company flight following procedures were in effect. Flight 3153 departed Quinhagak Airport (PAQH), Quinhagak, Alaska, at 1133, destined for Togiak Airport (PATG), Togiak, Alaska.

D. DETAILS OF THE INVESTIGATION

The Operational Factors group traveled to Anchorage, Alaska on December 6, 2016 to conduct interviews with personnel from Hageland Aviation Services, Inc. These included the Director of Operations, (DO), the current Chief Pilot, the Chief Pilot at the time of the accident, the lead pilot from the Bethel Airport (PABE), Alaska base (the Bethel base was the home base of the accident crew, and their point of origin for the series of flights that included the accident flight,) pilots who had recently flown with the accident pilot and SIC, the vice president of safety, the manager of the Hageland Operations Control Center (OCC), and the operational control agent (OCA) on duty in the OCC when the flight departed.

On December 19, 2016, the group conducted telephone interviews with the FAA Principal Operations Inspector (POI) and Assistant Principal Operations Inspector (APOI) assigned to Hageland Aviation.

On February 7, 2017, the group conducted interviews in Alaska with two departure control agents (DCAs) who were on duty at the Bethel base on the morning the accident flight departed.
The group also received familiarization briefings of operations at the base.

On February 10, 2017, the group conducted telephone interviews with the PIC and safety pilot of a flight that flew the same leg (but different route) as the accident flight about 5-10 minutes after the accident flight.

On February 22, 2017, the group conducted a telephone interview with the Hageland Aviation Director of Training.

[2] Doing business as.

On May 17, 2017, the group conducted interviews with Medallion Foundation leadership at the FAA and NTSB offices in Anchorage, Alaska. The following day, the group interviewed the Alaska Region Flight Standards Division Manager at the NTSB office in Anchorage.

On May 18, 2017, the group conducted work in the Cessna 208B (C-208B) Caravan level B simulator located on the Anchorage campus of the University of Alaska, which was used to train Hageland pilots in CFIT[3] avoidance. The ability of the simulator in reproducing the environmental conditions necessary for the three scenarios which Hageland Aviation used in their CFIT avoidance training was documented. The accident route was flown in the simulator. The group also interviewed a former Medallion employee at the NTSB office in Anchorage, Alaska.

On June 20, 2017, the group visited the Honeywell facility in Redmond, Washington. During this visit, the probable accident flightpath was re-created by Honeywell in a simulator with a visual display. The TAWS (Terrain Awareness and Warning System) that was installed in the accident airplane, a Honeywell KGP560, was used, and the group could hear the cautions and warnings that the system produced as the flight proceeded over the accident route. These alerts could be correlated with the terrain picture from the visual display system in the simulator.

E. FACTUAL INFORMATION

1.0 History of Flight

Flight 3153 had originated in Bethel, Alaska, made scheduled stops in Togiak and Quinhagak, and was scheduled to return to Togiak and then Quinhagak before returning to Bethel, the intended final destination for the day. The flight departed Quinhagak for Togiak, the third leg of the trip, on October 2, 2016, about 1133. The airplane, a turbine-powered Cessna 208B Grand Caravan airplane, N208SD was being operated as flight 3153 by Hageland Aviation Services, Inc., dba Ravn Connect, Anchorage, Alaska, as a scheduled flight[4] under the provisions of 14 CFR Part 135. Three people were on board; two commercial pilots and one passenger. The flight took an almost direct route from Quinhagak to Togiak, which involved flying over or around higher terrain. Another Hageland flight, which departed Quinhagak for Togiak about 10 minutes after flight 3153, chose a more southern, longer route which allowed it to remain over lower terrain.

Visual meteorological conditions (VMC[5]) prevailed at the Togiak Airport, and company flight following procedures were in effect. According to the Director of Operations (DO) for Hageland Aviation Services, Inc., about 1214, he received a notification from the Air Force Rescue Coordination Center (AFRCC) that it received a signal from a 406 megahertz (MHz) Emergency Locator Transmitter (ELT), which activated about 1208 and was registered to N208SD. After accessing the aircraft location data provided by an on-board flight tracking system and discovering

[3] Controlled flight into terrain.

[4] During interviews with FAA and Hageland Aviation personnel, investigators could not determine whether the flight was operated as an on-demand charter or a scheduled flight under 14 CFR Part 135. In a June 19, 2017 response to an NTSB inquiry, the FAA stated the flight was operated as a scheduled commuter flight.

[5] According to Federal Aviation Regulations, at an airport in Class G airspace such as Togiak, VMC exists during the day when visibility is at least one mile. Hageland Aviation imposed higher visibility requirements, requiring at least two miles visibility.

the aircraft had been stationary for about 20 minutes, the Hageland DO contacted the Hageland OCC in Palmer, Alaska, to verify the information. At that time, the operator initiated a company search for the airplane.

At 1326, the Alaska State Troopers (AST) were notified by the AFRCC personnel of an ELT activation near the village of Togiak, within the confines of the Togiak National Wildlife Refuge.

Shortly before 1430, an AST helicopter was dispatched from Dillingham, Alaska, about 67 miles east of Togiak, to the coordinates associated with the ELT signal, but poor weather conditions kept the searchers from locating the accident airplane until about 1630. Alaska State Troopers were able to access the scene on foot shortly before 1730 and subsequently confirmed there were no survivors.

On October 3, the NTSB investigator-in-charge (IIC), along with another NTSB investigator and two Alaska State Troopers reached the accident site. The airplane's fragmented wreckage was located on the southeast side of a steep, loose rock-covered mountainside, adjacent to the Quigmy River, about 12 miles northwest of Togiak, at N 59 degrees 9.92 minutes of latitude, and W 160 degrees, 39.10 minutes of longitude.

The airplane was equipped with a Spidertracks flight tracking system[6] which indicated the airplane's last known location at 1153 was about 19 nautical miles northwest of the Togiak Airport, at an altitude of 1,043 feet, traveling at 144 knots across the ground on a heading of 140 degrees.

2.0 Flight Crew Information

The accident flight crew consisted of a pilot-in-command (PIC) and second-in-command (SIC). Since the flight was operated under VFR, and the aircraft was type-certificated for a single pilot, only one pilot was required.[7] Under 14 CFR 135.267[8], having an SIC would allow the operator to utilize the pilots for a maximum of 10 hours of flight time during a standard duty period, versus 8 hours maximum flight time allowed for operations conducted with a single pilot. In an interview, the Hageland Aviation DO stated they would sometimes assign an SIC to a flight for this reason. Another reason for an SIC would be to have an extra pilot to assist in loading and unloading the aircraft. The Hageland DO stated he did not know why there was an SIC assigned to this flight, but that whenever the company assigned an SIC, he was expected to act as a second crewmember. There was no separation of flight duties between a PIC and an SIC, such as pilot flying and pilot monitoring, specified in the Hageland General Operations Manual (GOM) or training program.

When the second pilot was added to allow for extended flight time, that person became a required crewmember, however when added for cargo assistance, they were not. A search of FAA exemptions revealed that Hageland Aviation did not possess exemption 9770, which allowed for second pilots of aircraft certificated for single pilot operations to log the flight time received. This

[6] The Spidertracks provided near real-time aircraft flight tracking data. Flight tracking information was transmitted via Iridium satellites to an internet-based storage location at 6-minute intervals.
[7] According to 14 CFR 135.101, an operator must have a second-in-command if the aircraft is operated under IFR.
[8] This regulation applies to both scheduled and unscheduled operations conducted specifically in Alaska.

exemption also outlines the purpose for which the SIC flight time can be used, such as for upgrade to PIC within a 135 carrier, but not in furtherance of a certificate or rating.

Pilots at Hageland typically worked 15 days on duty followed by 15 days off. When on duty, they would normally have a 14-hour duty day. The amount of flight time each pilot would accrue during this duty period varied. According to the previous chief pilot, each base would hold a morning meeting every day before flying could begin. At this meeting, the base lead pilot would review applicable NOTAMs[9], weather, airplane issues, and other items that would affect the operations at that base on that day. A check airman who flew from the base the morning of the accident stated in her initial interview there was a morning meeting. In a subsequent interview, she stated there was no meeting. The base lead pilot stated that no meeting took place since it was Sunday and that typically meant fewer flights. After the morning meeting, pilots would complete flights that may have been scheduled the previous day, or flights that may have arisen that day.

Hageland records do not indicate what time the pilot and SIC reported for duty on the accident day. A review of previous monthly duty records indicated pilots reported at 0730 each day of duty. A departure control agent[10] who was on duty that morning stated that crews usually show up about 0730. On a Sunday, flights usually did not start until about 1130, but on the day of the accident, according to interviews, it was earlier because there was a lot of bypass mail (cargo) to go from Togiak to Quinhagak. The agent stated he talked to the accident PIC about the weather, and that there was nothing out of the ordinary about either pilot. According to the aircraft flight log found in the wreckage, the flight departed on its first leg (Bethel-Togiak) at 0927.

2.1 The Pilot-in-Command

The pilot was 43 years old and resided in Montana. He had been employed by Hageland Aviation since November 2, 2015. According to company records, he had a total of 5,800 hours, including 4,000 hours in the Cessna 207 (C-207) aircraft, and 100 hours in the C-208B aircraft when hired by Hageland, which included 4,300 hours of Alaska PIC time. He was initially assigned as a PIC in the company's C-207 aircraft. In January 2016, he completed the necessary training and checks, and was assigned as PIC in the C-208B.

Prior to Hageland Aviation, he had been employed as a pilot at Flight Alaska, dba Yute Air, from August 26, 2011 through August 26, 2013. At Yute Air, he had been PIC on the Cessna 172 (C-172) and C-207 aircraft, and had served as a flight instructor on the C-207 and as a check airman on the C-172.

Company records showed he had flown the C-208B 98.2 hours in September 2016, and 95 hours in August 2016. He had completed his most recent proficiency check in the C-208B in July 2016. His training and checking records at Hageland and Yute Air did not reveal any problems or concerns. An interview with a copilot who had flown with him the day before the accident did not reveal anything unusual or noteworthy in the pilot's behavior. The copilot stated it had been a normal day, and the pilot seemed happy. On the day of the accident, the pilot was on his second of fifteen days of duty scheduled for October 2016, following fifteen days off at the end of

[9] Notices to Airmen.
[10] See paragraph 7.2 for more information on the duties of the departure control agent at Hageland Aviation.

September 2016. For more details on the activities of the PIC in the 3 days prior to the accident, see the Human Performance Specialist's Factual Report.

2.1.1 The PIC's Pilot Certification Record

FAA records indicated the following certificates were issued to the PIC:

Notice of Disapproval – Private Pilot issued June 20, 1996. Areas for reexamination: All pilot operations. Computing aircraft performance unsatisfactory.

Private Pilot – Airplane Single Engine Land certificate issued June 23, 1996.

Private Pilot – Airplane Single Engine Land; Instrument Airplane certificate issued July 21, 1997.

Commercial Pilot – Airplane Single Engine Land; Instrument Airplane certificate issued September 2, 1997.

Commercial Pilot – Airplane Single and Multi-Engine Land; Instrument Airplane certificate issued August 7, 2009.

Flight Instructor – Airplane Single Engine certificate issued May 22, 2008.

Flight Instructor – Airplane Single Engine; Instrument Airplane certificate issued March 13, 2009.

Flight Instructor – Airplane Single- and Multi-Engine; Instrument Airplane certificate issued February 14, 2011. Renewed March 12, 2013, January 28, 2015.

2.1.2 The PIC's Certificates and Ratings Held at Time of the Accident

Commercial Pilot, issued August 7, 2009
Airplane Single- and Multi-Engine Land, Instrument Airplane

Flight Instructor, issued January 28, 2015
Instrument Airplane, single and multi-engine

FAA Medical Certificate, issued July 22, 2016
Second Class – No limitations

2.1.3 The PIC's Training and Proficiency Checks Completed[11]

Date of Hire with Hageland Aviation	November 2, 2015
14 CFR 135.293(a) Oral check[12]	July 7, 2016

[11] Source: Hageland Aviation.
[12] Title 14 CFR 135.293(a) required pilots to pass a written or oral test every 12 calendar months covering topics such as regulations, airplane systems, weight and balance, and weather.

14 CFR 135.293(b) Competency check[13]	July 7, 2016
14 CFR 135.297 Instrument Proficiency check[14]	July 7, 2016
14 CFR 135.299 PIC Line Check[15]	July 7, 2016

2.1.4 The PIC's Flight Times

The PIC's flight times, based on Hageland Aviation records:

Total pilot flying time	6,465 hours
Total PIC time	6,165 hours
Total C-208B flying time	765 hours
Total flying time last 24 hours	4.3 hours
Total flying time last 7 days	4.3 hours
Total flying time last 30 days	95.4 hours
Total flying time last 90 days	256.9 hours
Total flying time last 12 months	836 hours

2.2 The Second-in-Command (SIC)

The SIC was 29 years old. He had been employed by Hageland Aviation since July 18, 2016. Prior to being hired at Hageland, he was enrolled in a flight training program at the University of Alaska at Anchorage. He completed the required flight test and gained a commercial pilot certificate on May 4, 2016. When he was hired at Hageland, he stated he had a total of 189 hours, including 139 hours PIC flight time. On September 3, 2016, he completed necessary training and checks at Hageland, and was assigned as SIC in the C-208B. On the day of the accident flight, the SIC was on his third of fifteen scheduled days of duty following fourteen days off. For more details on the activities of the SIC in the 3 days prior to the accident, see the Human Performance Specialist's Factual Report.

2.2.1 The SIC's Pilot Certification Record

Private Pilot – Airplane Single Engine Land certificate issued March 10, 2015.

Private Pilot – Airplane Single Engine Land; Instrument Airplane certificate issued February 25, 2016.

Commercial Pilot – Airplane Single Engine Land; Instrument Airplane certificate issued May 4, 2016

[13] Title 14 CFR 135.293(b) required pilots to pass a competency check every 12 calendar months to determine the pilot's competence in practical skills and techniques.
[14] Title 14 CFR 135.297 required a pilot operating as a PIC to pass an instrument proficiency check every 6 months.
[15] Title 14 CFR 135.299 required a pilot operating as a PIC to pass a flight check every 12 calendar months in one of the types of aircraft which that pilot was to fly

2.2.2 The SIC's Certificates and Ratings Held at Time of the Accident

Commercial Pilot, issued May 4, 2016

Airplane Single-Engine Land; Instrument Airplane

FAA Medical Certificate, issued July 13, 2016

Second Class – No limitations

2.2.3 The SIC's Training and Proficiency Checks Completed[16]

Date of Hire with Hageland Aviation	July 18, 2016
Completion of initial ground training	July 25, 2016
Completion of initial flight training	September 2, 2016
14 CFR 135.293(a) Oral check	September 3, 2016
14 CFR 135.293(b) Competency check	September 3, 2016

2.2.4 The SIC's Flight Times

The accident SIC's flight times, based on Hageland Aviation records and the pilot's logbook:

Total pilot flying time	273.6 hours
Total PIC time	138.7 hours
Total SIC time	80.0 hours
Total flying time in C-208	84.2 hours
Total flying time last 24 hours	4.7 hours
Total flying time last 7 days	4.7 hours
Total flying time last 30 days	83.2 hours
Total flying time last 90 days	84.2 hours

3.0 Aircraft Information

The aircraft was a Cessna 208B Grand Caravan, Registration N208SD, and serial number 208B0491. It was powered by a Pratt and Whitney PT6A-114A (engine model number 52032) turbo-prop engine. The airplane was manufactured in 1995, and according to FAA records, the last airworthiness certificate was issued March 2, 2009. The airplane was registered to Icecap LLC Trustee in Anchorage, Alaska.

At the beginning of the accident flight, the airplane had accumulated 20,562 hours total time, and a Hobbs/Tach (engine) time of 1566 hours. The next maintenance/inspection was due at an airplane total time of 20,600 hours.

[16] Source: Hageland Aviation.

The airplane had two pilot seats, and could be configured with a maximum of eight passenger seats behind the two pilot seats. When the airplane was operated with a single pilot, a passenger could occupy the right-hand pilot seat, for a total allowable capacity of one pilot and nine passengers. Fewer passenger seats were sometimes installed to allow for more space for cargo in the main cabin of the airplane. According to the flight log found at the accident site, the airplane was configured with 2 passenger seats, one behind each of the pilot seats.

The airplane was equipped with a Honeywell EGPWS (Enhanced Ground Proximity Warning System) TAWS. (The terms EGPWS is a proprietary term belonging to Honeywell. The term TAWS is a generic term for any terrain warning and avoidance systems. They are often used interchangeably.) See paragraph 8.1 for additional information on this system.

The airplane was also equipped with two GPS navigation systems. These systems would provide the pilot with route guidance between airports when ground-based navigational aids were not available for use. This was the case over much of the region in which Hageland operated. On VFR flights like the accident flight, pilots would generally follow the direct route that the GPS navigation systems created, but would typically deviate from this route as required to avoid terrain and/or non-VFR weather conditions.

The airplane was operated with an FAA-approved Minimum Equipment List[17] (MEL). For the accident flight, the plane's ADS-B[18] system was not functioning, and repair of this item was deferred per the company's MEL. This was discovered by the presence of a sticker, listing the deferred item, that was found placed in the aircraft flight log and maintenance record container (the "can") which was recovered from the accident site.

3.1 Weight and Balance

Pilots at Hageland Aviation were responsible for calculating the weight and balance of the airplane prior to each flight. Hageland procedures for calculating and recording weight and balance for each flight are contained on page 5.2.4 of the GOM[19], Pilots were required to record the following information on the flight log prior to each flight:

Takeoff weight
Maximum allowable takeoff weight
Center-of-gravity (cg)
Forward and aft cg limits
Number of passengers
Weight of cargo onboard

[17] An MEL is an FAA-approved document that allows operators to fly airplanes with specified pieces of equipment not functioning provided a specific set of requirements are met.
[18] Automatic dependent surveillance – broadcast. The ADS-B system transmits information about altitude, airspeed, and location derived through GPS satellites from an equipped aircraft to ground stations and to other equipped aircraft in the vicinity. Air traffic controllers use the information to "see" participating aircraft in real time with the goal of improving traffic management. The ADS-B system, which allows for aircraft tracking by air traffic control in certain geographic areas, is not related to terrain avoidance.
[19] Attachment 3

Flight log and load manifest records recovered at the accident site had this information recorded for the previous two flights but, except for the airplane's maximum takeoff weight, not for the accident flight (Attachment 19). The maximum takeoff weight for the accident flight, entered on the manifest found at the site, was 9062 lbs. Separate records (a revenue manifest) received after the accident from the Hageland OCC indicated a single passenger on the flight but did not show the passenger's weight, or the weight of any cargo onboard for the accident leg (see Attachment 4.)

Page 6.1.1 of the Hageland GOM (see Attachment 3) stated, in part;

- *The village agent (VA) shall create a village manifest listing each passenger's full names, body weights, baggage weights, and any cargo with indicated weights for all scheduled flights originating from the village. The VA manifest shall be provided to the PIC and a copy retained by the agent.*
- *In the event the VA does not provide a village manifest, the PIC is responsible to enter the passenger's names, body weights, baggage weights, and cargo information onto the revenue manifest issued by the DCA.*

Though required by the GOM, the village agent at the last departure airport of the accident flight could not produce a village manifest which would have shown the weights of passengers and cargo loaded at that station. No revenue manifest, as required by the second paragraph above, was recovered from the accident site.

Due to the lack of information on weights of fuel, cargo, and passengers, accurate weight and cg information for the accident flight cannot be determined. Calculations made using an estimated passenger weight of 200 lbs., and assuming no cargo on board[20], show the airplane weight and the cg to be within operating limitations set by the airplane manufacturer.

4.0 Meteorological Information

At 1156, a METAR[21] from the Togiak Airport reported wind calm, visibility 7 statute miles, light rain, scattered clouds at 3,900 feet agl,[22] sky overcast at 4,700 feet agl, temperature 7° C, dew point 6° C, and altimeter setting 29.88 in. Hg. At a distance of 12 miles, this was the closest weather reporting facility to the accident site. The last METAR report of Togiak Airport weather the pilot had available to him prior to his 1133 departure from Quinhagak was time-stamped 1056, and reported the conditions at Togiak Airport as wind calm, visibility 10 statute miles, sky overcast at 1600 feet agl, temperature 7° C, dew point 6° C, and altimeter setting 29.86 in. Hg. As the flight approached Togiak Airport, the airport weather at 1139 was reported as wind calm, visibility 9 statute miles, light rain, scattered clouds at 1400 feet agl, sky overcast at 4400 feet agl, temperature 8° C, dew point 6° C, and altimeter setting 29.87 in. Hg. It is not known if the pilot received this report over the radio as he was approaching Togiak.

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[20] Hageland has stated that there was no cargo on the flight, and none was found at the accident site.
[21] A METAR is a routine aviation weather report of current conditions at an airport, usually issued hourly.
[22] Above ground level

There were FAA weather cameras at the Togiak Airport, which provided views of the terrain and sky at various angles looking out from the airport. Prior to the flight's departure from Bethel earlier in the day, the OCA assigned to the flight reported he had checked the weather cameras at the flight's destinations, and they indicated the flight could be flown under VFR. The weather camera pointing west from the Togiak airport captured an image at 1156, about the time the accident occurred. In the photo, low clouds are partially obscuring the top of a 1300-foot mountain located 7 miles west of the airport. The weather camera pointing north from the Togiak airport captured an image at 1159 in which the top of a 400-foot mountain 3.5 mile from the airport was clearly visible but another 550-foot mountain 12 miles away was only faintly visible. The accident flight was arriving from the northwest and no weather camera captured images from that direction.

Terminal Aerodrome Forecasts (TAFs) are not issued for the Togiak airport.

For additional information refer to the Meteorology Group Chairman's Factual Report.

5.0 Aids to Navigation

There were no ground-based navigational aids between the departure airport and the arrival airport. There was a Non-directional beacon (NDB) located at the destination airport with the identifier of TOG. It was not known if the pilot was using the signal from the NDB for navigation.

6.0 Airport Information

The destination airport for the accident flight, Togiak, (PATG), had an AWOS[23] weather reporting system. This automated system provided weather data including altimeter setting, wind, temperature, dew point, density altitude, visibility, ceiling, and precipitation identification. The AWOS weather information was transmitted over VHF radio to allow inbound aircraft to gain awareness of the conditions at the airport. There were also FAA weather cameras and a non-directional beacon (NDB) navigational aid located at the airport. The airport elevation was 18 feet above sea level. There were two GPS and two NDB approaches available at the airport.

7.0 Hageland Aviation Services, Inc.

7.1 Company Information

The Hageland Aviation website stated the following in part:

> *Hageland began Alaska operations in September 1981 with one Cessna 180. In 1982, Hageland added a C-207 to its operations. The following year, Hageland Aviation Services became a corporation. Throughout the '80s, the company added more aircraft, pilots and routes, including the Aniak, McGrath and Unalakleet regions. Into the 1990s, Hageland continued to expand, by obtaining a certificate to transport mail in addition to building hangars in Bethel, St. Mary's and Kotzebue, with new bases eventually in Barrow and Nome.*

[23] Automated Weather Observing System.

At the end of the 20th century, Hageland continued to add planes to its fleet, including its first Cessna Caravan II.

The company continued its steady growth through the first decade of the new century, adding the Beech 1900C to its fleet and relocating its headquarters to the former Reeve Aleutian Airways facility near Anchorage International Airport.

According to FAA-issued Operations Specification[24], Hageland Aviation Services, Inc. was a 14 CFR Part 135 certificated operator, providing both scheduled (commuter) and un-scheduled (on-demand) flights. They operated under the brand *Ravn Connect*. Hageland employed about 120 pilots and operated 56 airplanes. Hageland pilots were non-union and based at various airports throughout Alaska. All flights were planned and released from the Hageland OCC located in Palmer, Alaska.

7.2 Operational Control

According to the Hageland GOM, operational control was defined as the following:

…the exercise of authority over initiating, conducting, or terminating a flight. Its purpose is to ensure safe, consistent management of flight operations according to identifiable policies and procedures.

The GOM further stated the following:

The OCA and PIC are jointly responsible for preflight planning, flight delay and release of a flight in compliance with FAR (Federal Aviation Regulations), the Ops Specs, and the procedures of this manual.

According to Volume 3, Chapter 25, Section 5, paragraph 3-2029 of FAA Order 8900.1,[25] there were two tiers to the operational control concept, defined below:

1) The First Tier. All first-tier actions must be taken by the certificate holder's direct employees.

a) The first tier is the assignment of flightcrew member(s) and aircraft for revenue service under the operating certificate. The assignment of crew and release of aircraft to revenue service is the responsibility of the certificate holder, and must be made by the management of the certificate holder or management delegates. In order to be delegated the authority to make these decisions, the management delegates must be trained, found competent, and designated by the certificate holder, be listed in the GOM (or in OpSpec A006, A039 or A040, if applicable), and be under management supervision.

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[24] Operations Specifications are specific operating rules issued to individual air carriers by the FAA. In addition to complying with Federal Aviation Regulations, the carrier must also follow the rules and restrictions imposed by operations specifications, sometimes shortened to Ops Specs.)

[25] FAA Order 8900.1 provides flight standards policy and guidance documents regarding aviation safety for FAA Aviation Safety Inspectors (ASIs).

b) Management supervision means, for example, that the certificate holder tracks the actions of the management delegate or employee, samples the work of that employee (reviews a sample of the decisions made), and has the ability to enforce the certificate holder's standards through corrective actions such as retraining, requalification, or disciplinary actions such as disqualification, demotion, suspension, or termination. Because the certificate holder is responsible for the conduct of its employees or agents, it must have the ability to monitor and control their performance.

2) The Second Tier. All second-tier actions may be taken either by the certificate holder's direct employees or by the certificate holder's agents. The second tier of operational control is more tactical. This involves the decisions made by personnel (such as the PIC) in the day-to-day conduct of operations. This may include the initiation of flights upon the PIC receiving a request from the customer directly (often the case in on-demand operations being conducted under a dedicated service contract, such as offshore operations or emergency medical service (EMS)). This is acceptable if the PIC is authorized by the certificate holder to make those decisions on behalf of the certificate holder. To do so would require that the PIC be trained, found competent by the certificate holder, designated, be listed in the GOM (or in OpSpec A006, A039, or A040, if applicable), and be under management supervision. If maintaining a list of these personnel in the GOM is too cumbersome, a list of these personnel may be maintained at the air carrier's principal base of operations and referenced in the GOM. The method of maintaining and distributing this list to all affected parties must be described in OpSpec A008 or in the GOM.

3) The GOM (or other appropriate documentation) must contain guidance which describes the certificate holder's operational control system. The training program must provide the certificate holder's personnel with the knowledge and skills required to ensure that the operational control system is effective.

According to Hageland's GOM and their FAA-issued Operations Specifications A008 (Attachment 18), operational control at Hageland was exercised by the Hageland DO and individuals designated by the DO. Although the authority of operational control could be delegated, the DO retained responsibility. These designated individuals included all PICs, and all OCAs. The Chief Pilot maintained a list of all PICs who were qualified to exercise operational control, and the GOM listed the names of all OCAs who may exercise operational control along with the PIC. All OCAs at Hageland worked from the Hageland OCC located in Palmer, Alaska. An OCA was assigned for each flight, and the OCA and the PIC together had operational control over that flight[26].

The Hageland GOM stated the following in part:

OCAs report directly to the OCM or DO. The OCA has operational control and meets the requirements to fulfill his or her duties per [14 CFR Part 119.69 (d.)] as defined in [FAR

[26] At Hageland, a flight could consist of multiple legs, as aircraft stop at various airports prior to arrival at their final destination. Although utilized in the GOM and operations specifications in the context of "prior to operating any flight," the term "flight" is not defined in the GOM or operations specifications.

135.77]. The OCA shall successfully complete OCA training and maintain qualification and shall inform the OCM or DO before any required qualification expires. The OCA obtains, understands and acts on information according to the procedures found in the operational control chapter of this manual. With safe conduct as the first consideration, the OCA releases flights to operate according to the operational control chapter of this manual.

According to interviews, for every flight, the OCA considered the elements of risk for the flight, and together with the PIC, determined the risk assessment (RA) number for that flight. The RA number was determined by completing a Hageland Aviation Safe Flight Categories form.[27] After considering various potential hazards for the flight using this form, the PIC would arrive at an RA number between one and four. The PIC would then consult with the OCA for the flight, and verify that the OCA concurred with the RA number. An RA of one or two would allow the flight to proceed with only the approval of the PIC and the OCA. An RA of three would require the flight also be approved by a designated management official named in the GOM. An RA of four would delay or cancel the flight. The OCA entered the RA in the flight manifest remarks section and via telephone conversation with the pilot, verbally confirmed their agreement that the flight could safely begin. For additional information on the RA process, see Attachment 6.

Since a flight could consist of multiple legs (as with the accident flight), a single risk assessment value, agreed upon prior to the flight's departure, could cover several hours of flying in mountainous terrain with rapidly changing weather conditions.

During the flight, the OCA and PIC retained responsibility for the safe conduct of the flight. According to the GOM;

The OCA or Departure Control Agent shall inform the flight crew promptly with information critical to the safety of the flight or with any operational information that may assist the flight crew.

The OCA shall delay or cancel the flight if, in his opinion or in the opinion of the PIC, the flight cannot operate or continue to operate safely as planned or released.

According to interviews, due to the terrain and remoteness of the areas in which Hageland operates, direct communication with aircraft in flight from the OCC was usually not possible. If the OCC had updated weather or other information to pass to the flight en route, they would call the aircraft's departure base (in this case, Bethel) and ask them to relay the message to the flight. Departure control agents (DCAs) at a plane's base would sometimes monitor weather on their computer and by telephone with village agents, and if there was a change that could impact a flight in progress, they would contact the pilot via VHF radio and pass the information along to them. Also, if pilots could not reach the OCC by radio, they would sometimes call the DCA at the pilot's base and ask for updated weather. If the base could not reach the aircraft on the radio, they may call another Hageland aircraft in flight, or an airport that the flight is near, and ask them to relay the message. According to interviews, the OCC did not attempt to pass any additional information to the accident flight after its initial departure from the Bethel base.

[27] Attachment 5

Additionally, the OCA monitored the progress of each flight and remained at the worksite until the last airplane had landed safely at the destination. The OCA initiated flight locating procedures for any flight that has exceeded its last revised ETA and the flight position was not verified. The OCA notified the DO or his delegate as soon as the OCA became aware of any aircraft accident, emergency, or overdue aircraft and makes the report according to the accident notification procedures of the GOM.

DCAs were involved in the process of arranging flights at Hageland. In interviews with the previous chief pilot, chief pilot at the time of the accident, and two DCAs, DCAs were said to *assign* or *schedule* pilots, airplanes, and flights[28]. Assigning pilots and planes to flights meets the definition of tier one operational control from FAA order 8900.1, as noted above. DCAs are not listed in the GOM or Ops Specs as being authorized to conduct operational control, and do not receive any FAA- approved training. According the GOM, they report directly to the base manager and are responsible for business-only functions such as manifesting and load planning assistance. They may also act as a liaison between pilots and the OCC, maintenance control center (MCC), village agents, and passengers. In an interview[29], the Hageland DO stated that the DCAs do not exercise tier one operational control because they do not assign planes and crews to flights, they only proposed the assignments to the OCC, who along with the PIC, has operational control over the flight. DCAs would propose a flight by entering a pilot(s), a plane, and a route into a company computer program. An OCA would then access the flight the DCA created, and work with the PIC to plan and release the flight. Once the OCA received the proposed flight information from the DCA, the OCA was responsible for assuring that the pilot(s) and airplane met all the requirements for a Part 135 flight.

For the accident flight, the OCA described the release procedure as normal. Per their Ops Specs, the approved weather source for Hageland is the U.S. National Weather Service (NWS). At the OCC, the OCA assigned to the flight stated he checked the NWS's Alaska Aviation Weather Unit website to view area forecast, METARs, TAFs. and the FAA weather cameras located at Quinhagak and Togiak airports. He then spoke with the accident PIC, and they agreed the weather was VFR at the departure and arrival airports, and the area forecast was good. There was some rain and clouds in the vicinity of Quinhagak Airport, the second airport that this flight would land at and the departure airport for the accident leg. The OCA had recommended that the flight proceed under an instrument flight rules (IFR) flight plan because of the rain he observed near Quinhagak, but he agreed with the PIC that the airport was in VFR conditions, and operating the flight under VFR would be legal according to company policy and FAA Regulations. According to the flight manifest generated by the OCA (see Attachment 4), the RA value for the flight was two. In an interview, the OCA stated that after the flight departed, there was no need to contact the crew with weather updates because the weather was improving.

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[28] See Attachments 1 and 2, and Human Performance Specialist Factual Report, Attachment 2.
[29] See Attachment 1.

7.3 Company Training

7.3.1 Pilot Training

Hageland pilots received training per the company's Operations Training Manual (OTM). The training listed in the OTM was required by the FARs (except for the CFIT-A ground training discussed below), and the manual is reviewed and approved by the FAA. This training included both ground and flight training.

7.3.1.1 Controlled Flight Into Terrain Avoidance (CFIT-A) Training

CFIT avoidance training was not required for 14 CFR Part 135 certificate holders. Hageland Aviation, along with numerous other Alaska air carriers, was a member of the Medallion Foundation (see Section 11.0 of this Report). The Medallion Foundation encouraged CFIT avoidance training for its members, and Hageland had constructed a CFIT-A Manual which contained a training program for Hageland pilots. The training, which was given during a pilot's initial and annual recurrent training, consisted of ground and simulator events. The training was outlined in the Hageland Aviation CFIT-A Manual. The ground training provides definitions, background, procedures and strategies for dealing with potential CFIT scenarios. The simulator training allows pilots to practice these procedures by recognizing and responding to these potential CFIT scenarios.

Hageland had chosen to incorporate the CFIT-A ground training element into their OTM. The CFIT-A ground training was not required by the FAA, but the FAA approved the training by its approval of the OTM.

The CFIT-A simulator training element was not included in the OTM, and was not required or approved by the FAA. For C-208B pilots at Hageland, the CFIT-A simulator training was conducted in the C-208B simulator at the University of Alaska at Anchorage.

Ground training elements were outlined in Hageland's CFIT-A Manual and the CFIT-A module of the OTM. The simulator training was developed from the CFIT-A Manual. This manual was produced by Hageland using guidance from the Medallion Foundation's CFIT-A Star Program (see paragraph 10.1.1). The CFIT-A Manual was not required or approved by the FAA. Hageland Aviation used their CFIT-A Training Manual to provide guidance to instructors for CFIT-A training. This manual contained both ground and simulator training syllabuses. According to the instructions in the manual, the effectiveness of the policies, procedures, and content of the manual was to be audited by the Hageland Director of Training each year. Senior management also reviewed and endorsed the CFIT-A program annually. The Director of Training will then make any changes to the manual necessary in accordance with this audit and review. The results of the audit and review for 2015 and 2016 are included in Attachment 11.

Hageland's CFIT-A FAA-approved ground training was listed as module 7 in the Airman General Subjects section of their OTM (see Attachment 7). This ground training module was an element of both initial and recurrent pilot training. The training listed in the OTM was mandatory because the manual was an approved FAA document which governed Hageland training. The specific course training materials for the CFIT-A training listed in the module 7 were two FAA Advisory

Circulars which are not related to CFIT avoidance. The company also used a PowerPoint presentation on CFIT avoidance that was provided to pilots during ground training. This was presented as computer-based training (CBT), which pilots may accomplish outside of a formal classroom setting. This presentation was several decades old and did not include mention of GPS-based approaches or the most recent TAWS. The presentation was not oriented towards low-altitude VFR flying in mountainous terrain, or to Hageland's operation.

According to the Hageland CFIT-A Manual, ground training in CFIT avoidance was to be recorded in the standard ground school records for pilots. The records for the accident PIC indicate he completed the ground training in January of 2016 during his annual recurrent training. The records for the SIC indicate he completed the ground training during his initial training in July 2016. The training records of both pilots indicated they completed this training on-line, using the CBT method.

The CFIT-A simulator training which Hageland conducted was based on the syllabus contained in the company's CFIT-A Manual. The syllabus contained elements to teach the recognition of deteriorating visibility, flat light, and white-out conditions. Actions required for pilots entering these conditions were practiced. The training was conducted during initial flight training for pilots, and yearly during annual recurrent training, and according to the Hageland CFIT-A Manual, the training could be conducted in a simulator or flight training device. For Hageland pilots assigned to the C-208B airplane, initial CFIT-A training was included in their simulator flight training using a simulator operated by the University of Alaska at Anchorage. According to the Hageland DO, since the accident, initial CFIT-A training has been incorporated into multiple C-208B simulator lessons during the pilot's initial C-208B training. Previously, initial CFIT-A training was done in a single simulator lesson. For recurrent training, the CFIT-A training was done in a single simulator lesson. Hageland leased the simulator from the University, and provided company instructors for the training.

The C-208B simulator capabilities were documented and the CFIT-A training scenarios used by Hageland were replicated by the NTSB during a visit to the University's simulator (see Attachment 8.) It was noted that the display of environmental conditions (outside the window) could not recreate flat light conditions as defined in the company's CFIT-A Manual. The manual suggested setting up flight between two cloud layers with a visible horizon ahead. The simulator could only reproduce a single cloud layer. The simulator also presented only a generic (non-mountainous) picture of the terrain to the pilot.

According to the Hageland CFIT-A Manual, record of pilot completion of the CFIT-A simulator training was made on the Hageland pilot proficiency check form. This was a standard form used to record FAA-required checks for pilots. According to Hageland's CFIT-A Manual, an additional item titled "CFIT (simulator)" should be added at line 42 of the form. An "s" will be placed on that line when a pilot completes the training. The records for the accident PIC indicated he last received the training during his recurrent training in January of 2016. No record could be found of the SICs CFIT-A simulator training. The company did produce a certificate stating the SIC had completed the CFIT Accident Prevention Program in August of 2016. The certificate did not specify separate dates for completion of the ground-training and simulator elements of Hageland's CFIT-A training program.

The Hageland CFIT-A Manual further stated that no pilot shall be assigned flying duties until they completed the CFIT accident avoidance training program.

7.3.1.2 Crew Resource Management (CRM) Training

Crew Resource Management is the effective use of all available resources (human, hardware, and information) by flight crew personnel to assure a safe and efficient operation, reduce error, avoid stress and increase efficiency. CRM encompasses a wide range of knowledge, skills and attitudes including communications, loss of situational awareness, problem solving, decision making, and teamwork.

CRM training was required for 14 CFR Part 135 operators, per 14 CFR 135.330. Hageland included CRM training in both pilot initial and recurrent training programs. The outline for the ground training CRM element was contained in Airman General Subjects module 9 in the OTM (see Attachment 9.) CRM training was conducted both in initial pilot training and in annual recurrent training. For more information on CRM training, see the Human Factors Group Chairman's Factual Report.

Although Hageland flights frequently utilized two crewmembers in the C-208B airplane, there were no company policies or procedures outlining duties for each pilot when two-person crews were used, and the airplane checklist was designed for use by a single pilot.

Pilot training records indicated the accident PIC completed recurrent CRM training on January 30, 2016. The SIC completed his initial CRM training on July 22, 2016.

7.3.2 Operations Control Agent Training

There were no experience, training, or FAA certificate prerequisites for employment at Hageland as an OCA. According to the Hageland OTM, pages H27 and H28 (see Attachment 10), Operations Control Agents received 8 hours of initial and annual recurrent training. Initial training was followed by a period of on-the-job (OJT) training. This period was 16 hours for personnel who were already Hageland employees, and 40 hours for OCAs who were new-hires. The training covered the following topics: reading and understanding aviation weather and NOTAMs; using Flight Master software and other available resources for flight planning, flight following and company data bases for airport runway information and village contacts; use of the risk-assessment process; use of company resources to confirm aircraft are airworthy and pilots are current and legal to fly; ability to effectively communicate over the phone with pilots, station and village agent personnel regarding flight operations. An annual competency review of these OJT functions was required following annual classroom training. Completion of a written test with a score of at least 80% is also required.

Hageland records indicated the OCA who released the accident flight had completed the required OCA annual recurrent training on January 8, 2016.

8.0 Relevant Systems

8.1 Terrain Awareness and Warning Systems (TAWS)

Per 14 CFR 135.154 (a)(2), the accident airplane was equipped with a TAWS, the Honeywell KGP 560 EGPWS. This system used an internal GPS receiver and terrain database to determine if the airplane was in a position where conflicts with terrain or obstacles are a possibility. If the system determined a conflict could occur, it would provide various levels of alerts (cautions and warnings) to the pilot. For the en route phase of flight, this system would provide aural and visual cautions and warnings if the pilot descended below 700 feet agl and was not within 5 miles of an airport.[30]

Through a "look-ahead" feature, the system looks at the predicted flight path of the airplane for the next minute, and would also alert the pilot if it determined the flight would come into conflict with terrain or obstacles. These alerts would be aural and visual. The visual alert would be the illumination of either a red (warning) or yellow (caution) TERR light on the unit's control panel.

The aural and visual terrain warnings and cautions that the KGP 560 produced may be inhibited. A latching push-button on the control panel would inhibit these alerts when pushed in. The button would remain pushed in, and the cautions and warnings inhibited, until the pilot pushed the button again and it moved out to the un-inhibited position. When the system's warnings and cautions were inhibited, a light next to the button illuminated the message TERR INHB. This was to inform the pilot that terrain warnings and cautions would not be provided.

A post-accident examination of the inhibit switch on the control unit found the switch to be in the out, not-inhibited position. It is not known if this was the position of the switch prior to impact, or if forces of the impact caused it to move from the in, or inhibited position, to the out position. See Figure 1 below for a depiction of the TAWS control panel.

The flight manual supplement for this system required that the system be tested before every flight. In interviews, pilots stated they tested the system only before the first flight of the day. The FAA POI also stated the system was tested on the first flight of the day. The APOI did not recall if the test was to be done on the first flight of the day, or before every flight. The FAA-approved C-208B cockpit checklist that Hageland used did not contain any mention of testing the unit.

Using available data about aircraft position and altitude, the manufacturer of the TAWS unit, Honeywell, recreated and flew the accident flightpath in a simulator configured to represent an airplane equipped with the same TAWS unit as the accident plane (see Attachment 20 for details.) At a point 46 seconds prior to impact the system began providing terrain cautions (requiring the pilot to check his flightpath and adjust it as necessary until the alert ceased.) At a point 36 seconds prior to impact, and until impact, the system provided continuous terrain warnings (requiring the pilot to act immediately by beginning a maximum performance climb.) A Honeywell engineer stated that based on the available date for the flightpath, it is likely that the TAWS system in the

[30] Per 14 CFR 135.203, flights during the day may operate at altitudes as low as 500 ft. agl. In May of 2017, the NTSB issued safety recommendation AS-17-035, which called for ways to provide effective TAWS protections while mitigating nuisance alerts for single-engine airplanes operated under 14 Code of Federal Regulations Part 135 that frequently operate at altitudes below their respective TAWS class design alerting threshold.

accident airplane was providing cautions and warnings throughout the flight due to the airplanes altitude of 500-700 feet above the terrain for most of the route.

According to interviews with Hageland personnel, there was a company policy which allowed pilots to inhibit the TAWS aural and visual cautions and warnings if they occurred while the pilot was in VMC. The pilot could only inhibit the system if he could visually verify that the flight was not in danger of terrain conflicts. If the pilot did inhibit the alerts, there was no company guidance on when to un-inhibit (enable) them.

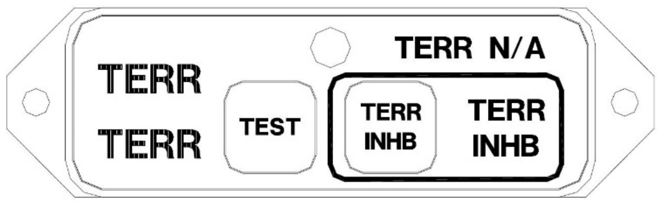

Figure 1 – TAWS control panel[31]

8.2 Navigational equipment

The airplane was equipped with a Garmin 430W and a King KLN 89B GPS navigational systems. Both system allowed the pilot to set a variety of paths to follow between his departure and arrival airport, and were capable of providing guidance for GPS approaches.

8.3 Multi-Function Display (MFD)

The airplane was equipped with a multi-function display, a Garmin GMX 200. This unit provided the pilot a choice of displays showing the aircraft's position relative to the planned flight path, navigational aids, airports, and the terrain surrounding the aircraft. This unit would not provide aural or visual warnings or cautions regarding terrain conflicts, but through two different modes of terrain display, would provide color-coded depictions of terrain near the aircraft. One mode, called the sectional mode, would show absolute (non-relative) terrain, similar to the depiction of terrain on an aviation sectional map. The second mode, the terrain awareness mode, showed a color-coded view of terrain where the colors relate to terrain elevation relative to the airplane's altitude. Terrain that is from 100 feet below the airplane's current altitude and up is displayed in red. Terrain that is between 100 and 1000 feet below the airplane's current altitude is displayed in yellow. No terrain contour lines were visible through the colors in the terrain awareness mode. The depiction of terrain could also could be turned off. See Photo 1 for a typical display on the Garmin GMX 200. In the picture, the "split" display mode is shown, with the sectional terrain depiction mode shown on the left, and the terrain awareness mode shown on the right. It is not known what, if any, terrain depiction the pilot had selected on this unit during the accident flight.

[31] Source: *MidContintent Instruments and Avionics* Installation and Operating Instructions MD41-1200 Series Terrain Awareness Annunciation Control Unit for Honeywell KGP 560 EGPWS Systems.

Photo 1 – Sample Garmin GMX 200 display[32]

9.0 Relevant Procedures

9.1 CFIT Avoidance Procedures

Hageland procedures for CFIT avoidance were outlined in their CFIT-A Manual. These procedures were to be followed in response to encountering three specific CFIT scenarios. The first is flight into deteriorating conditions, often also described as inadvertent flight into IMC (instrument meteorological conditions), or VMC into IMC flight. For this event, the manual states:

> *The pilot shall take immediate action to exit the IMC condition. The pilot must make their own assessment on whether or not to turn around, climb, enter the ATC system, or declare an emergency. We expect all pilots to follow the procedures as outlined in this manual, except that these procedures are to be used as generalizations only, and due to various*

[32] Photo taken during specialist group visit to University of Alaska at Anchorage C-208 simulator, May 18, 2017.

conditions which only the pilot can factor in, each pilot will use his or her best judgement in executing any maneuver required to exit IMC conditions. As a general rule of thumb, when in non-mountainous terrain, the pilot will turn around using instrument references to return to VFR conditions. In mountainous terrain, the pilot will execute a high-performance climb to a safe altitude for that sector, declare an emergency if necessary, and request an IFR clearance. In addition, pilots flying airplanes equipped with TAWS systems are expected to execute emergency actions when warning systems are activated, as outlined in the equipment supplement.

The second scenario is flight in flat light conditions. The manual states:

Flat light in Alaska primarily occurs when snow covered ground refracts light that blends into an overcast sky. This condition inhibits visual cues, creating the inability to distinguish distance and closure rates.

The manual further states:

Flying in flat light can be safely accomplished by using good judgment, proper training and planning. In flat light conditions, the pilot may continue the flight by increasing reliance on the flight instruments. Continuation in flat light conditions requires that the pilot ensures that the altimeter is set to the current altimeter setting for the area of flight. Furthermore, it is paramount that the pilot verifies the aircraft is being flown above any terrain for the route of flight by using appropriate current charts and/or ADS-B equipment.

The third scenario is flight in white-out conditions. The manual states:

White out conditions are recognizable when the pilot becomes engulfed in a uniformly white glow caused by blowing snow.

Pilots will not continue flight into white-out conditions.

Pilots encountering white-out conditions are expected to execute an escape maneuver as outlined above in the scenario of inadvertent flight into IMC.

9.2 VFR Route and Altitude Guidance

The Hageland GOM stated on page 6.2.5 that day VFR flights be flown at an altitude of no lower than 500 AGL. It also stated that flight plan routes shall be along the shortest safe route, or as assigned by ATC. For VFR flights at night, the GOM refers to FAR 135.203(a)(2), which states that the altitude flown must be no lower than 1000 feet (2000 feet in mountainous terrain) above the highest obstacle within 5 miles distance of the route of flight. Further guidance came from the FAA in the form of Operations Specification B050, which stated that Special VFR operations (for departing or arriving at an airport that has less than standard VFR weather) are only authorized when ceilings are reported at or above 600 feet, and visibility is reported as 2 miles or greater. Special VFR operations were not authorized at night.

This Operations Specification also set specific ceiling, visibility, and minimum altitude requirements for 213 different Hageland VFR routes when flown at night[33]. The altitude set for each route ensured that the 2000 feet above terrain within 5 miles limitation is met. This Operation Specification also required 3 miles visibility for these routes when flown at night. The accident route Quinhagak to Togiak was one of these routes. The Operations Specification required a minimum ceiling of 5400 feet MSL[34], a minimum altitude of 4900 feet MSL, and a minimum visibility of 3 statute miles for this route when flown at night.

10.0 The Medallion Foundation

The Medallion Foundation website stated the following in part:

> *The Medallion Foundation, a non-profit aviation safety organization, embraces mentors and advocates for all aspects of aviation: Student pilots to airline management. Our programs and services are designed to enhance aviation safety through multiple avenues, such as the highly sought after Shield® award, education and advocacy programs, and numerous initiatives in cooperation with industry and the FAA, expanding expectations and performance of enhanced safety cultures.*
>
> *Our core mission of reducing aviation accidents in Alaska and beyond is fostered through one-on-one mentoring, auditing, education and continuous improvement. We elevate aviation safety by the conscious endeavor of all our participating members, and help them sustain exceptional safety performance through the application of Safety Management System principles.*
>
> *The Medallion Shield® program is built on elements which exceed regulatory standards. Our operators recognize and value the impact on their organizations, both financially through a reduction in accidents, incidents and near misses, and culturally through shifting and sustaining positive safety attitudes among their personnel.*
>
> *Working with industries that use aviation services, we promote and establish high standards in aviation safety awareness with both the industry and each of their aviation providers.*
>
> *As a premier test bed for many FAA pilot projects, we are proven leaders in developing and assisting small operators with scalable safety management programs. Our CFI/DPE initiative led the industry in scenario based training before directed in the Practical Test Standards requirements. By providing pilots across Alaska with free aircraft training devices and simulators, fatal accident rates have decreased. Passengers are now more educated about the operator they choose to fly with, in part to the Circle of Safety® program.*

[33] Following this accident, Hageland and the FAA agreed that Hageland would follow the restrictions of these routes during day VFR flights as well. The agreement is shown in Attachment 12.
[34] mean sea level

The Medallion Foundation had about 15 employees, four of which were considered full-time. Around 50 operators in Alaska were Medallion members. The Foundation received funding from the State of Alaska, the FAA, membership fees, and other sources.

10.1 Medallion Star and Shield Program

The Medallion Foundation website stated the following in part:

> *Voluntary in nature, the Medallion Foundation Shield Program® focuses on establishing and sustaining an elevated level of safety performance through the application of system safety and safety management system principles. Whether you are a part 135, part 121 or 91 operator, we help you develop and promote:*
>
> - *A safety culture that holds safety as a core value*
> - *Continuous professional development of individual skills and competence*
> - *Proactive sharing of operational control responsibilities*
> - *Hazard identification and risk management techniques and trend analysis*
> - *Management practices that support the organization's safety objectives*
>
> *Each of the Five Stars represents the cornerstones of the Medallion Shield. Our program is a step-by-step approach to building a safety management system by providing program and process guidelines, specific training classes, one-on-one company mentoring and auditing to determine if the applicant meets the specific program requirements. We conduct a final external audit to determine whether the applicant has incorporated the concepts into its organizational culture. Audits are conducted annually by Medallion's independent auditors to ensure the applicant is maintaining the required Medallion standards.*
>
> *Membership in Medallion is required to participate in the Shield Program. Value-added benefits include reduced insurance rates, cross promotional marketing of Shield carriers and recognition by DOD, OGP and the FAA as an operator who incorporates higher standards of safety than required by regulations.*
>
> *The culmination of all the star cornerstones, an operator who is eligible for the Shield is evaluated on engagement and support of the corporate safety culture by company management and front-line employees to determine if the concepts associated with the Stars are successfully incorporated into day-to-day company operations."*

A Medallion Star was recognition, in the form of a certificate and letter to both the member and the FAA, that the member had met all the requirements for the Star and had successfully passed a Medallion audit confirming this.

The five Stars offered by Medallion were CFIT Avoidance (CFIT-A), Operational Control, Maintenance and Ground Service, Safety, and Internal Evaluation. Medallion members who achieved all five Stars, and after passing a final audit, would be awarded the Medallion Shield.

Medallion provided guidance to its members for specific training, policies, manuals, etc. which were required to earn any of the foundation's five Stars. A program manager from Medallion was assigned to the member, and that manager worked with the member to guide them through the necessary steps required to achieve a Star. When the member had incorporated the requirements for the Star, they would notify the program manager, who would schedule and conduct a pre-audit review to ensure that all elements necessary to achieve the Star were in place. Following successful completion of the pre-audit review, the program manager would recommend the member for an official audit by one of the foundation's auditors. If successful in the audit, the member was then awarded the Star.

Hageland Aviation had earned the CFIT-A Star in June of 2005, and the Operational Control Star in April of 2014. All five Stars from Medallion have been earned by Hageland, and in June 2016 the company was awarded the Medallion Shield.

10.1.1 Medallion CFIT-A Star

To earn the Medallion CFIT-A Star, a company must meet the requirements of a Medallion document titled *CFIT Avoidance Star Audit and Process Measurement Points*[35]. One of the primary requirements of this document was that the company establish a CFIT-A training program. Regarding evaluation of this program, the document states:

> *The purpose of these Controlled Flight into Terrain (CFIT) Avoidance Star audit points is to determine if the company has established an appropriately documented and effective training program for all pilots which emphasizes the recognition of flat light, white out, and rapidly deteriorating visibility. This includes but is not limited to knowledge of company procedures in the application of appropriate actions regarding operations in these conditions.*

Concerning evaluating the effectiveness of a company's program, the Medallion Executive Director stated in an interview that Medallion does not judge a carrier's training program, the carrier did that. Medallion looked at the training to make sure it was in place; it was the carrier's training program and the carrier decided if it was working. Medallion looked for the existence of policies and procedures, not effectiveness.[36]

According to the document mentioned above, during the annual recurrent Star evaluation, Medallion will consider member's accident history. They will check to see if the member has completed their internal investigation of any accident (termed a "TapRoot" investigation) and that they have implemented corrective measures that the investigation may have suggested.

At the time of the accident, there was no action taken against the Hageland CFIT-A Star or Hageland's Medallion Shield. Although Hageland experienced several CFIT accidents after being awarded the CFIT-A Star, it was never suspended. Following the Togiak accident, the Medallion Executive Director stated in an interview that they decided not to suspend the Hageland Shield when they saw the changes that the company was trying to make.

[35] Attachment 16
[36] For the complete interview, see Attachment 1 of the Human Factors Specialist Report.

In addition to creating a CFIT-A training program, the company must meet a variety of other "audit points" contained in the Medallion document mentioned above. These points include establishing program management structures for the CFIT-A program, naming company persons responsible for the program, publishing definitions of the three conditions that may lead to a CFIT accident, specifying company policies for pilots who encounter these conditions, and establishing a process for the company to audit, review, and revise their CFIT-A program.

10.1.2 Medallion Operational Control Star

To earn the Medallion Operational Control Star, a company must meet the requirements of a Medallion document titled *Operational Control Star Program Design and Process Measurement Audit Points*[37]. One of the requirements that must be met to be awarded the Star is for the member to have in place a flight risk assessment process used for every flight. The Medallion document does not define the term "flight." The section in Hageland's GOM addressing the risk assessment process for the carrier also does not define "flight". Interviews with Hageland personnel and review of the flight manifest form provided by Hageland indicated that the practice at the carrier was to assign a single flight number and complete a single risk assessment for an airplane that may depart its base and make stops at several other airports before returning to the base.

Another requirement for the Operational Control Star that was included in a February 2016 revision of this document is that the member define day and night VFR routes with designated minimum ceiling and visibility requirements. Hageland had only designated night VFR routes (contained in Hageland Operations Specification B050, Attachment 18.) at the time of the accident. In an interview, Medallion indicated that operators had 12 months to implement changes made to the CFIT-A Star requirements. It is not known if this 12-month period also applied to changes in the requirements for the Operational Control Star.

11.0 FAA Oversight

11.1 Oversight of Hageland Aviation

Oversight of Hageland Aviation was the responsibility of inspectors from the FAA's Polaris Certificate Management Office (CMO) in Anchorage, Alaska. The Principal Operations Inspector (POI) assigned to Hageland Aviation had an assistant POI (APOI) working under his supervision who assisted him in his oversight responsibilities. He also worked with other personnel from the CMO who were assigned Hageland oversight, including a Principal Maintenance Inspector (PMI), an assistant PMI, and a Principal Avionics Inspector (PAI.) There was also an Aviation Safety Inspector (ASI) assigned full time to the Hageland base in Bethel, Alaska. In an interview (see Attachment 2) the Hageland POI stated he would spend 5 days every 6 weeks in at the Hageland base in Bethel, conducting surveillance on Hageland. During these 5 day periods, he would conduct a least 3 en route checks. He would visit other Hageland sites once a quarter on average. Between him and the APOI, they visited all Hageland bases twice a year. He last observed operations at the Hageland OCC in August of 2016. He had observed CFIT-A simulator training

[37] Attachment 17.

by Hageland but it had probably been 2 years since the observation. The APOI stated he thought he had observed Hageland's CFIT training within the last year. The POI stated that his oversight duties included working with the director of operations, chief pilot and check airmen. He stated there was a robust safety culture from the president/owner down; all were very genuine in their safety concerns. He felt Hageland was taking all necessary steps since the accident to reduce the chances of another CFIT accident. These steps included hiring an outside agency to accomplish an audit on Hageland safety procedures, providing more human-factors training to pilots, seeking to enhance pilot professionalism, implementing a different hiring and vetting process for new pilots, and consistently and continuously encouraging pilots to turn around if they have any doubts about their ability to safely complete a flight due to weather conditions.

The POI conducted a monthly Certificate Management Team (CMT) meeting with the Hageland management personnel. He stated the meeting was well-attended by Hageland personnel.

11.2 FAA Oversight of the Medallion Foundation

A portion of Medallion Foundation funding was provided by the FAA via a contract with the FAA called an "Other Transactional Agreement" (OTA), (see Attachment 13). This funding supplied about 45% of Medallion's operating budget. The provisions of the contract provided for semi-annual audits to be conducted by the FAA. According to an interview with the Alaska Region Flight Standards Division Manager, the audits involved verifying Medallion was complying with the contract. They were not intended to evaluate the effectiveness of any Medallion programs, just that the programs existed and met the requirements of the OTA. The FAA auditors of Medallion would not visit Medallion members to check the efficacy of any Medallion programs the members may have used. [38]

The OTA set forth the relationship between the FAA and Medallion, and contained the Medallion program objectives. FAA auditors would develop questions around these program objectives. Medallion had a policy and procedures manual they were required to follow. The auditors looked at this manual in addition to the OTA to make sure Medallion was following the Manual's guidance. The FAA would do an audit, indicate whether it met the requirements or not, and then send the results to Medallion.

The FAA would review its prior Medallion audit before doing the next one. According to the FAA Alaska Region Flight Standards Division Manager, the audits never revealed anything that was a "showstopper." If there were any issues, he would call the executive director of Medallion and have a meeting with him to discuss it. He very rarely had to do that. The Flight Standards Division Manager did not conduct the audits. They were done by the FAAST[39] System Safety Analysis branch, AAL-290. These auditors were also responsible for the FAA's ISO9000 internal processes and internal FAA quality assurance audits.

In addition to the FAA audits of Medallion, Medallion would invite the FAA each quarter to meet with Medallion auditors and discuss changes or enhancements to Medallion's audit system or Star programs. The FAA would make recommendations to them. In 2016, The FAA made suggestions

[38]For the complete interview summary, see Attachment 1 of the Human Factors Specialist Report.
[39] FAA Safety Team

to the CFIT and Operational Control Star programs. These suggestions included flying under IFR flight plans as much as possible, flying GPS VFR routes that had a minimum hard altitude, eliminating or enhancing special VFR procedures, recommending 600-foot minimum altitude and 2-mile visibility for carriers, and making sure training was adequate for flat light and white out conditions.[40] The FAA has also reviewed the Medallion audit form. They suggested that Medallion could help the industry raise the bar by increasing their special VFR minimums. Medallion would put the suggested enhancements into their programs where they felt they fit best.

12.0 Previous Safety Recommendations and Guidance

As a result of previous accidents at Hageland (and other operators owned by Hageland's parent company, HoTH, Inc.), the NTSB had issued two safety recommendations in 2014; A-14-22 and A-14-23.

Safety Recommendation A-14-22 requested that the FAA conduct an audit of regulatory compliance and safety programs in place at Hageland, using personnel from outside the Alaska region to conduct the audit. The FAA conducted this audit between April 28 and May 9, 2014 (Attachment 14). In response to the audit, Hageland implemented six changes to their operation. From an operations standpoint, the most significant was the creation of the OCC. Previously, operational control at Hageland was exercised by approximately 80 flight coordinators and 96 company pilots. With the creation of the OCC, the number of persons having operational control was reduced to those OCAs named in the GOM and Company PICs. At the time of this accident, the number of OCAs listed in Revision 7 of the GOM was 8, which includes 7 OCAs and the manager of the OCC.

Because of the FAA's completion of the audit of Hageland and the other HoTH Inc. carriers, and the implementation of satisfactory corrective action on the part of the carriers for all adverse audit findings, the NTSB classified the recommendation as "Closed-Acceptable Action" on October 18, 2016.

Safety Recommendation A-14-23 requested that the FAA conduct an audit of FAA oversight of HoTH Inc. operators, including Hageland Aviation. The audit should be conducted by FAA personnel from outside the Alaska region, and address inspector qualifications, turnover, working relationships between the FAA and the operators, and inspector workload to determine whether staffing is sufficient.

This audit was conducted by the FAA in June of 2015. They reported no adverse findings, and the NTSB classified this recommendation as "Closed-Acceptable Action" on October 18, 2016.

Safety Recommendation A-15-029 came from the investigation of a 14 CFR Part 135 accident (NTSB accident designation DCA13MA121) in 2013 involving a single-engine airplane. This recommendation called for the extension of the requirements of 14 CFR 135.63(c) to single engine airplanes. This requirement, applicable only to multi-engine airplanes, was for the preparation of

[40] Many of these recommendations are also contained in a May 2016 letter to all Alaska 14 CFR Part 135 air carriers from the Alaska Region Flight Standards Division Manager. See paragraph 12.0.

a load manifest before each flight, showing number of passengers, total airplane weight, and the center of gravity of the loaded airplane.

This recommendation is currently classified by the NTSB as “Open-Acceptable Response.”

To provide Alaskan operators with additional safety guidance, in May of 2016 the Division Manager of the FAA Alaska Region Flight Standards Division wrote a letter (see Attachment 15) to owners and management officials of Alaskan-based 14 CFR Part 135 carriers regarding the recent significant increase of CFIT accidents. This letter provided suggestions and guidance on multiple points to bring awareness of CFIT risks and strategies for their reduction.

13.0 Recent Guidance

Following this accident, the FAA and Hageland had agreed to a seven-point mitigation plan to help prevent further CFIT accidents (see Attachment 12). Key elements of this plan were: developing and implementing GPS VFR routes, with minimum altitude and weather requirements, for all city-pair routes that Hageland flies; installing FOQA-type equipment in the entire fleet; reformatting the GOM, GMM (General Maintenance Manual) and OTM into electronic formats; flying current night VFR routes (from Operations Specifications B-050) both day and night; developing a program to address human factors in training; developing a Flight Operations Compliance Monitoring Department, and; requiring an operative GPS capability on all flights. Along with listing mitigating actions to be taken, proposed implementation dates were also shown in the agreement.

F. LIST OF ATTACHMENTS

Attachment 1: Interview Transcripts
Attachment 2: Interview Summaries
Attachment 3: Hageland GOM Excerpts-Weight and Balance - Manifests
Attachment 4: Hageland Flight 3153 OCC Flight Manifest
Attachment 5: Hageland GOM Excerpt-Safe Flight Categories Form
Attachment 6: Hageland GOM Excerpt-Risk Assessment Process
Attachment 7: Hageland OTM Excerpt-CFIT-A Training Module
Attachment 8: University of Alaska Simulator Evaluation
Attachment 9: Hageland OTM Excerpt-CRM Training Module
Attachment 10: Hageland OTM Excerpt-OCA Training
Attachment 11: Hageland CFIT-A Program Audit and Review (2015 & 2016)
Attachment 12: Hageland-FAA 7-Point CFIT Mitigation Plan
Attachment 13: FAA-Medallion Foundation Contract (OTA)
Attachment 14: FAA Hageland Audit Results
Attachment 15: FAA CFIT-A Letter to Operators
Attachment 16: Medallion Foundation CFIT Avoidance Star Program Design and Process Measurement Audit Points
Attachment 17: Medallion Foundation Operational Control Star Program Design and Process Measurement Audit Points
Attachment 18: Hageland Operations Specifications A008, B050

Attachment 19: Hageland Flight 3153 Flight Log
Attachment 20: Operational Factors / Human Performance Visit to Honeywell Aerospace

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