Docket No. SA-540

Exhibit No. 14 A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

Human Performance Factual

(17 Pages)

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

August 15, 2017

Specialist's Factual Report

HUMAN PERFORMANCE

ANC17MA001

A. ACCIDENT

Operator:	Hageland Aviation Services, Inc.
Location:	Togiak, Alaska
Date:	October 2, 2016
Time:	1154 Alaska daylight time (AKDT)[1]
Airplane:	Cessna Grand Caravan 208B
Registration:	N208SD

B. PARTICIPANTS

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[1] All times are based on a 24-hour clock and are in AKDT unless otherwise noted. Time of the accident is approximate.

C. SUMMARY

On October 2, 2016, about 1154 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 Ravn Connect, Anchorage, Alaska, as a scheduled commuter flight under the provisions of 14 Code of Federal Regulations (CFR) Part 135 and 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 (TOG), Togiak, and company flight following procedures were in effect. Flight 3153 departed Quinhagak, Alaska, (KWN) at 1133, destined for Togiak.

D. DETAILS OF THE INVESTIGATION

The Human Performance Specialist joined the investigation on October 27, 2016, to support the ongoing investigation. Investigative activities included conducting interviews in Anchorage, Alaska, in November 2016 and March 2017, and in Bethel, Alaska, in February 2017, gathering relevant documentation, conducting simulator testing at University of Alaska-Anchorage in March 2017, and meeting with Honeywell Aerospace in June 2017.

The Human Performance Specialist's Factual Report contains information relevant to the flight crew's pre-accident activities and health; company policies and training regarding controlled flight into terrain, crew resource management, risk assessment, terrain alerting warning systems, and safety management; and the Medallion Foundation Shield Program.

E. FACTUAL INFORMATION

1.0. History of flight

On October 2, 2016, the accident crew began their duty day at 0900. They were assigned to fly five legs that day – BET-TGK-KWN-TGK-KWN-BET. The operational control agent and pilot in command (PIC) completed a risk assessment and the flight was assigned a value of RA2. The accident crew departed Bethel, Alaska, (BET) for Togiak Airport, about 0927, arriving at 1029. After loading cargo, the crew departed Togiak at 1044 for Quinhagak, arriving at 1025. The flight flew at an altitude of about 4500 feet msl. The crew was on the ground in Quinhagak about 8 minutes, loaded and unloaded cargo and picked up a passenger then departed for a return flight to Togiak, flying at an altitude about 1000 feet msl (500-700 feet agl). The crew then departed Quinhagak at 1133 on the accident leg.

A second Hageland flight departed Quinhagak for Togiak within minutes of the accident flight. According to the pilots of the second flight, about 10 minutes into that flight, they determined the weather over the direct route was not favorable for VMC and elected to take a more westerly route over lower terrain. After arriving in Togiak, the crew of the second airplane received a call from the director of operations alerting them of an ELT signal. The crew departed Togiak to locate the accident flight. Due to clouds obscuring the mountain from which the ELT signal was emitting, they were unable to locate the wreckage.

2.0. Crew information

The crew information was documented through interviews[2], FAA records, company records, and cellular telephone records. Hageland pilots worked 2 weeks on, 2 weeks off schedules.

2.1. Pilot in command

The pilot in command (PIC), who was acting as the pilot flying (PF), age 43, was based in Bethel, Alaska. He lived in Montana with his wife, who said his commute time was 8 hours "door to door." His wife said he had no major changes, good or bad, to his financial situation, health, or personal life that would have impacted his performance on the day of the accident. He did not have any specific concerns about working for Hageland or flying the C208, but was worried after a couple of friends died in plane crashes. His wife stated the accidents made him safer and he did not take any chances. Pilots that flew with the PIC said he had good crew resource management (CRM) hand had "supreme" hand to eye coordination; there were no concerns about his decision making or judgment.

The PIC's most recent second class medical certificate, issued by the FAA, was dated July 22, 2016, with no limitations. He had no issues with his vision or hearing and listed no medications. His wife described him as "very healthy" and said he took over the counter vitamins but not medications, prescription or nonprescription. He chewed tobacco throughout the day and drank one beer in the evenings but his wife was not aware of him having any alcoholic beverages in the days before the accident. He fell asleep quickly and had no problems sleeping. When not working, he would go to sleep about 2300 and wake up about 0900. For more information on the PIC's medical background, see the Medical Factual Report.

2.1.1. Pre-accident activities

The PIC's pre-accident activities are summarized below. The PIC was off duty September 16-30, 2016.

On Thursday, September 29, 2016, the PIC awoke about 0900. He and his wife went for a motorcycle ride and had an "easy day." Intermittent outgoing cellular telephone activity (voice calls and SMS text messages[3]) occurred from 0817 until 0959, from 1152 until 1355, at 1406 and 1422, and from 1456 until 1500. His wife thought he went to bed about 2300.

On Friday, September 30, the PIC had to be at the Bozeman airport by 0620 so his wife thought he got up about 0500. He took an Alaska Airlines flight to Anchorage via Seattle and then a Ravn flight to Bethel. She thought he arrived in Bethel about 1800. Intermittent outgoing cellular telephone activity was recorded from 1300 until 1952 and at 2028. His wife said he took it easy at the pilot house and got rested for work the next day. She did not recall when they talked that night but said he was usually in bed between 2200 and 2230.

[2] See Attachments 1 and 2 to this report.

[3] Cellular telephone activity did not account for incoming/outgoing iMessages which were transmitted as data, not SMS.

On Saturday, October 1, the PIC's wife received a "good morning" message from him, she thought at about 0700 because he had to be to work at 0730. She thought he did not start flying until about 1100 because of weather. The PIC logged 4.3 hours of flight time. Intermittent outgoing cellular telephone activity was recorded from 0900 until 1100, at 1247, 1447, 1716, 1731, and 2025, and from 2042 until 2043. The PIC's wife recalled talking to him that evening and he had no concerns. According to another pilot that was staying in the same house with the accident pilots, they stayed up until about 2330-0000 talking.[4] Outgoing cellular telephone activity was recorded from 0002 until 0108.

On Sunday, October 2, the PIC's wife received a message from him about 0700; he seemed to be in very good spirits and did not mention any concerns. Outgoing cellular telephone activity was recorded from 0814 until 0902. He started his duty day at 0900 and the accident crew departed Bethel at 0927 for Togiak, arriving at 1029. The crew was on the ground about 15 minutes before departing for Quinhagak, arriving at 1125. The crew then departed Quinhagak at 1133 on the accident leg.

2.2. Second in command

The second in command (SIC), who was acting as the pilot monitoring (PM), age 29, was based in Bethel, Alaska. He lived in Anchorage, Alaska, with his girlfriend. His girlfriend said he had no major changes, good or bad, to his financial situation, health, or personal life that would have impacted his performance on the day of the accident. The SIC was excited to "move up the chain" flying and he told his girlfriend it was like the "wild west," flying in low visibility and below minimums. The SIC's friend also reportedly stated that the SIC would agree with what the captain of the flight wanted to do. A pilot that recently flew with the SIC prior to the accident said he was smart and experienced, recalling that he had been in the military. The SIC was described as new and a little rough on the controls, but he was open to taking input during the flight; the pilot did not have any concerns about flying with the SIC.

The SIC's most recent second class medical certificate, issued by the FAA, was dated July 13, 2016, with no limitations. He had no issues with his vision or hearing and listed no medications[5]. His girlfriend described him as "very healthy" and he was a "very active person." He sometimes had problems falling asleep and would use Nyquil to help him sleep. He would typically wake up between 1100 and 1200. For more information on the SIC's medical background, see the Medical Factual Report.

2.2.1. Pre-accident activities

The SIC's pre-accident activities are summarized below. The SIC was off duty September 16-29, 2016.

[4] See Attachment 1 – Interview Summaries.
[5] According to the SIC's fiancée, he was prescribed Ambien for post-traumatic stress disorder.

On Thursday, September 29, 2016, the SIC went rock climbing with his girlfriend. He had limited outgoing cellular telephone activity (voice calls and SMS text messages[6]) at 1412, 1720, 2146 and 2152. His girlfriend said they stayed up until about 0200 talking.

On Friday, September 30, his wake time was unknown, but his girlfriend said he left the house about 0700 to pick up a colleague before driving to Palmer Airport. He had intermittent cellular telephone activity from 0856 until 1046 and at 1943 and 2153. According to Hageland records, he logged 5 hours of flight time that day, but the times were unknown. His other activities that day were also unknown.

On Saturday, October 1, the SIC told his girlfriend that there was bad weather and he was able to sleep in that morning.[7] According to Hageland records, he was on duty from 0730 until 2130. He logged 4.7 hours of flight time that day, flying from 0850 until 1100, 1551 until 1720 and 1749 until 1915. His girlfriend received a message from him about 1500 that said he had taken a "serious nap" of almost 2 hours. That evening he attended a bonfire for a colleague's child. The SIC's girlfriend said she received at message from him at 2240 and they spoke sometimes between then and midnight. According to another pilot that was staying in the same house with the accident pilots, he and the SIC stayed up until about 2330-0000 talking.

On Sunday, October 2, the SIC's girlfriend said they exchanged messages from about 0805 until 0821. He started his duty day at 0900 and the accident crew departed Bethel at 0927 for Togiak, arriving at 1029. The crew was on the ground about 15 minutes before departing for Quinhagak, arriving at 1125. The crew then departed Quinhagak at 1133 on the accident leg.

3.0. Medical and Pathological Information

Toxicology tests performed by the FAA's Civil Aerospace Medical Institute on specimens from the pilots tested negative for carbon monoxide, ethanol, and a wide range of drugs, including major drugs of abuse.

4.0. Hageland Guidance and Training

Information pertaining to pilot guidance and training was included in the Hageland Aviation Services General Operations Manual (GOM), Operations Training Manual (OTM), and Controlled Flight Into Terrain-Avoidance (CFIT-A) Training Manual.[8]

4.1.1. Pilot responsibilities

The Hageland GOM, revision 6, chapter 1 "Duties & Responsibilities – Personnel"[9], section 14 "Pilot in Command" stated:

[6] Cellular telephone activity did not account for incoming/outgoing iMessages which were transmitted as data, not SMS.
[7] There was no cellular telephone activity (voice calls or SMS text messages) on October 1, 2016.
[8] See Attachment 3 – Hageland CFIT-A Training Manual Excerpts; see Attachment 5 – Hageland OTM Excerpts; see Attachment 6 – Hageland GOM Excerpts
[9] See Attachment 6 – Hageland GOM Excerpts

1. Reports directly to the Chief Pilot and assigned base Lead Pilot.
2. Ensures safe operation of flight assignments in accordance with the Ops Specs, Company procedures, and all applicable regulations.
3. Prior to originating a flight or a series of flights, ensures the aircraft is equipped with all required systems and components for its assigned operations.
4. Is responsible for the safety of the passengers, crewmembers, cargo, and aircraft when executing a flight assignment.
5. Has authority and responsibility for managing any additional crewmembers assigned to the PIC during duty time, including allocation of duties with respect to operation of the aircraft.
6. Promotes fundamental CRM [crew resource management] when working with other Pilots and station personnel.
7. Is jointly responsible with the OCA [operational control agent] for preflight planning, flight delay and flight release for any flight assignment in compliance with the operational control procedures in this manual.
8. Shall suspend or modify the continuation of a flight assignment to the extent necessary to avoid any conditions that are hazardous to flight.
9. Is responsible for maintaining currency with certification and flight experience (e.g. medical certificates, check rides, recency of experience of experience [sic], etc.).
10. Shall ensure every day's flight and duty time is recorded in the Monthly Summary prior to the end of the day.
11. Shall ensure every day's flight and duty time is entered into FlightLogger prior to the end of the day.
12. Shall keep all manuals and other documents assigned to him in current status.
13. Play an active role in the WBAT[10] system.

The Hageland Aviation General Operations Manual (GOM), revision 6, chapter 1 "Duties & Responsibilities – Personnel", section 15 "Second in Command" stated:

1. Reports directly to the assigned PIC during flight operations an otherwise reports to the Chief Pilot and base Lead Pilot.
2. Assumes all duties delegated by the PIC or specified by Company policies.
3. Immediately informs the PIC of any observed illegal or suspected unsafe situation.
4. In the event the PIC becomes incapacitated during the flight, the SIC will assume command and fulfill all of the responsibilities and duties of the PIC.
5. Shall ensure every day's flight and duty time is recorded in the Monthly Summary and is entered in FlightLogger.
6. Shall keep all manuals and other documents assigned to him in current status.
7. Play an active role in the WBAT system.

The Hageland Aviation GOM, revision 6, chapter 1 "Duties & Responsibilities – Personnel", section 21 "Safety Pilots" stated:

1. Reports to the Director of Training.

[10] WBAT (web-based analytical technology) is a system that supports voluntary safety reporting systems.

2. Provide familiarization for the recognition, avoidance, and operational considerations of terrain features in the terrain features in the geographic region where the flight is conducted.
3. Provide familiarization of local weather patterns for the area of operation.
4. Provide familiarization of local route structures and operational considerations including unique ATC procedures.
5. Promote safety and good judgement in aeronautical decision making.

The Hageland Aviation GOM, revision 6, chapter 3 "Pilot Policies", section 3 "Pilot Responsibilities during Duty Time" stated, in part:

1. Report for duty at the beginning of the duty day and remain on duty or available for work until the Lead pilot [sic] (LP) or departure control agent (DCA) releases you or your duty day ends. On days where reduced flights are allowed, report for duty time is one hour before scheduled departure time or as assigned by the Lead Pilot or DCA.

5. Obtain current weather and aeronautical information for each flight segment.

8. Participate in the 2-party decision (Operational Control Center and PIC) for flight release according to the operational control procedures of this manual.

12. Operate the aircraft in a safe manner while on the ground and in the air.

15. Participate in the policies and procedures of the Company safety program and comply with the submission requirements for hazard reports and irregularity reports as follows here. Submit a WBAT report: (a) whenever directly involved in a safety-related event, (b) whenever company equipment is damaged and you know something about it, (c) anytime you are concerned about a hazard.

16. While ASAP [aviation safety action program] is voluntary, Hageland strongly encourages eligible employees to complete them. Whether a certificate issue may or not be present, a Safety Assurance Report to the Company safety department is expected.

4.1.2. CFIT

Hageland Aviation published the CFIT-Avoidance (CFIT-A) Training Manual which outlined the carrier's CFIT avoidance program, including guidance and training on exiting IMC conditions if an IFR clearance is not held and use of TAWS. This manual was available to pilots on the online Litmos training site but was not required to be read.

CFIT guidance and training was not required per Part 135 regulations. However, Hageland participated in the voluntary Medallion Foundation Shield Program. As a requirement for obtaining the CFIT star, the carrier was required to provide ground school and simulator CFIT training to its pilots. In addition to providing the training, Hageland was required to conduct a

CFIT training self-audit and a CFIT-A program review on an annual basis. The most recent audit of the CFIT-A training and program was completed by the director of training on April 20, 2016, and approved by the director of operations on April 25, 2016.

A review of Hageland training records indicated that the PIC completed CFIT computer-based training (CBT) during recurrent ground school training on January 28-29, 2016, and CFIT simulator training during his proficiency check on January 29, 2016. The SIC completed initial CFIT CBT during initial ground school training on July 18-19, 2016; no documentation was provided for his completion of simulator training.

4.1.3. Manual guidance

The Hageland Aviation CFIT-Avoidance Training Manual, revision Original, section "Policy", stated, in part:

> A. No Hageland Aviation pilot will fly into IMC conditions without an IFR clearance. If at any time IMC conditions are encountered while VFR, the pilot shall take immediate action to exit the IMC conditions. 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 conditions which only the pilot can factor in, each pilot will use his or her best judgment in executing any maneuver required to exit IMC conditions. As a general rule of thumb, when in nonmountainous 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.

Additional information regarding Hageland's CFIT avoidance program can be found in Attachment 3 to this report.

4.1.4. CFIT-A Training

The CFIT-A training provided by Hageland was a voluntary training program required by the Medallion Foundation CFIT star elements. Pilots received CFIT training during initial and annual recurrent training. Training consisted of a computer based training (CBT) module and simulator training. CBT training was recreated from the CFIT Education and Training Aid[11] completed in 1995. Topics covered included accident statistics, factors that contribute to CFIT, and prevention strategies. The CBT training was not tailored to Hageland Aviation operations or the unique challenges of flying in Alaska.

[11] See Attachment 4 – FSF CFIT Education and Training Aid Excerpts.

In addition, pilots received simulator training focused on three scenarios – flat light, whiteout and deteriorating weather conditions.[12] Hageland provided the instruction in a C208 simulator at the University of Alaska-Anchorage for its training.

The CFIT CBT training was listed in the Hageland Operations Training Manual (OTM), and therefore a part of the FAA-approved training program; the simulator training was not. According to the Hageland Director of Operations, following the accident, the carrier was revising the OTM to include CFIT simulator training.

The Hageland Aviation CFIT Avoidance Training Manual, revision 1, section "General", stated, in part:

> **TRAINING OBJECTIVE**
>
> It is recognized that in a great many CFIT accidents, systemic factors made by the flight crew resulted in the final link of the accident chain of events. Therefore, at the conclusion of the CFIT accident prevention training, the individual involved will be able to successfully demonstrate their knowledge of the CFIT casual [sic] factors, polices, and procedures by correctly answering 80 percent of the questions on written tests. Oral tests in lieu of written tests may be conducted when approved by the Director of Training. At the completion of the simulator/FTD check, the pilot will meet or exceed the minimums as set forth by the appropriate Practical Test Standards (PTS).
>
> **TRAINING SYULLABUS** [sic]
>
> At a minimum the simulator/FTD proficiency checks will cover the following:
>
> 1. Simulated VFR flight into IMC, flat light and white out conditions, and associated escape maneuvers.
> 2. Use of autopilot, if installed.
> 3. Standard rate turns (level, climbing and descending).
> 4. Instrument approaches appropriate to the aircraft and area of operation.
> 5. Multitasking (flying, tuning radios, communicating with ATC, etc.)

Additional information regarding CFIT avoidance training included in ground school was included in the Hageland OTM.[13]

4.2. CRM

Pilots received crew resource management (CRM) training in compliance with FAR 135.330. According to the Hageland OTM, Airman General Subjects Module #9 "Crew Resource Management (CRM),"[14] the objective of CRM training was "to enhance company pilots' awareness and understanding of CRM concepts with the ultimate goal of promoting safe and

[12] See Attachment 3 – Hageland CFIT-A Training Manual Excerpts.
[13] See Attachment 5 – Hageland OTM Excerpts.
[14] See Attachment 5 – Hageland OTM Excerpts.

efficient company operations." CRM training elements included: purpose of CRM, pilot in command authority, communication, building and maintaining a flight team, workload and time management and situational awareness, the effects of fatigue and stress, and aeronautical decision making and risk management. Training did not discuss differences in single versus dual pilot operations, Hageland operations specifically or flying in Alaska.

4.3. Risk Assessment

The Hageland Aviation General Operations Manual (GOM), revision 6, chapter 2 "Operational Control", section 4 "Flight Release Procedures and Standards" stated, in part:

> D. Risk Assessment
>
> This risk assessment is meant to give an overall value to the amount of risk a certain flight may encounter and the associated operational control given to each individual flight. The risk assessment (RA) categories are broken down into four specific categories with RA1 being the lowest risk and RA4 being the highest risk. When conducting a risk assessment for your flight, start by noting each hazard factor that applies to your flight. The hazard factors are explained below for further definition. Once you have all of the factors that apply to your flight, note the highest RA value for any of the hazards that you have circled, don't overlook hazard letter "R". If your highest hazard falls under RA value 1 or 2, your flight can be released by the Operational Control Agent (OCA) in Palmer. If you find that your RA value is 3, you will need approval from the OCA and from a Designated RA3 Company Manager. If you find yourself with a RA value of 4, your flight is deemed too risky, save yourself the phone call and inform the departure control agent at your base that the flight will need to be canceled or delayed until the risk is lowered.
>
> Once you have determined what your RA value is and the associated hazards are, be sure to review this information to the OCA upon your phone call for release. An example phone call may go something like this: "Flight 232 going out to Savoonga. I've got a RA3 - Lima." This would indicate that the proposed flight is a RA3 due to the surface winds being above 30kts and would require approval from a Designated RA3 Company Manager. The OCA will record your RA and all applicable hazard letters for your flight in FlightMaster and you will only need to verify that it is printed on your manifest along with the time of release.
>
> Remember, this is a risk assessment for conditions prior to accepting a flight. Once you have been released it is up to you to make good decisions that abide by the GOM and the FAR's. If you find that the conditions have changed and may put you into a higher risk category, it is up to you as the PIC to decide whether to continue the flight or take other actions with safety in mind.
>
> Category 1 – Common Hazards
>
> a. Day
>
> VMC conditions for the entire route.
>
> AWOS fully functional – Must have official reported weather.

Surface winds from any direction below 15 knots.

No runway contamination reported or expected.

No DMI – Any deferred items go under RA2.

No company imposed pilot restrictions.

Category 2 – Caution

b. Night – Any portion to be conducted at night.
c. IMC – Any portion of your flight where you expect IMC conditions and will obviously will be IFR.
d. No AWOS – This would indicate that there is not any official weather from an approved FAA source on the field.
e. Known Icing – Any known icing along your route.
f. X-Wind Component exceeding 15 knots.
g. Runway Conditions Contaminated – Any reported contamination.
h. Any DMI – Any deferred item even if it does not affect your flight.
i. Company Imposed Restrictions – If you are on restrictions you are automatically a RA2.
j. Haven't landed at the airport in the last 30 days – Look back at the calendar, not days worked.
k. Surface winds from any direction 15-29 knots.

Category 3 – Requires Approval from a Designated RA3 Company Manager

l. Special VFR – If you are departing on a Special or expect to get one at your arrival.
m. Surface winds from any direction above 30 knots.
n. Wind over the manufacturer's max demonstrated crosswind.
o. Published runway not including any overrun that is less than 1800 feet.
p. Breaking Action reported poor or less.
q. Special Airport- Haven't landed at the airport in 30 days.
r. Special Approaches- Haven't used approach in the last 30 days.
s. Part 91 flights - All part 91 flights regardless of their nature and Check Rides.
t. 5 or more hazards from Cat. 2 – Be sure to reference Category 2, if you have 5 or more hazards from Category 2 you will be elevated to a RA3.

Category 4 – Flights are Prohibited

u. Any limitations or restrictions. – All flights that may exceed any company, FAA, or manufacturer's limitations or restrictions fall under this category.
v. Human Factors – Self-Assessment using the "IMSAFE" checklist.

For more information, see Attachment 6 – GOM Excerpts.

4.4. TAWS

The accident airplane had a Honeywell KGP 560 TAWS and a Garmin GMX-200 terrain display system installed.

FAR 135. 154 Terrain awareness and warning system stated the following:

(a) *Airplanes manufactured after March 29, 2002:*

(1) No person may operate a turbine-powered airplane configured with 10 or more passenger seats, excluding any pilot seat, unless that airplane is equipped with an approved terrain awareness and warning system that meets the requirements for Class A equipment in Technical Standard Order (TSO)–C151. The airplane must also include an approved terrain situational awareness display.

(2) No person may operate a turbine-powered airplane configured with 6 to 9 passenger seats, excluding any pilot seat, unless that airplane is equipped with an approved terrain awareness and warning system that meets as a minimum the requirements for Class B equipment in Technical Standard Order (TSO)–C151.

(b) *Airplanes manufactured on or before March 29, 2002:*

(1) No person may operate a turbine-powered airplane configured with 10 or more passenger seats, excluding any pilot seat, after March 29, 2005, unless that airplane is equipped with an approved terrain awareness and warning system that meets the requirements for Class A equipment in Technical Standard Order (TSO)–C151. The airplane must also include an approved terrain situational awareness display.

(2) No person may operate a turbine-powered airplane configured with 6 to 9 passenger seats, excluding any pilot seat, after March 29, 2005, unless that airplane is equipped with an approved terrain awareness and warning system that meets as a minimum the requirements for Class B equipment in Technical Standard Order (TSO)–C151.

(Approved by the Office of Management and Budget under control number 2120–0631)

(c) *Airplane Flight Manual.* The Airplane Flight Manual shall contain appropriate procedures for—

(1) The use of the terrain awareness and warning system; and

(2) Proper flight crew reaction in response to the terrain awareness and warning system audio and visual warnings.

Training for TAWS (terrain awareness warning systems) was referenced in several areas of the Hageland OTM.[15] Specifically, the Hageland OTM, "Airman General Subjects Module #7 – CFIT Avoidance", stated in part:

Materials: General Subjects – TAWS FAA AC-91-74B/91-73B

[15] See Attachment 5 – Hageland OTM Excerpts.

The FAA Advisory Circulars referenced are titled “Pilot Guide: Flight in Icing Conditions” and “Parts 91 and 135 Single Pilot, Flight School Procedures During Taxi Operations,” respectively.

In addition, the Hageland OTM, Aircraft Ground Module #10 – Airplane Systems and Procedures, stated in part:

> **Warning Systems.** Aural, visual, and tactile warning systems, including the character and degree of urgency related to each signal, warning and caution annunciator systems, including ground proximity warning system (GPWS) and Terrain Warning System (TAWS) as installed.

Finally, the Hageland OTM, section Cessna 208 Flight Training, Flight Module 2: C-208 Normal Procedures and section Simulator Training - C-208 Flight Training-Pre-Flight, Module 5: C-208 Pre-Flight and Equipment Differences listed elements to be discussed “to familiarize the trainee with the interior and preflight inspection of a C-208 aircraft.” Under subsection (e) Cockpit Orientation, line item (7) stated “TAWS/GPWS test.”

The Honeywell KGP-560/860 Pilot’s Guide[16], section “Functions and Features” stated, in part:

> **TERRAIN INHIBIT SWITCH**
>
> The KGP 560/860 GA-EGPWS requires the installation of a "Terrain Inhibit" switch as part of the system installation. When engaged by the pilot, this switch will inhibit all visual and aural alerts and warnings associated with the GA-EGPWS. Also, an external annunciator lamp is illuminated and a message will be displayed indicating “Warnings Inhibited”.
>
> The terrain display, if installed, remains operational. The purpose of the "Terrain Inhibit" switch is to allow aircraft to operate without nuisance or unwanted warnings at airports that are not in the system database. Examples might be private airports or those with runways shorter than 2000 feet. Additionally, there may be some "VFR-only" airports where unique terrain features are in close proximity to the runway, and the "Terrain Inhibit" may be used when operating in good VFR conditions. The "Terrain Inhibit" switch should be NOT engaged for normal operations.

According to interviews with Hageland personnel, the TAWS system could be inhibited in VMC if the pilot was confident that there were no terrain concerns. In IMC, the pilot was to comply with the TAWS alert and perform the appropriate escape maneuver. When the TAWS would be uninhibited by the pilot

For information on the airworthiness criteria for installing approved TAWS systems for Part 25 airplanes, see Attachment 12 to this report.

[16] See Attachment 11 – KGP 560/860 Pilot’s Guide

5.0. Safety Management

Hageland Aviation did not have a formal safety management system (SMS) in place at the time of the accident. Asked to describe the safety culture at Hageland, the vice president of safety at the time of the accident, stated:

> I would say that the safety culture at Hageland is -- it is -- I believe we are still in a reactive phase of safety culture, but we're moving towards a proactive phase and the employees are actively participating in the safety program. They don't in my experience cover things up that are safety issues. They would rather identify them and get them repaired. So I would say in general the safety culture is very healthy. It's well supported throughout top and mid-management and the employees actively engage with the safety department and with their managers on safety issues.

Hageland also had various outlets for employees to report safety concerns. The Hageland GOM, chapter Emergencies & Reports – Safety Reports, Section 1 Program Description, described the company's reporting policy and programs available to employees; see Attachment 6 to this report. Additional information about Hageland's safety programs can be found in Attachment 13 to this report.

5.1. Morning Safety Briefings

The Hageland GOM, chapter Pilot Policies, Section 9 Daily Pilot Safety Briefings, stated:

> The station Lead Pilot shall ensure that each Pilot receives a daily safety briefing prior to conducting any flights. The Lead Pilot shall conduct the briefing as a meeting with all morning flight crews at bases where three (3) or more Pilots are working. The Lead Pilot or Departure Control Agent shall conduct a safety briefing individually or with a small group at stations.
>
> The briefing should include but is not limited to a discussion of:
>
> - Pilot and aircraft status
> - Current weather reports and forecasts
> - NOTAMS and ADS-B NOTAMS
> - Any abnormal operational issues affecting flight operations, such as station staffing, refueling, potential for icing conditions and deice preparations, etc.
> - Flight assignment plan, including any needed discussion re:
>   - Nature of the flight loads
>   - Anticipated non-scheduled flights, e.g. extra sections, charters, reposition flights
>   - IFR vs. VFR flights
>   - Civil twilight hours and flights affected by Day vs. Night flight rules

According to an interview with the lead pilot in Bethel, no morning meeting was held on the day of the accident because it was a Sunday.[17]

5.2. Post-Accident Actions

Following the accident, the FAA and Hageland Aviation agreed to a 7-point mitigation plan[18] to prevent a future CFIT accident at the carrier which included implementing GPS VFR routes for all flights, installing FOQA equipment on all aircraft, converting manuals to an electronic format, flying under IFR rules when able, developing a professional pilot program, creating a flight operations compliance monitoring department and requiring that the GPS be operative for all flights.

6.0. Medallion Foundation

The Medallion Foundation website, section "About Us" stated, 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.
>
> 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.
>
> We continue to educate, mentor and advocate for our primary Alaska audiences while expanding our years of success into other aviation markets.

[17] See Attachment 2 – Interview Transcripts.
[18] See Attachment 7 – FAA-Hageland Post-Accident CFIT Mitigation Plan.

The Medallion Foundation works with carriers to develop each of the five star cornerstones – CFIT avoidance, Operational Control, Maintenance and Ground Service, Safety, and Internal Evaluation. Once the five stars are obtained, the carrier is eligible for the Shield. A carrier's program is audited by Medallion annually. The carrier is also responsible for conducting self-audits of their stars annually. For additional information, see Attachment 1 – Interview Summaries and Attachment 8 – Medallion Foundation Shield Program Documents.

Hageland Aviation obtained the CFIT A star on June 24, 2005, the Operational Control star on April 7, 2014, the Maintenance and Ground Service star on January 20, 2015, the Safety star on November 20, 2009, and the Internal Evaluation star on August 14, 2015. Hageland was then issued the Medallion Shield on June 28, 2016. The most recent audit of Hageland's stars by Medallion prior to the accident was completed on June 28, 2016.

7.0. CFIT Initiatives in Alaska

On May 11, 2016, the FAA released a letter[19] signed by the Alaskan Region Flight Standards Division Manager discussing the "significant increase" in Part 135 CFIT events. The letter was sent to owners and Part 119 officials of Part 135 carriers. In conjunction with the Medallion Foundation, the letter asked, in part, the following questions to help carriers reduce their CFIT potential:

- Are you an IFR capable operator who routinely operates VFR based on pilot preference?
- How do you conduct Special VFR operations? Do you have good policies and procedures to ensure a safe outcome?
- Have you identified VFR routes that you expect your pilots to fly? Are these routes documented in your manual system, including day and night VFR weather minimums that comply with Part 135.203 and .205? Are these routes programmed in the databases of your navigational equipment?
- Are your training programs thorough and effective, covering scenarios that your pilots are likely to encounter?
- Do you require the completion of Flight Risk Assessments prior to all departures?
- Is your Flight Locating System appropriate for the size and scope of your operation?
- Is the culture of your company one that supports the taking of inappropriate risks or is it one that makes it every employee's responsibility to ensure safety is at the heart of every operation?

The FAA also published the 2017 Alaskan Aviator's Safety Handbook (third edition) which provided additional information about FAA Alaskan Region flight services, aviation weather camera program and the FAA Safety Team (FAAST team).[20]

8.0. Related Open NTSB recommendations

[19] See Attachment 9 – FAA CFIT Letter.
[20] See Attachment 10 – FAA 2017 Alaskan Aviator's Safety Handbook

The following recommendations have been issued by the NTSB to the FAA and are classified as "Open":

> Work with members of the Ketchikan air tour industry to improve existing training programs aimed at reducing the risk of weather-related accidents involving continuation of flight under visual flight rules into instrument meteorological conditions, with special attention paid to the human factors issues identified in this investigation, including (1) the need to help pilots better calibrate what constitutes safe weather conditions to conduct flights based on objective standards and requirements, such as set criteria for what landmarks must be clearly visible from which locations in order to proceed on a particular route; (2) the need to help pilots who are new to the area recognize dynamic local weather patterns that can place them in a dangerous situation; and (3) operational influences on pilot decision-making. (A-17-37)
>
> Expand the application of Federal Aviation Administration Order 8900.1, volume 3, chapter 19, section 6, "Safety Assurance System: Flight Training Curriculum Segments," paragraphs 3-1251(B) and 3-1252, which address controlled flight into terrain-avoidance training programs for 14 *Code of Federal Regulations* (*CFR*) Part 135 helicopter operations, to all 14 *CFR* Part 135 operations. (A-17-38)
>
> Require all 14 *Code of Federal Regulations* Part 135 operators to establish safety management system programs. (A-16-36)
>
> Require the installation of a crash-resistant flight recorder system on all newly manufactured turbine-powered, nonexperimental, nonrestricted-category aircraft that are not equipped with a flight data recorder and a cockpit voice recorder and are operating under 14 *Code of Federal Regulations* Parts 91, 121, or 135. The crash-resistant flight recorder system should record cockpit audio and images with a view of the cockpit environment to include as much of the outside view as possible, and parametric data per aircraft and system installation, all as specified in Technical Standard Order C197, "Information Collection and Monitoring Systems." (A-13-12)
>
> Require all existing turbine-powered, nonexperimental, nonrestricted-category aircraft that are not equipped with a flight data recorder or cockpit voice recorder and are operating under 14 *Code of Federal Regulations* Parts 91, 121, or 135 to be retrofitted with a crash-resistant flight recorder system. The crash-resistant flight recorder system should record cockpit audio and images with a view of the cockpit environment to include as much of the outside view as possible, and parametric data per aircraft and system installation, all as specified in Technical Standard Order C197, "Information Collection and Monitoring Systems." (A-13-13)