

# Attachment 20

To Operational Factors Specialist Factual Report

ANC17MA001

Operational Factors and Human Performance  
Specialist's Visit to Honeywell Aerospace

# **Operational Factors and Human Performance Specialist's Visit to Honeywell Aerospace, Redmond, Washington**

## **ACCIDENT**

Operator: Hageland Aviation Services, Inc.  
Location: Togiak, Alaska  
Date: October 2, 2016  
Time: 1154 AKDT  
Airplane: Cessna 208B, N208SD

## **PARTICIPANTS**

Marvin Frantz  
Operational Factors Division (AS-30)  
National Transportation Safety Board (NTSB)

Katherine Wilson  
Human Performance and Survival Factors  
Division (AS-60)  
NTSB

Patrick Hempen  
Accident Investigation Division (AVP-100)  
Federal Aviation Administration (FAA)

## **ACCIDENT 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, Togiak, and company flight following procedures were in effect. Flight 3153 departed Quinhagak, Alaska, at 1133, destined for Togiak.

## **HONEYWELL VISIT/OBJECTIVES**

The NTSB Operational Factors and Human Performance Specialists and an FAA representative met with system experts from Honeywell Aerospace in Redmond, Washington, on June 20, 2017. In attendance from Honeywell Aerospace were Steve Johnson, Mackenzie McGehee, Maggie Wintermute and Gary Ostrom.

The purpose of the visit was for the investigative team to participate in a simulator session and EGPWS demonstration that will replicate the alerts the EGPWS system installed on the accident airplane would have provided as the plane flew over the probable accident route.

The meeting began with a presentation by Steve Johnson that provided a briefing of the work Honeywell done to prepare for the simulator observation. The team then made observations in the simulator. The day concluded with a debrief in the conference room.

## **MEETING SUMMARY**

The accident airplane was equipped with a Bendix King KGP560 EGPWS (released in 1999-2000 timeframe) that met the Class B TAWS requirements<sup>1</sup>. The system relied on GPS, either internal or external and was compatible with a single display (note: there was no TAWS -linked terrain display on the accident aircraft and the internal GPS receiver of the TAWS unit was in use). The last software update (Mod 1) provided by Honeywell was in March 2004. The accident airplane was also equipped with a Garmin 430 which did not have a TAWS option (the 530 and later series Garmin did have a TAWS option). The terrain database version on the accident airplane was updated in 2012 (version 466); the most up-to-date version at the time of the accident was 481<sup>2</sup>, however, Honeywell's analysis showed no differences in the accident site terrain between the two versions.

## **SIMULATOR OBSERVATIONS**

Honeywell used three available Spidertrack data (location and altitude) points and the accident location and altitude to construct the route to be flown in the simulator. Because Spidertrack data was only available at 6 minute intervals, Honeywell created several intermediate data points to define the most probable route of flight taken between the known Spidertrack points. This re-created route between Spidertrack points was based on terrain between the points.

- Spidertrack data point 1 – altitude 700 feet
- Spidertrack data point 2 – altitude 1000 feet
- Spidertrack data point 3 – altitude 1000 feet
- Impact point – altitude approximately 2300 feet

The TAWS unit used in the simulation was the KGP560 EGPWS system with version 481 terrain database (noted above to be the same as the version 466 on the accident airplane.) Three separate flights over the probable route were conducted. The first used Class B TAWS specifications and two others used Class C specifications.

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<sup>1</sup> Class B TAWS sets an en route required terrain clearance of 700 feet AGL; Class C TAWS sets an en route required terrain clearance of 250 feet AGL.

<sup>2</sup> The most up-to-date terrain database at the time of this meeting used NED (National Elevation Database) data versus US Geological Survey (USGS) data.

Flight 1 – flight path recreation using Class B TAWS. The EGPWS sounded “caution terrain” and “pull up pull up” for a majority of the flight from the first Spidertrack data point until the impact point. Radar altitude in the simulator fluctuated between 500 and 800 feet depending on terrain along the accident flight path. Increasing the flight path altitude to about 1300 feet MSL reduced the number of EGPWS alerts.

Although terrain cautions and warnings were received over a large portion of the probable flight path flown in the simulator, there was a period of TAWS silence, lasting about 30 seconds, immediately prior to the final cautions and warnings associated with the impact. The final “Caution Terrain Caution Terrain” messages came at 48 seconds before impact and again at 38 seconds before impact. About 28 seconds before impact, the final “Terrain Terrain Pull Up Pull Up” warning was heard, followed by a continuous “Pull Up Pull Up” warning until impact.

Flight 2 – flight path recreation using Class C TAWS. Reducing the required terrain clearance height significantly reduced the number of EGPWS alerts received along the accident route.

Flight 3 – flight path recreation using Class C and updated terrain database using NED data. Using the NED terrain data produced the fewest EGPWS alerts of all three simulator runs.