NATIONAL TRANSPORTATION SAFETY BOARD
Public Meeting of April 10, 2018
(Information subject to editing)

Collision with Terrain, Hageland Aviation Services, Inc., dba Ravn Connect Flight 3153, Cessna 208B, N208SD Togiak Village, Alaska
October 2, 2016
NTSB/AAR-18/01

This is a synopsis from the NTSB's report and does not include the Board's rationale for the conclusions, probable cause, and safety recommendations. NTSB staff is currently making final revisions to the report from which the attached conclusions and safety recommendations have been extracted. The final report and pertinent safety recommendation letters will be distributed to recommendation recipients as soon as possible. The attached information is subject to further review and editing to reflect changes adopted during the Board meeting.

Executive Summary

On October 2, 2016, about 11:57 a.m., Alaska daylight time, Ravn Connect flight 3153, a turbine-powered Cessna 208B Grand Caravan airplane, N208SD, collided with steep, mountainous terrain about 10 nautical miles (nm) northwest of Togiak Airport (PATG), Togiak Village, Alaska. The two commercial pilots and the passenger were killed, and the airplane was destroyed. The scheduled commuter flight was operated under visual flight rules (VFR) by Hageland Aviation Services, Inc., Anchorage, Alaska, under the provisions of Title 14 *Code of Federal Regulations* (*CFR*) Part 135. The NTSB's investigation determined that instrument meteorological conditions (IMC) were likely in the vicinity of the accident site at the time of the accident. The flight departed Quinhagak Airport, Quinhagak, Alaska, at 11:33 a.m., and was en route to PATG.

Data available for the accident flight showed that, after departure in visual meteorological conditions, the airplane proceeded along a generally direct route toward the destination at an altitude of about 1,000 ft mean sea level (msl), which resulted in terrain clearances between 500 and 700 ft above ground level (agl). During the last 4 minutes of the flight, the airplane climbed as it approached the mountain ridge that it eventually struck at an elevation of about 2,300 ft msl after having likely entered IMC. The airplane was equipped with Class B terrain awareness and warning system (TAWS) that had an en route required terrain clearance (RTC) of 700 ft agl; flight at altitudes below the RTC (and not within 15 miles of an airport, given certain criteria) would result in TAWS terrain alerts. Hageland flights operated under VFR were allowed to fly as low as 500 ft agl, as was seen with this flight, which was flown en route below the TAWS alerting threshold. The system was equipped with a terrain inhibit switch that allowed the pilot to manually inhibit all TAWS aural and visual caution and warning alerts. A TAWS simulation that used an estimated flightpath for the accident airplane (assuming a level cruise altitude between known data points and a climb after the last data point to the accident elevation) showed that, if the alerts were not inhibited, the TAWS would have provided continuous alerts for most of the assumed flight.

The investigation concluded that the TAWS alerts were likely inhibited for most, if not all, of the flight, eliminating a margin of safety.

The NTSB identified the following safety issues as a result of this accident investigation:

- **Inadequacies in Hageland's Federal Aviation Administration (FAA)-approved crew resource management (CRM) training program.** Although most of Hageland's Cessna 208 flights were operated under VFR as single-pilot operations, the company sometimes assigned a second-in-command (SIC) to assist with cargo or to extend the allowable flight time per duty period. However, Hageland's CRM computer-based training (CBT) presentation did not describe how the pilot-in-command (PIC) and SIC should work together in Hageland's operational environment or specify the respective roles of pilot flying and pilot monitoring. Further, the CRM CBT did not address aeronautical decision-making and judgment tailored to company operations and the aviation environment, which are subjects required by 14 *CFR* 135.330. Also, the CRM CBT provided no guidance on how flight crews should work together with the company's operations control center (OCC) personnel who share operational control of flights and are integral to the preflight risk assessment process.

- **Inadequate FAA oversight of Hageland's CRM training program.** Hageland's training program previously has been the focus of both FAA and NTSB concern, resulting from five accidents and a runway excursion incident involving Hageland flights that occurred between December 3, 2012, and April 8, 2014. Collectively, the accidents suggested the likelihood of systemic problems, which prompted the FAA (after the first four accidents) to suspend Hageland's training program between December 13, 2013, and January 8, 2014, due to concerns that included CRM and flight crews' ability to estimate in-flight visibility. Four months later, on April 8, 2014, a fatal training accident involving a Hageland Cessna 208B in Kwethluk occurred. The NTSB issued Urgent Safety Recommendation A-14-22 to the FAA regarding operators owned by HoTH, Inc., which (at the time) included Hageland. Among the many actions requested in the recommendation, the NTSB asked that the FAA conduct a comprehensive audit of the regulatory compliance and operational safety programs in place at Hageland, including an assessment of its training programs. The NTSB also issued Safety Recommendation A-14-23 asking the FAA to conduct a comprehensive audit of the FAA oversight of Hageland (and the other HoTH, Inc., operators). Both recommendations were classified "Closed—Acceptable Action" based on the FAA's responses to the NTSB that it had completed the recommended audits and had ensured that corrective action was implemented for all adverse findings. However, despite the FAA's focused efforts and its assurance that responsive action had been completed, this investigation found that Hageland's approved CRM training did not contain all the required elements of 14 *CFR* 135.330.

- **Need for improvements in Hageland's controlled flight into terrain (CFIT)-avoidance training.** Although not required by federal regulation to have a CFIT-avoidance training program, Hageland chose to provide CFIT-avoidance ground and simulator/flight training device (FTD) training to its pilots during both initial and

annual recurrent training. Hageland chose to incorporate one CFIT-avoidance training module into its FAA-approved *Operations Training Manual* (OTM), which meant that the module was required training for Hageland pilots and subject to FAA oversight. However, the module was not carefully focused on entirely relevant topics, and the CFIT-avoidance CBT contained information extracted from a training aid that was more than 20 years old and did not address current TAWS technologies. It also did not specifically address Hageland's operational environment. Hageland's CFIT-avoidance flight simulator/FTD training was designed to train pilots to properly react to certain conditions that are associated with CFIT accidents; however, the simulator lacked realistic visual cues to replicate all the specified scenarios and did not have a TAWS to enable pilots to practice responding to actual TAWS alerts. Further, Hageland's training program did not specify what alternative means it would use to train its pilots to acquire the decision-making skills critical for CFIT avoidance.

- **Lack of FAA requirements for CFIT-avoidance training programs for Part 135 fixed-wing operations.** FAA Order 8900.1, volume 3, chapter 19, section 6, "Safety Assurance System: Flight Training Curriculum Segments," outlines in paragraph 3-1251(B) the requirements for FAA-approved CFIT-avoidance training programs for Part 135 helicopter operations and provides guidance for FAA principal operations inspectors for evaluating programs, but no such requirements exist for fixed-wing operations. As a result of the NTSB's investigation of the June 2015 fatal CFIT accident involving a de Havilland DHC-3 airplane operated by Promech Air, Inc., in Ketchikan, Alaska, and other CFIT accidents involving fixed-wing aircraft (including the November 2013 CFIT accident involving a Cessna 208B operated by Hageland), the NTSB issued Safety Recommendation A-17-38 to the FAA to expand the application of the order's requirements for Part 135 helicopter operations to all Part 135 operations.

- **Lack of effective TAWS protections and nuisance-alert mitigations for flights that operate under VFR at altitudes below the TAWS RTC.** Numerous Part 135 operators are authorized to conduct flights under VFR at altitudes below their respective TAWS class RTC, and the NTSB has investigated several other fatal CFIT accidents involving operations with TAWS alerts inhibited. As a result, the NTSB issued Safety Recommendation A-17-35, which asked the FAA to implement ways to provide effective TAWS protections while mitigating nuisance alerts for single-engine airplanes operated under Part 135 that frequently operate at altitudes below their respective TAWS class design alerting threshold.

- **Hageland's inadequate guidance for pilots' use of the terrain inhibit switch for the TAWS alerts.** Although Hageland had no official published policy regarding use of the terrain inhibit switch, the company allowed pilots to inhibit the TAWS aural and visual alerts at times contrary to the manufacturer's recommendations because the alerts could be distracting to the crew during flights below the TAWS RTC. At the time of the accident, Hageland also had no guidance for its pilots on when the TAWS alerts should be uninhibited after having been inhibited. The lack of specific guidance on TAWS use led to pilots routinely inhibiting a safety system important in CFIT prevention.

- **TAWS design limitations that require pilot action to uninhibit the alerts after they have been inhibited.** As designed, once the terrain inhibit switch was pushed to inhibit the TAWS alerts, a pilot would have to push the switch again to uninhibit the alerts. Remembering to uninhibit the system requires the pilot to adequately monitor the situation and perform the action at the intended time. However, research has shown that pilots can forget to perform an action due to multitasking, distraction, task interruption, absence of cues, or poorly formed intentions in memory. Although the risk of making such an error is reduced significantly when operations are proceduralized and overlearned, a design that prevents the TAWS alerts from remaining inhibited indefinitely in the event that a pilot does not uninhibit them would provide a greater level of safety.

- **Need for safety management systems (SMS) for Part 135 operators.** Hageland did not have an SMS at the time of the accident but was working toward implementation. The NTSB has investigated several other Part 135 accidents (including the two Hageland accidents that occurred in 2013) that highlighted operational safety issues that could have been identified and mitigated with SMS. As a result of its investigation of a 2015 fatal accident in Akron, Ohio, involving a British Aerospace HS 125-700A (as well as other accidents cited in the report), the NTSB issued Safety Recommendation A-16-36, which recommended that the FAA require all Part 135 operators to establish SMS programs.

- **Need for flight data monitoring (FDM) programs (and supporting devices) for Part 135 operators.** At the time of the accident, Hageland did not have a process in place to collect and review flight data to identify deviations from standard operating procedures and regulations and other potential safety issues. The company has since begun installing monitoring equipment on its fleet that will enable Hageland to identify risk trends and to take corrective action before an accident occurs. The NTSB has long recognized the value of using flight data recording devices as part of an FDM program, having first issued a safety recommendation for such devices and programs for helicopter air ambulances in 2009. More recently, as a result of the investigation of the Akron accident (as well as others cited in that accident report), the NTSB issued Safety Recommendation A-16-34 to recommend that the FAA require all Part 135 operators to install flight data recording devices capable of supporting an FDM program. The NTSB also issued Safety Recommendation A-16-35, which recommended that the FAA, after the action in Safety Recommendation A-16-34 was complete, require all Part 135 operators to establish a structured FDM program.

- **Lack of assurance that operators implemented Medallion Foundation programs effectively.** Medallion is a nonprofit organization, partially funded by an FAA grant, with a core mission of reducing aviation accidents in Alaska. Hageland participated in the Medallion Foundation Shield Program, which involved implementing specific training, policies, manuals, and other criteria in various categories, including CFIT avoidance. Hageland, like most carriers that were Medallion members, kept most of its Medallion program materials separate from its FAA-approved and -accepted manuals and training programs; thus, most of Hageland's Medallion program activities were not

subject to FAA oversight. Although Medallion staff performed annual audits of Hageland's programs, the audits did not provide oversight of the programs or assess their effectiveness but rather ensured that the programs had the prescribed items in place. Incorporating the Medallion programs into an operator's FAA-approved or -accepted manuals would ensure that the FAA oversees these programs.

- **Need for improved infrastructure to support IFR operations in Alaska.** Although IFR flight capability was available for the accident flight segment, both the accident PIC and the PIC of the second company flight that departed PATG chose to operate under VFR; the safety pilot for the second company flight stated that it was easier to fly the route under VFR due to difficulties obtaining timely air traffic control clearances for IFR flights. Hageland and FAA personnel described that communications and weather-reporting limitations could not support IFR operations in many areas in Alaska.
- **Lack of a requirement for crash-resistant flight recorder systems capable of capturing cockpit audio and images for Part 135 operators.** The accident airplane was not equipped (and was not required to be equipped) with a crash-resistant flight recorder system capable of capturing cockpit audio and images of the instrument panel and pilot's forward view. Thus, investigators lacked information about the dynamic aspects of the weather the flight crew faced, visual cues of deteriorating weather, the status of the TAWS terrain inhibit switch, and how the flight crew reacted to the developing situation and worked together. Such information would have benefited the investigation and provided the details needed to determine the most effective countermeasures to prevent future accidents.
- **Need for improved sharing of pilot weather reports (PIREPs) in remote areas in Alaska.** The investigation found that there were no publicly disseminated PIREPs made within 2 hours of the accident time within 100 miles of the accident location. The investigation also found that, although Hageland pilots submitted PIREPs directly for public dissemination in the National Airspace System (NAS), any PIREPs received by Hageland OCC personnel were not publicly disseminated to the NAS. The NTSB previously identified in a special investigation report in 2017 that other operators also did not share PIREPs to the NAS, even though multiple means of capabilities were available. As a result, the NTSB issued Safety Recommendation A-17-25 that asked the FAA to encourage industry safety efforts to provide incentives for operators and the general aviation community to freely share PIREPs to the NAS to enhance flight safety. This is critically important for areas in Alaska in which weather-reporting infrastructure is sparse.

Findings

1. None of the following were factors in the accident: (1) flight crew qualifications in accordance with federal regulations, (2) flight crew medical conditions or impairment by alcohol or other drugs, or (3) airplane mechanical condition.

2. Based on the available weather information that indicated the likelihood of decreased visibility due to precipitation and/or clouds in the accident area and the observation from a company flight crew that clouds obscured the accident site within an hour after the accident, the accident flight crew likely encountered instrument meteorological conditions before the collision with terrain.

3. The pilot-in-command's decision to continue the visual flight rules flight into reduced visibility conditions resulted in the flight entering instrument meteorological conditions.

4. The investigation found no evidence that management or scheduling pressures, habitual noncompliance with company policy, or history of risk-taking behaviors influenced the pilot-in-command's decision to continue the flight.

5. Once the flight entered instrument meteorological conditions, the pilot-in-command should have either executed an escape maneuver or commanded the second-in-command to execute one.

6. Although damage precluded determination of the preimpact position of the terrain inhibit switch, the terrain awareness and warning system (TAWS) alerts were likely inhibited for most, if not all, of the accident flight, because the flight crew otherwise would have received continuous TAWS alerts for most of the flight (as shown by a general aviation enhanced ground proximity warning system simulation), and Hageland pilots routinely inhibited the alerts during normal operations.

7. Hageland's approved crew resource management training was inadequate because it did not address aeronautical decision-making and judgment tailored to company operations and the aviation environment, as required by Title 14 *Code of Federal Regulations* 135.330, and it did not provide the flight crew with procedures for flight crew coordination, communication, and the division of crew duties, including respective pilot flying/pilot monitoring responsibilities.

8. Incorporating the operational control agents into crew resource management training for flight crews would better facilitate teamwork during the risk assessment process and other communications with flight crews.

9. Approved crew resource management training that is tailored to Hageland's flight operations and aviation environment, includes defined expectations for each crewmember's role and responsibilities, and addresses effective communication and coordination among flight crewmembers and Operations Control Center personnel, would provide flight crews with the skills to exercise good aeronautical decision-making and judgment to mitigate the risk of controlled flight into terrain.

10. Despite the Federal Aviation Administration's (FAA's) focused efforts to improve its oversight of Hageland's flight crew training after several accidents involving Hageland

pilots in the preceding 4 years, which included performing an audit recommended by the National Transportation Safety Board in 2014, the FAA did not ensure that Hageland's approved crew resource management training contained all the required elements of Title 14 *Code of Federal Regulations* 135.330.

11. Hageland's controlled flight into terrain (CFIT)-avoidance computer-based training (ground) presentation, which was not tailored to Alaska or Hageland operations and did not address current CFIT-avoidance technologies, was a missed opportunity for Hageland to educate its pilots about mitigating the CFIT risks associated with their operations.

12. Limitations with the Cessna 208 Level B flight simulator, including the lack of realistic visual cues and a terrain awareness and warning system (TAWS) to enable pilots to practice responding to actual TAWS alerts, prevented it from replicating all of the controlled flight into terrain (CFIT)-avoidance training scenarios specified in Hageland's *CFIT-Avoidance Training Manual*, and Hageland's training program did not specify what alternative means it would use to train its pilots to acquire the decision-making skills critical for CFIT avoidance.

13. Due to the weather and terrain challenges associated with visual flight rules operations in Alaska and the significant risk of controlled flight into terrain (CFIT) in this region, CFIT-avoidance training that contains cue-based and scenario-based content specific to Alaska operations could improve pilots' abilities to accurately assess weather and make appropriate weather-related decisions.

14. Controlled flight into terrain (CFIT)-avoidance training program requirements specified for Title 14 *Code of Federal Regulations* (*CFR*) Part 135 helicopter pilots in Federal Aviation Administration (FAA) Order 8900.1, if applied also to 14 *CFR* Part 135 airplane operations, could help ensure the quality of the CFIT-avoidance training and ensure standardization because the order outlines the requirements for an FAA-approved training program and provides guidance for principal operations inspectors for evaluating the program and providing competency checks to pilots.

15. The operation of flights at altitudes below the terrain awareness and warning system (TAWS) required terrain clearance, and the corresponding frequent TAWS alerts and pilots' routine use of the inhibit feature contrary to the manufacturer's guidance, is inconsistent with the goal of providing the greatest possible level of safety, in which terrain awareness is high and terrain alerts from TAWS are both rare and taken seriously when received.

16. At the time of the accident, Hageland did not provide adequate guidance to pilots regarding use of the terrain awareness and warning system alerts Terrain Inhibit function to help ensure that this critical safety system can provide the intended protections to reduce the risk of controlled flight into terrain.

17. Given the circumstances this and other accidents that the National Transportation Safety Board has investigated involving visual flight rules operations conducted below the terrain awareness and warning system (TAWS) required terrain clearance with the TAWS alerting feature inhibited, all Title 14 *Code of Federal Regulations* Part 135 operators could likely benefit from improved guidance and procedures related to testing, inhibiting, and enabling the TAWS alerts.

18. A design feature that prevents the terrain awareness and warning system alerts from remaining inhibited indefinitely in the event that a pilot does not uninhibit them could reduce the likelihood of unintentional operation with the alerts inhibited.

19. A safety management system, which requires operators to incorporate formal system safety methods into their internal oversight programs, could help Hageland and other Title 14 *Code of Federal Regulations* Part 135 operators identify and mitigate the types of risks identified in this accident investigation.

20. Operational flight data monitoring programs can provide Title 14 *Code of Federal Regulations* Part 135 operators with objective information on how their pilots conduct flights, and a periodic review of such information can assist operators in detecting and correcting unsafe deviations from company standard operating procedures.

21. Without any oversight to assess and ensure effectiveness, there is no meaningful distinction between Medallion star or shield members that implement and use the program tools and those that may hold the same star or shield status but simply have the program elements in place.

22. Continued improvements to the low-altitude instrument flight rules (IFR) infrastructure in Alaska, including enhanced communications and weather-reporting capabilities, can help reduce the risk of controlled-flight-into-terrain accidents by allowing more widespread access to the IFR system to ensure terrain clearance and to better support the state's air transportation needs.

23. A crash-resistant flight recorder system capable of capturing cockpit audio and images of the instrument panel and pilot's forward view would have benefitted this accident investigation and provided valuable information to help improve training programs for pilots.

24. Pilot weather reports from operators like Hageland that provide air service to remote areas that have relatively few weather observation sources are particularly important not only to other pilots for avoiding weather hazards but also to weather forecasters for issuing advisories and improving forecasts in areas that have few observation stations.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of this accident was the flight crew's decision to continue the visual flight rules flight into deteriorating visibility and their failure to perform an immediate escape maneuver after entry into instrument meteorological conditions, which resulted in controlled flight into terrain (CFIT). Contributing to the accident were (1) Hageland's allowance of routine use of the terrain inhibit switch for inhibiting the terrain awareness and warning system alerts and inadequate guidance for uninhibiting the alerts, which reduced the margin of safety, particularly in deteriorating visibility; (2) Hageland's inadequate crew resource management (CRM) training; (3) the Federal Aviation Administration's failure to ensure that Hageland's approved CRM training contained all the required elements of Title 14 *Code of Federal Regulations* 135.330; and (4) Hageland's CFIT-avoidance ground training, which was not tailored to the company's operations and did not address current CFIT-avoidance technologies.

RECOMMENDATIONS

New Recommendations

As a result of this investigation, the National Transportation Safety Board makes the following new safety recommendations:

To the Federal Aviation Administration:

1. Although controlled flight into terrain (CFIT)-avoidance training programs are not required by federal regulation for Title 14 *Code of Federal Regulations* Part 135 fixed-wing operations, work with Part 135 operators in Alaska to improve any voluntarily implemented training programs aimed at reducing the risk of CFIT accidents involving continuation of flight under visual flight rules (VFR) into instrument meteorological conditions, with special attention paid to the human factors issues identified in recent Alaska accident investigations, including but not limited to, (1) the challenges of flying in mountainous terrain in Alaska and low-altitude VFR flight in an area subject to rapid changes in weather; and (2) limitations of the Alaska infrastructure, particularly weather observations, communications, and navigation aids.

2. Work with Title 14 *Code of Federal Regulations* Part 135 certificate holders that operate under visual flight rules in mountainous terrain at altitudes below the required terrain clearance of the aircraft's required terrain awareness and warning system (TAWS) class to (1) ensure that management and pilots are aware of the risks associated with distraction (from continuous nuisance alerts) and complacency (brought about by routine use of the terrain inhibit feature); (2) develop plans for mitigating those risks and minimizing nuisance alerts; and (3) develop procedures that specifically address when pilots should test, inhibit, and uninhibit the TAWS alerts, considering the operator's typical operations and the TAWS manufacturer's guidance.

3. Modify the terrain awareness and warning system requirements in Technical Standard Order C151 such that, once the alerts are manually inhibited, they do not remain inhibited indefinitely if the pilot does not uninhibit them.

4. Install communications equipment throughout Alaska, after determining what would be most effective, to allow increased access to the instrument flight rules (IFR) system, giving priority to those areas used by 14 *Code of Federal Regulations* Part 135 operators.

5. Ensure that Alaska airports that are served by 14 *Code of Federal Regulations* (*CFR*) Part 135 operators and have instrument approaches are equipped with weather reporting capabilities to enable instrument flight rules operations in accordance with 14 *CFR* 135.225(a).

To the Medallion Foundation:

6. Expand the criteria for the Medallion stars and shield to include requirements for your members to incorporate Medallion program materials into their Federal Aviation Administration-approved and -accepted training programs and manuals.

7. Expand the criteria for your safety star to include requirements for a flight data monitoring program.

To Hageland Aviation:

8. Incorporate into your crew resource management training program ground, simulator, and flight training that define second-in-command responsibilities for dual-pilot operations, including but not limited to (1) the use of standard operating procedures and execution of pilot flying/pilot monitoring duties as outlined in Advisory Circular 120-71B and (2) aeronautical decision-making and judgment scenarios that are tailored to Hageland's flight operations and aviation environment, including communications and teamwork with Operations Control Center personnel.

Reiterated Recommendations

The National Transportation Safety Board reiterates the following safety recommendations to the Federal Aviation Administration:

1. 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)

2. Implement ways to provide effective terrain awareness and warning system (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. (A-17-35)

3. Require all 14 *Code of Federal Regulations* Part 135 operators to establish safety management system programs. (A-16-36)

4. Require all 14 *Code of Federal Regulations* Part 135 operators to install flight data recording devices capable of supporting a flight data monitoring program. (A-16-34)

5. After the action in Safety Recommendation A-16-34 is completed, require all 14 *Code of Federal Regulations* Part 135 operators to establish a structured flight data monitoring program that reviews all available data sources to identify deviations from established norms and procedures and other potential safety issues. (A-16-35)

6. 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)

7. 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)

8. Encourage industry safety efforts, such as the Commercial Aviation Safety Team and the General Aviation Joint Steering Committee, to identify, develop, and implement incentives for 14 *Code of Federal Regulations* Part 121, 135, and 91K operators and the general aviation community to freely share pilot weather reports (PIREPs), including braking action or runway condition reports filed as PIREPs, to the National Airspace System to enhance flight safety. (A-17-25)