May 26, 2022

Mr. Bill Nolen
Acting Administrator
Federal Aviation Administration
Washington, DC 20591

The attached letter from the NTSB Chair provides information about the NTSB's May 10, 2022, report, *Collision into Terrain, Safari Aviation Inc., Airbus AS350 B2, N985SA, Kekaha, Hawaii, December 26, 2019*, NTSB AIR-22-05. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at http://www.ntsb.gov.

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We encourage you to submit your response to ExecutiveSecretariat@ntsb.gov. If your reply exceeds 20 megabytes, including attachments, please e-mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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National Transportation Safety Board

Office of the Chair

Washington, DC 20594

May 26, 2022

Mr. Bill Nolen
Acting Administrator
Federal Aviation Administration
Washington, DC 20591

Dear Mr. Nolen:

This letter provides information about the National Transportation Safety Board's (NTSB) May 10, 2022, report, *Collision into Terrain, Safari Aviation Inc., Airbus AS350 B2, N985SA, Kekaha, Hawaii, December 26, 2019*, NTSB AIR-22-05. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at http://www.ntsb.gov.

As a result of this investigation, we identified the following safety issues:

- Aviation safety infrastructure limitations in Hawaii, including the need for aviation weather cameras, improved air-to-ground radio communications, and improved automatic dependent surveillance-broadcast (ADS-B) capabilities to enable flight tracking and other safety services for low-flying air tour flights.

- Lack of effective cue-based weather training for air tour pilots in Hawaii.

- Need for trained company flight support personnel with operational control authority to support pilots' en route, weather-related decision-making.

- Need for safety management systems and flight data monitoring programs for Part 135 operators and the incorporation of recorded onboard videos and ADS-B flight tracking data into safety assurance reviews.

- Need for improved Federal Aviation Administration (FAA) surveillance of air tour operations in Hawaii.

- Value of crash-resistant flight recorder systems in providing information critical for enabling the identification of the most effective measures to prevent similar accidents.

- Emerging technologies to help prevent accidents resulting from inadvertent encounters with instrument meteorological conditions, including helicopter safety technologies and simulation devices used in pilot training.

Accordingly, the NTSB makes the following safety recommendations to the FAA. Additional information regarding these recommendations can be found in the noted sections of the report.

- Install the necessary infrastructure in Hawaii to enable continuous radio communication between the pilots of low-flying tour flights and ground support personnel, such as flight service station specialists and company flight support personnel, along the most heavily trafficked air tour routes. (A-22-11) (See section 2.4.2.1)

- Implement automatic dependent surveillance-broadcast (ADS-B) infrastructure improvements in Hawaii, such as additional ADS B ground stations, that provide adequate coverage to enable real-time flight tracking and traffic advisory services for ADS-B Out- and In-equipped, low-flying air tour aircraft throughout their entire tour routes. (A-22-12) (See section 2.4.2.2)

- As an interim measure until completion of the action to satisfy Safety Recommendation A 21-15 [previously issued on May 13, 2021], require Hawaii air tour operators to install Automatic Dependent Surveillance-Broadcast Out equipment in their aircraft to enable real time flight position tracking. (A-22-13) (See section 2.4.2.2)

- Require air tour operators to have flight support personnel who are trained to exercise operational control authority, participate in preflight risk analysis, provide pilots with weather briefings, monitor the progress of the flights, and participate in two-way communications with pilots to alert them of any weather hazards. (A-22-14) (See section 2.5.1)

- Develop guidance for small operators for scaling a safety management system that includes methods and techniques for implementation and specific examples applicable to several operational sectors, including air tours. (A-22-15) (See section 2.5.2)

- Issue a safety alert for operators to encourage air tour operators to establish safety assurance processes to routinely review recorded onboard videos and automatic dependent surveillance-broadcast flight tracking data, ideally as part of a safety management system with an integrated flight data monitoring program, for the purpose of identifying and addressing risky trends in weather related operating practices, such as encounters or near encounters with

instrument-meteorological-conditions-related hazards. (A-22-16) (See section 2.5.4)

- Improve the surveillance of air tour operations in Hawaii through the use of technologies and innovative approaches, including but not limited to comparing automatic dependent surveillance broadcast flight position data from air tour flights with weather camera imagery for the route and periodically reviewing onboard video recordings, to detect and correct operating practices that may lead to unacceptable weather-related risky behavior. (A-22-17) (See section 2.6)

- Issue and periodically update a special airworthiness information bulletin that lists newly manufactured helicopters that are equipped with features likely to reduce accidents resulting from inadvertent encounters with instrument meteorological conditions, describes retrofit options for helicopters that do not have such equipment, and encourages the voluntary integration of these safety features. (A-22-18) (See section 2.8.1)

In addition, the NTSB reiterates the following recommendations to the FAA:

- 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) (See section 2.7)
- Initiate an aviation weather camera program in Hawaii that includes the installation and maintenance of aviation weather cameras at critical locations in Hawaii. Establish public access to these aviation weather cameras' real-time imagery. (A-13-25) (See section 2.4.1)
- Equip flight service station specialists responsible for Hawaii and the continental United States with the technical capabilities and training to provide verbal preflight and en route briefings using aviation weather camera imagery. (A-13-27) (See section 2.4.1)
- 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) (See section 2.5.3)
- 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) (See section 2.5.3)

- Require all 14 *Code of Federal Regulations* Part 135 operators to establish safety management system programs. (A-16-36) (See section 2.5.2)
- Identify high-traffic air tour areas and require, through a special federal aviation regulation or other means, that Title 14 *Code of Federal Regulations* Parts 91 and 135 air tour operators that operate within those areas be equipped with an Automatic Dependent Surveillance Broadcast Out- and In-supported traffic advisory system that 1) includes both visual and aural alerts, 2) is driven by an algorithm designed to minimize nuisance alerts, and 3) is operational during all flight operations. (A-21-15) (See section 2.4.2.2)
- Require the use of appropriate simulation devices during initial and recurrent pilot training for Title 14 *Code of Federal Regulations* Part 135 helicopter operations to provide scenario-based training that addresses the decision-making, skills, and procedures needed to recognize and respond to changing weather conditions in flight, identify and apply mitigation strategies for avoiding adverse weather, practice the transition to the use of flight instruments to reduce the risk of spatial disorientation, and maintain awareness of a variety of influences that can adversely affect pilot decision-making. (A-21-5) (See section 2.8.2)
- Convene a multidisciplinary panel of aircraft performance, human factors, and aircraft operations specialists to evaluate spatial disorientation simulation technologies to determine which applications are most effective for training pilots to recognize the onset of spatial disorientation and successfully mitigate it, and make public a report on the committee's findings. (A-21-6) (See section 2.8.2)

In the same report, we also classified and reiterated two previously issued safety recommendations:

- In cooperation with Hawaii commercial air tour operators, aviation psychologists, and meteorologists, among others, develop a cue-based training program for commercial air tour pilots in Hawaii that specifically addresses hazardous aspects of local weather phenomena and in-flight decision-making. (A-07-18, classified "Open—Unacceptable Response" in section 2.3.2)
- Once a cue-based training program that specifically addresses hazardous aspects of local weather phenomena and weather-related, decision-making issues is developed (as requested in Safety Recommendation A-07-18), require all commercial air tour operators in Hawaii to provide this training to newly

hired pilots. (A-07-19, classified "Open—Unacceptable Response" in section 2.3.2)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (new Safety Recommendations A-22-11 through -18, Reiterated Recommendations A-13-13, A-13-25, A-13-27, A-16-34 through -36, A-21-5, A-21-6, and A-21-15), and Classified and Reiterated Recommendations (A-07-18 and -19). We encourage you to submit your response to ExecutiveSecretariat@ntsb.gov. If your reply, including attachments, exceeds 20 megabytes, please e-mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

Sincerely,

[Original Signed]

Jennifer Homendy
Chair

May 26, 2022

Mr. James A. Viola, President
Helicopter Association International and
Industry Advisor for Vertical Aviation Safety Team
c/o Helicopter Association International
1920 Ballenger Ave, 4th Floor
Alexandria, VA 22314-2898

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation—railroad, highway, marine, and pipeline. We determine the probable cause of the accidents and issue safety recommendations aimed at preventing future accidents. In addition, we carry out special studies concerning transportation safety and coordinate the resources of the federal government and other organizations to provide assistance to victims and their family members affected by major transportation disasters.

The attached letter from the NTSB Chair provides information about the NTSB's May 10, 2022, report, *Collision into Terrain, Safari Aviation Inc., Airbus AS350 B2, N985SA, Kekaha, Hawaii, December 26, 2019*, NTSB AIR-22-05. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at http://www.ntsb.gov. For more information about NTSB and our recommendation process, please see the attached one-page summary.

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We are providing the following information to urge the Vertical Aviation Safety Team (VAST) to act on the safety recommendation in this letter because we believe your organization can help reduce the risk of future accidents.

This letter also includes information about our May 10, 2022, report, *Collision into Terrain, Safari Aviation Inc., Airbus AS350 B2, N985SA, Kekaha, Hawaii, December 26, 2019*, NTSB AIR-22-05. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at http://www.ntsb.gov.

As a result of this investigation, we identified the following safety issue relevant to your organization's interest in helicopter safety:

- Helicopter safety technologies to help prevent accidents resulting from inadvertent encounters with instrument meteorological conditions.

Accordingly, the NTSB makes the following safety recommendation to VAST. Additional information regarding this recommendation can be found in the noted section of the report.

Include, in your proposed helicopter safety rating system, helicopter safety features for preventing accidents resulting from inadvertent encounters with instrument meteorological conditions. (A-22-19) (See section 2.8.1)

The NTSB is vitally interested in this recommendation because it is designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement this recommendation. When replying, please refer to the safety recommendation by number (Safety Recommendation A-22-19). We encourage you to submit your response to ExecutiveSecretariat@ntsb.gov. If your reply, including attachments, exceeds 20 megabytes, please e-mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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Sincerely,

[Original Signed]

Jennifer Homendy
Chair

May 26, 2022

Mr. Christopher Young, Executive Director
Tour Operators Program of Safety
6831 Airway Ave
Redding, CA 96002

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May 26, 2022

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We are providing the following information to urge the Tour Operators Program of Safety (TOPS) to act on the safety recommendation in this letter because we believe your organization can help reduce the risk of future accidents.

This letter also includes information about our May 10, 2022, report, *Collision into Terrain, Safari Aviation Inc., Airbus AS350 B2, N985SA, Kekaha, Hawaii, December 26, 2019*, NTSB AIR-22-05. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at http://www.ntsb.gov.

As a result of this investigation, we identified the following safety issue relevant to your organization's interest in air tour safety:

- Helicopter safety technologies to help prevent accidents resulting from inadvertent encounters with instrument meteorological conditions.

Accordingly, the NTSB makes the following safety recommendation to TOPS. Additional information regarding this recommendation can be found in the noted section of the report.

Inform your members and make information available to the broader air tour community about the circumstances of this accident, provide information about available helicopter safety technologies for reducing the risk of accidents related to inadvertent encounters with instrument meteorological conditions, and encourage air tour operators to voluntarily incorporate such features into their helicopter fleets. (A-22-20) (See section 2.8.1)

To aid you in implementing this recommendation, we are also attaching an article regarding our investigation of this accident that you may use, either in its entirety or modified to fit the length and style considerations of your publication and/or website. We ask that you publish it, or similar content, in the next issue of your newsletter and/or website and that you send us a copy of the newsletter or a link to the website article once it has been published.

The NTSB is vitally interested in this recommendation because it is designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement this recommendation. When replying, please refer to the safety recommendation by number (Safety Recommendation A-22-20). We encourage you to submit your response to ExecutiveSecretariat@ntsb.gov. If your reply, including attachments, exceeds 20 megabytes, please e-mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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Sincerely,

[Original Signed]

Jennifer Homendy
Chair

Reducing the Risk of Accidents Resulting from Inadvertent Flight into Instrument Meteorological Conditions

Reviews of National Transportation Safety Board (NTSB) accident data by the US Helicopter Safety Team (USHST) have repeatedly identified inadvertent flight into instrument meteorological conditions (IMC) as one of the leading categories of fatal helicopter accidents. An inadvertent encounter with IMC in a helicopter is considered an emergency that often leads to a fatal outcome, such as an in-flight loss of control or controlled flight into terrain accident. A USHST analysis of fatal helicopter accidents involving such encounters found that the average time between IMC entry and ground impact was just 56 seconds. This is due, in part, to the inherent instability of helicopters.

A pilot's ability to manually control a helicopter during visual flight rules (VFR) flight operations is highly dependent on the availability of good outside visual references. Maintaining such visual references is particularly critical for pilots of helicopters not certified for instrument flight rules (IFR) operations (like most helicopters used for air tours), which are not typically equipped with features designed to help a pilot to maintain orientation and helicopter control in IMC. At a minimum, these include instruments, trim, and stability enhancements, which may include a stability augmentation system (SAS) or autopilot, or both.

The NTSB's May 10, 2022, final report on a fatal air tour accident involving an Airbus AS350 B2 helicopter that crashed December 26, 2019, near Kekaha, Hawaii, on the island of Kauai, has highlighted once again the hazards of inadvertent encounters with IMC. On the day of the accident, the accident pilot and at least three other tour pilots flew their helicopters into reduced visibility weather conditions. This suggests that such scenarios are not rare, at least for air tour operations in Hawaii where rapidly changing weather conditions may be more difficult for a pilot to assess and anticipate.

Historically, the primary strategy for preventing helicopter accidents resulting from inadvertent encounters with IMC has relied on pilots to avoid entering reduced visibility conditions. As discussed in the NTSB's final report, pilot training interventions and safety assurance processes can help reduce inadvertent IMC encounters by improving pilot weather assessment and decision-making skills, as well as monitoring the effectiveness of existing procedural and regulatory mitigations. However, the continuing occurrence of VFR-into-IMC accidents demonstrates that these strategies alone are not sufficient. A review of NTSB accident data from 1997 to April 25, 2022, revealed 282 air tour accidents occurred nationwide, 61 of which were fatal. For this same period, 41 air tour accidents occurred in Hawaii, 15 of which were fatal, with 9 of the fatal accidents involving a pilot's decision to continue a VFR flight into deteriorating weather.

Another strategy to increase the likelihood that helicopter pilots can successfully avoid or escape inadvertent IMC encounters involves the increased use of helicopter safety technology. USHST has noted that helicopter trim and stability are increasingly important as visual conditions deteriorate, asserting that many in-flight loss-of-control accidents could be avoided if all helicopters were designed to meet some of the IFR stability requirements, as such stability would help the pilot maintain positive control when experiencing a temporary loss of visual references or disorientation. The NTSB believes that such technology (when combined with the use of instruments and a terrain awareness display) may also help reduce controlled flight into terrain accidents by reducing the pilot workload associated with

maintaining helicopter control in reduced visibility, allowing the pilot to allocate more attention to terrain avoidance while maneuvering to escape the conditions.

In the past, the complexity, weight, and cost of automatic flight control system (AFCS) components, including SAS or autopilot systems, has made it impractical to integrate such systems into most normal category helicopters. However, according to the USHST, the increasing maturity of existing flight control technology and the development of new technologies for the remotely piloted aircraft and electric vertical takeoff and landing aircraft markets suggest it is possible to find new AFCS solutions that achieve sufficient stability and reliability through low-cost/low-weight systems.

The USHST has urged the development of such systems for both new and retrofitted installations in helicopters intended for VFR operations. It has suggested that, at a minimum, systems like force gradient trim (which provide strong cues that prevent the pilot from unintentionally changing flight control positions) and SAS (either basic or advanced) could substantially reduce pilot workload in reduced visibility conditions. According to the USHST, SAS may provide a low-cost, lightweight solution that could be easily integrated into normal category helicopters to significantly enhance the safety of VFR operations while providing a baseline for more-sophisticated AFCS designs. Some helicopter manufacturers and supplemental type certificate holders already offer options for integrating AFCS features like SAS into normal category helicopters, and additional options intended for VFR use are being developed or are undergoing certification review.

As part of the USHST's long-term strategy for reducing helicopter accidents resulting from inadvertent encounters with IMC, it developed technology-related recommendations to the industry, which included the following (paraphrased):

- Establish VFR certification criteria for AFCS and SAS, focusing on the basic AFCS modes that are designed for VFR use but may also providing substantial safety benefits during brief encounters with degraded visual conditions, such as inadvertent IMC;
- Partner with remotely piloted aircraft and electric vertical takeoff and landing system developers to migrate and integrate new technologies into helicopters; and
- Engage with trade associations, insurance providers, and Congress to advocate the incorporation of new safety-enhancing technology.

The NTSB agrees with these recommended efforts and notes that, while the development of new certification criteria for mandatory equipment is likely a long-term effort, the voluntary adoption of existing technologies (and new technologies as they become available) can start improving safety now. The NTSB believes that increased voluntary adoption of helicopter safety technologies designed to help reduce accidents resulting from inadvertent encounters with IMC can help save lives.

Historically, the Federal Aviation Administration (FAA) and industry groups have played an essential role in encouraging voluntary adoption of safety technologies. The NTSB has recommended that the FAA issue and periodically update a special airworthiness information bulletin that lists newly manufactured helicopters that are equipped with features likely to reduce accidents resulting from inadvertent encounters with IMC, describes retrofit options for helicopters that do not have such equipment, and encourages the voluntary integration of these safety features.

In addition, the NTSB has recommended that the Vertical Aviation Safety Team (VAST, of which USHST is a member) include such helicopter safety technologies in its proposed helicopter safety rating system. VAST's special projects working group, "Safety Rating for Helicopters," is developing a worldwide voluntary safety rating scheme that will increase stakeholder awareness of available design and equipment safety enhancements, including those that are beyond the certification basis of the helicopter. VAST has identified several helicopter safety technologies (including AFCS, synthetic vision system displays, and terrain and obstacle detection systems) that can help prevent helicopter accidents resulting from inadvertent encounters with IMC. The NTSB would like to see these technologies reflected in VAST's proposed helicopter safety rating system.

In the meantime, the NTSB believes that the Tour Operators Program of Safety can be an essential part of any campaign to achieve voluntary adoption of safety technologies among air tour operators that operate in areas with climatic and geographic risk factors for inadvertent encounters with IMC, including Hawaii and Alaska. Specifically, the NTSB has recommended that the Tour Operators Program of Safety inform its members and make information available to the broader air tour community about the circumstances of this accident, provide information about available helicopter safety technologies for reducing the risk of accidents related to inadvertent encounters with IMC, and encourage air tour operators to voluntarily incorporate such features into their helicopter fleets.

Additional information about the referenced air tour accident helicopter involving an inadvertent encounter with IMC near Kekaha, Hawaii, including the final investigation report, can be found on the NTSB's website at www.NTSB.gov, aviation investigation report NTSB/AIR-22-05.