NATIONAL TRANSPORTATION SAFETY BOARD
Virtual Meeting of May 19, 2020
(Information subject to editing)

Helicopter Air Ambulance Collision with Terrain, Survival Flight Inc.,
Bell 407 Helicopter, N191SF
near Zaleski, Ohio
January 29, 2019
NTSB/AAR-20/01

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 January 29, 2019, about 0650 eastern standard time, a single-engine, turbine-powered Bell 407 helicopter, N191SF, being operated as a helicopter air ambulance (HAA) flight, collided with forested terrain about 4 miles northeast of Zaleski, Ohio. The certificated commercial pilot, flight nurse, and flight paramedic died, and the helicopter was destroyed. The helicopter was registered to and operated by Viking Aviation, LLC, doing business as Survival Flight Inc., under Title 14 *Code of Federal Regulations* Part 135. Company flight-following procedures were in effect for the visual flight rules (VFR) flight, which departed Mount Carmel Hospital, Grove City, Ohio, about 0628 and was destined for Holzer Meigs Emergency Department, Pomeroy, Ohio, about 69 nautical miles southeast, to pick up a patient. Night visual meteorological conditions existed at the departure location, but available weather information indicated that snow showers and areas of instrument meteorological conditions (IMC) existed along the route of flight.

On the morning of the accident, before contacting Survival Flight, an emergency room technician at Holzer Meigs Emergency Department contacted two other HAA operators with a request to transport a patient from her facility to OhioHealth Riverside Methodist Hospital, Columbus, Ohio; both operators ultimately turned down the flight request due to poor weather conditions. After speaking with the ERT about the details of the request, the operations control specialist at Survival Flight contacted the Survival Flight pilot on duty (the evening shift pilot) at Base 14 and requested a weather check to determine if the mission could be accepted. About 28 seconds later, the evening shift pilot accepted the flight. Because the request was received around the time the evening shift pilot's shift was ending, he informed the operations control specialist that the day shift pilot (the accident pilot) was 5 minutes away from the base and may take the flight.

When the accident pilot arrived at Base 14, she proceeded directly to the already-started helicopter and departed. There was no record of the accident pilot receiving a weather briefing or

accessing any imagery on the weather application (Foreflight). Additionally, neither pilot completed a preflight risk assessment for the flight, as required by Title 14 *Code of Federal Regulations* Part 135.617, and the evening shift pilot stated he expected the accident pilot to complete the assessment after she returned.

On the morning of the accident, station models around the accident site indicated marginal visual meteorological conditions with gusty surface wind from the west between 10 to 20 knots. Visibilities were reported as low as 3 miles at the surface in light snow conditions. There was a 30% to 60% chance of light snow and two airmen's meteorological information advisories had been issued; one for moderate turbulence below 10,000 feet mean sea level (msl) and one for moderate icing conditions below 8,000 feet msl.

Recorded weather radar and flight data monitoring (FDM) data indicate that, about 0628, the helicopter began to gain altitude, reaching a maximum altitude of about 3,000 feet, and traveled in a southeast direction for about 22 minutes, flying through two snow bands en route to the destination hospital. During the encounter with the second snow band, the pilot likely encountered instrument meteorological conditions (IMC) due to reduced visibility in snow. Shortly after the encounter with the second snow band, the helicopter flew a path consistent with a 180° descending left turn, which may have indicated the pilot was attempting to perform an escape maneuver to exit inadvertent IMC. However, she did not command the helicopter to climb, and it continued to descend until the last moments of the flight. The helicopter impacted trees on the reciprocal heading of the flightpath.

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

- **Survival Flight's lack of comprehensive and effective flight risk assessment and risk management procedures.** The preflight risk assessment procedure Survival Flight used at the time of the accident did not include identifying prior flight refusals by another HAA operator, including forecast en route weather, or conducting the flight risk assessment before every flight. When the criteria for the accident flight were entered into the exemplar risk assessment worksheet that contained all the components included in Advisory Circular 135-14B, "Helicopter Air Ambulance Operations," the resultant score indicated the flight would have been classified two levels higher than the risk assessment used for the accident flight . However, because of the ineffective flight risk assessment used at Survival Flight, the accident flight was allowed to depart, and the pilot had no knowledge of other operators' previous refusals of the flight or the potential weather along the route of flight.

- **The lack of a positive safety culture endorsed by Survival Flight management and the lack of a comprehensive safety management system (SMS).** The investigation revealed multiple safety-related deficiencies at Survival Flight, including the failure to record accurate duty times, noncompliance with regulations and procedures, the pressure to complete flights, punitive repercussions for safety decisions, and the lack of operational oversight. Additionally, the casual behavior of Survival Flight management regarding risk assessment and safety programs was not indicative of a

company with an established SMS program. A comprehensive SMS program has been recognized in the aviation industry as an effective way to establish and reinforce a positive safety culture and identify deviations from established procedures.

- **Need for FDM programs for HAA operators.** Survival Flight had FDM equipment installed on its helicopters, as required by federal regulations; however, it did not have a FDM program in place. Thus, Survival Flight had the data to evaluate flight performance and identify other flight deviations due to IMC encounters, which Survival Flight was unaware of. An FDM program would have allowed Survival Flight to proactively identify these safety issues and correct them.

- **Lack of HAA experience for principal operations inspectors assigned to HAA operations.** The investigation revealed the Federal Aviation Administration principal operations inspector assigned to oversee Survival Flight's operation had limited helicopter experience, did not hold a rotorcraft rating on his commercial pilot certificate, and had no experience with HAA operations. The investigation found that, although multiple deficiencies in Survival Flight's operations were identified postaccident, the principal operations inspector's previous inspections of Survival Flight did not reveal any deficiencies; the principal operations inspector was unaware of deficiencies that were later identified in Survival Flight's flight risk assessment.

- **Lack of accurate terminal doppler weather radar data available on the HEMS (helicopter emergency medical services) Weather Tool.** The current version of the HEMS Weather Tool does not incorporate terminal doppler weather radar data to display precipitation. Instead weather radar imagery incorporates information from the network of Weather Surveillance Radar-1988 Doppler weather radars, which may have gaps in coverage. As a result, the HEMS Weather Tool does not always show all potential precipitation, and there is no way for a user to know if the data are lacking or if there is, in fact, no precipitation.

- **Lack of a flight recorder.** The helicopter was not required to have a crash-resistant recorder installed. If a recorder system that captured cockpit audio, images, and parametric data had been installed, it would have enabled NTSB investigators to reconstruct the final moments of the accident flight and determine why the accident pilot did not maintain the helicopter's altitude and successfully exit the inadvertent IMC encounter.

Findings

1. The pilot likely encountered instrument meteorological conditions inadvertently when the helicopter flew through a snow band, which resulted in decreased visibility.

2. In an attempt to recover from the inadvertent instrument meteorological conditions (IIMC) encounter, the pilot began a 180° turn as part of an IIMC escape maneuver, in keeping

with standard operating procedures but did not maintain altitude and allowed the helicopter to descend until it impacted terrain.

3. None of the following were factors in the accident: (1) pilot qualifications; (2) pilot medical conditions or impairment by alcohol or other drugs; (3) the airworthiness of the helicopter.

4. Survival Flight's risk assessment process was inadequate for identifying weather risks for the accident flight as illustrated by (1) consistent failure by Survival Flight operational personnel to complete the risk assessment worksheet before every flight, including the accident flight, and (2) the absence of required elements on the worksheet, including en route weather risks and refusals of previous requests for a flight.

5. Survival Flight's lack of a procedure to track pilots' actual duty time contributed to the ineffectiveness of the company's risk management.

6. Survival Flight's inconsistent compliance with standard operating procedures and regulations, combined with management's procedural gaps in risk management, advertising of flights in lower weather minimums, pressure to complete flights, and punitive repercussions for safety decisions, were indicative of a poor safety culture at the company.

7. Survival Flight's poor safety culture likely influenced the accident pilot's decision to conduct the accident flight without a shift change briefing, including an adequate preflight risk assessment.

8. A properly implemented safety management system, consistent with guidance in Title 14 *Code of Federal Regulations* Part 5 and Advisory Circular 120-92B, would have provided Survival Flight with a foundation to develop a positive safety culture and enhanced the company's and the Federal Aviation Administration's ability to identify poor risk management practices and determine mitigations.

9. Although helicopter air ambulances are required to be equipped with flight data monitoring (FDM) systems, the lack of a required FDM program for all Title 14 *Code of Federal Regulations* Part 135 operators to analyze these data continues to result in operational risks remaining unidentified and unmitigated, as occurred in this accident.

10. The principal operations inspector's oversight of the Survival Flight flight risk assessment (FRA) was inadequate because it failed to identify that the FRA did not meet the requirements of Title 14 *Code of Federal Regulations* 135.617 or comply with the guidance in Advisory Circular 135-14B.

11. Both helicopter and helicopter air ambulance (HAA) experience would allow principal operations inspectors assigned to oversee HAA operations to better identify and mitigate associated risks.

12. Although sufficient information was available to the evening shift pilot and the operations control specialist to identify the potential for snow, icing, and reduced visibility along the accident flight route, their failure to obtain complete en route information precluded them from identifying crucial meteorological risks for the accident flight.

13. The availability of the lower-altitude reflectivity echoes from terminal doppler weather radar data on the HEMS Weather Tool radar overlay would have provided awareness to the operations control specialist, the evening shift pilot, and the accident pilot of the potential for snow along the flight route.

14. Without specialized experience or knowledge of an area, users of the HEMS Weather Tool may not be able to determine if the absence of a weather radar return in a particular area is due to a lack of precipitation or a limitation in radar coverage.

15. If a recorder system that captured cockpit audio, images, and parametric data had been installed, it would have enabled NTSB investigators to reconstruct the final moments of the accident flight and determine why the accident pilot did not maintain the helicopter's altitude and successfully exit the encounter with inadvertent instrument meteorological conditions.

Probable Cause

The NTSB determines that the probable cause of this accident was Survival Flight's inadequate management of safety, which normalized pilots' and operations control specialists' noncompliance with risk analysis procedures and resulted in the initiation of the flight without a comprehensive preflight weather evaluation, leading to the pilot's inadvertent encounter with instrument meteorological conditions, failure to maintain altitude, and subsequent collision with terrain. Contributing to the accident was the Federal Aviation Administration's inadequate oversight of the operator's risk management program and failure to require Title 14 *Code of Federal Regulations* Part 135 operators to establish safety management system programs.

Recommendations

New Recommendations

As a result of its investigation, the NTSB makes the following 14 new safety recommendations:

To the Federal Aviation Administration

1. Require that principal operations inspectors (POI) assigned to helicopter air ambulance (HAA) operations possess helicopter and either HAA experience or experience as an assistant POI under a POI with HAA experience.

2. Review the flight risk assessments for all helicopter air ambulance operators for compliance with Title 14 *Code of Federal Regulations* 135.617 and Advisory Circular 135-14B and require operators to address any deficiencies that are identified.

3. Install the latest software on your terminal doppler weather radars (TDWR) and require the National Weather Service (NWS) to distribute Level II TDWR data to all of its users (as recommended in Safety Recommendation 6 to the NWS) so they will have access to the most accurate precipitation information.

4. Require the National Weather Service (NWS) to add terminal doppler weather radar data to the HEMS Weather Tool overlay (as recommended in Safety Recommendation 7 to the NWS).

5. Require the National Weather Service (NWS) to provide capability in the HEMS Weather Tool to graphically display areas of weather radar limitations, including areas where beams may lack low-altitude coverage, areas that lack radar coverage, and areas of beam blockages (as recommended in Safety Recommendation 8 to the NWS).

To the National Weather Service

6. Distribute Level II terminal doppler weather radar data to all of its users (as recommended in Safety Recommendation 3 to the Federal Aviation Administration) so they will have access to the most accurate precipitation information.

7. Add terminal doppler weather radar data to the HEMS Weather Tool overlay (as recommended in Safety Recommendation 4 to the Federal Aviation Administration).

8. Provide capability in the HEMS Weather Tool to graphically display areas of weather radar limitations, including areas where beams may lack low-altitude coverage, areas that lack radar coverage, and areas of beam blockages (as recommended in Safety Recommendation 5 to the FAA).

To Survival Flight

9. Revise your flight risk assessment procedures to incorporate the elements described by Advisory Circular 135-14B, including procedures for determining prior flight refusals by another helicopter air ambulance operator and forecast en route weather.

10. Require pilots to complete a comprehensive risk assessment before each flight and complete the appropriate paperwork to reflect their assessment as required by Title 14 *Code of Federal Regulations* 135.617.

11. Develop a procedure for tracking actual pilot duty times in compliance with Title 14 *Code of Federal Regulations* 135.267.

12. Develop a process to ensure shift change briefings are performed, to include comprehensive preflight risk assessments, before the acceptance of any flight requests.

13. Establish a safety management system (SMS) program under the Federal Aviation Administration SMS Voluntary Program that includes compliance with Advisory Circular 120-92B, "Safety Management Systems for Aviation Service Providers."

14. Develop and implement a flight data monitoring program independent of a Federal Aviation Administration requirement.

Previously Issued Recommendations Reiterated and Classified in This Report

As a result of this investigation, the NTSB reiterates and classifies the following safety recommendations to the Federal Aviation Administration:

> After the action in Safety Recommendation A-16-34 is completed, require all Title 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).[1]
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> Safety Recommendation A-16-35 is classified "Open—Unacceptable Response."
>
> Require all Title 14 *Code of Federal Regulations* Part 135 operators to establish safety management system programs (A-16-36).
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> Safety Recommendation A-16-36 is classified "Open—Unacceptable Response."

Previously Issued Recommendations Reiterated in This Report

As a result of this investigation, the NTSB reiterates the following safety recommendations to the Federal Aviation Administration:

> 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 Title 14 *Code of Federal Regulations* Parts 91, 121, or 135. The crash-resistant

[1] Safety Recommendation A-16-34 recommended to the Federal Aviation Administration to require all 14 *Code of Federal Regulations* Part 135 operators to install flight data recording devices capable of supporting a flight data monitoring program.

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 Title 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).