



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

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**Date:** September 29, 2009

**In reply refer to:** A-09-72 through -81  
and A-06-23 (Reiteration)

The Honorable J. Randolph Babbitt  
Administrator  
Federal Aviation Administration  
Washington, D.C. 20591

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On March 4, 2008, about 1515 central standard time,<sup>1</sup> a Cessna 500, N113SH, registered to Southwest Orthopedic & Sports Medicine Clinic PC of Oklahoma City, Oklahoma, entered a steep descent and crashed after colliding in flight with a flock of large birds about 2 minutes after takeoff from Wiley Post Airport (PWA) in Oklahoma City.<sup>2</sup> None of the entities associated with the flight claimed to be its operator. The pilot, the second pilot,<sup>3</sup> and the three passengers were killed, and the airplane was destroyed by impact forces and postcrash fire. The flight was operated under 14 *Code of Federal Regulations* (CFR) Part 91 with an instrument flight rules (IFR) flight plan filed. Visual meteorological conditions prevailed. The flight originated from the ramp of Interstate Helicopters (a 14 CFR Part 135 on-demand helicopter operator at PWA) and was en route to Mankato Regional Airport (MKT), Mankato, Minnesota, carrying company executives who worked for United Engines and United Holdings, LLC.

The flight departed from PWA and climbed to its assigned altitude of 3,000 feet. The flight's assigned heading and altitude carried it over the southeast corner of Lake Overholser at an altitude of about 1,800 feet above ground level. Witnesses near the lake reported seeing the airplane roll to the left and spiral nose-down to the ground about 4 miles from PWA. One witness reported seeing bird remains fall into the water. A security camera located about 1/2 mile southwest of the accident site captured images of the accident airplane descending steeply, nose down to the ground.

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<sup>1</sup> All times are central standard time unless otherwise indicated.

<sup>2</sup> For more information, see National Transportation Safety Board, *Crash of Cessna 500, N113SH, Following an In-Flight Collision with Large Birds, Oklahoma City, Oklahoma, March 4, 2008*, Aircraft Accident Report NTSB/AAR-09/05 (Washington, DC: NTSB, 2009). The public docket for this accident is available from the NTSB's website at <<http://www.nts.gov/dockets/aviation/DFW08MA076/default.htm>>.

<sup>3</sup> The terms "pilot" and "second pilot" are used (rather than more traditional terms, such as "pilot-in-command" and "copilot") to avoid inaccurate descriptions based on any regulatory interpretation of the flight's operation.

The airplane collided into a flock of American white pelicans, which are common in central Oklahoma from March to May. These large birds range in weight from about 8 to 20 pounds (lbs) and in length from about 50 to 65 inches (in), and have a wingspan of about 96 to 114 in. In accordance with the transport-category airplane requirements of 14 CFR 25.571(e)(1), the wing structures of the Cessna 500 are certificated to withstand an impact from a 4-lb bird while cruising at 287 knots (kts) without precluding the airplane from continued safe flight and landing. The NTSB performed a bird-strike energy study that determined that the kinetic energy of such a strike is 14,586 foot-pounds (ft-lbs).<sup>4</sup> However, the accident airplane was cruising about 200 kts when it encountered American white pelicans. At this airspeed, the kinetic energy of a strike with a single pelican would have been as high as 35,416 ft-lbs, which far exceeds the demonstrated kinetic energy of the airplane's certification standard.

The National Transportation Safety Board (NTSB) determined that the probable cause of this accident was airplane wing-structure damage sustained during impact with one or more large birds (American white pelicans), which resulted in a loss of control of the airplane. The investigation identified safety uses related to airframe certification standards for bird strikes, inadequate FAA enforcement of wildlife hazard assessment requirements for airports located near wildlife attractants, the lack of published information regarding aircraft operational strategies for pilots to minimize bird-strike damage to aircraft, and inadequate FAA detection of and intervention in improper charter operations. Member Kathryn O. Higgins filed a concurring statement to the probable cause.

### **Airframe Certification**

The bird-strike certification criteria for Part 25 airplanes (such as the accident airplane) specify that the windscreen and other airframe structures (including the wing) be able to withstand an impact with a 4-lb bird, whereas the empennage (tail structure) must withstand impact from an 8-lb bird (as specified in 14 CFR 25.571 and 25.631, respectively). In recent correspondence with the NTSB, the FAA stated that the rulemaking that added the 8-lb bird-strike criteria specified in 14 CFR 25.631 was completed in 1970 after an aircraft accident in 1962 prompted a review of existing statistical bird-strike data.<sup>5</sup> As a result of the review, the FAA concluded that

most existing transport airplanes were inherently bird resistant, although a few types, such as the one ... that crashed [in 1962], were not sufficiently resistant in the empennage area. After considering (various) factors, the FAA determined that a specific rule applying to the entire airplane would only add to the substantiation effort without providing any significant design changes.

In 1993, the FAA reviewed bird-strike certification standards by forming an Aviation Rulemaking Advisory Committee (ARAC): the General Structures Harmonization Working

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<sup>4</sup> A ft-lb is a unit of energy; 1 ft-lb is equivalent to the amount of energy needed to raise a 1-lb object a distance of 1 foot.

<sup>5</sup> In e-mail correspondence dated February 23, 2009, the FAA's Office of Accident Investigation, Recommendation and Analysis Division, provided an attachment that responded to the NTSB's November 24, 2008, request for information about the history of the airframe certification standards.

Group. This ARAC working group included personnel from the FAA, the Joint Aviation Authorities (which represents the civil aviation regulatory authorities of a number of European States), and aircraft manufacturers and was tasked to “develop new or revised requirements for the evaluation of transport category airplane structure for in-flight collision with a bird, including the size of the bird and the location of the impact on the airplane.”<sup>6</sup>

In the working group’s concluding documents, the FAA stated that the Part 25 “requirement for the remainder of the airframe structure, of continued safe flight and landing after impact with a 4 [lb] bird at  $V_c$  [design cruising speed]... is probably inadequate as a structural criterion, although it is likely that most airframe structure has acceptable capability due to structural redundancy typical of modern airplane construction.” The FAA further stated that it “believes that service experience demonstrates that bird strikes pose a real threat to safety and that there is considerable room for improving the bird strike capability of modern aircraft.”<sup>7</sup> However, the FAA did not take any action to improve the bird-strike certification requirements.

According to U.S. Department of Agriculture (USDA) research published about 2 years after the working group’s findings, the risk to aircraft posed by bird populations has increased in the last few decades due to a number of factors, including an increase in air traffic volume.<sup>8</sup> Also, although populations of bird species, in general, have declined, the populations of nearly all of the large bird species (those with mean body masses greater than 8 lbs) in North America have increased significantly in the past 30 years.<sup>9</sup>

Although the FAA based its conclusion that most Part 25 airplanes are “inherently bird resistant” on a review of statistical bird-strike incident and accident data, the NTSB disagrees with this approach because it suggests that more stringent requirements can only be justified reactively through a statistically significant increase in bird-strike injuries and fatalities; it does not consider that a review of the standards is warranted based on the latest statistical data for bird populations and on evidence that bird-strike risks to aviation are increasing. Also, the NTSB interprets the FAA’s conclusion to imply that the entire airplane would allow for continued safe flight and landing following a strike with an 8-lb bird at cruise speed. The NTSB observes, however, that there is no requirement for airframe manufacturers to demonstrate such capability over an entire airframe through analysis or testing. Thus, the NTSB questions how the FAA, without requiring manufacturers to substantiate this implied level of protection, can be satisfied that an airplane would be capable of continued safe flight and landing following an impact with an 8-lb bird.

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<sup>6</sup> See *Federal Register*, vol. 58, no. 48 (March 15, 1993), p. 13817.

<sup>7</sup> General Structures Harmonization Working Group Report. Version 2, dated June 30, 2003. Available on the FAA’s website at <[http://www.faa.gov/regulations\\_policies/rulemaking/committees/arac/media/tae/TAE\\_GSH\\_T2.pdf](http://www.faa.gov/regulations_policies/rulemaking/committees/arac/media/tae/TAE_GSH_T2.pdf)>, accessed July 24, 2009.

<sup>8</sup> Air traffic volume has increased from about 17.8 million aircraft movements in 1980 to 29 million as of 2004. For more information, see Sandra E. Wright and Richard A. Dolbeer, “Percentage of Wildlife Strikes Reported and Species Identified Under a Voluntary Reporting System,” *Proceedings, 2005 Bird Strike Committee-USA/Canada 7th Annual Meeting, Vancouver, British Columbia, Canada* (Lincoln: University of Nebraska, 2005).

<sup>9</sup> For more information, see R.A. Dolbeer and P. Eschenfelder, “Amplified Bird-Strike Risks Related to Population Increases of Large Birds in North America,” *Proceedings, International Bird Strike Committee, May 5-9, 2003, Warsaw, Poland, IBSC26/WP-OS4* (2003).

The American white pelican that the accident airplane encountered is very large and is not representative of the general risk that bird populations present to aircraft; thus, there is no basis to suggest that airframe components should be certificated to withstand impacts from birds of such size. However, the NTSB is concerned that the current airframe bird-strike certification standards, which are inconsistent in that different criteria apply to different structures on the same airplane, have evolved piecemeal as a result of past accidents and do not uniformly address the risks to aircraft presented by current bird populations. Therefore, the NTSB concludes that the current airframe certification standards for bird strikes are insufficient because they are not based on bird-strike risks to aircraft derived from analysis of current bird-strike and bird-population data and trends and because they allow for lower levels of bird-strike protection for some structures on the same airplane. The NTSB recommends that the FAA revise the bird-strike certification requirements for Part 25 airplanes so that protection from in-flight impact with birds is consistent across all airframe structures. The FAA should consider current military and civilian bird-strike database information and trends in bird populations in drafting this revision.

### **Airport Wildlife Hazard Assessments and Management**

FAA Advisory Circular (AC) 150/5200-33B, *Hazardous Wildlife Attractants On or Near Airports*, states that airports that have received federal grant-in-aid assistance must comply with the AC's standards and practices. The AC states that operators of airports surrounded by woodlands, water, or wetlands should provide for a wildlife hazard assessment (which includes birds) conducted by a wildlife damage management biologist. It also states that airport operators should establish a distance of 5 miles between the farthest edge of the airport operations area and any wildlife attractant that could cause hazardous wildlife movement into or across the approach or departure airspace. The accident airplane crashed about 4 miles south of PWA after encountering American white pelicans over Lake Overholser at its assigned departure altitude. Because PWA is located near attractants and is federally obligated, the airport should have conducted a wildlife hazard assessment in accordance with the AC.

The NTSB is concerned that the FAA did not detect that PWA had not performed a wildlife hazard assessment, especially considering that PWA is surrounded by multiple attractants, some of which (including Lake Overholser) were known to the FAA because they were detailed in the FAA-approved wildlife management plan of Will Rogers World Airport, Oklahoma City, Oklahoma, a nearby 14 CFR Part 139-certificated airport. Although the NTSB recognizes that there are nearly 4,000 noncertificated public use airports in the U.S. and that the level of oversight provided to such airports is lower than the level provided to Part 139 airports, the FAA has a responsibility to ensure that the requirements are met, particularly for those airports, like PWA, that receive federal funding.

As referenced previously, the risks to aviation posed by bird populations have increased in the last few decades due to a number of factors. Therefore, the FAA's responsibility for ensuring appropriate wildlife hazard assessments are performed is perhaps more critical now than in past decades. The NTSB concludes that, because an airport's wildlife hazard management plan is based on a wildlife hazard assessment, PWA's failure to perform such an assessment, as required, prevented the determination of what mitigation measures, if any, could

have been implemented to reduce the risk of an in-flight collision with American white pelicans. Therefore, the NTSB recommends that the FAA verify that all federally obligated general aviation airports that are located near woodlands, water, wetlands, or other wildlife attractants are complying with the requirements to perform wildlife hazard assessments as specified in FAA AC 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*.

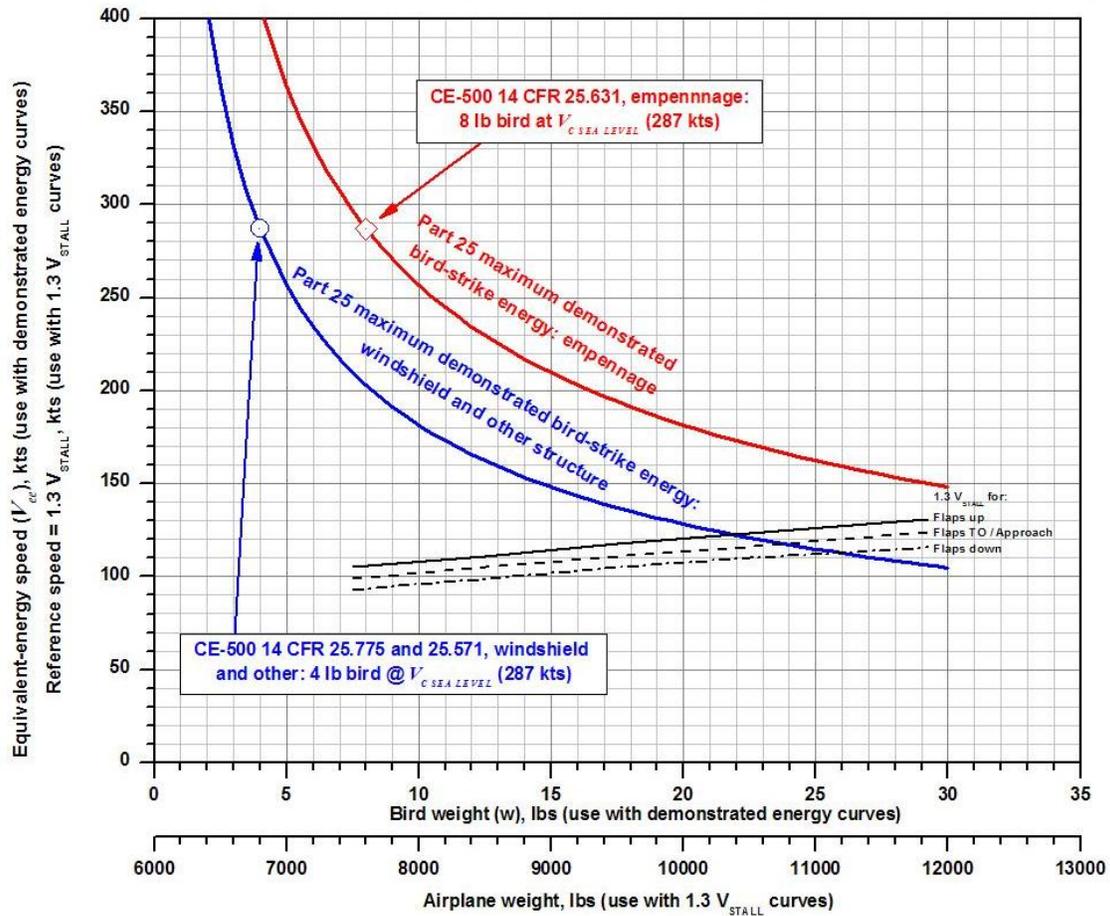
### **Precautionary Operational Strategies for Minimizing Airframe Bird-Strike Damage**

To date, efforts to mitigate the risk of bird strikes have focused on wildlife hazard management programs at airports and notification and data resources. However, these efforts aim primarily at avoiding bird strikes altogether. Another approach to the issue includes exploring considerations for operational strategies that might reduce the severity of the aircraft damage sustained during an in-flight collision with birds.

The severity of a bird strike against the airframe depends primarily on the kinetic energy of the bird relative to the airplane (the “bird-strike energy”). The certification standards do not specify this bird-strike energy directly; instead, they indirectly specify the energy through bird masses and airplane speeds that must be considered during a strike. It is reasonable to assume that, in general, the airframe will meet the requirements of the standards for bird-strike energies that are less than or equal to the energies implied by the standards. In this way, the severity of damage from impacts with larger birds may be reduced.

For any airplane, it is possible to define airspeeds, as a function of bird weight, that will result in the equivalent bird-strike energy demonstrated during the certification standards. It is also possible to define minimum safe airspeeds, as a function of airplane weight and flap setting, to provide adequate stall margin for maneuvering. Together, these sets of airspeeds define upper and lower speed limits within which the airplane will be both at a safe flying speed and below the bird-strike energy defined by the certification standards. Such information may help pilots devise operational strategies for minimizing the severity of a potential bird-strike when operating in areas of known bird activity.

For example, the following figure shows how these two sets of airspeeds can be illustrated for an airplane like the Cessna 500. The figure shows two bird-strike energy speed curves: The blue line corresponds to the certification standard for the airplane’s windshield, wing, and other structures (which are based on an impact from a 4-lb bird at 287 kts), and the red line corresponds to the certification standard for the empennage (which uses an 8-lb bird at 287 kts). The figure also shows the exemplar airplane’s minimum safe airspeed (defined as 1.3 times the stall speed), as a function of weight, in various flap configurations (shown in solid, dashed, or dotted black lines).



**Figure.** Exemplar reference chart showing airplane speed and bird-weight relationships for equivalent bird-strike energy.

Using this chart, if a pilot of the exemplar airplane operating at a gross weight of 11,200 lbs were concerned about the possibility of a collision on the airplane's wing structure with birds as large as 10 lbs during a flaps-up climb, then the pilot might choose an airspeed between about 129 and 180 kts until reaching an altitude where the risk of a bird strike is reduced; the limits of this range represent the airplane's minimum safe airspeed for the specified gross weight and the maximum airspeed that would allow for a collision with a 10-lb bird while remaining below the airplane's bird-strike energy for the wing structure demonstrated in compliance with regulations. Similarly, using the same airplane scenario but assuming a 20-lb bird, the chart shows that the airspeed range for sustaining such a strike narrows considerably to about 129 to 130 kts.

The NTSB recognizes that pilots face many safety of flight considerations for airspeed selection during airport departures and arrivals; these may include, but are not limited to, air traffic control (ATC) clearances, maneuvering requirements, and desired climb performance or descent rates. The NTSB does not expect that a pilot flying an aircraft in an area with a high risk of bird strikes would select airspeed based on bird-strike energy considerations alone. However, knowledge of the range of target airspeeds within which the aircraft can operate below the bird-strike energy defined by the certification standards could be useful in scenarios in which

flying within the target airspeed range is feasible without compromising other safety of flight issues.

Therefore, the NTSB concludes that reference charts that depict both the airspeeds at which the airframe can sustain strikes from various-sized birds without exceeding certification standards and minimum safe airspeeds could help pilots devise precautionary operational strategies for minimizing potential airframe bird-strike damage in high-risk areas for bird strikes. The NTSB further concludes that reliable information about the mass, numbers, and activity of birds likely to be encountered near the airports of operation is necessary for pilots who wish to devise precautionary operational strategies for minimizing potential airframe bird-strike damage. Therefore, the NTSB recommends that the FAA require aircraft manufacturers to develop aircraft-specific guidance information that will assist pilots in devising precautionary aircraft operational strategies for minimizing the severity of aircraft damage sustained during a bird strike, should one occur, when operating in areas of known bird activity. This guidance information can include, but is not limited to, airspeed charts that depict minimum safe airspeeds for various aircraft gross weights, flap configurations, and power settings; and maximum airspeeds, defined as a function of bird masses, that are based on the aircraft's demonstrated bird-strike energy.

### **Bird and Other Wildlife Strike Reporting**

Information collected on FAA Form 5200-7, *Bird/Other Wildlife Strike Report*, is compiled by the FAA National Wildlife Strike Database and used to identify the wildlife species most commonly involved in strikes, the seasonal patterns of strikes for various species, and the extent and types of aircraft damage resulting from strikes. According to the FAA, these data and species information are “critical for biologists developing and implementing wildlife risk management programs at airports because a problem that cannot be measured or defined cannot be solved.”<sup>10</sup>

Although the FAA has developed ACs and contracted for educational outreach programs to encourage pilots, airport operators, maintenance personnel and others to report wildlife strikes to the FAA, such reporting is not mandatory. Nearly a decade ago, the NTSB expressed concerns about the effectiveness of voluntary reporting, concluding in a November 19, 1999, safety recommendation letter to the FAA that “the voluntary reporting system has not resulted in the provision of adequate data on bird strike hazards and this has hindered the proper evaluation of the problem and implementation of safety improvements.” In that letter, the NTSB issued Safety Recommendation A-99-91 that asked the FAA to do the following: “Require all airplane operators to report bird strikes to the Federal Aviation Administration.”

However, the FAA responded that it planned no action to address the recommendation because it believed that the reporting procedures were sufficient to obtain adequate trend analysis data. The FAA also stated that a requirement for all pilots to report bird strikes would be difficult to enforce. As a result, the NTSB classified Safety Recommendation A-99-91 as “Closed—Unacceptable Action” on May 11, 2000.

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<sup>10</sup> FAA National Wildlife Strike Database Serial Report No. 14.

However, according to USDA research published in 2005, only 21 percent of the known strike data were captured in the FAA National Wildlife Strike Database;<sup>11</sup> this research showed that some airports and air carriers routinely collect significantly more reports of wildlife strikes than are voluntarily reported to the FAA. On May 15, 2009, the FAA awarded a contract for performing a statistical analysis of the current wildlife strike data to estimate what percentage of known bird-aircraft strikes are being reported and to determine what level of reporting would be required to be statistically valid.

The NTSB commends the FAA for awarding a contract to conduct a statistical analysis of the current strike data to estimate what percentage of known bird-aircraft strike are being reported and to determine what level of reporting would be required to be statistically valid; however, the project is under way, and the analysis has not yet been completed and distributed for review. The NTSB concludes that the low level of participation in voluntary wildlife strike reporting has resulted in data that severely underestimate the number and type of actual wildlife strikes and that such incomplete data have limited effectiveness for use in developing wildlife risk management and hazard mitigation programs. Also, such incomplete information could reduce the effectiveness of any efforts to develop information that will assist pilots in developing operational strategies for minimizing the risk and severity of bird strikes.

Although the FAA has taken measures to increase the aviation community's awareness of the importance of voluntary wildlife-strike reporting, the NTSB concludes that a wildlife-strike reporting requirement would improve the quality of the data in the FAA National Wildlife Strike Database. The NTSB acknowledges that, as a practical matter, a wildlife strike reporting requirement for all pilots would be difficult for the FAA to enforce; however, the NTSB notes that certificated airports, air carriers, commercial operators, and certain fractionally owned, managed aircraft are subject to the oversight of FAA inspectors. Thus, enforcement protocols are already in place to obtain data from those operators. Therefore, the NTSB recommends that the FAA require all 14 CFR Part 139 airports and 14 CFR Part 121, Part 135, and Part 91 Subpart K aircraft operators to report all wildlife strikes, including, if possible, species identification, to the FAA National Wildlife Strike Database.

## **Operational Issues**

Following the accident, interviews with representatives from Southwest Orthopedic (which owned the accident airplane and operated it for the owner's use under Part 91), Interstate Helicopters (a Part 135 helicopter operator), and United Engines (the passengers/customers) revealed that none considered themselves or their companies to be the flight's operator.

Days before the accident, the then-president of United Engines directed his executive assistant to contact Interstate Helicopters to see if the flight from PWA to MKT could be arranged. The executive assistant stated that she usually called Interstate Helicopters for airplane flights because United Engines was already using Interstate Helicopters at the time she was

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<sup>11</sup> For more information, see Sandra E. Wright and Richard A. Dolbeer, "Percentage of Wildlife Strikes Reported and Species Identified Under a Voluntary Reporting System," *Proceedings, 2005 Bird Strike Committee-USA/Canada 7th Annual Meeting, Vancouver, British Columbia, Canada* (Lincoln: University of Nebraska, 2005).

hired; she said that whenever she called Interstate Helicopters to arrange flights, Interstate Helicopters' manager usually replied to her within a day with a flat, total-rate quote for the trip. The current president of United Engines stated that he believed that the accident flight was a charter flight; he said that he had flown on airplane charters provided by Interstate Helicopters multiple times.

Interstate Helicopters' owner stated that he "put the flight together" for people whom he knew.<sup>12</sup> Interstate Helicopters' owner said that, after United Engines contacted him for the flight, he called Southwest Orthopedic's pilot (who managed the airplane) and asked if the airplane was available;<sup>13</sup> the owner's pilot told him that it was. Interstate Helicopters' owner subsequently called the accident pilot (who was not an Interstate Helicopters' employee and was regularly employed at another company's Part 91 flight department), who agreed to fly the airplane. Interstate Helicopters' owner said that he knew that the accident pilot had a good reputation through word of mouth; he had no résumé or flight time statement from the pilot. Interstate Helicopters' owner asked the accident pilot to provide a copilot. According to the second pilot's spouse, the accident pilot contacted the second pilot for the flight, and he agreed because he wanted to build flight hours. Interstate Helicopters' owner did not know the second pilot, his qualifications, or his background.

No documented aircraft lease, time-sharing, pilot services, or other agreements were discovered to help determine the identity of the operator or the nature of the flight (commercial or noncommercial). However, Interstate Helicopters' actions with regard to arranging the accident flight gave the customer all outward appearances that the flight was a commercial charter flight. Further, the passengers arrived at Interstate Helicopters' ramp to board the accident airplane and were greeted by Interstate Helicopters' manager, who assisted with their bags, obtained their weight information, and ensured that the airplane had been cleaned and stocked.

Postaccident interviews with all the parties who participated in the flight resulted in conflicting accounts of their respective roles. The airplane's owner stated that he was not sure what a dry lease was and that his pilot handled all the arrangements. The owner's pilot (a current airline pilot with previous Part 135 charter experience) said that Interstate Helicopters operated the flight. Interstate Helicopters' owner claimed that the airplane owner's pilot was responsible for it and that the airplane was dry leased to United Engines. The president of United Engines said that his company did not lease or purchase aircraft block time and that he thought that the flight was a charter. In the wake of the accident, the determination of the operator could only be made after extensive investigative efforts, which included reviewing records of financial transactions.

Although Interstate Helicopters held a valid Part 135 operating certificate, its certificate was for helicopter operations only. On September 12, 2008, the FAA initiated an emergency revocation of Interstate Helicopters' operating certificate based on Interstate Helicopters'

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<sup>12</sup> He stated that he had been acquainted with two of the passengers for about 1.5 years because they were good friends with the owners of another airplane that he flew.

<sup>13</sup> The airplane's owner would, on occasion, allow his airplane to be used by others when he was not using it himself.

involvement with the accident airplane on the date of the accident. The NTSB concludes that, at the time of the accident, Interstate Helicopters was operating the accident airplane in commercial service contrary to its FAA-issued Part 135 operating certificate, which, at the time, did not authorize operation of the accident airplane or any other fixed-wing aircraft.

Although Interstate Helicopters was the accident flight's operator, several individuals—the aircraft owner and his pilot, the accident pilot-in-command, and the customers—had the ability to prevent the operation by choosing not to participate but failed to do so, either because they did not fully understand that the arrangement was improper or they did know but disregarded the rules. Scenarios in which parties either inadvertently or intentionally participate in improper charter operations is not a new concern; FAA AC 91-37A, which advises potential aircraft lease or charter customers to be wary of “devious leases and conditional sales contracts” designed to “[evade] compliance with applicable certification and operating rules,” is a January 16, 1978, update to a document originally issued in 1972. This AC observed, more than 30 years ago, that “there are some irresponsible companies that may use various ways to confuse the issue concerning who is the actual aircraft operator. For example, the sham ‘dry lease’ has been used, whereby [the customer is] provided with an aircraft on a lease basis, although it is actually serviced and flown by the leasing company.”

The NTSB is also concerned that some of these practices may be fostered by pilots who are reluctant to question suspicious operations for fear that they may lose their jobs or contract work, aircraft owners or managers who are either ignorant of or complacent about improper operations conducted with their aircraft by lessees, and/or bargain-hunting customers who are aware of the noncompliant nature of a flight but do not fully understand the potential safety and regulatory implications associated with it.

Given the apparent decades-long existence of operational issues similar to those which were observed in this accident, a combination of measures must be taken to ensure that all participants in each facet of a flight operation—the operators, pilots, aircraft owners and managers, aircraft lessees, and charter customers—are aware of and take responsibility for their respective roles. The following analysis describes how expanded lease disclosure, pilot reporting, and carriage disclosure requirements, as well as improved customer awareness resources and federal oversight and surveillance, could help prevent improper charter operations.

### *Lease Disclosure Requirements*

The investigation revealed that Interstate Helicopters made available to customers the accident airplane and several others under arrangements that it invoiced as aircraft leases. Some of these airplanes (including the accident airplane) that appeared on Interstate Helicopters' invoices to the passengers' company did not meet the FAA definition of a “large”<sup>14</sup> airplane, which means that these airplanes were not subject to the 14 CFR 91.23 truth-in-leasing requirements for disclosing operational control, filing copies of leases with the FAA, and notifying the local flight standards district office (FSDO) before any flights were conducted. The NTSB concludes that the absence of written lease and FAA notification requirements for

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<sup>14</sup> Title 14 CFR 1.1 defines a “large aircraft” as having a maximum certificated takeoff weight of more than 12,500 lbs. (The accident airplane's maximum certificated takeoff weight was 11,850 lbs.)

airplanes that do not meet the FAA definition of “large” increases the likelihood that airplane owners, managers, lessees, operators, and customers could either intentionally or inadvertently participate in improper charters involving such airplanes and that it hinders the FAA’s ability to detect and correct such activity.

A wide variety of airplanes, like the accident airplane, have a maximum certificated takeoff weight of 12,500 lbs or less, and a new class of very light jets (VLJs) is emerging. A VLJ is, by convention, a jet airplane with a maximum takeoff weight of less than 10,000 lbs that is approved for single-pilot operation and can typically seat four to eight people. Several manufacturers have VLJs either in production or under development, and an FAA forecast estimates that 4,875 VLJs will enter the U.S. active fleet by 2025.<sup>15</sup> The NTSB is concerned that, as more airplanes that are smaller than “large,” as defined by FAA regulations, become widely available and are often used in charter operations, these airplanes will be attractive to improper operators seeking to exploit their ability to operate undetected through the use of lease agreements that are not disclosed to the FAA. The NTSB concludes that 14 CFR 91.23 truth-in-leasing regulations, which exclude an expanding class of turbine-powered airplanes, leave aircraft charter customers vulnerable to operators that attempt to circumvent commercial charter regulations. Therefore, the NTSB recommends that the FAA revise 14 CFR 91.23 truth-in-leasing regulations to include all turbine-powered airplanes.

### *Pilot Responsibility*

Because the pilot did not survive to be interviewed, it is not known to what extent he knew of the nature of the operation—or of the passengers’ understanding of it—when he agreed to Interstate Helicopters’ request for him to fly passengers on Southwest Orthopedic’s airplane under 14 CFR Part 91. In any such scenario, it would be possible for a pilot to be unaware that the passengers’ understanding of the flight operation differs from that which is being provided; this would depend on what information the pilot requested or received and from whom.

According to 14 CFR 91.3, “the pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft.” Therefore, a pilot has a responsibility to understand the nature of that operation. In the case of the accident flight, regulations state that even an unauthorized operator attempting to engage in on-demand operations would be subject to Part 135 rules;<sup>16</sup> thus, if the pilot had been aware that the passengers believed that they were on a charter flight, it would have been apparent that the flight should not be performed for a number of reasons, the most obvious of which were that neither he nor the second pilot were trained or qualified in accordance with Part 135, that the airplane was

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<sup>15</sup> According to the FAA Aerospace Forecast for fiscal years 2009-2025, this total is lower than the FAA’s previously published VLJ fleet forecast because unforeseen events, which included a VLJ manufacturer bankruptcy and the demise of a VLJ air taxi operator, “dampened expectations for a rapid penetration of VLJs into the market.” For more information, see FAA Aerospace Forecasts FY 2009-2025 <[http://www.faa.gov/data\\_research/aviation/aerospace\\_forecasts/2009-2025/](http://www.faa.gov/data_research/aviation/aerospace_forecasts/2009-2025/)> (accessed May 11, 2009).

<sup>16</sup> Title 14 CFR 135.7, “Applicability of rules to unauthorized operators,” states that “the rules in this part which apply to a person certificated under Part 119 of this chapter also apply to a person who engages in any operation governed by this part without an appropriate certificate and operations specifications required by Part 119 of this chapter.”

not maintained to those standards, and that neither the pilots nor the airplane were on Interstate Helicopters' Part 135 operating certificate.

In the United States, pilots are required to file flight plans with the FAA for IFR flights and for visual flight rules (VFR) flights that cross national borders. When a pilot files an FAA flight plan before departure, the pilot provides the FAA such basic information as the airplane's registration number, the number of people on board, the flight's departure and arrival points, and whether the flight is operating under IFR or VFR. Although FAA Form 7233-1, which collects such flight plan information, is used primarily for ATC services and search-and-rescue purposes, the NTSB notes that it also provides a mechanism for recording operator information. For example, the FAA *Aeronautical Information Manual* provides pilots the following guidance for filling out Block 14 (designated for the pilot's contact information and the aircraft's home base) on the flight plan form: "Enter your complete name, address, and telephone number. Enter sufficient information to identify home base, airport, *or operator* [emphasis added]."<sup>17</sup>

Had the accident pilot been required to document on the FAA flight plan the identity of the accident flight's operator and whether or not the flight was a commercial operation, he may have been motivated to ask questions of the airplane's owner, Interstate Helicopters, or the passengers if he did not fully understand the nature of the flight operation. Similarly, if he had understood that the flight was an unauthorized commercial charter operation, he may have been less likely to accept it had he been responsible, as the pilot-in-command, for providing the FAA with the identity of the operator and an assessment of the commercial or noncommercial nature of the flight. Therefore, the NTSB concludes that a pilot would be less likely to intentionally or inadvertently agree to fly an unauthorized commercial charter operation if the pilot, as the final authority for the operation of the aircraft, were required to identify on the flight plan the name of the operator and the regulation under which the flight is operating. Therefore, the NTSB recommends that the FAA require that FAA flight plans include a block for the pilot to identify the operator and a block to specify the operating rules under which the flight is being conducted.

#### *Need for Terms of Carriage Disclosure*

When United Engines' personnel needed flight services, a representative contacted Interstate Helicopters to set each flight's departure date, time, and itinerary. Although some of United Engines' executives may have had some understanding of the way flight arrangements can be made (the company once owned an airplane that was on a Part 135 certificate), they had no involvement in arranging the accident flight beyond what a typical charter customer would normally assume.

Unlike 14 CFR Part 121 air carriers, Part 135 on-demand operators are not required to issue tickets or other contract documents that clearly indicate to the customer the terms of carriage. With ticketing, customers enter into a contract of carriage with the air carrier, allowing the customer to be certain that they are flying on commercial transportation. On August 4, 2006, the NTSB issued to the Department of Transportation (DOT) Safety Recommendation A-06-43, which pertains to ensuring that charter customers are provided the name of the operator of the

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<sup>17</sup> *Aeronautical Information Manual* (Washington, DC: U.S. Department of Transportation, Federal Aviation Administration, 2008), paragraphs 5-1-4 and 5-1-8.

flight.<sup>18</sup> Although the DOT is making acceptable progress in response to that safety recommendation, the scenario on which that safety recommendation was based involved two properly certificated Part 135 operators and a compliant charter flight; the intent of the recommendation was to ensure that a customer knew which operator was providing the service.

As the accident involving Interstate Helicopters shows, any verbal or other form of unwritten or implied agreement with regard to “the name of the company with operational control” may not protect the customer from noncompliant charter operations; although the customers knew the name of Interstate Helicopters, they did not know that the accident flight was not a charter flight operated in compliance with Interstate Helicopters’ Part 135 operating certificate. Further, following the accident, Interstate Helicopters denied that it was the flight’s operator. The NTSB notes that these additional issues discovered in this accident highlight operational requirements that are subject to oversight by the FAA, not the DOT. Therefore, the NTSB concludes that a requirement for Part 135 on-demand operators to provide customers a written disclosure of the terms of carriage of the flight, similar to what is provided to Part 121 passengers, would eliminate uncertainty about the commercial intent of the flight. Therefore, the NTSB recommends that the FAA require 14 CFR Part 135 on-demand operators to provide their customers with a written document, correspondence, or ticket that expressly describes the terms of carriage, including the regulatory part under which the flight is operated.

#### *Customer Awareness Resources*

Representatives from United Engines stated that, following the accident, the company’s policy on charter flights was to require copies of the pilot and aircraft certificates and insurance information. However, the NTSB notes that, when a charter customer attempts to verify the status of a charter company by themselves, they may ask the wrong questions. In the case of the accident flight, had United Engines’ representatives requested copies of pilot and aircraft certificates and insurance information, these documents alone likely would not have revealed that the operator was not certificated to provide Part 135 service in the accident airplane or that the pilots were not qualified to operate under Part 135.

Many aircraft charter guides are available on the Internet, and some provide fairly detailed information,<sup>19</sup> in some cases without charge. However, some of these guides are sales tools for rating agencies that provide detailed operator, aircraft, and crew information for a fee.

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<sup>18</sup> Safety Recommendation A-06-43 asked that the DOT do the following: “Require that, for 14 *Code of Federal Regulations* Part 135 on-demand air taxi flights, the following information be provided to customers and passengers at the time the flight is contracted and at any point there is a subsequent change: the name of the company with operational control of the flight, including any doing business as names contained in the operations specifications; the name of the aircraft owner; and the name(s) of any brokers involved in arranging the flight.” On September 20, 2006, the DOT responded that it would continue its ongoing work with the on-demand air charter industry, directly and through its representative organizations, to ensure that complete and accurate information is available to the public about such operations. Further, on January 26, 2007, the DOT published an advance notice of proposed rulemaking requesting public comments on the actions recommended by the NTSB. As a result of the DOT’s ongoing actions, the NTSB classified Safety Recommendation A 06-43 as “Open—Acceptable Response” on May 2, 2007.

<sup>19</sup> One example is the National Business Aviation Association, Inc. (NBAA), *NBAA Aircraft Charter Consumer Guide*, which provides information, such as how to find charter operators, guidance for placing inquiries with the FAA for charter safety information, and sample questions that consumers may use to vet charter operators. The guide can be requested from the NBAA website at <<http://www.nbaa.org>>.

Further, on-demand operators' fleets and pilots may change frequently, making current, accurate information difficult to maintain, and FAA certificate actions, including suspensions and revocations, may not become publicly available in a timely way.

Although the FAA provides a charter aircraft guide on its website, the guide was issued in May 2002 and contains only basic information; it does not provide information about or links to the FAA's current data on charter operations or information about specific operators.<sup>20</sup> The NTSB concludes that a comprehensive aircraft charter guide that includes both basic information and reliable, up-to-date FAA information on the certification status of on-demand commercial operators and the aircraft that each is authorized to operate is needed to provide customers with a single-source reference to ensure the legitimacy of their charter service options. Therefore, the NTSB recommends that the FAA update and keep current the aircraft charter guide on its website to include reliable information on the certification status of on-demand commercial operators and the aircraft that they are authorized to operate.

### **Federal Aviation Administration Oversight and Surveillance**

The FAA FSDO in Oklahoma City has direct oversight of flight operations at PWA. The unit operational supervisor described PWA as a very active airport at which about 50 jet and turboprop airplanes were based. The facility manager described the FSDO as consistently short-staffed with significant turnover in personnel; 10 out of 30 inspectors were new. The principal operations inspector (POI) for Interstate Helicopters had been assigned to the certificate 2 days before the accident. The previous POI was assigned to a different FSDO about 6 months before the accident, and the unit operational supervisor had temporarily assumed the oversight duties. The unit operational supervisor said that the FSDO sometimes received reports or complaints about operators at PWA but that often such complaints were nonspecific and difficult to address.

Despite having a qualified inspector workforce and a documented record of inspections and correspondence with Interstate Helicopters, the Oklahoma City FSDO did not prevent Interstate Helicopters from operating what was likely multiple noncompliant charter flights. In the 3 years that preceded the accident, Interstate Helicopters operated at least 19 flights for United Engines<sup>21</sup> using at least nine different airplanes that were not listed in its operations specifications. During that time frame, the FSDO targeted Interstate Helicopters for inspections at least twice—once in January 2007 in response to a complaint and once in November 2007 as part of a required operational control inspection—but still failed to identify the noncompliant operations.

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<sup>20</sup> The guide, "Chartering an Aircraft, a Consumers' Guide," is available at <[http://www.faa.gov/about/office\\_org/field\\_offices/fsdo/grr/local\\_more/media/How%20to%20Charter%20an%20Aircraft.pdf](http://www.faa.gov/about/office_org/field_offices/fsdo/grr/local_more/media/How%20to%20Charter%20an%20Aircraft.pdf)> (accessed May 11, 2009).

<sup>21</sup> It is unknown if other customers used Interstate Helicopters similarly because such inquiries were beyond the scope of this accident investigation.

### *Inspector Presence*

In response to a January 2007 complaint that Interstate Helicopters was using jet airplanes to conduct charter operations, the FSDO's unit operational supervisor assigned two inspectors to look into it; however, one of the inspectors stated that he was given only 2 hours on a Saturday to investigate the complaint. The Oklahoma City FSDO likely placed a low priority on such ad-hoc surveillance because it can be time consuming and is not part of the inspectors' required work activities.

The NTSB was unable to determine if the documented shortcomings in the Oklahoma City FSDO's oversight of Interstate Helicopters were due to shortages in manpower or other resources; however, there appears to be a correlation between the low physical presence of FAA inspectors at PWA and the ability of Interstate Helicopters (and possibly other operators) to operate Part 91 airplanes for hire. One maintenance provider stated that he had not seen an FAA inspector conduct a ramp check at PWA in 8 to 10 years. This maintenance provider, a charter operator, and some FAA inspectors stated that they suspected that some improper activity took place at PWA; however, no violations were ever identified by the FSDO. The NTSB concludes that the level of emphasis that the Oklahoma City FSDO placed on conducting surveillance activities at PWA, which included limited inspector visits and a 2-hour on-site inquiry into a complaint about Interstate Helicopters, was insufficient to detect or deter improper charter activity at the airport. Therefore, the NTSB recommends that the FAA explore and implement strategies to improve on-site inspector surveillance activities at airports and of flight operations to detect and deter improper charter operations.

### *Operational Control Inspections*

The November 2007 inspection of Interstate Helicopters was conducted in accordance with FAA Notice 8900.16, *Special Emphasis Inspection: Operational Control*, which was issued on August 17, 2007. Although the notice directed POIs to inspect all Part 135 operators to ensure that none was operating noncompliant charter flights, the inspection of Interstate Helicopters found only a few minor paperwork issues (unrelated to noncompliant charter flights) and failed to detect Interstate Helicopters' repeated operations involving airplanes that were not on its operating certificate.

In the case of the accident flight, Interstate Helicopters had no written agreements with either Southwest Orthopedic or United Engines. The FAA's operational control inspection of Interstate Helicopters likely focused on its operation of aircraft (all helicopters) that were listed in the company's operations specifications. Without some means of determining that other aircraft were being used, the FAA could not detect and correct the type of operational control issues at Interstate Helicopters that facilitated its operation of the accident flight as a noncompliant charter. In fact, Interstate Helicopters' involvement with the accident airplane was detected during the accident investigation only through an examination of financial transactions, including invoices from Interstate Helicopters, payments to Southwest Orthopedic, payments from United Engines, and interviews with representatives from all three entities. As a result, the NTSB concludes, although the FAA inspected Interstate Helicopters in accordance with FAA Notice 8900.16, *Special Emphasis Inspection: Operational Control*, the inspection was insufficient to detect the type of noncompliant charter operations that were conducted by Interstate Helicopters. Therefore, the NTSB recommends that the FAA assess why its existing

policies, procedures, and practices resulted in a failure to detect the noncompliant actions of Interstate Helicopters and develop additional methods, measures, or procedures for performing inspections of and following up on complaints about 14 CFR Part 135 on-demand operators that can successfully detect noncompliant charter operations.

### **Cockpit Voice Recorder Functionality**

Although not required to be equipped with a cockpit voice recorder (CVR), the accident airplane was equipped with an older-model CVR designed to record 30 minutes of analog audio. However, a tape-mechanism malfunction, which was likely present well before the accident flight, precluded the recovery of any useable audio information. Quality audio information would have helped the NTSB to better understand the flight crew's challenges during the events that led up to and followed the airplane's collision with the flock of American white pelicans.

The characteristics of the accident airplane's CVR tape damage indicate that the damage most likely occurred before the accident flight. Safety Recommendation A-06-23, which was issued on March 24, 2006, and is classified "Open—Unacceptable Response," asked the FAA to do the following:

Require all operators of aircraft equipped with a cockpit voice recorder (CVR) to (1) test the functionality of the CVR before the first flight of each day as part of an approved aircraft checklist and (2) perform a periodic maintenance check of the CVR as part of an approved maintenance check of the aircraft. The CVR preflight test should be performed according to procedures provided by the CVR manufacturer and should include listening to the recorded signals on each channel to verify that the audio is being recorded properly, is intelligible, and is free from electrical noise or other interference. The periodic maintenance check of the CVR should include an audio test followed by a download and review of each channel of recorded audio. The downloaded recording should be checked for overall audio quality, CVR functionality, and intelligibility.

The NTSB concludes that a preflight functionality test of the accident airplane's CVR likely would have detected that the CVR was inoperative. Therefore, the NTSB reiterates Safety Recommendation A-06-23.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration do the following:

Revise the bird-strike certification requirements for 14 *Code of Federal Regulations* Part 25 airplanes so that protection from in-flight impact with birds is consistent across all airframe structures. Consider the most current military and civilian bird-strike database information and trends in bird populations in drafting this revision. (A-09-72)

Verify that all federally obligated general aviation airports that are located near woodlands, water, wetlands, or other wildlife attractants are complying with the requirements to perform wildlife hazard assessments as specified in Federal

Aviation Administration Advisory Circular 150/5200-33B, *Hazardous Wildlife Attractants On or Near Airports*. (A-09-73)

Require aircraft manufacturers to develop aircraft-specific guidance information that will assist pilots in devising precautionary aircraft operational strategies for minimizing the severity of aircraft damage sustained during a bird strike, should one occur, when operating in areas of known bird activity. This guidance information can include, but is not limited to, airspeed charts that depict minimum safe airspeeds for various aircraft gross weights, flap configurations, and power settings; and maximum airspeeds, defined as a function of bird masses, that are based on the aircraft's demonstrated bird-strike energy. (A-09-74)

Require all 14 *Code of Federal Regulations* (CFR) Part 139 airports and 14 CFR Part 121, Part 135, and Part 91 Subpart K aircraft operators to report all wildlife strikes, including, if possible, species identification, to the Federal Aviation Administration National Wildlife Strike Database. (A-09-75)

Revise 14 *Code of Federal Regulations* 91.23 truth-in-leasing regulations to include all turbine-powered airplanes. (A-09-76)

Require that Federal Aviation Administration flight plans include a block for the pilot to identify the operator and a block to specify the operating rules under which the flight is being conducted. (A-09-77)

Require 14 *Code of Federal Regulations* Part 135 on-demand operators to provide their customers with a written document, correspondence, or ticket that expressly describes the terms of carriage, including the regulatory part under which the flight is operated. (A-09-78)

Update and keep current the aircraft charter guide on the Federal Aviation Administration's website to include reliable information on the certification status of on-demand commercial operators and the aircraft that they are authorized to operate. (A-09-79)

Explore and implement strategies to improve on-site inspector surveillance activities at airports and of flight operations to detect and deter improper charter operations. (A-09-80)

Assess why your existing policies, procedures, and practices resulted in a failure to detect the noncompliant actions of Interstate Helicopters and develop additional methods, measures, or procedures for performing inspections of and following up on complaints about 14 *Code of Federal Regulations* Part 135 on-demand operators that can successfully detect noncompliant charter operations. (A-09-81)

In addition, the National Transportation Safety Board reiterates the following safety recommendation to the Federal Aviation Administration:

Require all operators of aircraft equipped with a cockpit voice recorder (CVR) to (1) test the functionality of the CVR before the first flight of each day as part of an approved aircraft checklist and (2) perform a periodic maintenance check of the CVR as part of an approved maintenance check of the aircraft. The CVR preflight test should be performed according to procedures provided by the CVR manufacturer and should include listening to the recorded signals on each channel to verify that the audio is being recorded properly, is intelligible, and is free from electrical noise or other interference. The periodic maintenance check of the CVR should include an audio test followed by a download and review of each channel of recorded audio. The downloaded recording should be checked for overall audio quality, CVR functionality, and intelligibility. (A-06-23)

In response to the recommendations in this letter, please refer to Safety Recommendations A-09-72 through -81 and A-06-23. If you would like to submit your response electronically rather than in hard copy, you may send it to the following e-mail address: [correspondence@ntsb.gov](mailto:correspondence@ntsb.gov). If your response includes attachments that exceed 5 megabytes, please e-mail us asking for instructions on how to use our secure mailbox. To avoid confusion, please use only one method of submission (that is, do not submit both an electronic copy and a hard copy of the same response letter).

Acting Chairman ROSENKER and Members HERSMAN,<sup>22</sup> HIGGINS, and SUMWALT concurred in these recommendations.

*[Original Signed]*

By: Deborah A.P. Hersman  
Chairman

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<sup>22</sup> At the time that these recommendations were adopted, Chairman Hersman had been confirmed but had not yet been sworn in as Chairman of the NTSB.