United States Government Accountability Office

GAO

Report to the Chairman, Subcommittee on Aviation, Committee on Transportation and Infrastructure, House of Representatives

February 2007

AVIATION SAFETY

Improved Data Collection Needed for Effective Oversight of Air Ambulance Industry

GAO-07-353

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Highlights

Highlights of GAO-07-353, a report to the Chairman, Subcommittee on Aviation, Committee on Transportation and Infrastructure, House of Representatives

Why GAO Did This Study

Air ambulance transport is widely regarded as improving the chances of survival for trauma victims and other critical patients. However, in recent years, the number of air ambulance accidents has led to increased industry scrutiny by government agencies, the public, the media, and the industry itself. The Federal Aviation Administration (FAA), which provides safety oversight, has been called upon by the National Transportation Safety Board (NTSB) and others to issue more stringent safety requirements for the industry.

GAO's study addressed (1) recent trends in the air ambulance industry, (2) FAA's challenges in providing safety oversight, and (3) FAA's efforts to address the challenges and what is known about the effects of these efforts. To address these issues, we analyzed FAA, NTSB, and industry data, interviewed federal and industry officials, and conducted five site visits, among other things.

What GAO Recommends

GAO recommends that FAA (1) identify the data necessary to better understand the air ambulance industry and develop a systematic approach for gathering and using this data and (2) collect information to evaluate the effectiveness of voluntary FAA guidance. DOT agreed with our findings and conclusions, and agreed to consider our recommendations.

www.gao.gov/cgi-bin/getrpt?GAO-07-353.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Gerald L. Dillingham, Ph.D., at (202) 512-2834 or dillinghamg@gao.gov.

What GAO Found

From 1998 to 2005, the air ambulance industry grew, largely in stand-alone (independent) operations, and experienced an increased number of accidents, resulting in added industry efforts to improve safety. Although there are few data on the industry's basic aspects, available data show increased numbers of helicopters and base stations between 2003 and 2005. Most of the base-station growth has been at airports and stand-alone helipads rather than hospital-based locations, a strong indication of the shift to stand-alone operations. The annual number of accidents increased from 1998 to 2003 but declined in 2004 and 2005. The decline may reflect added industry safety efforts, such as the creation of a study group that recommends best practices. However, the lack of actual flight-hour data prevents calculation of the industry's accident rate, making it difficult to determine whether the industry has become more or less safe.

FAA's main challenge in providing safety oversight for air ambulances is that its oversight approach is not geared toward air ambulance operations. For example, FAA uses the same set of regulations to oversee air ambulance operations as it uses to oversee other air taxi services. Air ambulance flights are subject to greater risks than other helicopter operations because they often fly at night, in a variety of weather conditions, and to remote sights to provide medical attention. These transports also can involve multiple medical and aviation officials, increasing the potential for human error. The broad nature of the applicable regulations further inhibits FAA oversight because they may not fully address the potential risks air ambulance operations face.

FAA has initiated many efforts to strengthen its oversight of air ambulances but does not evaluate the effectiveness of its efforts. FAA's efforts include establishing a task force to review air ambulance accidents, plans for hiring additional staff to oversee large operators, and issuing guidance to inspectors and operators promoting various safety practices. However, FAA does not track implementation of its voluntary guidance. Also, FAA cannot measure basic industry trends, such as accident rate changes. Measuring these trends requires actual flight-hour data, which FAA does not currently collect. Without this data, FAA cannot know if its efforts are achieving their intended results.

Air Ambulance Helicopter

Source: Clare McLean © 2006.

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Abbreviations

AAMS	Association of Air Medical Services
AMPA	Air Medical Physician Association
AMSAC	Air Medical Safety Advisory Council
CAMTS	Commission on the Accreditation of Medical Transport Systems
CUBRC	Calspan-University of Buffalo Research Center
DOT	Department of Transportation
FAA	Federal Aviation Administration
FARE	Foundation for Air Medical Research and Education
GAATAA	General Aviation and Air Taxi Activity and Avionics survey
HEMS	Helicopter Emergency Medical Services
NTSB	National Transportation Safety Board
PHI	Petroleum Helicopters International
SEP	Surveillance and Evaluation Program

GAO
Accountability * Integrity * Reliability

United States Government Accountability Office
Washington, DC 20548

February 21, 2007

The Honorable Jerry F. Costello
Chairman
Subcommittee on Aviation
Committee on Transportation and Infrastructure
House of Representatives

Dear Mr. Chairman:

The image of a helicopter air ambulance landing at a hospital or on the side of a highway—a familiar sight on television news—is an indication of the degree to which such ambulances are now a part of the nation's medical system. Air ambulance transportation is widely regarded as having a beneficial impact on improving the chances of survival and recovery for trauma victims and other critical patients, particularly in rural areas that lack readily accessible advanced-care facilities and medical specialists. Medical theory and practice hold that providing critically injured patients with surgical intervention within the first hour after injury occurs—a time period referred to by some as the "golden hour" —can significantly improve chances for survival and recovery. Air ambulance helicopters, with their ability to land at accident sites and quickly shuttle to landing areas at or near hospitals, can reduce transport times for many patients.

Figure 1: Air Ambulance Helicopter

Source: Clare McLean © 2006.

Air ambulance operations, however, can also be risky. Challenging flight conditions such as flying at night and into unfamiliar landing sites, within the critical window for medical intervention, makes these flights inherently more risky than those conducted by other helicopters. In recent years, the number of air ambulance accidents has led to increased scrutiny of the industry by government agencies, the public, the media, and the industry itself. In addition, the Federal Aviation Administration (FAA), the federal agency responsible for providing safety oversight, has been asked by the National Transportation Safety Board (NTSB) and others to issue more stringent safety requirements for the industry.

In response to your request, we examined the safety issues facing the industry and FAA's safety oversight. Specifically, we addressed the following questions: (1) What have been the recent trends in the air ambulance industry with regard to size, composition, and safety record? (2) What challenges does FAA face in providing safety oversight of the air ambulance industry? and (3) What efforts does FAA have under way to address any oversight challenges, and what is known about the effects of these efforts? To address these questions, we analyzed NTSB, FAA, and industry data; conducted an extensive literature review; and interviewed FAA and NTSB officials, as well as industry experts and representatives from key industry associations and air ambulance operators. In addition, we conducted site visits to five states that had multiple air ambulance

operators with a diversity of business models operating in proximity to one another. During these site visits, we interviewed representatives of air ambulance service providers and officials from local FAA flight standards district offices. We also visited operator facilities and observed a number of elements of operations. This report focuses on the aviation safety aspects of commercial helicopter air ambulances; the scope of our study did not include analysis of the appropriateness of associated costs, payments, or medical utilization of air ambulance transportation. We conducted our review from April 2006 through January 2007 in accordance with generally accepted government auditing standards. More details regarding our scope and methodology can be found in appendix I.

Results in Brief

The air ambulance industry has experienced recent growth, primarily in stand-alone (independent) operations, and an increase in the number of accidents, resulting in increased efforts to make safety-related improvements. There is limited or incomplete data available on basic aspects of the industry, including the number of air ambulance helicopters and the number of hours flown by air ambulances. Although data limitations preclude a complete understanding of the industry, including its growth, available data for 2003 to 2005 show the number of helicopters involved exclusively in air ambulance operations increased 38 percent (from 545 to 753), while the number of locations from which they operate grew by 30 percent (from 472 to 614). Similarly, although data are not available on the number of stand-alone and hospital-based operators, most of the growth in operating locations since 2003 has been in airports and stand-alone helipads rather than hospital-based locations. This is a strong indication of the movement toward stand-alone operations. Industry sources indicate that this growth has produced more competition in certain areas and potentially led to such unsafe practices as "helicopter shopping"—a continued search for air ambulance service by emergency medical service dispatchers until an operator agrees to accept a flight. We identified a total of 89 air ambulance accidents from 1998 to 2005 that resulted in 75 fatalities and 31 serious injuries. These 89 accidents represent nearly 40 percent of the total air ambulance accidents since 1972. The annual number of accidents involving air ambulances tripled from 6 to 18 from 1998 to 2003 but has since declined to 12 and 11 in 2004 and 2005, respectively. This number remains above the levels of the 1980s, but the drop in the past two years may reflect increased safety efforts by the industry. These efforts include the creation of a study group that recommends practices for operators to follow and the implementation of various training programs. However, the lack of data about the number of flights or flight hours precludes the calculation of the industry's accident

rate, making it difficult to determine whether the industry is becoming more or less safe.

FAA's main challenge in providing safety oversight for air ambulances is that its oversight approach is not geared toward air ambulance helicopter operations, but rather to other segments of the aviation industry that do not share many of the same operating characteristics and risks. To oversee air ambulance operations, FAA uses a set of regulations—Part 135—that it also uses to oversee air taxi services and other on-demand operations. Unlike these other operators, air ambulances provide urgent medical transport often by flying to remote scenes, landing at ad-hoc prepared sites, and operating at all times of day in a variety of weather conditions. Further, air ambulance transport can involve emergency medical service dispatchers, crew members, and others, underscoring the role of human factors before and during a transport. Available data confirm that air ambulance accidents are often related to their unique operating environment. For example, fatal crashes involving air ambulances occur most often at night, and air ambulance helicopters are four times more likely to have weather-related crashes than helicopters used by other operators flying under the same set of regulations. Our work showed that FAA inspectors may not have the necessary expertise to certify some safety technology for implementation by air ambulance operators. Inspectors also have limited opportunities to review the air ambulance operations at the many remote base stations of large operators due to a lack of time and resources. The broad nature of Part 135 regulations further inhibits FAA safety oversight, as requirements within these regulations may not fully address the risks inherent to air ambulance operations.

FAA has a number of efforts under way to strengthen its oversight of air ambulance operators, but it has not developed ways to evaluate the effectiveness of these efforts. FAA's efforts include establishing a task force to review air ambulance accidents, conducting various meetings with industry officials, and devoting additional staff resources to overseeing the largest operators. Another effort involves issuing guidance to FAA inspectors and air ambulance operators to enhance air ambulance safety. This new guidance has covered such matters as reviewing pilots' and mechanics' adherence to procedures, promoting risk management, and emphasizing certain aspects of safety. Although the guidance has been voluntary to date, FAA has not ruled out future regulatory action. While FAA inspectors are required to promote the safety actions outlined in the guidance to air ambulance operators, FAA has no plans for tracking the degree to which operators are voluntarily implementing the guidance.

FAA's ability to assess its efforts is limited not only because it does not know the extent of operators' implementation of the guidance but also because it cannot accurately measure basic trends in the industry, such as changes in the accident rate. Measuring these trends requires reliable data about actual flight hours—data FAA does not currently have. Without this data, FAA cannot know if it is targeting the appropriate amount of agency resources to air ambulance oversight or whether its efforts are achieving their intended results. Our discussions with air ambulance operators indicated that flight-hour information is available and that operators are willing to share it with FAA.

To help FAA monitor industry growth trends, accident rates, and operator implementation of FAA guidance, we are recommending that the Secretary of Transportation direct the Administrator of FAA to (1) identify the data necessary to better understand the air ambulance industry and develop a systematic approach for gathering and using this data, and (2) collect information to evaluate the effectiveness of voluntary FAA guidance. We provided the Department of Transportation (DOT) and NTSB with a draft copy of this report for their review and comment. DOT agreed with our findings and conclusions, and agreed to consider our recommendations. NTSB agreed with our findings, conclusions, and recommendations. Both agencies provided technical comments, which were incorporated, as appropriate. We also provided the Association of Air Medical Services (AAMS) with a draft of this report to review, and AAMS agreed with our recommendations.

Background

Air Ambulance Operations Perform Various Duties and Take Several Forms

Air ambulance use in the United States began on a small scale in the early 1970s, after use of air evacuation for wounded troops was demonstrated to be an effective means of reducing combat mortality both in the Korean and Vietnam wars. Air ambulances currently perform a number of functions. Although most people may associate an air ambulance with an on-scene response to an accident, the majority of transports—about 54 percent—are from hospital to hospital. On-scene responses make up another 33 percent, and the remaining 13 percent of transports include organ, medical supply, and specialty medical team transports. Air ambulances are of two main types—helicopters and fixed-wing aircraft. These two types of aircraft are generally used on different types of missions, with helicopters providing on-scene responses and much of the shorter distance hospital-to-hospital transport, and fixed-wing aircraft

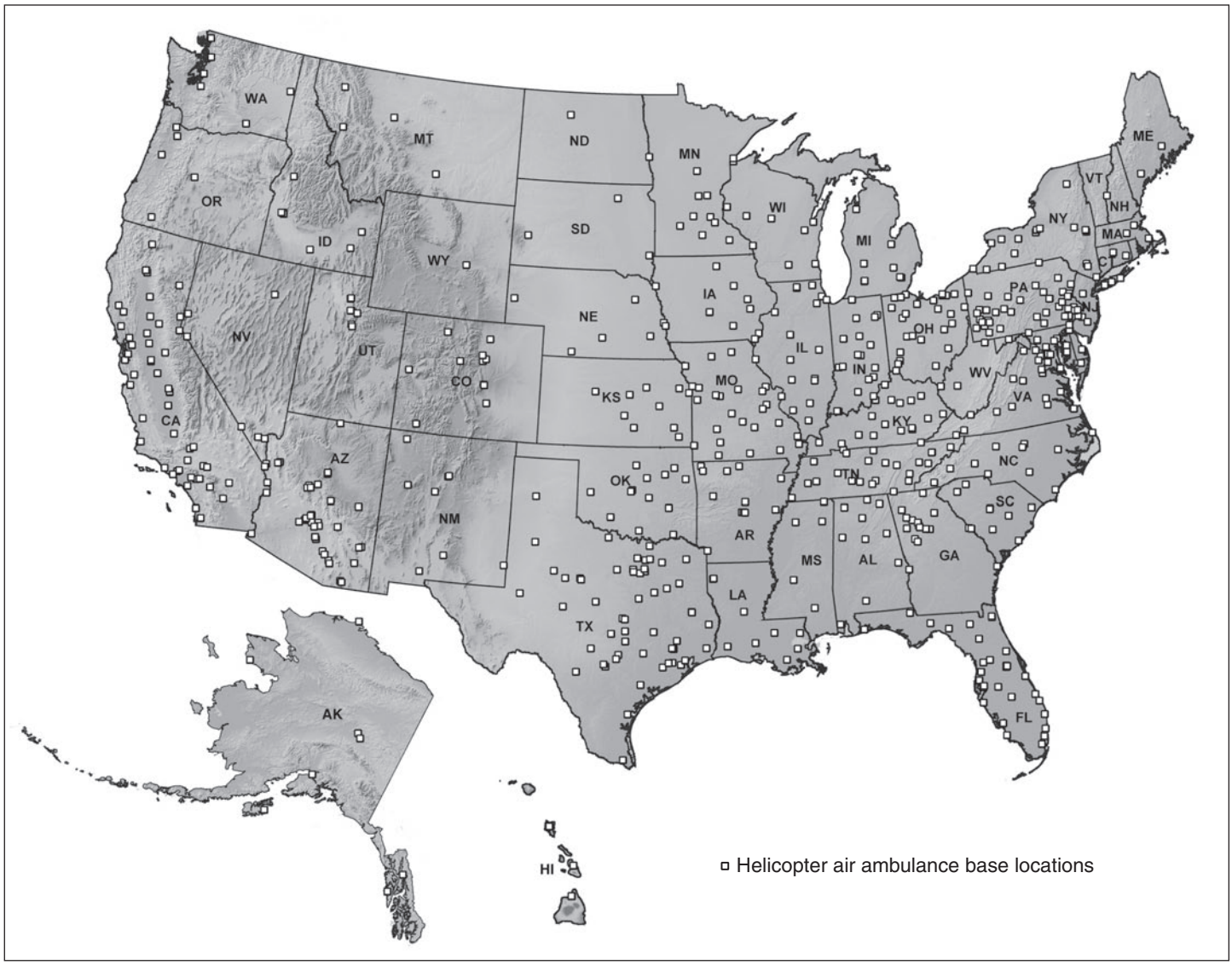
providing longer hospital-to-hospital transports between airports. Helicopter air ambulances make up more than 80 percent of the air ambulance fleet and, unlike fixed-wing aircraft, do not always operate under the direction of FAA air traffic controllers. This report concentrates on safety oversight issues related to helicopter air ambulances.

Air ambulances are an integrated part of emergency medical systems throughout the United States, and the market is dominated by a few large operators. For example, it has been estimated that the top seven operators operate nearly 80 percent of helicopter air ambulances. Before commencing air ambulance flights, an operating certificate must be obtained from FAA.[1] FAA issues the certificate after determining that an operator's manuals, aircraft, facilities, and personnel meet federal safety standards. FAA subsequently monitors the operator, primarily through safety inspections, to ensure that an operator continues to meet the terms of its certificate. Air ambulance operators often operate multiple air ambulance programs from a variety of satellite base stations at hospitals, airports, or helipads in other locations.[2] Figure 2 shows base locations of helicopter air ambulance services that perform on-scene transports.

[1]Such direct air carriers must also obtain an exemption from the Department of Transportation's economic regulatory authority, which is provided under 14 CFR Part 298.

[2]For the purposes of this report, the use of the term "operator" refers to the FAA certificate holder.

Figure 2: Helicopter Air Ambulance Service Locations



Sources: Atlas and Database of Air Medical Services (ADAMS); compiled by CUBRC's Center for Transportation Injury Research (CenTIR) in alliance with the Association of Air Medical Services (AAMS) with support from the Federal Highway Administration (FHWA) and National Highway Traffic Safety Administration (NHTSA); composite map by GAO.

Air ambulance operations can take many different forms but are generally one of two types—hospital-based or stand-alone:[3]

- In a hospital-based model, a hospital typically provides the medical services and staff and contracts with an aviation services provider for pilots, mechanics, and aircraft. The aviation services provider also holds the FAA operating certificate. In the hospital-based model, the hospital is responsible for billing the patient and pays the operator on a fixed monthly and variable hourly rate for services provided.[4]

- In a stand-alone (independent) provider model, an independent operator sets up a base in a community and serves various facilities and localities. Typically, the operator holds the FAA operating certificate and employs both the medical and flight crews, or contracts with an aviation services provider for all of these things. Compared with the hospital-based model, this approach carries more financial risk for the operator because revenues depend solely on patient flights.

Table 1 illustrates the differences in these business models by providing information on two of the operators we visited.

[3]Other types of operations include services that are operated by government entities or the military. For example, the Maryland State Police Aviation Division has a comprehensive helicopter air ambulance capability that covers the entire state, while the California Highway Patrol provides air ambulance services in portions of California. In addition to these public-use operators, federally operated aircraft provided by the U.S. Coast Guard and the U.S. Army conduct civilian air ambulance operations in select states. It is estimated that 10 percent of air ambulance operations in the United States are publicly operated. FAA does not have direct safety oversight responsibilities for public-use and military aircraft, and therefore, we did not include information on these types of operations in this report.

[4]A hospital, or other non airline entity, may hold an exemption from DOT's economic authority to operate as an "indirect air carrier" (an entity that does not actually operate aircraft) to sell air ambulance air transport services directly to the public as a principal and, in turn, contract with a properly licensed airline for the air transportation. A blanket exemption authorizing such operations was issued in 1983 by the Civil Aeronautics Board, DOT's predecessor. Such indirect air carriers may not, however, mislead the public into thinking that they are airlines, which has been emphasized to the industry through a letter from DOT's Office of Aviation Enforcement to the Association of Air Medical Services.

Table 1: Examples of Independent and Hospital-Based Operators

Characteristic	Independent operator	Hospital-based operator
Program	Petroleum Helicopters International Air Medical	Teddy Bear Transport Cook Children's Medical Center
Holder and location of FAA operating certificate	Petroleum Helicopters International (PHI); Lafayette, Louisiana	CJ Systems; Harrisburg, Pennsylvania
Number of bases	49	1
Location of bases	14 states	Fort Worth, Texas
Number of helicopters	224	1
Tax status	For profit	Nonprofit
Flight crew employer	PHI	CJ Systems
Medical crew employer	PHI	Cook Children's Medical Center
Revenue sources	Per-flight basis	Patient flights, hospital admission
Mission profile	50% on-scene 50% hospital-to-hospital	100% hospital-to-hospital

Source: GAO.

Government and Industry Both Play a Role in Air Ambulance Oversight

All levels of the government and the air ambulance industry play significant roles in air ambulance oversight. FAA has oversight over commercial aviation activities performed by air carrier operators, a group that includes operators of air ambulances. FAA's air ambulance safety oversight is carried out by inspectors located in FAA field offices throughout the United States that are a part of nine regional offices. For each operating certificate, FAA puts together a team of inspectors (also known as the certificate management team), led by principal inspectors, who focus on one of three disciplines: avionics, maintenance, or operations. Since 1985, FAA has used the National Flight Standards Work Program Guidelines, its traditional inspection program for airlines, as a primary means of ensuring air ambulance operator compliance with safety regulations. Under the National Flight Standards Work Program Guidelines, an FAA committee identifies an annual minimum set of required inspections that are to be undertaken. In addition, inspectors determine annual sets of planned inspections based on their knowledge and experience with the particular operator they oversee. When violations of statutory and regulatory requirements are identified through inspections, FAA has a variety of enforcement tools that it may use to respond to the violations, including administrative and legal sanctions.

Under FAA regulation, most air ambulances operate under rules specified in Part 135 of Title 14 of the Code of Federal Regulations.[5] However, pilots may operate under different standards, depending on whether they are carrying patients. Without patients or passengers on board, pilots may operate under rules specified in Part 91 of Title 14.[6] These flights are considered "positioning" flights and occur when flying to an accident scene or after having transported the patient to the hospital or other destination. Medical personnel are often on board for these flights, as they are considered part of the crew rather than passengers. With patients on board, pilots are required to operate under Part 135 rules.

Part 91 and Part 135 flight rules differ significantly in two key areas—(1) weather and visibility minimums and (2) rest requirements—with Part 135 requirements being more stringent. Under Part 91, the basic weather minimum requirements for visual flight rules only state that helicopters operate "clear of clouds" if flying under 1,200 feet in uncontrolled (Class G) airspace and that the pilot must have "adequate opportunity to see any air traffic or obstruction in time to avoid a collision." This does not impose any specific flight visibility distance on the pilot. In contrast, Part 135 requires that helicopter operators flying under 1,200 feet have visibility of at least a half mile during the day and at least one mile at night. This is the only situation in which Part 91 weather minimums for visual flight rules are lower than Part 135. Additionally, Part 135 requires that all helicopter operators have visual surface reference during the day and visual surface light reference at night. The other key difference between Part 91 and Part 135 is the imposition of rest requirements on pilots. Part 91 neither contains requirements for pilots to rest prior to their flights nor prescribes a maximum duty time. Part 135, on the other hand, requires helicopter pilots conducting emergency medical operations to have adequate rest periods before and after their flights, and it also contains restrictions on the number of consecutive hours that pilots may fly.[7]

In many air ambulance trips, part of the trip may involve Part 135 rules, while another part may involve Part 91 rules. Scene response missions for air ambulance helicopters frequently have three legs: the flight en route to

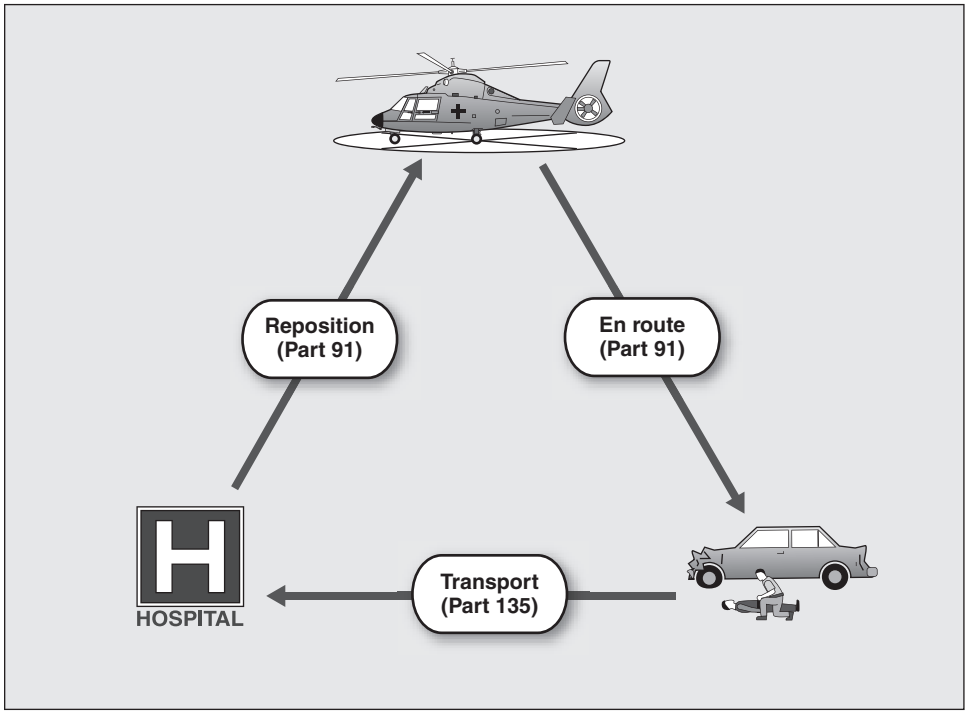
[5]Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons on Board Such Aircraft, 14 C.F.R. pt. 135 (2006).

[6]General Operating and Flight Rules, 14 C.F.R. pt. 91 (2006).

[7]According to FAA officials, while Part 91 repositioning flights are not directly governed by Part 135 flight duty and rest requirements, there is little, if any, negative effect.

the accident scene, the transport of the patient to the hospital, and the repositioning of the helicopter back to its base (see fig. 3). Of these three flight legs, only the leg during which patients or other passengers (medical crew are not considered passengers) are on board must be flown under Part 135 flight rules. Because air ambulance flights without patients or passengers could be flown under Part 91 requirements, there may be more than twice as many flights taking place under Part 91 compared with Part 135.

Figure 3: Air Ambulance Scene Response Flight Legs



Source: GAO.

NTSB also plays a role in monitoring the safety issues related to the air ambulance industry. As an independent federal agency charged by Congress with investigating every aviation accident in the United States, NTSB conducts investigations of air ambulance accidents and develops factual reports containing determinations of probable cause for these accidents. In January 2006, NTSB published a special report focusing on emergency air medical operations, which included an identification of

recurring safety issues in air ambulance accidents and subsequent recommendations for improving safety in the industry.[8] Additionally, in 1988, in response to an increased number of accidents in the mid-1980s, NTSB published a safety study that examined similar issues. The study contained 19 safety recommendations to FAA and others, which have since been addressed, according to NTSB.[9]

Some state and local governments play a role in oversight of the air ambulance industry, as well. The federal Airline Deregulation Act of 1978 explicitly prohibits states from regulating the price, route, or service of an air carrier; therefore, oversight at the state or local levels is generally limited to the medical care and equipment of air ambulance services. The extent of this oversight, however, varies by state and locality. Some states have not developed a regulatory framework to oversee the medical care side of air ambulance services. Other states do provide some oversight; California, for example, delegates authority to local governments for emergency medical service coordination and requires air ambulance providers to obtain a permit from any county in which they routinely operate, irrespective of where the provider is based. Still others, such as Maryland, Texas, Washington, and Arizona, require state licensure of all air ambulance service providers.

The industry also plays a role in its own oversight. One such industry-driven activity is the accreditation offered by the Commission on Accreditation of Medical Transport Systems (CAMTS), a 16-member organization that provides voluntary accreditation for medical transport systems, including air ambulances. Over 120 air ambulance providers have earned CAMTS accreditation since its inception in 1991, and five states have made CAMTS accreditation mandatory for all air ambulance providers wishing to operate within their jurisdiction. CAMTS places an overarching emphasis on patient care and transport safety, with specific accreditation standards focusing on aircraft maintenance and use as well as the medical, communications, and management aspects of operation. Industry trade groups also play an informal role in oversight. Industry groups, including the Association of Air Medical Services, Helicopter Association International, the Air Medical Physician's Association, and the

[8]National Transportation Safety Board, *Special Investigative Report on Emergency Medical Services Operations* (Washington, D.C., 2006).

[9]National Transportation Safety Board, *Safety Study: Commercial Emergency Medical Services Helicopter Operations* (Washington, D.C., 1988).

National EMS Pilots Association, devote much of their attention to information sharing regarding operational challenges and best practices within the industry, organizing conferences, and publishing white papers in order to place a continued emphasis on safety.

Increase in Size and Safety-Related Concerns Mark Industry's Recent Years

Since 1998, the air ambulance industry has been characterized by growth, an increased number of accidents, and various efforts to make operations safer. Growth, according to industry officials and the limited data available, has occurred mainly in stand-alone for-profit operations rather than nonprofit hospital-based programs. For much of this expansion period, the number of accidents also rose, peaking at 18 in 2003. During the 8-year period we examined (1998 through 2005), 89 air ambulance accidents occurred, but a lack of data about the number of flights or hours flown prohibits us from calculating whether the rate of accidents has increased, decreased, or remained the same over this period. The 89 accidents represent nearly 40 percent of all air ambulance industry accidents since 1972. Thirty-one of these accidents resulted in fatalities, and 9 others resulted in serious injuries to people on board. To address these developments, the air ambulance industry has been encouraging greater safety among its operators through such steps as conferences, additional training, and safety awareness programs.

Data Limitations Preclude Complete Understanding of Industry's Growth

Although industry experts and observers acknowledge the recent growth of the air ambulance industry, the available data make it difficult to gauge clearly the extent of the growth. Several years of data on two indicators—number of aircraft and number of operating locations—are available in a database maintained by the Calspan-University of Buffalo Research Center (CUBRC) in alliance with AAMS.[10] For 2003, the first year of the database, association members reported a total of 545 helicopters stationed at 472 bases (airports, hospitals, and helipads).[11] By 2005, the number of helicopters listed in the database had grown to 753, an increase of 38 percent, and the number of bases had grown to 614, an increase of 30

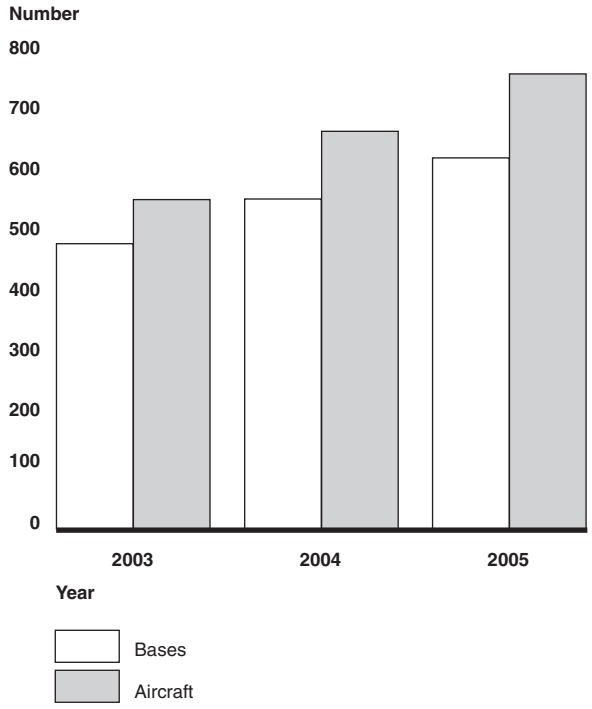
[10]AAMS is a nonprofit international association that serves providers of air and surface medical transport systems.

[11]The Atlas and Database of Air Medical Services is compiled by CUBRC's Center for Transportation Injury Research in alliance with AAMS and the air medical industry, with support from the Federal Highway Administration and the National Highway Traffic Safety Administration. We did not independently assess the accuracy of these data for the purposes of this study. See appendix I for more information.

percent (see fig. 4). A database official said that to some degree, the increase reflects a broadening of the criteria for inclusion as well as better reporting since the database was first established, but the increase also reflected actual growth, which is similar to anecdotal information relayed to us by air ambulance operators. For example, officials from two large operators told us that their companies had added bases or aircraft in the last few years. FAA maintains records of the number of air ambulance operator aircraft currently in operation but does not distinguish a company's dedicated air medical aircraft from its other aircraft. FAA does estimate the number of air medical aircraft based on its annual General Aviation and Air Taxi Activity and Avionics (GAATAA) survey, and according to available estimates, there were 435 air medical helicopters in 1999 and 741 in 2004, an increase of 70 percent.[12] It is difficult to regard these estimates as reliable, however, because the survey is based on a sample of aircraft owners and has historically experienced low response rates.

[12]GAATAA is an annual survey of a sample of Part 135 on-demand and general aviation operators. FAA uses the survey data to evaluate the impact of safety initiatives and regulatory changes and for other purposes.

Figure 4: Annual Air Ambulance Bases and Aircraft, 2003 to 2005



Source: Association of Air Medical Services, Atlas and Database of Air Medical Services.

Data are less available on whether this increase in aircraft translates into an increased number of operating hours. FAA does not collect flight-hour data from air ambulance operators. Unlike scheduled air carriers, which are required to report flight hours, air ambulance operators and other types of on-demand operations regulated under Part 135 are not required to report flight activity data to FAA or DOT.[13] FAA does develop estimates of these flight hours, using responses to its annual GAATAA survey. FAA estimated that air ambulances amassed about 900,000 flight hours annually from 1999 to 2003 and that the number of flight hours increased to 1.6 million in 2004. However, as noted, the reliability of these estimates is questionable, given various shortcomings with the GAATAA survey.[14]

[13]NTSB has previously recommended FAA require activity reporting for all Part 135 operators.

[14]Based on the methodologies used, we recognize limitations with the estimates of flight hours, and our presentation is for the purposes of showing the wide range of estimates and the uncertainty associated with these estimates. Therefore, we did not assess the reliability of FAA or other estimates of flight hours for the purposes of this report.

Other studies have shown flight-hour estimates that are much lower than FAA estimates. For example, a study sponsored by the Air Medical Physician Association (AMPA) has also estimated annual flight hours for the air medical industry. To determine flight hours, the study's authors posted a survey on the Flightweb listserve and surveyed five of the largest air medical operators—as well as information listed in the AAMS membership directory and the Directory of Air Medical Programs, published in *AirMed*—to determine the number of programs and helicopters.[15] To determine the number of flight hours, the authors multiplied the average flight hours per program by the total number of programs identified in each year. As a result, the AMPA study estimated that the total number of air medical flight hours grew from 187,216 in 1998 to 217,584 in 2001, an increase of 16 percent. FAA estimates were considerably higher for this period. For example, for 2001, FAA estimated a total of 1 million air medical flight hours.

Some other operations-related indicators are available, and they point to an increase in activity. The 2002 AMPA study also estimated that the total number of patients flown in air ambulances rose from 174,501 in 1998 to 203,772 in 2001, an increase of 17 percent. The study's authors obtained these estimates by multiplying the number of air medical programs by the average number of patients transported each year. Data maintained by the Department of Health and Human Services' Centers for Medicare and Medicaid Services indicate that the number of air ambulance trips reimbursed by Medicare increased 24 percent, from 1.65 transports per 1,000 beneficiaries in 2001 to 2.04 transports per 1,000 beneficiaries in 2004. Finally, two recent studies by government agencies, including the Congressional Research Service and FAA, acknowledged the industry's growth.[16] However, these studies, like our own, did not find a fully comprehensive indicator of this growth.

[15]Ira J. Blumen, M.D., and the University of Chicago Aeromedical Network, *A Safety Review and Risk Assessment in Air Medical Transport: Supplement to the Air Medical Physician Handbook* (November 2002). The methodology used in this study was updated in a follow-up study to include the nine largest air ambulance operators in the United States. For more information, see I.J. Blumen and D. Lees, "Air Medical Safety: Your First Priority," *Principles and Direction of Air Medical Transport* (Salt Lake City, Utah: Air Medical Physician Association, September 2006).

[16]For more information, see Bart Elias, Congressional Research Service, *The Safety of Air Ambulances* (Washington, D.C., 2006); and Matthew J. Rigsby, FAA, *U.S. Civil Helicopter Emergency Medical Services Accident Data Analysis, the FAA Perspective* (September 2005).

One other potential indicator of growth is the number of air ambulance operators, but we were unable to find data showing the change in operators over a several-year period. FAA maintains information about the air ambulance operators it oversees, but only on those currently in operation. As such, there was no way to determine how the number of operators had changed over time. FAA data indicate that as of July 31, 2006, there were a total of 76 air ambulance operators. The number of operators is considerably lower than the number of aircraft and bases. This is because some operators have large fleets of aircraft and operate from many bases. For example, Air Methods, the largest air medical operator, operates 208 helicopters out of 96 bases. Government and industry officials and operators we spoke with indicated that industry consolidation was the current trend.

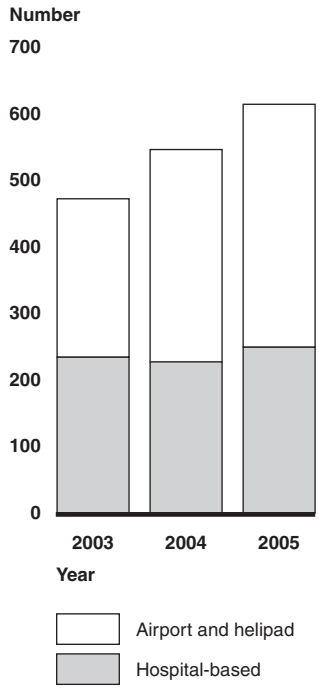
Growth Is Primarily in Stand-Alone Businesses and Has Led to Increased Competition in Some Locales

We did not find any data on the distribution of business models within the air ambulance industry, but the consensus that emerged from the industry officials we spoke with and the information we reviewed was that growth has occurred mainly in the stand-alone (independent) provider business model. For example, a 2006 public policy paper by the Foundation for Air Medical Research & Education (FARE)[17] observed that many air medical services "had become independent, community based resources." Similarly, an FAA research paper published in September 2005 noted that "the fastest growing segment of the [air medical] industry is the independent provider." In our interviews with government and industry officials, there was general agreement that the independent provider model has grown more than the traditional hospital-based model.

Additional support for this view can be seen in the types of operating bases that are growing most rapidly—airport and helipad bases, which are the typical bases of stand-alone operators. According to the Atlas and Database of Air Medical Services, the total number of stand-alone bases increased more than hospital bases from 2003 to 2005 (see fig. 5). In 2003, the number of bases reported by AAMS members was about equally divided between hospital bases and airport and helipad bases. By 2005, the number of hospital bases had increased by 6 percent (from 234 to 249), while the number of airport and helipad bases had increased by 53 percent (from 238 to 365).

[17]FARE's mission is to support the charitable, educational and research purposes of AAMS.

Figure 5: Number of Hospital-Based and Airport and Helipad Air Ambulance Bases, 2003 to 2005



Source: Association of Air Medical Services, Atlas and Database of Air Medical Services.

The growth in the stand-alone business model has been influenced by the potential for profit making, according to the officials we interviewed and others who have studied the industry. The influencing factor they most often cited was the 1997 mandate for the development of a Medicare fee schedule for ambulance transports.[18] Officials we spoke with and literature we reviewed cited the implementation of the fee schedule as a factor in the increase in stand-alone services. The fee schedule was implemented gradually starting in 2002, and since January 2006, 100 percent of payments for air ambulance services have been made under the fee schedule. Prior to 2002, all ambulance service reimbursements by Medicare were based on the type of provider. Hospital-based providers were reimbursed based on their reasonable costs, while independent providers were reimbursed based on reasonable charges. These payment patterns resulted in wide variation in payment rates for the same service. In its final rule on the fee schedule published in the Federal Register on

[18]Balanced Budget Act of 1997, P.L. No. 105-33, § 4523 (Aug. 5, 1997).

February 27, 2002, the Centers for Medicare and Medicaid Services anticipated that the fee schedule would redistribute income from ground to air ambulance services and from hospital-based to independent operators.

This potential for higher and more certain revenues has, in the opinion of many of our sources, increased competition in certain areas. The Phoenix and Dallas/Fort Worth areas were cited as examples of locales where the presence of a large number of air ambulance operators intensifies competition. One industry official wrote that there were more air medical helicopters in Phoenix than in all of Canada.[19] Another noted that the Dallas/Fort Worth area had been home to only one operator for many years, but by mid-2006 it had eight air ambulance operators.

Increased competition, according to industry experts, can also bring potentially unsafe practices. Although we were unable to determine how widespread these activities are, experts cited the potential for such practices, including the following:

- **Helicopter shopping:** FAA defines this as the practice of calling, in sequence, various operators until an operator agrees to take a flight assignment, without sharing with subsequent operators the reasons the flight was declined by previously called operators. This practice can lead to an unsafe condition in which an operator initiates a flight that it may have declined if it had been aware of all of the facts surrounding the assignment.[20] For example, in July 2004, a medical helicopter collided with trees shortly after takeoff, killing the pilot, flight nurse, flight paramedic, and patient. Three other air ambulance operators had previously turned down this same flight, including one who had attempted it but was forced to return due to fog. The pilot during the accident, however, was not informed by emergency medical service dispatchers that other pilots had declined the flight due to the weather conditions. According to NTSB, inadequate dispatch information contributed to the accident.

[19]Bryan E. Bledsoe, "Thank You for Not Flying," *Air and Space Journal* (June/July 2006).

[20]In 2006, FAA issued a letter to all state Emergency Medical Services Directors (or equivalent positions) describing "helicopter shopping" and requesting that the directors take action within their jurisdiction to implement standards and procedures to prohibit this practice.

- **Call jumping:** Industry officials reported that call jumping occurs when an air ambulance operator responds to a scene to which that operator was not dispatched or when multiple operators are summoned to an accident scene. This situation is potentially dangerous because the aircraft are all operating in the same uncontrolled airspace—often during nighttime or in marginal weather conditions—increasing the risk of a midair collision or other accident. The term "call jumping" originated in the 1970s when some ground ambulance services were involved in a similar practice.

- **Inappropriate use of air medical aircraft:** One industry official has posited that air medical helicopter use may be excessive, unsafe, and not beneficial for most patients, citing recent studies that conclude few air transport patients benefited significantly over patients transported by ground and the recent increase in the number of air medical accidents. Other studies have disagreed with this position, citing air ambulances' impact on reductions in mortality by quickly transporting critically injured patients.

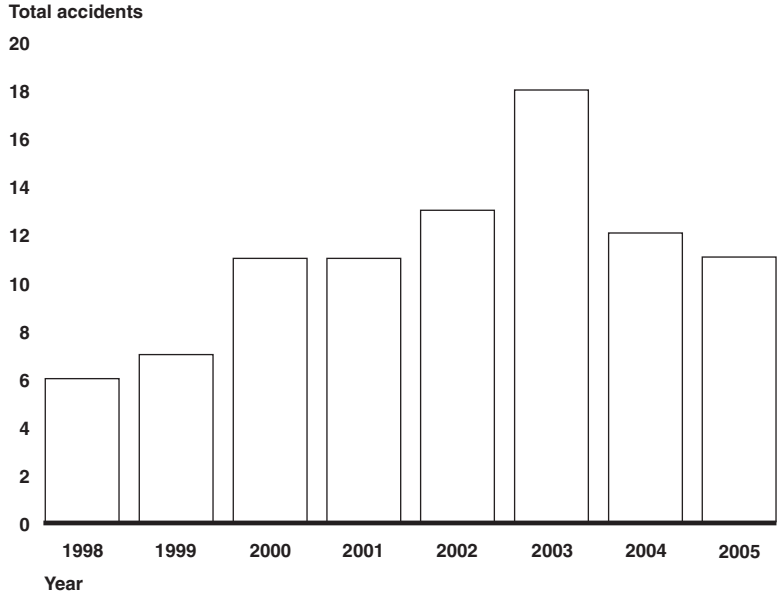
Increase in Number of Accidents Has Led to Greater Industry Focus on Safety-Related Activities

From 1998 through 2005, the air ambulance industry averaged 11 accidents per year, according to NTSB data.[21] The annual number of air ambulance accidents increased from 6 in 1998 to a high of 18 in 2003, then receded to 12 in 2004 and 11 in 2005 (see fig. 6). Of the 89 total accidents from 1998 to 2005, 31 accidents resulted in the deaths of 75 people.[22] Another nine accidents resulted in serious injuries to passengers or crew. In 2003, the peak year for accidents in our review period, there were 4 accidents with fatalities and 1 with serious injuries. The remaining 2003 accidents had either minor injuries (4) or no injuries (9).

[21]NTSB defines an aviation accident as "an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage." An accident was included in the analysis as a helicopter air ambulance accident if (1) the accident involved a helicopter being operated by an air medical transport company and (2) the accident occurred during flight under either Part 91 or Part 135 regulations. All accidents involving public operators were excluded from our analysis. See appendixes I and II for more information about the accidents used in this analysis.

[22]NTSB categorizes accidents by the highest level of injury sustained; therefore, accidents in which fatalities occurred could also include serious injuries, minor injuries, or no injuries.

Figure 6: Total Air Ambulance Accidents, 1998 to 2005



Source: GAO analysis of NTSB data.

The drop in the number of accidents in 2004 and 2005 came as the industry undertook a series of steps designed to increase safety awareness, discussed in further detail below. While this drop is a favorable development relative to the number of accidents in 2003, the numbers of accidents in 2004 and 2005 still closely match the overall average for the period. In addition, the annual average of 11 accidents for the 8-year period is higher than in previous years. Given the apparent growth in the industry, an increase in the number of accidents may not indicate that the industry has, on the whole, a poorer safety record during our review period than in previous years. More specifically, without actual data on the number of hours flown (data that FAA does not gather at present but attempts to estimate), no accident rate can be accurately calculated, eliminating the possibility of determining whether the industry is becoming safer or more dangerous.

The air ambulance industry's response to the higher number of accidents has taken a variety of forms. These initiatives include efforts aimed at flight-hour data collection, research into accident causes, training, and sharing of recommended practices. For example, in 2005, the Pilot Study Safety Group—with the support of FARE—sponsored a Web-based survey of air medical pilots in which pilots were asked about their primary safety

concerns and what equipment they need to fly more safely. As a result of the survey, the study group is recommending (1) that a gold standard for air medical operators be established that would include annual crew resource management[23] training for all personnel, (2) flight simulation training for all pilots that includes motion and instrument meteorological conditions, and (3) night vision aid or mission-oriented unaided night flight training for all crew members. Table 2 highlights some of the other industry initiatives we have identified. Although the impact of these initiatives on reducing accidents has not been assessed, the decrease in the annual number of industry accidents since 2003 may be an indicator that the initiatives are having some effect. This seemed to be the case in the mid-1980s when a reversal of the increasing accident trend occurred after a combination of industry and FAA efforts.

Table 2: Examples of Air Ambulance Industry Initiatives to Address Safety Concerns

Year	Organization	Initiative
1999	AAMS	Distributed a safety poster to its members and held "Safety Day" at the Air Medical Transport Conference to focus on program safety.
2000	Air Medical Safety Advisory Council (AMSAC)	Develops recommended practices for the industry.
2001/2002	AMSAC	Implemented "Train the Trainer" Air Medical Resource Management programs.
2002	Air Medical Physicians Association	Published "A Safety Review and Risk Assessment in Air Medical Transport."
2005	AAMS	Adopted "Vision Zero," the air medical community's program to promote safety awareness.
2006	AAMS	Sponsors the Flight Operational Database for Air Medical Services—an effort to collect flight and flight-hour data for air medical operators.
2006	Air & Surface Transport Nurses Association	Published a position paper on transport nurse safety in the transport environment.

Source: GAO.

[23]Crew resource management is the effective management of resources to ensure that group members are operating from a common frame of reference and toward a common goal of safety.

FAA Safety Oversight Does Not Fully Address Industry's Operational Risks

FAA resources, safety inspections, and regulations are tailored to oversee a wide range of aviation activities and do not address many of the operational risks facing air ambulance operators; therefore, FAA faces challenges in providing safety oversight of the air ambulance industry. Compared with other operators, air ambulance transports are subject to greater risks, because these flights often occur during nighttime, in adverse weather, and to remote sites in order to provide medical attention. Operational control often occurs away from headquarters, and many individuals and systems are involved in coordinating these flights, underscoring the role of human judgment and risk-management protocols. Available data demonstrate the risks inherent to the flight environment and stemming from poor judgment. For example, NTSB data show that more than one-third of all fatal air ambulance helicopter accidents involved weather. FAA inspections and resources are not tailored to the air ambulance industry, as few inspectors have the necessary qualifications to certify operators' use of available safety technology, and inspections of satellite bases by the assigned inspectors are infrequent. In addition, the requirements within Part 135 regulations are broad and may not fully address the dangers of poor decision making and the propensity for flights to occur at night or to remote sites.

Air Ambulance Operations Face Risks Different from Those Faced by Other Operations Subject to Part 135 Regulations

Under Part 135 rules, FAA regulates a wide variety of aviation operations, including both "scheduled" (commuter flights with fewer than 10 seats) and "nonscheduled" (on-demand air carriers, including air ambulances).[24] Part 135 operations can include such flights as small package cargo transport, business and personal domestic and international transport, and shuttle services to industrial job locations, such as oil platforms at sea. While these operators may provide services in a variety of conditions, their operations are generally characterized by smaller geographic operating areas and more uniformity across their bases compared with that of air ambulance operators. For example, these operators generally do not have many remote bases and they take off and land at established landing zones.

Operationally, air ambulance operations are distinct from these other types of operations in several key ways:

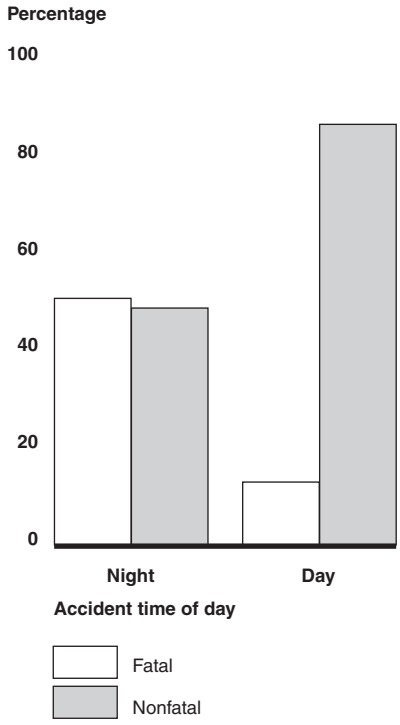
[24]The FAA also applies specific limitations and requirements for Part 135 operators through the use of operations specifications, which are individually developed for each operator.

- **Operations are subject to greater risks**. Air ambulance helicopters are used to quickly transport individuals requiring urgent or emergency medical attention at all hours of the day, and crews face greater risks from flying at night, in marginal weather conditions, and to and from remote sites. In "scene work" (picking up a sick or injured patient at an off-airport/heliport site), the landing zone is a makeshift site to which the pilot has likely never been. Such operations, coupled with low visibility, can contribute to severe outcomes. Available data tend to confirm that the air ambulance transports face greater risks than other types of helicopter transports. NTSB data of helicopter accidents occurring between 1998 and 2005 show that factors related to flight environment (such as light, weather, and terrain) underlie 70 percent of all air ambulance accidents, compared with 40 percent of accidents for other helicopter accidents.[25] Data on the flight environment of air ambulance accidents indicate a number of risks, including the following:

  - *Nighttime operations.* Nighttime accidents for air ambulance helicopters were more prevalent than for other helicopter operations, and air ambulance accidents tended to be more severe when they occurred at night than during the day. More than half of all air ambulance helicopter accidents took place at night, compared with 9 percent of non-air-ambulance helicopter accidents. Nighttime accidents also carry a greater tendency to be fatal. NTSB data indicate that from 1998 to 2005, air ambulance accidents that occurred at night were almost four times more likely to result in fatalities than those occurring during the day—51 percent versus 13 percent (see fig. 7).

[25]Our analysis of NTSB data from 1998 through 2005 included 89 air ambulance helicopter accidents and 1,129 non-air-ambulance helicopter accidents.

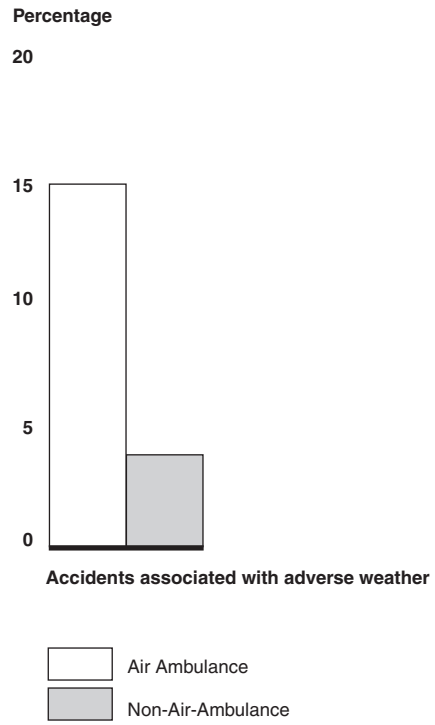
Figure 7: Time of Day of Air Ambulance Fatal and Nonfatal Accidents, 1998 to 2005



Source: GAO analysis of NTSB data.

- *Adverse weather*. Air ambulance accidents were more often associated with weather conditions compared with other helicopter accidents. Weather conditions such as snow, gusting wind, and fog have been known to contribute to air ambulance accidents. While 4 percent of other helicopter accidents are associated with bad weather, air ambulance accidents were nearly four times more likely (15 percent) to be attributed to adverse weather (see fig. 8). NTSB data show that overall, more than one-third of fatal air ambulance accidents were attributable in part to weather.

Figure 8: Percentage of Air Ambulance and Other Helicopter Accidents Associated with Adverse Weather, 1998 to 2005



Source: GAO analysis of NTSB data.

- *Remote sites*. Flying to remote sites may further expose the crew to other risks associated with unfamiliar topography or ad-hoc landing sites. Data show that accidents attributable to an in-flight collision with objects occurred more frequently for air ambulances than other helicopters. Air ambulance helicopters also can encounter difficulties with ad-hoc landing zones at remote sites, such as being engulfed in clouds of dust commonly referred to as brownouts. For example, in July 1998 during a brownout, an air ambulance helicopter rolled over when the pilot lost visual contact with the ground.

- **Multiple bases located away from headquarters**. FAA inspectors assigned to large air ambulance certificates told us that the dispersion of bases away from operator headquarters may result in less disciplined adherence to internally established risk assessment practices and protocols. Air ambulance bases are often dispersed away from headquarters, either as independent stand-alone bases or through

contractual relationships with hospitals. In contrast, other Part 135 helicopter operations typically are not dispersed. The dispersion of bases away from the certificate holders' headquarters and the location of bases are in part due to medical need and demand for services. For example, one state emergency medical services official reported that operators look at high accident road intersections in considering where to locate their bases.

- **Many individuals and systems are involved in transports.** Many individuals and systems may be involved in coordinating air ambulance transports. The number and expertise of people involved in making decisions and passing on information about flights and flight conditions can increase the risk of incorrect or incomplete information being relayed. Multiple systems, involving both public and private resources, are used in determining when to relay a request, which air ambulance provider the request will be relayed to, and if a request will be accepted and completed. Emergency medical service dispatchers may not uniformly gather all of the information needed by air ambulance providers, such as weather at the landing site. Ground personnel may also be involved with relaying critical information about the landing site to the crew; but again, they may not provide critical information to the air ambulance operator. For example, in Parumph, Nevada, an air ambulance helicopter crashed while attempting to pick up a patient at a remote site when ground personnel incorrectly informed the helicopter crew that there were no wires obstructing the site.

- **Human judgment may override risk-based protocols.** Human judgment can play a critical role in air ambulance transport, particularly given the risks found in the flight environment and the medical urgency. For example, during a dark night in June 1998 in La Gloria, Texas, a helicopter crashed into trees nearly 20 miles past the accident site to which it was headed. Attributes of the crash, as reported by NTSB, indicated that the pilot failed to recognize his intended destination and had flown past it and that the adverse weather conditions resulted in the pilot's loss of control from experiencing spatial disorientation. The pressure to complete the airlift and the pilot's lack of experience with flying by instruments were cited among the contributing factors by NTSB in its accident report. The following accident data highlight the prominence of poor human judgment in an already inherently risky line of work:

    - Ninety-four percent of air ambulance accidents between 1998 and 2005 had at least one cause related to pilot/operational errors, while 86 percent of non-air-ambulance accidents during the same time period had pilot/operational causes.

- In total, 28 percent of air ambulance accidents between 1998 and 2005 had at least one planning or decision-making related cause, while 19 percent of non-air-ambulance accidents had such causes.

Air operators rely on a number of protocols, such as operational control (the authority over initiating, conducting, and terminating a flight), risk assessment matrices, and air medical resource management training to help reduce the potential for poor or erroneous judgment.[26] However, there are indications that in air ambulance operations, these protocols may be inconsistently implemented or followed. According to an FAA report that reviewed air ambulance accidents occurring from 1998 to 2004, a lack of operational control and poor aeronautical decision making were significant contributing factors to these accidents.[27] Specifically, the report cited the susceptibility of crew members to external factors in decision making. FAA inspectors we spoke with reported that factors such as competition and the contractual relationship between a vendor and provider can result in a loss of operational control when unauthorized medical or other staff exert pressure over the crew to fly. Several trade organizations also said that the trend toward stand-alone providers has increased the susceptibility of operational decision making to financial incentives. Additionally, FAA inspectors we interviewed reported that the dispersion of bases away from certificate holder headquarters may result in less disciplined adherence to internally established risk assessment practices and protocols.

FAA Inspections Framework Is Not Tailored to Risks of the Air Ambulance Industry

FAA faces challenges in providing safety oversight to the air ambulance industry because the existing inspections approach and resources are not tailored to address the specific operational aspects of air ambulance transports. Current FAA inspections and resources may not enable its staff to meet the workload, training, and travel requirements associated with conducting oversight activities of air ambulance certificates. These challenges stem from the distinctive way that air ambulance operators are

[26]FAA requires certificate holders to maintain a process for operational control of their aircraft. FAA officials noted that operational control should be (1) independent from the clinical or medical side of management and operations, (2) dictated solely by criteria such as weather and operational capability of crew and equipment, and (3) managed exclusively by the certificate holder.

[27]For more information, see Matthew J. Rigsby, FAA, *U.S. Civil Helicopter Emergency Medical Services Accident Data Analysis, the FAA Perspective* (September 2005).

structured, their size, use of emerging technology, and dispersed bases. In addition, FAA does not collect data that would help demonstrate how its inspections approach is connected to safety outcomes. These challenges are discussed in more detail below.

- **Size and scope of air ambulance operations.** Each year, the National Flight Standards Work Program Guidelines sets the minimum number of FAA required inspections for all Part 135 operators. Although the National Flight Standards Work Program Guidelines outlines the minimum inspection requirements for all Part 135 operators, the principal inspectors must determine how many additional inspections might be necessary for adequate oversight in light of the size and risk factors associated with a certificate holder. In the case of large air ambulance operators, these additional inspections can be considerable due to the size and scope of the operations. For example, according to FAA officials, the certificate management team for one large air ambulance operator had 2,396 hours of required inspector surveillance hours for fiscal year 2006. However, the team estimates that a total of 4,425 inspector surveillance hours will actually be needed for fiscal year 2006 in order to provide appropriate oversight. Additionally, FAA's procedures for establishing and maintaining pay grades for inspectors may be a contributing factor in how much attention is given to the oversight of large air ambulance operators. FAA assigns points to the inspection activities of inspectors, and these points, in turn, are tied to an inspector's pay. Several inspectors of air ambulance operators reported that the points assigned to the oversight of these operators are not commensurate with the risk and size of these operations.

- **Lack of training and qualifications to oversee use of technology.** According to FAA inspectors and officials we spoke with, FAA has few inspectors who have the necessary qualifications to certify the use of safety technology being adopted by air ambulance operators, and FAA does not provide inspectors with training in emerging safety technology. Several of the FAA inspectors we interviewed reported not receiving what they felt to be the necessary training that would allow them to provide oversight of operators' implementation of new technology. This is similar to concerns we raised in a previous report on FAA's inspection program.[28] Specifically, we found that FAA develops technical courses on an ad-hoc basis rather than part of an overall curriculum for each inspector specialty—such as air ambulance operations—because the agency has not

[28]GAO, *Aviation Safety: FAA Management Practices for Technical Training Mostly Effective; Further Actions Could Enhance Results*, GAO-05-728 (Washington, D.C.: Sept. 7, 2005).

systematically identified the technical skills and competencies each type of inspector needs to effectively perform inspections. FAA developed the Flight Standards Inspector Resource Program, in which inspectors with special expertise in a technology can assist other inspectors whose operator may be using such technology. For example, currently few inspectors are qualified to provide operator certification in night vision goggle use. However, several inspectors we spoke to found this program problematic, because of the burden it poses to the inspector that must certify the use of night vision goggles and continue to carry out their other required duties.

- **Limited oversight of base locations.** While air ambulance bases and helicopters for any one operator are often located across the country, the assigned principal inspectors are based in the FAA district office where the operating certificate is registered and held by an operator's headquarters office. This may be important because operators may have many remote bases of operations; for example, one of the largest air ambulance companies has no helicopters located at the headquarters location. FAA principal inspectors assigned to large air ambulance certificates we spoke with said they did not have the travel funds or time to perform inspections of many remote bases. Instead, inspectors from local FAA offices—called geographic inspectors—assist with the oversight of these bases at the request of a principal inspector.[29] Some FAA principal inspectors expressed little confidence in the quality of these inspections, however, because geographic inspectors may lack comprehensive knowledge of the operators' manuals or lack helicopter expertise.

The challenges that FAA faces in applying its general inspections approach to the air ambulance industry are also evident in its violations and enforcement activities. Principal inspectors we spoke with noted that the problems they typically found with air ambulance operator certificates were generally tied to the maintenance of proper paperwork and other record keeping irregularities, and not to known industry safety issues such as risk management and decision making. This may indicate that the factors that frequently contribute to air ambulance accidents, such as flying at night or in adverse weather, are not necessarily addressed by typical FAA oversight activities, which focus on such things as maintenance and training. Additionally, FAA was unable to provide us

[29]FAA is shifting the oversight of commercial airlines (Part 121 carriers) to a new system—the Air Transportation Oversight System—and as part of this realignment is restructuring the resources for geographic oversight. This restructuring may affect the availability of geographic resources for air ambulance oversight.

with reliable data of FAA enforcement actions related specifically to helicopter air ambulances because enforcement data for operators do not distinguish the actions taken against operators' air medical operations from operators' other lines of business. For example, the core business of Petroleum Helicopters International (PHI), one of the largest air ambulance operators, consists of providing offshore helicopter support to oil and gas companies operating in the Gulf of Mexico. FAA enforcement data we reviewed for PHI do not specify which enforcement actions were taken against the company's air medical operations and its offshore operations. Moreover, FAA only maintains data on enforcement actions taken against air ambulance operators currently in operation. These data limitations constrain FAA's ability to assess its air ambulance oversight activities and are similar to the concerns we have previously reported about FAA's inadequate evaluative processes with its inspections and enforcement program.[30]

Part 135 Regulations Do Not Address Specific Dangers Inherent in Air Ambulance Transports

Many air ambulance flights are subject to different weather and crew-rest requirements under federal aviation regulations, depending on whether patients or passengers are on board. For example, flights without patients or passengers, such as flights en route to an accident scene or as part of training exercises, are subject to minimum requirements outlined in Part 91 regulations. When patients are on board, Part 135 requirements are applicable. Some operators we interviewed and visited reported that it is their company policy to follow Part 135 requirements at all times and believed that the more stringent requirements of Part 135 regulations offer safer operating parameters.[31]

Despite its more stringent requirements, Part 135 regulations cover a broad range of operators and do not address the risks inherent in the operational aspects of air ambulance transports—adding to FAA's challenges in providing oversight of the air ambulance industry. For example, Part 135 regulations do not distinguish the operational control responsibilities of the certificate holder from the base or hospital program,

[30]GAO, *Aviation Safety: FAA's Safety Oversight System Is Effective but Could Benefit from Better Evaluation of Its Programs' Performance*, GAO-06-266T (Washington, D.C.: Nov. 17, 2005).

[31]Our analysis of NTSB accident data (see app. II) showed that more accidents occurred under Part 91 flight rules. However, because more flights take place under Part 91 rules, it is difficult to tie the accident record of Part 91 and Part 135 flights to safety.

which may be important in this industry because many air ambulance operations are geographically dispersed or involve third parties, such as an emergency medical system communications specialist or medical director. In a recent review of Part 135 operators, FAA identified a problem of questionable operational control being exercised by certificate holders working under commercial arrangements with aircraft owners or management companies. In December 2006, FAA issued Notice 8000.347, which reiterates existing regulation about the exercise of operational control. The notice outlines that operational control requires Part 135 operators to "put procedures in place to ensure that when safety conditions for a flight cannot be met, the flight is canceled, delayed, rerouted, or diverted." Because multiple people are involved in dispatching air ambulance helicopters, operational control, as outlined within the current Part 135 regulations, has been interpreted differently. According to one FAA official, in some instances, tracking a flight or "flight following"—one function of operational control—was being performed by the hospital rather than the certificate holder because the former entities were in two-way communication with the helicopter. The official noted that this lack of formalized flight following inhibits the efficacy of the certificate holder in maintaining control of the aircraft and responsibility for the flight at all times.

Part 135 regulations are also not tailored to the air ambulance industry's scene response transports that often require flights to remote sites. Remote-site flights may require crews to use new or different flight routes that can be further complicated by marginal weather or flying at night. Within Part 135 regulations, instrument flight rules allow for the use of instruments in guiding the aircraft in inclement weather. However, in order to utilize instrument flight rules equipment, weather reporting must be available for the destination location. According to Part 135 regulations, if such weather reporting is unavailable flights must use visual flight rules (not instrument). According to some operators, since many air ambulance flights are to remote landing sites or to hospitals that do not have such weather reporting available, air ambulances can be inhibited in their use of instrument flight rules equipment under Part 135. [32] Some industry trade

[32]FAA is considering a request from an air ambulance operator to perform instrument flight rules departures and approach procedures at airports and helipads that do not have an approved weather reporting source. If this exemption to current Part 135 rules is approved by FAA, this operator would be able to fly in accordance with instrument flight rules more often and, according to the operator, thereby improve the safety of its Part 135 flights.

organizations consider flights that utilize instruments to be much safer than the flights that rely solely on visual cues.

FAA Efforts to Improve Safety Are Under Way, but Effects Are Not Being Measured

While FAA has various efforts under way to address safety oversight of the air ambulance industry, the agency currently is not assessing the effects of these efforts. FAA's efforts have taken three main forms. First, FAA has issued numerous items of guidance for its inspectors and for air ambulance operators. The guidance directed at air ambulance operators is not subject to enforcement because it is not mandatory, and FAA has not established a way to track the extent to which operators are voluntarily implementing these practices. Second, FAA has authorized additional inspectors to oversee large air ambulance operators and taken other steps designed to improve the safety of large operations. Third, FAA has increased collaboration with air ambulance industry officials through sponsorship of and attendance at meetings and conferences that address industry safety issues. However, FAA has no way to measure the impacts of these safety efforts because FAA does not collect basic data about industry trends, such as flight hours, that are necessary to indicate if accident rates are increasing or decreasing. Additionally, the extent to which operators are following FAA voluntary guidance is not currently tracked. Without an approach for evaluating the effects of FAA efforts, it will be difficult to determine whether the current approach and level of FAA safety oversight of the air ambulance industry is appropriate.

FAA Efforts Targeted at Improving Air Ambulance Safety Oversight Include Issuing Guidance, Expanding Inspection Resources, and Collaborating with the Industry

FAA has taken a number of steps to develop initiatives and strategies to reduce the number of air ambulance accidents. In August 2004, FAA established the FAA Emergency Medical Services Task Force to review and guide government and industry efforts to reduce air ambulance accidents. The FAA task force initiated a collaborative relationship with air ambulance industry officials that resulted in FAA developing and publishing numerous pieces of aviation safety guidance, including FAA notices aimed at improving the safety of air ambulances. Additionally, FAA has recently authorized an increase in the size of the inspection teams overseeing large air ambulance operators. Beyond the 2004 task force, FAA has worked together with the industry in a number of ways to help address the safety of air ambulances.

FAA Guidance Focuses on Identified Safety Concerns

FAA has issued guidance for air ambulance inspectors and operators that focus on a number of safety issues identified by the FAA task force's review of air ambulance accidents (see table 3). FAA's recently published guidance has been largely targeted at FAA safety inspectors of air

ambulance operators, but it also recommends actions for operators to take to improve safety. All published notices containing the guidance expire 1 year after their effective date. Key areas of emphasis for inspectors to relay to operators include improving decision-making skills, risk management, and operational control.

Table 3: Key FAA Published Efforts to Improve Air Ambulance Safety

Date	Type of action	Title	Purpose
January 2005	Notice 8000.293 (on Jan. 28, 2006, became permanent through Safety Alert for Operators 06001)	Helicopter Emergency Medical Service Operations	Provides guidance for FAA safety inspectors to help operators review pilot and mechanic decision-making skills, procedural adherence, and crew resource management practices.
August 2005	Notice 8000.301	Operational Risk Assessment Programs for Helicopter Emergency Medical Services	Provides guidance to FAA inspectors to promote improved risk assessment programs and risk management tools and training to all flight crews, including medical staff.
September 2005	Notice 8000.307	Special Emphasis Inspection Program for Helicopter Emergency Medical Services	Provides guidance to FAA safety inspectors of air ambulance operators to place emphasis on specific areas, including operational control (policies, procedures, training, etc), safety culture development, access to weather information, operators' knowledge of geographic area, etc.
September 2005	Advisory Circular 00-64	Air Medical Resource Management	Provides guidance to operators to establish minimum training guidelines for all air medical team members.
January 2006	*Flight Standards Handbook Bulletin for Air Transportation*, 06-02	Helicopter Emergency Medical Services Loss of Control and Controlled Flight into Terrain Accident Avoidance Programs	Provides information to inspectors about pilot training and checking standards and requires a review of air ambulance operator training programs.
January 2006	*Flight Standards Handbook Bulletin for Air Transportation,* 06-01	Helicopter Emergency Medical Services; OpSpec A021/A002 Revisions	Provides guidance to principal operations inspectors about revisions to the weather minimums for air ambulance operators.
March 2006	Notice 8000.318	Public Helicopter Emergency Medical Services Operations	Provides guidance to inspectors to ensure that public air ambulance operators are aware of current FAA policies and standards for air ambulance operations, and to emphasize the importance of public aircraft operators' compliance with these operating rules.
August 2006	Aeronautical Information Manual	Helicopter Night Visual Flight Rule Operations	Provides information and guidance concerning night celestial and man-made lighting on seeing conditions in night visual flight rule operations.
August 2006	Aeronautical Information Manual	Landing Zone Information	Provides information and guidance on the selection of ad-hoc helicopter landing sites by ground responders and the use of such sites by helicopter operators.

Date	Type of action	Title	Purpose
November 2006	Notice 8000.333	Helicopter Emergency Medical Services (HEMS) use of the Aviation Digital Data Service (ADDS) Experimental HEMS Tool	Provides information and guidance to principal inspectors on the use of the ceiling and visibility tool developed as a result of the 2006 Weather Summit.

Source: FAA.

FAA notices require actions by FAA personnel but are nonmandatory to the air ambulance operators and not subject to enforcement. For example, in Notice 8000.301, which concerns risk assessment programs, principal inspectors are to review the notice, provide a copy to their assigned operators, and "strongly encourage" operators to implement a risk assessment program. FAA inspectors told us that this published guidance is difficult to enforce and agreed that although many of the air ambulance operators are proactive in implementing FAA guidance, there is no way to ensure that operators adopt the guidance. An official from Professional Airways Systems Specialists, the union representing FAA inspectors, also commented that principal inspectors have no way to compel operators to adopt this guidance, because the enforcement tools they have (e.g., approving the operators' general operating manuals and levying sanctions and fines) are rooted in established regulations, not in the "good ideas" of the voluntary guidance. Additionally, FAA officials noted that in areas where there has been some industry resistance, such as new equipment recommendations, inspectors have little recourse. However, FAA officials told us that rule making is a time-consuming process that can take years to complete, hindering the agency's ability to quickly respond to emerging issues. By issuing guidance rather than regulations, FAA has been able to quickly respond to concerns about air ambulance safety. Officials added that FAA has not ruled out future regulatory action.

Industry officials and air ambulance operators we interviewed were largely supportive of FAA's efforts to provide additional guidance on air ambulance safety and reported that most operators are implementing this guidance. For example, CAMTS has adopted much of FAA's guidance within its accreditation standards for operators and, in cases such as risk assessment, has adopted more stringent standards than FAA encourages. Air ambulance operators also reported that they were already operating at higher standards than FAA recommends in guidance, such as weather minimums and safety equipment. Many industry groups and operators do not believe that additional regulations would be more effective than the published guidance. For example, the Helicopter Association International, a professional trade association for the civil helicopter industry, has stated that adherence to current regulations is far more

effective than generating new regulations and has encouraged air ambulance operators to adopt FAA guidance to the maximum extent possible to enhance safety.

Additional FAA Resources Allocated to Air Ambulance Oversight

FAA recently authorized the hiring of new inspectors to work on the certificate management teams for large air ambulance operators. In 2005, FAA sanctioned a group to review the resource needs for oversight of air ambulance operators with 25 or more dedicated air ambulance helicopters. Following this review, the task team made several recommendations to FAA headquarters that included increasing the number of FAA inspectors assigned to large air ambulance operators, dedicating these inspectors solely to air ambulance operator certificates (i.e., no other inspection responsibilities), and using the surveillance and evaluation program (SEP) to identify risks and target surveillance activities.[33] As a result of the task team recommendations, in June 2006, FAA accepted these recommendations and authorized an increase in the number of staff assigned to the inspection teams that oversee the seven large air ambulance operators.[34] For four of the seven largest operators, the size of the inspection teams will increase to eight inspectors to oversee the air ambulance operator certificates.[35] Additionally, the principal inspectors and newly hired inspectors for these operators will be dedicated to the certificate. Prior to this effort, many of the principal inspectors for large air ambulance operators were responsible for more than 20 different certificates. Following this hiring, and implementation and use of SEP, FAA will evaluate whether a further increase in inspection team sizes is necessary. Hiring efforts by FAA to fill these inspector positions are under way, and hiring is expected to be completed in fiscal year 2007.

FAA also initiated a series of efforts to improve the safety of one large air ambulance operator in 2005, and officials reported that they hope some of

[33]SEP is used by FAA in its oversight of commuter air carriers and is considered to be a more effective and efficient surveillance program than traditional, event-based surveillance. SEP emphasizes a system safety approach of using risk analysis techniques and allows FAA inspectors to prioritize workload based on areas of highest risk. For more information on SEP, see GAO, *Aviation Safety: System Safety Approach Needs Further Integration into FAA's Oversight of Airlines*, GAO-05-726 (Washington, D.C.: Sept. 28, 2005).

[34]FAA district offices have initiated hiring efforts to staff to target levels.

[35]For the other large operators, inspection team sizes were increased from three nondedicated inspectors to four dedicated inspectors.

the changes and recommendations being adopted by this operator will be implemented industrywide. FAA concluded that the recent increase in accidents of this operator emphasized the need for a new approach to FAA's involvement in the effort to enhance safety for air ambulance operators in general. The team working with the operator has since recommended changes to FAA to improve oversight, including increased and more focused surveillance, relieving inspectors of other certificate duties, and adding appropriately qualified inspectors. Additionally, the team has worked closely with the operator to evaluate the company safety program, encourage risk management, and to change some parameters for flights, including weather minimums.

FAA Has Increased Collaboration with the Industry

In addition to collaborating with the air ambulance industry on developing FAA guidance, FAA officials have worked together with the industry in a number of other ways, such as attending and participating in industry meetings, conferences, and task teams. For example, in March 2006, FAA hosted a Weather Summit to identify the air ambulance issues related to weather products and services and determine how FAA can better meet industry needs. Additionally, FAA officials participate in the AAMS Safety Committee and have made presentations at recent industry conferences, such as the Helicopter Safety Forum and the Air Medical Transport conference, to keep the industry informed of FAA efforts related to air ambulance oversight.

FAA officials also reported that they are working with the industry to address recent NTSB safety concerns but have not issued any new regulations for air ambulance operators as NTSB recommended. In its January 2006 Special Investigation Report on air ambulance operations and accidents, NTSB made four recommendations to FAA to improve air ambulance safety (see table 4). With these recommendations NTSB encouraged FAA to impose requirements for air ambulance operators because NTSB does not anticipate that the recently published FAA guidance will be widely implemented by operators due to its voluntary nature.[36]

[36]According to NTSB, as of December 21, 2006, these recommendations are still open.

Table 4: NTSB Recommendations and FAA Responses

NTSB recommendation to FAA	FAA response
Require all air ambulance operators to comply with Part 135 operations specifications during the conduct of all flights with medical personnel on board.	FAA is looking at options to address concerns about the differences in the flight rules—specifically the weather minimums—through new weather reporting requirements and the application of "eligible on demand" standards to air ambulance helicopter operations.
Require all air ambulance operators to develop and implement flight risk evaluation programs.	FAA has implemented this recommendation with the publication of Notice 8000.301.
Require air ambulance operators to use formalized dispatch and flight-following procedures.	FAA has a study under way to identify best industry practices in ground communication and dispatch to support effective FAA requirements and policy.
Require air ambulance operators to install terrain awareness and warning systems on their aircraft and to provide adequate training to ensure that flight crews are capable of using the systems.	FAA has emphasized the strategic avoidance of controlled flight into terrain accidents in *Flight Standards Handbook Bulletin for Air Transportation*, 06-02. At FAA request, RTCA Inc., a private corporation, has formed a special committee to develop the minimum operational standards for helicopter terrain awareness and warning systems, which will be used by FAA in developing future requirements.

Sources: NTSB and FAA.

Industry officials we spoke with generally agreed with the NTSB report recommendations but did raise some concerns. Some industry officials were concerned about the recommendation that air ambulances operate under Part 135 at all times, noting that this could inhibit transports in some areas due to a lack of weather information. For example, in a response letter addressed to NTSB, CAMTS stated that while the balance between lesser and more stringent regulation has always been a concern, it is difficult to operate under Part 135 regulations in rural areas due to airport and landing restrictions. Additionally, many industry officials expressed concerns about the costs related to implementing terrain awareness and warning systems, and some stated that this technology may not be appropriate for helicopters due to the low altitudes in which they operate. For example, AAMS has stated that the NTSB has seriously underestimated the costs involved in implementing terrain awareness and warning systems and has pointed out that, on one aircraft, the cost of the computer portion of this technology (which they say is the smallest part of the implementation costs) can range from $14,000 to $30,000. AAMS supports voluntary implementation of terrain awareness and warning systems due to the high costs involved in implementing the systems and limited proven benefits, especially in helicopter operations.

FAA Lacks an Approach for Evaluating the Effects of Its Efforts

While the efforts by FAA could have had an effect on safety, the extent of any effect is unknown because FAA does not collect necessary data to evaluate effectiveness. FAA efforts such as increasing its inspector workforce allow FAA to conduct more inspections and potentially improve oversight of air ambulance operators. However, whether this increased attention results in a better safety record will be difficult to determine without the data to conduct an analysis of the industry accident rate. FAA does not currently collect basic data to measure changes in the air ambulance industry, such as flight hours or number of trips flown. Without data about the number of flights or flight hours, FAA and the air ambulance industry are unable to identify whether the increased number of accidents has resulted in an increased accident rate or whether it is a reflection of the growing number of aircraft and programs. Data describing the safety trends of the industry is essential to understanding the effects of FAA efforts, especially as FAA continues to develop initiatives and dedicate resources to improve air ambulance safety. NTSB has also stated the need for valid activity data for Part 135 operators, not only to compare accident rates, but also to establish baseline measures to be used to identify and track accident trends and to assess the effectiveness of safety improvement efforts.[37]

Air ambulance flight hours and number of trips, while not currently collected by FAA, appear readily available. According to current regulations, Part 135 operators are not required to maintain flight-hour activity data, but most FAA inspectors and air ambulance operators we spoke with said that this information is available. Air ambulance operators maintain records on the number of flights and flight hours for a number of reasons, including to track the maintenance of the helicopter equipment, to track the costs associated with flights (for billing purposes), and to make business decisions such as where to place additional aircraft or crew. Operators we spoke with did not express concerns about reporting flight-hour or trip information to FAA. FAA officials reported that principal inspectors can get this information from operators, but regulatory changes would be necessary to require operators to report it to FAA. To address the lack of national data, the industry has an effort under way to create a database of air ambulance flight operations information. This initiative is still in the preliminary stages.

[37]NTSB, *Current Procedures for Collecting and Reporting U.S. General Aviation Accident and Activity Data Safety Report* (Washington, D.C., April 2005).

FAA also has no way to determine whether air ambulance operators are implementing published guidance. Although FAA inspectors are required to use FAA databases to record that guidance has been disseminated to air ambulance operators, there is no mechanism to report whether operators implemented the voluntary guidance. By issuing guidance for operators to adopt, rather than making changes through regulations, FAA has expedited the process of relaying safety information and encouraging safety initiatives by operators. However, without a mechanism to record whether operators are adopting this guidance, FAA is unable to link these efforts to any specific results. For example, according to Notice 8000.293, FAA inspectors were to encourage air ambulance operators to consider using enhanced vision systems and terrain awareness and warning systems for night operations. Without information about which operators adopted this guidance, FAA will not be able to link this effort to safer flights or fewer accidents and will thus be unable to determine whether voluntary guidance is an effective means to direct air ambulance operator safety efforts.

Conclusions

The number of air ambulance accidents, while decreasing somewhat over the last 2 years, remains above historic levels. FAA and the industry have implemented numerous efforts to improve the safety of air ambulances. However, FAA lacks basic information on the industry and its safety efforts, including the number of flights and flight hours, the number and location of air ambulance aircraft, and the number of violations and enforcement actions against air ambulance operations. This inhibits FAA's ability to gain a complete understanding of the industry and whether its efforts are sufficient. FAA needs data about the air ambulance fleet and operations, as well as the ability to track and evaluate the implementation of its voluntary guidance to operators. Without this information, FAA cannot assess the safety of the industry. Further, this lack of information makes it difficult to determine the extent to which operators are making changes and the effect the efforts are having. Given the differences between air ambulance operators and other Part 135 operators FAA oversees, as well as the challenges FAA faces in responding to inherent safety concerns of the industry, a clear understanding of trends and actions taken appears important in deciding if the current regulatory approach is appropriate or if more fundamental changes, such as revising FAA regulations or inspection processes, need to be considered.

Recommendations for Executive Action

To help FAA monitor industry growth trends, accident rates, and operator implementation of FAA guidance, we recommend that the Secretary of Transportation direct the Administrator of FAA to take the following two actions:

- Identify the data necessary to better understand the air ambulance industry and develop a systematic approach for gathering and using this data. At a minimum, this data should include the number of flights and flight hours, the number and locations of air ambulance helicopters, and the number and types of FAA violations and enforcement actions related to the air ambulance fleet.
- Collect information on the implementation of voluntary FAA guidance by air ambulance operators and evaluate the effectiveness of that guidance.

Agency Comments and Our Evaluation

We provided a draft of this report to DOT for their review and comment. On February 8, 2007, we met with DOT and FAA officials, including the Deputy Director of FAA's Flight Standards Service, to obtain their oral comments on the draft report. Overall, these officials agreed with the report's findings and conclusions, and agreed to consider the recommendations. FAA officials also provided technical comments, which were incorporated in this report, as appropriate. We also provided a draft of this report to NTSB for their review and comment. On January 30, 2007, NTSB's Audit Liaison provided technical comments, which were incorporated, as appropriate, and confirmed that NTSB agreed with the report's findings, conclusions, and recommendations via e-mail. In addition, we provided a draft of this report to AAMS since AAMS is a leading air ambulance industry representative. AAMS provided written comments, which are reprinted in appendix III. AAMS also provided technical comments, which were incorporated, as appropriate.

As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 14 days from the report date. At that time, we will send copies to appropriate congressional committees, the Secretary of Transportation, and the Chairman of the National Transportation Safety Board. We will also make copies available to others on request. In addition, the report is available at no charge on the GAO Web site at http://www.gao.gov.

If you have any questions about this report, please contact me at (202) 512-2834 or dillinghamg@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix IV.

Sincerely yours,

Gerald L. Dillingham, Ph.D.
Director, Physical Infrastructure Issues

Appendix I: Scope and Methodology

To identify and describe the recent trends in the air ambulance industry, we reviewed literature and analyzed data on industry composition, size, and accidents. The literature we reviewed included government, industry, and academic studies, reports, and other documents regarding the evolution of the industry in terms of composition, size, accidents, and safety initiatives. The Federal Aviation Administration (FAA) data included estimates of flight hours and aircraft based on its General Aviation and Air Taxi Activity and Avionics survey for 1999 to 2004, data on numbers of inspectors and operators (as of 2005), and numbers and types of violations and enforcement actions from various FAA databases for 1998 to 2005. The Association of Air Medical Services data, from the Atlas and Database of Air Medical Services, included numbers of bases and dedicated aircraft for 2003 to 2005. To examine the relationship between changes in Medicare reimbursement rules and industry trends, we analyzed data on Medicare reimbursed air ambulance trips from 1998 to 2005, as well as trips by type of air ambulance provider for 2001 and 2004; these data were obtained from the Medicare claims database. Based on reviews of data documentation, interviews with relevant officials, and tests for reasonableness, we determined that the data we used were sufficiently reliable for the purposes of our study. We also interviewed officials from the National Transportation Safety Board (NTSB), academic experts, and industry and trade group representatives about trends in the nature and scope of the industry and overall safety concerns. Table 5 lists the industry and trade organizations we contacted.

Table 5: Industry and Trade Organizations Interviewed

Organizations
Air Medical Physicians Association
Air Medical Safety Advisory Council
Air, Surface, and Transport Nurses Association
Association of Air Medical Services
Commission on Accreditation of Medical Transport Systems
Helicopter Association International
International Association of Flight Paramedics
National Association of Air Communications Specialists
National Association of State Emergency Medical Services Officials
National Emergency Medical Services Pilots Association
Professional Airways Systems Specialists
R. Dixon Speas Associates

Source: GAO.

To assess challenges to FAA oversight, we reviewed federal laws, regulations, and guidance on air ambulance safety to better understand the nature and extent of FAA's oversight role. Further, we interviewed FAA Flight Standards officials in headquarters, inspectors, and certificate management teams for air ambulance operators, as well as industry officials and other experts, about air ambulance safety and challenges to FAA oversight.

To help identify the key safety risks, we obtained and analyzed data from NTSB's Aviation Accident Database on accidents that occurred from January 1, 1998, to December 31, 2005. Our analysis of the NTSB data formed the basis of the descriptive and comparative information on air ambulance accidents shown throughout this report. According to NTSB, an aviation accident is "an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage." Accidents were included in our analysis as a helicopter air ambulance accident if the database showed (1) the accident involved a helicopter being operated by an air medical transport company and (2) the accident occurred during flight under either Part 91 or Part 135 regulations. For this period, we identified a total of 89 helicopter air ambulance accidents that occurred under Part 91 or Part 135 flight rules and analyzed data about these accidents to determine key contributing causes and factors.[1] All accidents involving public operators were excluded from our analysis. We also conducted analyses comparing these 89 air ambulance accidents with other helicopter accidents during the same time period.

To assess the reliability of the NTSB data, we (1) performed electronic testing for accuracy, completeness, and consistency; (2) reviewed internal NTSB documents about its collection, entry, and maintenance; and (3) interviewed officials in NTSB's Office of Aviation Safety and Office of Research and Engineering who were knowledgeable about the content and limitations of these data. We determined that these data were sufficiently reliable for the nationwide descriptive and comparative analyses used in this report. We documented the procedures that we used in our analyses

[1]There is no clear consensus about what constitutes an air ambulance accident; thus, other studies may present different accident totals covering the same time period.

and submitted them to officials in NTSB's Office of Research and Engineering for their review and concurrence.

To learn more about air ambulance safety risks and concerns, we conducted a total of five site visits of air ambulance providers in Arizona, California, Maryland, Texas, and Washington. We chose these states based on the presence of a large air ambulance market,[2] state accreditation requirements, or an operating public provider. To have access to a greater number of providers representing a variety of business models, operational characteristics, and accident histories, we narrowed our possible site visit locations to large air ambulance markets. To examine the relevance and describe the extent of state accreditation requirements, we included states with and without these requirements. Lastly, to learn about the policies and practices public providers may be engaged in that impact safety, we chose states that had a public operator.

We selected the providers based on a number of operational characteristics to include a variety of business models (hospital-based and stand-alone programs, and public and private programs) and certificate holder arrangements (operating certificate held by program or vendor). During these site visits, we interviewed company officials, including pilots, and obtained documentation of some programs' flight safety protocols. Table 6 provides a description of each state we visited.

[2]Large air ambulance markets were determined by state using the total number of bases and aircrafts as identified in the Atlas and Database of Air Medical Services. After states had been identified as having the greatest number of bases and aircrafts, metropolitan regions were chosen on the basis of having the greatest number of operators present in the area.

Table 6: Description of States Selected for Site Visits

State	Description of air ambulance market	Description of programs visited
Arizona	*Providers:* 10 *Helicopters:* 50 *Accidents, 1998 to 2005:* 8 *State requirements*: The state requires licensing for all air ambulance providers through the Arizona Department of Health Services. Inspection and registration for all air ambulance units operating in Arizona is required on a yearly basis. If a provider is accredited by the Commission on Accreditation of Medical Transport Systems (CAMTS), the state requirement for a licensure inspection is waived.	• **Native Air**, a subsidiary of Omniflight Helicopters, is a community-based operator, and its fleet is composed of 15 helicopters located at 12 bases in Arizona and Montana.
California	*Providers:* 28 *Helicopters:* 72 *Accidents, 1998 to 2005:* 7 *State requirements*: The state of California has delegated authority to local governments for emergency medical services (EMS). County governments are responsible for coordinating emergency medical services, including the coordination and monitoring of air ambulance services.	• The **FlightCare** Program at Enloe Medical Center is a nonprofit hospital-based program. The program's fleet consists of one helicopter based at the Enloe Hospital helipad. • **REACH** is an independent for-profit air ambulance provider. The company has seven helicopters and nine bases in California and Oregon. • **CALSTAR** is a nonprofit community-based program. The company's fleet consists of 11 helicopters and seven bases in California. • The **California Highway Patrol** operates as an air rescue provider. The California Highway Patrol maintains a fleet of 14 helicopters, 11 of which are partially used for medical emergency transport and air rescue. These helicopters are based at nine locations throughout the state.
Maryland	*Providers:* 3 *Helicopters:* 18 *Accidents, 1998 to 2005:* 1 *State requirements:* Maryland requires private providers of air ambulance services operating in the state to be licensed by the state and CAMTS accredited.	• The **Maryland State Police Aviation Command** is a public provider and has a fleet of 12 helicopters based in eight locations across the state.
Texas	*Providers:* 23 *Helicopters:* 61 *Accidents, 1998 to 2005:* 13 *State requirements:* The state requires air ambulances and providers to be licensed by the Texas Department of State Health Services. The licensure process requires providers to submit a copy of their current FAA operational certification that includes designation for air ambulance operations.	• **Teddy Bear Transport of Cook Children's Medical Center** is a hospital-based program that conducts hospital-to-hospital transports for pediatric patients. The program contracts with a vendor for its aviation services and operates one helicopter. • **PHI Air Medical** is an independent program conducting a mix of scene response and hospital-to-hospital transports. PHI's programs in Texas include 12 helicopters stationed at 12 bases. In total, the company has 224 air ambulance helicopters stationed at 49 bases in 14 states.

State	Description of air ambulance market	Description of programs visited
Washington	*Providers:* 2 *Helicopters:* 10 *Accidents, 1998 to 2005:* 3 *State requirements:* The state requires providers and air ambulances to be licensed through the Washington Department of Health. Providers must be accredited by CAMTS. Air ambulance licensure applicants must affirm in the application that their service meets all FAA regulations, and they must also provide a copy of their current FAA certificate and operational specifications.	• **Airlift Northwes**t is a nonprofit community-based program. The program contracts out its aviation services. Its fleet consists of six helicopters stationed at four bases in Washington.

Source: GAO.

To supplement information gathered through interviews and visits with local program officials, we also conducted semistructured interviews with management officials from five of the largest air ambulance operators to discuss air ambulance safety and trends. We also met with local geographic and assigned principal FAA inspectors to learn more about their roles and responsibilities in the oversight of the programs we visited.

To describe the FAA efforts in addressing safety oversight challenges, we identified and reviewed regulatory and voluntary guidance implemented by FAA to address safety in the air ambulance industry. We reviewed advisory circulars, notices, and other guidance issued by FAA since 2004. We also obtained and reviewed documentation of FAA's heightened oversight of one air ambulance operator and other documents regarding staffing levels for the certificate management teams of large air ambulance operators.

Appendix II: NTSB Air Ambulance Accident Data

According to NTSB, from January 1998 through 2005, 89 air ambulance accidents took place, resulting in 75 fatalities, 31 serious injuries, and 27 minor injuries. An additional 133 people involved in these accidents suffered no injuries. Of the 89 accidents, 64 took place during Part 91 flight and the remaining 25 took place during Part 135 flight. Forty-seven of the accidents took place during the night and the remaining 42 took place during the day. Table 7 provides information collected from NTSB on each of these accidents.

Table 7: NTSB Air Ambulance Accident Information, 1998 through 2005

Year	Flight regulation	When accident occurred	Number of fatalities, injuries, or uninjured	State	Accident details
1998	135	Night	4 fatalities	UT	An air ambulance helicopter transporting an injured skier to a hospital was destroyed when it collided with mountainous terrain after flying into known adverse weather.
1998	91	Day	3 injuries	AR	An air ambulance helicopter en route to pick up a patient from a hospital was substantially damaged during a hard landing following a loss of engine power.
1998	91	Night	3 fatalities	TX	An air ambulance helicopter en route to an accident scene collided with terrain and trees after encountering poor visibility conditions.
1998	91	Night	3 uninjured	CA	An air ambulance helicopter was destroyed when it rolled over while attempting to land at a makeshift landing zone near an accident site.
1998	91	Night	3 fatalities	IA	Due to faulty components, an air ambulance helicopter experienced an in-flight breakup during descent and was destroyed.
1998	135	Night	4 uninjured	ID	An air ambulance helicopter taking off from an off-site landing zone sustained substantial damage when it collided with wires.
1999	91	Night	3 injuries	OH	An air ambulance helicopter en route to pick up a patient from a hospital was destroyed when it impacted a house after the pilot inadvertently entered snowy conditions.
1999	135	Day	5 uninjured	TX	An air ambulance helicopter transporting a patient to a hospital from an accident scene was substantially damaged when it impacted power lines during takeoff.
1999	91	Night	3 fatalities	NV	An air ambulance helicopter returning to base after transporting a patient to a hospital was destroyed after encountering deteriorating weather conditions and colliding with terrain.
1999	91	Day	3 uninjured	FL	An air ambulance helicopter en route to pick up a patient collided with a building while hovering in preparation for takeoff.

Year	Flight regulation	When accident occurred	Number of fatalities, injuries, or uninjured	State	Accident details
1999	91	Day	1 uninjured	MO	An air ambulance helicopter impacted terrain (during takeoff from a helipad located on top of a hospital) because an auxiliary power line was still attached to the helicopter.
1999	91	Night	3 injuries	FL	An air ambulance helicopter crashed when approaching an off-site landing zone to pick up a patient.
1999	135	Day	4 uninjured	MT	An air ambulance helicopter collided with a tower during takeoff from a remote site.
2000	91	Night	3 uninjured	TN	An air ambulance helicopter was substantially damaged when it collided with a tree while attempting to land at a roadside landing zone.
2000	135	Night	4 fatalities	TX	An air ambulance helicopter transporting a patient to a hospital was destroyed when it impacted terrain after flying into known adverse weather conditions.
2000	91	Day	2 uninjured	MN	An air ambulance helicopter returning from dropping off a patient was substantially damaged from an in-flight collision with a warehouse.
2000	91	Day	3 fatalities	FL	An air ambulance helicopter traveling back to base after completing an interfacility transport collided with a radio transmission tower and was destroyed.
2000	91	Night	3 uninjured	TX	An air ambulance helicopter was substantially damaged when the tail rotor contacted trees while attempting to land at an accident site.
2000	91	Night	3 fatalities	GA	An air ambulance helicopter returning to base was destroyed when it collided with trees and the ground during flight.
2000	91	Day	1 uninjured	MN	An air ambulance helicopter departing for refueling was substantially damaged during takeoff from a hospital helipad during windy conditions.
2000	135	Day	4 injuries	AZ	An air ambulance helicopter attempting to airlift a seriously injured patient impacted trees and terrain and was substantially damaged.
2000	91	Night	1 fatality	NC	An air ambulance helicopter experiencing mechanical difficulties collided with terrain and was destroyed. The accident occurred after a mechanic had taken insufficient action to fix the problem.
2000	91	Night	3 uninjured	NV	An air ambulance helicopter attempting to pick up a patient at a remote site collided with the ground during an aborted landing and sustained substantial damage.
2000	91	Night	3 injuries	AZ	An air ambulance helicopter on a positioning flight sustained substantial damage when the pilot became ill and lost control just before landing.
2001	91	Night	1 injury, 2 uninjured	IL	An air ambulance helicopter readying for takeoff received minor damage when a hospital security guard walked into the tail rotor.

Year	Flight regulation	When accident occurred	Number of fatalities, injuries, or uninjured	State	Accident details
2001	91	Day	1 fatality	CO	An air ambulance helicopter conducting a postmaintenance flight check was destroyed when it impacted the ground after losing rotor speed.
2001	91	Day	2 injuries	NY	An air ambulance helicopter on a positioning flight was substantially damaged during a precautionary landing following a mechanical malfunction.
2001	91	Day	3 uninjured	WY	An air ambulance helicopter conducting an off-site landing was substantially damaged when its tail rotor impacted a barrel.
2001	91	Day	3 uninjured	AZ	An air ambulance helicopter on a positioning flight was substantially damaged during a forced landing following a reported loss of engine power.
2001	135	Day	4 uninjured	OR	An air ambulance helicopter departing an off-site landing zone had to conduct an emergency landing because of a fire in the aircraft.
2001	91	Day	3 injuries	TX	An air ambulance helicopter en route to pick up a patient was substantially damaged when it impacted trees and terrain following a loss of engine power.
2001	135	Day	4 uninjured	CA	An air ambulance helicopter encountering low visibility conditions rolled onto its side during takeoff from a remote location.
2001	91	Night	1 fatality, 1 injury, 1 uninjured	CA	An air ambulance helicopter attempting to land at an off-site landing zone was destroyed when it encountered brownout conditions and collided with trees.
2001	91	Night	2 injuries, 1 uninjured	TX	An air ambulance helicopter on a nighttime positioning flight was substantially damaged during a hard landing following a total loss of engine power.
2001	91	Night	1 injury	ID	An air ambulance helicopter on a nighttime repositioning flight was destroyed when it collided with terrain after the pilot became spatially disoriented.
2002	91	Night	2 fatalities, 1 injury	OH	An air ambulance helicopter was destroyed when it collided with a brick façade during a takeoff from a rooftop helipad in windy conditions.
2002	91	Day	1 fatality, 2 injuries	CA	An air ambulance helicopter en route to pick up a patient was substantially damaged when the pilot became visually disoriented and collided with the surface of a lake.
2002	91	Night	3 uninjured	AR	An air ambulance helicopter was substantially damaged when its tail rotor struck trees during an approach to a landing zone.
2002	91	Day	3 uninjured	FL	An air ambulance helicopter experiencing mechanical trouble was substantially damaged when it performed a forced landing.
2002	91	Day	3 fatalities	NE	An air ambulance helicopter en route to pick up a patient was destroyed when it experienced a loss of control and a corresponding collision with terrain.

Year	Flight regulation	When accident occurred	Number of fatalities, injuries, or uninjured	State	Accident details
2002	135	Night	5 uninjured	FL	An air ambulance helicopter transporting a patient had an engine fire and was forced to conduct an emergency landing.
2002	91	Day	4 injuries	FL	An air ambulance helicopter en route to pick up a patient collided with a corner of a multistory parking garage during takeoff from a hospital helipad.
2002	91	Night	3 fatalities	CA	An air ambulance helicopter en route to an accident scene was destroyed after impacting terrain while maneuvering.
2002	135	Night	4 fatalities	SD	An air ambulance helicopter completing a nighttime interfacility transport crashed into terrain and was destroyed after the pilot lost control.
2002	91	Day	3 uninjured	TX	An air ambulance helicopter sustained substantial damage following a loss of control while attempting to take off from a hospital helipad.
2002	91	Day	1 uninjured	KY	An air ambulance helicopter experiencing a loss of control was substantially damaged during an emergency landing at an off-site landing zone.
2002	135	Day	4 uninjured	WA	An air ambulance helicopter, while conducting an interfacility transport, sustained substantial damage when it encountered whiteout snow conditions and completed a hard emergency landing.
2002	91	Night	3 uninjured	NY	An air ambulance helicopter was substantially damaged after encountering a gust of wind during an engine startup on a rooftop helipad.
2003	91	Night	2 fatalities, 1 injury	UT	An air ambulance helicopter crashed into terrain after encountering dense fog while on an aborted mission to pick up a patient.
2003	91	Night	1 fatality	IL	An air ambulance helicopter operating in reduced visibility conditions was destroyed as a result of a collision with terrain.
2003	91	Day	1 injury, 2 uninjured	TX	An air ambulance helicopter en route to pick up a patient for interfacility transport sustained substantial damage when it impacted terrain during a hard landing.
2003	91	Day	3 uninjured	TX	An air ambulance helicopter was substantially damaged after a tail rotor drive failed during flight as a result of a blanket coming into contact with the tail rotor blades due to an unsecured cargo door.
2003	135	Night	1 uninjured	MI	An air ambulance helicopter at an off-site landing zone was substantially damaged when the tail rotor impacted a roadway sign during an aerial taxi.
2003	91	Day	3 uninjured	PA	An air ambulance helicopter conducted an emergency landing because a flashlight left on the tail boom came into contact with the tail rotor blades.

Year	Flight regulation	When accident occurred	Number of fatalities, injuries, or uninjured	State	Accident details
2003	91	Day	1 fatality, 1 injury, 1 uninjured	UT	An air ambulance helicopter en route to its home base after completing a patient transport was destroyed when it impacted a hillside.
2003	135	Day	3 injuries, 1 uninjured	FL	An air ambulance helicopter crashed while attempting to take off from an off-site landing zone.
2003	91	Day	3 injuries	NY	An air ambulance helicopter was substantially damaged during a forced landing when the pilot misinterpreted power loss.
2003	135	Day	4 uninjured	CA	An air ambulance helicopter in the process of transporting a patient made an emergency off-airport landing after experiencing severe in-flight vibrations.
2003	91	Night	3 uninjured	IL	An air ambulance helicopter executed a precautionary landing to a vacant parking lot after the helicopter encountered an in-flight vibration.
2003	91	Night	1 injury, 2 uninjured	TX	An air ambulance helicopter sustained substantial damage when it impacted a safety fence and rolled over during an aborted takeoff following a partial loss of engine power.
2003	135	Night	3 uninjured	IN	An air ambulance helicopter sustained substantial damage during a hard landing in a gravel lot after losing visibility due to dust.
2003	135	Day	4 uninjured	AZ	An air ambulance helicopter transporting a patient experienced a loss of control due to mechanical failure and crashed on a taxiway during an emergency landing.
2003	91	Day	1 injury	AR	An air ambulance helicopter was substantially damaged following a loss of control during engine start because the main rotor was still tied down.
2003	91	Night	3 uninjured	TX	An air ambulance helicopter readying for an off-site landing sustained substantial damage when the tail rotor blades impacted trees while maneuvering.
2003	91	Night	3 uninjured	KY	An air ambulance helicopter landing at an off-site landing zone was substantially damaged when its tail rotor struck a hydrant that had not been identified by ground personnel.
2003	91	Night	3 fatalities	CA	An air ambulance helicopter on the way to pick up a patient crashed into mountainous terrain during high winds and heavy rain.
2004	135	Night	4 fatalities, 1 injury	TX	An air ambulance helicopter transporting a patient crashed into terrain while maneuvering in reduced visibility.
2004	135	Night	1 fatality, 3 injuries	IN	An air ambulance helicopter transporting a patient was substantially damaged when it collided with terrain.
2004	91	Day	3 uninjured	TX	An air ambulance helicopter sustained substantial damage when its tail rotor struck a parked helicopter while hovering prior to takeoff from a helipad.

Year	Flight regulation	When accident occurred	Number of fatalities, injuries, or uninjured	State	Accident details
2004	91	Day	3 uninjured	AZ	An air ambulance helicopter landing at an off-site landing zone was substantially damaged after a hard landing in low visibility conditions.
2004	135	Night	4 fatalities	SC	An air ambulance helicopter flying in mist and light fog collided with trees shortly after picking up a patient at an Interstate accident site.
2004	135	Day	4 uninjured	ID	An air ambulance helicopter was substantially damaged while maneuvering at an accident site during windy conditions.
2004	135	Night	5 fatalities	NV	An air ambulance helicopter crashed into mountainous terrain at night and in deteriorating weather conditions.
2004	91	Night	1 injury	NM	An air ambulance helicopter on a positioning flight was substantially damaged after liftoff when the helicopter's skid struck the helipad and caused the helicopter to roll over.
2004	91	Night	3 fatalities	FL	An air ambulance helicopter attempting to return to base after abandoning a mission due to bad weather was destroyed when it crashed into water.
2004	91	Day	3 uninjured	AZ	An air ambulance helicopter flying to pick up a patient experienced a partial power loss, followed by a hard landing in a parking lot.
2004	135	Night	2 injuries, 1 uninjured	OK	An air ambulance helicopter was substantially damaged when it impacted terrain following a loss of control due to a blanket coming in contact with the tail rotor blades during flight.
2004	91	Night	1 fatality, 2 injuries	AZ	An air ambulance helicopter was destroyed when it collided with terrain while attempting to land at an off-site landing zone.
2005	91	Day	1 injury, 1 uninjured	AZ	An air ambulance helicopter readying to land at an airport experienced loss of control and collided with terrain.
2005	91	Night	1 fatality	MS	An air ambulance helicopter was destroyed after colliding with trees and the ground in adverse weather conditions.
2005	91	Night	2 fatalities, 1 injury	MD	An air ambulance helicopter returning to base was destroyed after impacting water.
2005	135	Day	1 fatality, 3 injuries	AR	An air ambulance helicopter transporting a patient lost control and was substantially damaged during a hard landing.
2005	91	Day	3 fatalities	CO	An air ambulance helicopter was substantially damaged when it impacted terrain while approaching an off-site landing zone.
2005	135	Day	4 uninjured	IN	An air ambulance helicopter was substantially damaged following an in-flight loss of control after it impacted the helipad after takeoff.
2005	91	Day	3 uninjured	FL	An air ambulance helicopter sustained substantial damage when it rolled over while conducting an emergency landing after takeoff.
2005	91	Night	3 fatalities	WA	An air ambulance helicopter was destroyed when it impacted ocean waters while returning to base.

Year	Flight regulation	When accident occurred	Number of fatalities, injuries, or uninjured	State	Accident details
2005	91	Night	1 fatality	PA	An air ambulance helicopter on a refueling flight was destroyed when it impacted trees and terrain while performing an instrument approach to the airport.
2005	135	Night	1 injury, 3 uninjured	WA	An air ambulance helicopter during takeoff sustained substantial damage after impacting an object and subsequently impacting terrain.
2005	91	Day	3 uninjured	MN	An air ambulance helicopter sustained substantial damage during an aborted takeoff after a loss of power.

Source: GAO analysis of NTSB data.

Appendix III: Comments from the Association of Air Medical Services

Association of Air Medical Services

February 6, 2007

Dr. Gerald L. Dillingham
Director of Civil Aviation Issues
U.S. Government Accountability Office
441 G St. NW, Room 2T23B
Washington, DC 20548

RE: GAO Report on Air Medical Services

Dear Dr. Dillingham:

The Association of Air Medical Services (AAMS) thanks the Government Accountability Office (GAO) for the opportunity to comment on this report, and we commend the members of the GAO research team for all of their efforts to continually engage the air medical community in the course of their research. The entire investigation process was conducted in an open and professional manner from the onset. We believe that this spirit of openness and cooperation led to an excellent report, despite the limited time the investigative team had to study and understand the complexities of the air medical community and its importance in providing timely patient care and transport.

Overall, AAMS supports the recommendations made in the GAO Report on Air Medical Services. It is our belief that increased data collection in the air medical community, and in the aviation community as a whole, will lead to better research and a much more focused understanding of the importance of air medical services and the need for a more robust infrastructure to support this vital service. While AAMS does support the recommendations and commends the GAO for their diligence, we also take this opportunity to clarify several issues presented in the report in order to provide the most accurate information possible.

Background

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Leading and Serving
Transport Medicine

The Association of Air Medical Services (AAMS) is a non-profit trade association representing air ambulance and critical care transport service providers in the U.S. and across the globe. AAMS is comprised of over 300 air medical transport provider programs in the United States and Canada, staffed with over 50,000 highly skilled crew members (including medical directors, flight physicians, transport nurses, flight paramedics, helicopter and fixed wing pilots, mechanics, administrators and others) who have dedicated themselves to improving the health outcomes of the patients we serve.

Air medicine has become a critically important part of our nation's health care delivery system, not only because air ambulance providers offer an ability to

provide time-sensitive care, but also because their highly skilled crews and technologically advanced equipment allow them to provide a higher level of patient care en-route than what is normally available via ground medical transport. Every 90 seconds, an air medical provider in the U.S. responds to a request to assist a critically ill or injured patient with a medically equipped and dedicated aircraft.

AAMS and its members are firmly committed to assuring the public of access to this essential medical service while maintaining the highest level of safety in the delivery of patient care. To meet that commitment, AAMS and its members have worked extensively and collaboratively with the Federal Aviation Administration (FAA) Helicopter Emergency Medical Services (HEMS) Task Force and other regulatory entities in an effort to foster an environment that promotes a safe and effective air medical system. We firmly believe that this cooperative effort, combined with numerous safety initiatives of the air medical community, has led to a dramatic decrease in the number of HEMS accidents in 2006.

Current Trends in the Air Medical Community

The air medical community is cognizant of and dedicated to the need for more thorough data collection, and to that end created the Atlas and Database of Air Medical Services (ADAMS), a voluntary database of air medical locations and other information which is referenced numerous times in the GAO's report. Support for ADAMS is provided by the US Department of Transportation (through the Federal Highway Administration and the National Highway Traffic Safety Administration). Through the voluntary reporting efforts of AAMS members, that database now represents the only accurate source for the locations, capabilities, and service areas for air medical programs and bases. This service is also being used by numerous government agencies, including the Department of Homeland Security, and remains the only source for information of this type.

While the ADAMS database has become an excellent tool, it is also a voluntary database, and is therefore flawed when viewed from a historical perspective. Because it is a voluntary database, it is impossible to compare the number of helicopter services from 2003 (the first year of reporting into the database) and 2005 because those numbers may only reflect an increase in the number of companies and programs reporting into the database, not an actual increase in existing aircraft and service locations. While there is no doubt that the use of air medical services as a mode of patient transport has increased steadily throughout the community's history, the actual increase in numbers in the database is not completely reliable over time.

It is equally problematic to compare the number of accidents in a certain period to the number of accidents in a different period; specifically, the number of accidents that occurred in the air medical industry in 1985 to the number of accidents that occurred in 2005. While the number of accidents is similar, the number of aircraft and hours being flown is dramatically different; in fact, AAMS estimates that the numbers of both aircraft and flight hours have increased ten-fold from 1985 to 2005. So, while there can be no specific determination of an accident rate due to the fact that the data is not available in the aggregate, we can easily surmise that an estimated

ten-fold increase in both aircraft and flight hours with a similar number of accidents between 1985 and 2005 illustrates an industry with a vastly improved safety record over time.

Air Medical Community Safety Initiatives

This is not to say, however, that there is any acceptable number of accidents in the air medical community. To that end, AAMS has instituted a number of safety-focused initiatives since 2000 as a way for our community to voluntarily address these issues.

For instance, AAMS launched its Vision Zero initiative in March of 2005 (www.aams.visionzero.org). Vision Zero signifies zero accidents of consequence; it is our community's safety program designed to promote safety awareness by reaching the community with timely information and educational opportunities. Vision Zero, since its inception, has greatly increased safety awareness by creating a culture of intolerance to the loss of life and the suffering caused by the consequences of poor decision-making. It is a message that is carried through every conference, committee meeting, education session, and program activity carried out by the air medical community. We only hope to enhance the visibility and effectiveness of this program in the future.

AAMS has also joined the International Helicopter Safety Team(www.ihst.org), led by the American Helicopter Society (AHS), the Helicopter Association International (HAI), the FAA, and Transport Canada, to reduce helicopter accidents. These efforts are premised on the model that providers must work collaboratively with regulators to identify and accelerate the implementation of best practice standards, and they are both very closely coordinated with the work done by the FAA's HEMS Safety Task Force.

AAMS represented the air medical community during the Part 135 Aviation Rulemaking Committee (ARC), the FAA's effort to engage the aviation industry during a re-write of Part 135 of the Federal Aviation Regulations (FAR's). The AAMS representatives sat on the steering committee and chaired the air medical subcommittee. The recommendations made by this group to the ARC included making all segments of a flight fall under the Part 135 regulations for rest and duty time and weather minima. It was also recommended to the ARC at that time to revise the existing Part 135 regulations to allow flights flying under Instrument Flight Rules (IFR) to off airport destinations without NWS approved weather stations. This change in the regulation would eliminate the need for any segment of a HEMS flight to operate under Part 91 as the current exemption requires. At present, the Part 135 ARC recommendations are being considered within the FAA for possible incorporation into regulatory changes.

AAMS believes these examples, as well as our other initiatives, provide a faster, more flexible, and a more comprehensive means to improving safety. In an era in which both providers and regulators are working in increasingly resource-constrained environments, a collaborative, data driven strategy is essential. AAMS welcomes efforts to track these efforts and report on their efficacy.

We further believe that the combination of these initiatives, a closely coordinated and cooperative effort, has led to the recent dramatic downturn of accidents in 2006, in which only three HEMS accidents occurred. While we firmly believe that any accident rate is unacceptable, we do believe that this dramatic decrease in the number of accidents is the direct result of the steps taken by the air medical community to improve safe operations.

Improving Data Collection Concerning Air Medical Services

Improving the safety of medicine and medical transportation is a complex undertaking and cannot be studied in isolation. Air medicine must be seen as both a portion of the aviation community and as a necessary part of our medical system. Significant gaps in available data resources are evident and are a severe detriment to research efforts both from a medical and an aviation perspective. AAMS would like to support the GAO's recommendations in order to help the air medical community fill those gaps. Given the unique nature of and diverse models for the delivery of air medical transport in our country today, we recommend that any data collection effort involve all service providers – hospital-based services, independent services and government-operated services – in order to present a balanced and comprehensive picture of the community.

Several AAMS members, often working through the non-profit Foundation for Air Medical Research and Education (FARE), conduct numerous research projects in order to determine what safety tools would be most effective. We firmly believe that these recommendations by the GAO can only help bolster the existing research and data-collection efforts and help provide the air medical community with the most valuable tools to improve and maintain safe operations.

AAMS has also initiated, with the cooperation of the National Emergency Medical Services Operators Executive Forum, the voluntary collection of flight hour and other aviation data through a similar process as the collection of the ADAMS data. This data will be collected through the Center for Transportation and Injury Research and reported to the public in the aggregate. This program, dubbed the Flight Operations Database for Air Medical Services (FODAMS), is still in its infancy and the data could not be used for the purposes of this report. However, it is important to note that the air medical community has long recognized the importance of quality data, and has undertaken, through numerous efforts, the collection of this data voluntarily.

AAMS and the air medical community are committed to improving safety of medicine and aviation; keeping those goals in mind, we also must continue to care for critically ill and injured patients every day. In our efforts to improve, we must not put more lives at risk by decreasing access to care.

Air Medical Services as Part of the Emergency Medical System

While there are numerous flaws in the voluntary reporting of the data, there can be no doubt that the number of air medical services and medically equipped aircraft has increased, specifically in

the last five years. Much of the growth in air medical services reflects a changing emergency healthcare system: as medical centers close emergency departments and trauma centers, especially in rural areas, the need for air transportation of the sickest and most badly injured patients greatly increases. The decreasing availability of specialized surgical resources, especially neurological, cardiac, and pediatric specialists, also drives the need for air medical transport, as time and distance to appropriate care have increased for large segments of our population.

The Institute of Medicine (IOM) recently completed a landmark study of the emergency healthcare system in the United States, a portion of which is dedicated to our nation's emergency medical system. That report, entitled *The Future of Emergency Care: Emergency Medical Services at the Crossroads* highlights the necessity of air medical services in the emergency medical system, focusing on the ability of the HEMS to provide patient transport when time is of the essence. The report also highlights the growing necessity of the use of air medical services in inter-facility transport, moving severely injured or very ill patients to more appropriate specialty healthcare centers where they can be treated properly.

The Institute of Medicine's report cited a study that claimed over 81 million Americans now depend on air medical resources to reach needed care within the "golden hour" for trauma, cardiac, and other time sensitive emergencies, and over 40 million Americans who live in very rural areas remain underserved in the face of these time critical emergencies. It is clearly evident that air medical services now provide a critical access point in what many consider to be a failing medical system. While we can only estimate the numbers of patients transported and cared for every year, or the amount of flight hours that were performed in the course of this operation, we can say with certainty that air medical transport has become a necessary and vital part of the medical system, both here in the United States and in many countries around the world. Medically equipped aircraft and specialized flight crews trained to meet the air medical mission are expensive investments that would not exist unless driven by a medical need; the changing emergency and specialized healthcare system in the United States is what provides that need.

Air medical services have also played a key role in disaster response and emergency preparedness, transporting patients from the Pentagon following the 9/11 disaster, and more recently responding to Hurricanes Katrina and Rita in 2005. As noted in the US House of Representatives Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, entitled *A Failure of Initiative*, air medical services were instrumental in much of the most critical hospital evacuations, especially in instances where hospitals were inaccessible by ground EMS providers. Over 60 civilian air medical helicopters transported thousands of affected citizens after Hurricane Katrina, despite the fact that there was a lack of communication and federal coordination of civilian aviation assets.

Commercial air medical helicopters provide over 80% of the medical airlift capacity in our country, and are thus uniquely designed and equipped to address national emergencies involving very sick and critically injured patients. These aircraft are also very well suited to transporting critical patients out of a disaster area before the event occurs, as evidenced by the pre-

evacuations to Hurricane Rita and the numerous hurricane responses in the state of Florida in which air medical helicopters are utilized both before and after a disastrous event.

Transport medicine is among the most complex arenas of medicine, characterized by a dichotomy in which access to time sensitive care for critically ill and injured patients must be immediately available, often with limited planning time conducted in hostile environmental conditions. As Justice Oliver Wendell Holmes once noted: "to be safe does not mean to be risk free." Recognizing that risk cannot be completely eliminated, it is essential both for the public we serve, and the pilots, nurses, paramedics, physicians, and other health care providers who deliver care, that the practice environment be as safe as practically possible. AAMS and the air medical community remain committed to this ideal.

AAMS would again like to thank the GAO for the opportunity to offer comments on this report. We also recognize and thank the Subcommittee on Aviation for their continued vigilance over the safety of the public, and we look forward to providing any further information that might be needed regarding our nation's critically important air medical mission.

Sincerely,

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&
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Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

In addition to the contact named above, Nikki Clowers, Assistant Director; Ashley Alley; David Hooper; Brooke Leary; Heather MacLeod; Mitchell Karpman; Sara Ann Moessbauer; Stan Stenersen; Friendly Vang-Johnson; and Pamela Vines made key contributions to this report.

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