



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: September 25, 2008

In reply refer to: A-08-63 through -68

The Honorable Robert A. Sturgell
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Parachute jump (“or skydiving”) operations, which the Federal Aviation Administration (FAA) defines as the activities performed for the purpose of or in support of the descent of parachutists (or “skydivers”) who jump from aircraft, are a segment of U.S. general aviation that transports parachutists on at least 2.16 to 3 million jumps annually, according to data compiled by the United States Parachute Association (USPA).^{1, 2} Most parachute operations flights³ are operated under the provisions of 14 *Code of Federal Regulations* (CFR) Part 91 and are typically revenue operations; parachute jump operators provide the flights as part of their services to parachutists who pay to go skydiving,⁴ or parachutists pay dues for membership in parachuting clubs.

The risks of parachuting are generally perceived to involve the acts of jumping from the aircraft, deploying the parachute, and landing; parachutists are aware of and manage these risks. However, the National Transportation Safety Board’s special investigation of the safety of parachute jump operations⁵ found that traveling on parachute operations flights can also present

¹ The USPA is a voluntary organization made up of about 31,000 individual members and about 270 operator members, referred to as “group members” or “drop zone” members. The USPA’s mission is to support and promote safe skydiving through parachuting training, rating, and competition programs, and it distributes safety information through printed publications and its website.

² According to a USPA membership survey, its members reported about 2.16 million jumps in 2007. In correspondence with a National Transportation Safety Board investigator dated February 5, 2008, the USPA director of safety and training noted that, because that number does not include jumps by students and because skydiving activity has been increasing, the actual number of parachutists’ jumps per year is likely closer to 2.5 to 3 million.

³ According to 14 *Code of Federal Regulations* 105.3, parachute operations include both parachute jumps (the descent of parachutists from aircraft) and parachute drops (the descent of objects). The parachute operations discussed in this report involve parachute jumps.

⁴ Types of paying passengers include licensed skydivers who pay only for a “lift ticket” on the aircraft and members of the public who, with little training, can be paired with an instructor parachutist-in-command to experience a tandem jump as a passenger-parachutist.

⁵ For more information, see National Transportation Safety Board, *Special Investigation Report on the Safety of Parachute Jump Operations*, NTSB/SIR-08/01 (Washington, DC: NTSB 2008).

risks.⁶ Since 1980, 32 accidents involving parachute operations aircraft have killed 172 people,⁷ most of whom were parachutists.

Although parachutists may accept risks associated with their sport, these risks should not include exposure to the types of highly preventable hazards that were identified in the Safety Board's review of the 32 accidents and that parachutists can do little or nothing to control. The Safety Board notes that passengers on parachute operations aircraft should be able to expect a reasonable level of safety that includes, at a minimum, an airworthy airplane, an adequately trained pilot, and adequate Federal oversight and surveillance to ensure the safety of the operation.

Aircraft Maintenance and Inspections

Maintenance is especially critical for parachute operations aircraft because jump operations typically involve a high ratio of cycles to flight hours and also periods of climb power followed by sudden reductions in power to descend, which can be particularly conducive to engine wear. Aircraft used in parachute operations are subject to the inspections required under 14 CFR 91.409; these include annual aircraft inspections, 100-hour inspections for aircraft that carry persons for hire, and additional requirements for turbopropeller-powered multiengine airplanes and certain other aircraft.

However, Part 91 requirements are not as extensive as the requirements for most other revenue, passenger-carrying operators, such as air carriers or on-demand Part 135 air-taxi and air-tour operators; these operators, unlike Part 91 operators, are required to incorporate their maintenance programs into an FAA-approved maintenance manual that specifies policies and procedures for ensuring that each aircraft is airworthy before it is released to service. Review of the 32 accidents showed that 8 of the accident airplanes were not airworthy at the time they were dispatched. Allowing such maintenance discrepancies not only indicates poor aircraft maintenance and inspection quality assurance practices, but also represents noncompliance with regulations.

Because they operate under Part 91, parachute jump operators are also not subject to the Federal regulations that require compliance with manufacturers' recommended maintenance instructions, such as service bulletins (SBs) and service information letters (SILs). Manufacturers' SBs or SILs often contain recommended time between overhauls (TBOs) and/or

⁶ The Safety Board notes that the FAA does not have data on the number of parachute jump operators or the number and type of aircraft used in parachute jump operations in the U.S. The absence of these data precludes any calculations of safety statistics for parachute jump operations, including accident rates.

⁷ Fatal accidents excluded from this review were ground accidents in which people walked into propellers, accidents related to the inadvertent deployment of parachutes (some of which included entanglement with aircraft), and one unauthorized parachute operation flight.

component service life limits⁸ for their engines. Some of these publications indicate that parachute operations may induce more engine wear than most other operations.⁹

In the 32 parachute operations accidents reviewed, at least 4 of the accident airplanes were powered by engines that were operated beyond their manufacturers' recommended TBOs, with which, as mentioned previously, the operators were not required to comply. Two of the airplanes (a de Havilland DHC-6-100 that crashed on July 29, 2006, in Sullivan, Missouri,¹⁰ and a Cessna 182A that crashed on August 14, 1993, in East Moriches, New York¹¹) crashed during takeoff following a loss of engine power due to fracturing of internal components. In both cases, it is possible that, had an overhaul been performed on each engine within the respective manufacturers' recommended TBO or sooner, the conditions that led to the fractures could have been detected and corrected.

The purpose of TBO and life-limit guidance is to establish periodic inspections of the engines to ensure their serviceability. The analysis involved in developing such guidance considers the cumulative effects of various stresses placed on the engine components over time and establishes a threshold that the manufacturer has determined will provide an acceptable level of safety. Federal regulations require that commercial operators, such as air carrier, air taxi, and Part 135 air tour operators, maintain and inspect their aircraft engines in accordance with these instructions. This provides an increased level of safety by increasing the likelihood that potentially problematic conditions will be detected and corrected before more serious problems develop.

Although some manufacturers indicate in their SBs and SILs that aircraft used in parachute operations may require increased engine maintenance and inspections, no mechanism is in place to ensure that the operators of these aircraft perform any recommended maintenance and inspections. The Safety Board concludes that, because parachute jump operations are particularly conducive to engine wear, the lack of requirements for parachute jump operators to comply with manufacturer-recommended maintenance instructions for their aircraft, including SBs and SILs for TBO and component life limits, increases the potential for the persistence of

⁸ TBOs are typically based on hours, and life limits are typically based on cycles. According to an engine cycle formula published in Pratt & Whitney Canada SB 1002R24, "Turboprop Engine Rotor Components - Service Life," a full cycle consists of an engine start, one flight, and an engine shutdown. The Safety Board notes that many parachute operations pilots do not shut down the aircraft engines completely between flights. However, the SB also defines an abbreviated cycle as consisting of idle, takeoff, flight, landing, and idle, and it provides a formula to account for abbreviated cycles in an engine's accumulated total cycles.

⁹ For example, Teledyne Continental Motors Aircraft Engine SIL98-9A, "[TBO] Periods," applicable to the reciprocating engines on airplanes involved in some of the accidents reviewed, states that "aircraft used in parachute jumping ... may require more frequent engine overhauls than listed for the specific engine." Also, Pratt & Whitney SB 1803R1, "Turboprop Engine Operating [TBOs] and Hot Section Inspection Frequency," applicable to the turboprop engines on an airplane that crashed in Sullivan, Missouri, specifically excludes engines that have been used in parachute jump operations from eligibility for the manufacturer's program for extending TBOs.

¹⁰ For more information, see National Transportation Safety Board, *Crash of Skydive Quantum Leap, de Havilland DHC-6-100, N203E, Sullivan, Missouri, July 29, 2006*, Aircraft Accident Summary Report NTSB/AAR-08/03/SUM (Washington, DC: NTSB, 2008).

¹¹ Information about the accident, NYC93FA154, is available at the Safety Board's website at <<http://ntsb.gov/ntsb/query.asp>>.

conditions that could lead to engine failure. Therefore, the Safety Board believes that the FAA should require parachute jump operators to develop and implement FAA-approved aircraft maintenance and inspection programs that include, at a minimum, requirements for compliance with engine manufacturers' recommended maintenance instructions, such as SBs and SILs for TBO and component life limits.

The Safety Board recognizes that parachute jump operations include a wide variety of aircraft and operators, including some that operate for revenue and others that may involve some other type of business or nonbusiness arrangements. Although the Board intends that additional maintenance and inspection program requirements should be universally implemented by all operators, the Board acknowledges that the diversity of the parachute operations industry may require flexibility in determining the best mechanisms by which to implement maintenance program requirements. In addition, guidance materials could assist operators in developing effective aircraft inspection and maintenance quality assurance programs. Because the USPA is knowledgeable about skydiving operations and distributes safety information to its member operators through printed publications and its website (much of which is also accessible to nonmember operators and the public), the USPA can be a valuable resource with which the FAA can work to develop and distribute safety information for operators. Therefore, the Safety Board believes that the FAA should develop and distribute guidance materials, in conjunction with the USPA, for parachute jump operators to assist operators in implementing effective aircraft inspection and maintenance quality assurance programs.

Pilot Proficiency and Training

A disturbing common denominator in nearly all of the 32 accidents reviewed is that the pilots, most of whom were commercial or airline transport pilots,¹² were deficient in basic airmanship tasks, such as performing adequate preflight inspections of airplanes, complying with airplane weight and balance limitations, maintaining airspeed during powered flight, and executing emergency procedures. These deficiencies or combinations of these deficiencies were noted in nearly all the accidents. The Safety Board is concerned that the pilots, whose experience in parachute operations ranged from one flight to hundreds of flights, were unprepared to provide the parachutists with the basic level of safety that passengers should have been able to expect from professional, for-hire, or parachuting-club flight operations.

Preflight inspection of an aircraft is one mechanism by which a pilot can mitigate potential flight risks before the aircraft leaves the ground. Such inspections, according to each aircraft's preflight procedures and checklists, typically include checking the airframe for discrepancies, checking flight control trim settings, and ensuring adequate fuel (quantity and quality) and engine oil. Twelve of the accidents reviewed involved a loss of aircraft engine power, a challenging emergency requiring immediate and appropriate pilot responses. At least four of these engine-related emergencies could have been prevented if the pilots had adhered to basic preflight practices.

¹² Six of the accident pilots were private pilots. Five of the accident airplanes flown by private pilots were piston-powered, single-engine Cessnas, and one was a Beech C-45H.

Aircraft weight and balance computations are another mechanism by which a pilot can mitigate potential flight risks before the aircraft leaves the ground. All pilots must ensure that an aircraft is loaded within its maximum allowable gross weight limitation before takeoff because excessive weight loading can adversely affect an aircraft's performance and controllability to the extent that, in some circumstances, the aircraft may be unable to obtain or sustain flight. In addition, parachute operations present unique challenges to pilots because the aircraft's load changes and shifts in flight as parachutists egress and because aircraft drag forces change as parachutists open and close aircraft doors and/or position themselves outside of the aircraft. Parachute operations pilots must consider these weight changes and perform multiple calculations before each flight to ensure that the airplane will remain within its center of gravity (cg) limits for the duration of the flight. Failure to ensure that the loading remains within the cg limits can adversely affect an airplane's stall and spin characteristics and controllability and, thus, the pilot's ability to prevent a stall or to recover the airplane from a stall or spin. In 9 of the 12 accidents involving airplanes that were loaded beyond their maximum allowable gross weights or outside their cg limits, the weight and balance issue was found to be a cause or factor.

Although several of the powered-flight accidents involved weight and balance or trim issues that could have adversely affected the pilots' ability to control the airplanes, at least three accidents, and possibly a fourth that remains under investigation, involved pilots who failed to maintain airspeed during powered flight in functional airplanes that were not reported to have been improperly loaded. These accident pilots not only failed to maintain airspeed to prevent a stall and/or spin from developing, but they also did not perform the necessary procedures to recover the airplanes from the stall/spin condition.

In addition, in the 12 accidents that involved a loss of engine power (11 shortly after takeoff and one at 3,700 feet above mean sea level), nearly all of the pilots allowed the airplanes to stall and/or made other critical procedural mistakes while responding to the engine emergencies.

Beyond possessing a current, valid airman medical certificate and a commercial pilot certificate (for revenue flights) or a private pilot certificate (for personal flights), no special qualifications are necessary for a pilot to perform parachute jump operations. Although most of the accident pilots met these qualifications, some of the pilots had little or no initial or recurrent training relating to parachute operations or in the airplanes that they were flying. Currently, there are no requirements for pilots to receive specialized parachute operations training or to demonstrate proficiency with the operations or the aircraft that they fly.

Parachute operations pilots must comply with only the flight-review requirements of 14 CFR 61.56, which specify that pilots must, within the preceding 2 years, receive a minimum of 1 hour of flight training and 1 hour of ground training that cover a review of Part 91 rules and the maneuvers and procedures necessary for the pilot to demonstrate that he or she can safely exercise the privileges of the pilot certificate. This review can be accomplished in any aircraft for which the pilot is rated to fly; therefore, it would be possible for a pilot who flies parachutists for revenue in a 23-seat, twin-engine, turbine-powered DHC-6-100 to fulfill the flight review

requirements with an authorized instructor in a 2-seat Cessna 152.¹³ In contrast, other revenue operations pilots, such as those who fly Part 135 on-demand operations, are subject to initial and recurrent pilot testing programs, which include annual requirements for pilot testing on aircraft performance, operating limitations, and weight and balance for each type of aircraft flown, as well as competency checks to determine pilot competence in practical skills and techniques in the class or type of aircraft that they fly, as specified in 14 CFR 135.293.

The Safety Board is concerned that the accident pilots, all of whom were entrusted to fly parachutists as passengers, were deficient in performing critical, basic airmanship tasks and procedures and that these deficiencies, most of which likely could have been prevented with appropriate and effective training, contributed to the loss of numerous lives. The Board recognizes that parachute jump operations include a wide variety of aircraft and operators; however, the Board notes that, using various mechanisms, the FAA has successfully implemented pilot training, examination, and/or flight check requirements for a variety of operations. Examples of such mechanisms include ground training, flight training, and endorsement requirements (such as those required for high-altitude operations and high-performance or conventional landing gear aircraft) and flight checks (such as those required for Part 135 pilot-in-command and instrument proficiency or for authorization to deviate from certain special regulations pertaining to air tours).

The Safety Board concludes that the current flight review requirements for pilots contained in Part 91 are insufficient for parachute operations because they do not ensure that parachute jump operations pilots are proficient in the specific aircraft in which they fly passengers, and they do not adequately address the unique considerations for performing parachute operations flights, including frequent takeoffs, slow-speed maneuvering while the parachutists exit, and subsequent high-speed, low-power descents. The Safety Board further concludes that training and examinations can help ensure that pilots are familiar with the skills needed to perform parachute operations and with the specific characteristics of the aircraft that they fly; recurrent training and examinations would refresh these skills and serve as a reminder to pilots of their duty to operate in a safe manner. Therefore, the Safety Board believes that the FAA should require parachute jump operators to develop initial and recurrent pilot training programs that address, at a minimum, operation- and aircraft-specific weight and balance calculations, preflight inspections, emergency and recovery procedures, and parachutist egress procedures for each type of aircraft flown. The Safety Board also believes that the FAA should require initial and recurrent pilot testing programs for parachute jump operations pilots that address, at a minimum, operation- and aircraft-specific weight and balance calculations, preflight inspections, emergency and recovery procedures, and parachutist egress procedures for each type of aircraft flown, as well as competency flight checks to determine pilot competence in practical skills and techniques in each type of aircraft.

FAA Advisory Circular (AC) 105-2C, *Sport Parachute Jumping*, contains suggestions for improving the safety of parachute jump operations and is intended to assist operators, pilots, and parachutists with complying with the regulations that pertain to parachute jump operations. Although the AC is an established source of safety guidance, the Safety Board notes that

¹³ Further, if the pilot owned only a single-seat aircraft, the pilot could complete the flight review in that aircraft; the authorized instructor would observe the flight from the ground.

AC 105-2C, which has not been updated since January 2, 1991, contains only basic information regarding pilot responsibilities with regard to proficiency and weight and balance calculations, and it contains little to no information regarding pilot training and examination programs, preflight inspections, emergency procedures, and parachutist egress procedures. Therefore, the Safety Board believes that the FAA should revise the guidance materials contained in AC 105-2C to include guidance for parachute jump operators in implementing effective initial and recurrent pilot training and examination programs that address, at a minimum, operation- and aircraft-specific weight and balance calculations, preflight inspections, emergency procedures, and parachutist egress procedures.

Federal Aviation Administration Oversight and Surveillance

The Safety Board has long been concerned with the adequacy of FAA surveillance of parachute operations and, on occasion, has determined that inadequate surveillance was a factor in an accident. A number of accidents in the 1980s and 1990s prompted the Board to issue Safety Recommendation A-94-19 on February 17, 1994, which asked the FAA to do the following: “Direct flight standards district offices [FSDOs] to increase their surveillance of sport parachute operations and comply with their associated operations bulletins regarding parachute operations.” Safety Recommendation A-94-19 was classified “Closed—Acceptable Action” on May 31, 1995, after the FAA’s November 21, 1994, response that it had published Notice 1800.134, “Required National Flight Standards Program Work Functions,” on July 8, 1994, to provide instructions to FSDOs for the development and execution of annual national work program guidelines. In its response to the Board, the FAA stated that Notice 1800.134 “directs principal operations inspectors to perform increased interior and exterior ramp inspections” of parachute operations aircraft, to include particular attention to inadequate aircraft maintenance, contaminated fuel, inadequate training of pilots, pilot inattention to weight and balance and to aircraft operating limitations issued for parachute operations, among other areas.

In its May 31, 1995, correspondence to the FAA, the Safety Board closed the safety recommendation based on its understanding that Notice 1800.134 “requires” FAA inspectors to perform increased surveillance. However, the Board notes that FAA Notice 1800.134 is no longer a current document but that information in current FAA Order 8900.1, “Flight Standards Information Management System,” is based, in part, on the former Notice 1800.134. FAA Order 8900.1 contains similar guidance for inspectors in Volume 6, “Surveillance,” Chapter 11, “Other Surveillance,” Section 5, “Surveillance of Sport Parachute Activities.” However, the current information serves as guidance information only; such surveillance is not a mandatory task for inspectors. The current national flight standards work program guidelines listed in FAA Order 1800.56H contain no surveillance requirements for parachute operations.

The Safety Board notes that 16 of the 32 fatal parachute operations accidents reviewed occurred after the FAA implemented the guidance in Notice 1800.134. These accidents claimed the lives of 77 people. Because few of the accident reports detailed FAA surveillance activity data for the respective operators and because the FAA does not retain such data indefinitely, the Board is unable to determine whether or not FAA surveillance of parachute jump operators increased. However, a review of FAA Program Tracking and Reporting Subsystem (PTRS) data and Safety Performance Analysis System (SPAS) data for the operators of the three most recent

parachute operations accident aircraft in the Safety Board's database (a nonfatal accident involving a Cessna 208B that lost engine power on June 1, 2008, in Greensburg, Indiana;¹⁴ a nonfatal accident involving a de Havilland DHC-6-200 that sustained substantial damage during descent on June 29, 2008, near Baldwin, Wisconsin;¹⁵ and the previously referenced April 19, 2008, Mount Vernon, Missouri, accident) revealed that two of the operators had no records of FAA surveillance visits. However, the Mount Vernon, Missouri, accident operator received an operations surveillance visit on December 7, 2007, and the airplane involved in the Baldwin, Wisconsin, accident received a ramp check on April 25, 2004, while being flown by an operator in Texas.

Although the Safety Board is pleased with the content of the FAA's parachute operations surveillance guidance materials contained in Order 8900.1, the nonmandatory surveillance is not effective. A comparison of the accidents that occurred in the 14 years before Safety Recommendation A-94-19 was closed (1980 to mid-1994) with the accidents that occurred in the 14 years after (mid-1994 to present) revealed little difference in their respective causes, factors, and other safety issues, with the exception of a reduction in contaminated fuel accidents. In addition, several of the accidents that occurred since the FAA's action show that the operators were deficient in specific areas, such as inadequate aircraft maintenance, inadequate training of pilots, and pilot inattention to weight and balance, that should have been targeted for particular attention from inspectors.

The Safety Board recognizes that the FAA has limited resources; however, as the review of accidents showed, numerous parachute jump operators, some of which carried thousands of revenue passengers annually, exhibited unacceptable deficiencies that could have readily been identified during FAA inspections, had any or adequate inspections occurred. For example, the Sullivan, Missouri, accident airplane had been flying for years with an inoperative autofeather system. However, the operator did not have an FAA-approved minimum equipment list for the airplane and, therefore, was not authorized to dispatch the airplane with any inoperative equipment.

The investigation of the July 31, 1999, accident involving a Beech 65-A90 that stalled during climb after takeoff in Marine City, Michigan,¹⁶ killing the pilot and nine parachutists, revealed that the operator's airframe and engine maintenance records regarding the airplane's required inspections were incomplete and that there were no records of compliance with five airworthiness directives (ADs) applicable to the accident airplane. Compliance with ADs is mandatory for all operators.

¹⁴ The 14 parachutists on board parachuted to safety following the loss of engine power, the cause of which has not yet been determined. The accident, CHI08LA144, remains under investigation at the time of this letter. Preliminary information for the accident is available at the Safety Board's website at <<http://ntsb.gov/ntsb/query.asp>>.

¹⁵ The pilot declared an emergency and landed the airplane safely; the 14 parachutists had egressed before the emergency occurred. The accident, CHI08LA190, remains under investigation at the time of this letter. Preliminary information for the accident is available at the Safety Board's website at <<http://ntsb.gov/ntsb/query.asp>>.

¹⁶ Information about the accident, CHI99MA269, is available at the Safety Board's website at <<http://ntsb.gov/ntsb/query.asp>>.

The investigation of the September 10, 1995, accident in West Point, Virginia,¹⁷ involving a Beech 65 that crashed following a loss of power in one engine on takeoff for undetermined reasons, killing the pilot, 10 parachutists, and 1 person in a house, revealed that the airplane's cabin seats had been removed, but maintenance records did not indicate when. Further, the maintenance records did not contain recalculated weight and balance information to correspond with other modifications. (The accident airplane was loaded over its maximum gross weight and beyond its aft cg limit when it crashed.)

Further, the airplane's aft boarding door had been removed for parachute operations; however, the accident airplane model was not on an FAA-approved eligibility list of aircraft eligible for flight with the aft boarding door removed. In addition, the operator had an FAA-approved flight manual supplement (FMS) that had been altered to give the appearance that the door removal was authorized for the model of the accident airplane; the unaltered FMS listed model "A65" as eligible, but the operator's copy had been altered to remove the "A," giving the appearance that model "65" was eligible.

The maintenance discrepancies on these three airplanes likely could have been detected with adequate surveillance that included, at a minimum, a visit to the operator and examination of each airplane's maintenance logs. A review of PTRS and SPAS data showed that at least one of these operators (the Sullivan, Missouri, accident operator) had no record of surveillance visits pertaining to maintenance and operations.¹⁸ This operator, which had been in business for more than 12 years at the time of the accident, averaged about 10,000 to 12,000 passengers per year, with a maximum of 15,000 passengers in 1 year. Although the number of surveillance visits, if any, to the other two operators is not known, the persistence of airworthiness discrepancies on the airplanes suggests that the operators received either minimal or inadequate surveillance with regard to aircraft maintenance.

The Safety Board notes that, in addition to maintenance discrepancies that could have been detected with adequate maintenance surveillance visits, many of the operational deficiencies observed with the accident operators could have been detected and corrected and the accidents prevented. For example, a ramp check could determine whether or not a pilot had appropriately computed the airplane's weight and balance for a flight, and a review of the operator's flight logs and data could provide an indication about whether or not the operator enforces the practice for all pilots and flights. Similarly, an operations surveillance visit could provide an inspector some indication of the adequacy of an operator's pilot training program.

As these examples show, parachute jump operator deficiencies have persisted after the publication of FAA guidance materials calling for increased surveillance. These accidents also show that surveillance of operators has been inconsistent. The FAA's action to increase surveillance, therefore, did not have the effect that Safety Recommendation A-94-19 intended. The Safety Board concludes that the FAA's oversight and surveillance of parachute jump

¹⁷ Information about the accident, NYC95MA220, is available at the Safety Board's website at <<http://ntsb.gov/ntsb/query.asp>>.

¹⁸ Of these six accidents, only the Sullivan, Missouri, accident investigation provided FAA surveillance activity records for the operator. The investigation found three SPAS records of FAA contacts with the operator; these were related to the operator's airspace waiver requests.

operators have been inadequate to ensure that operators are properly maintaining their aircraft and safely conducting operations. Therefore, the Safety Board believes that the FAA should require direct surveillance of parachute jump operators to include, at a minimum, maintenance and operations inspections.

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

Require parachute jump operators to develop and implement Federal Aviation Administration-approved aircraft maintenance and inspection programs that include, at a minimum, requirements for compliance with engine manufacturers' recommended maintenance instructions, such as service bulletins and service information letters for time between overhauls and component life limits. (A-08-63)

Develop and distribute guidance materials, in conjunction with the United States Parachute Association, for parachute jump operators to assist operators in implementing effective aircraft inspection and maintenance quality assurance programs. (A-08-64)

Require parachute jump operators to develop initial and recurrent pilot training programs that address, at a minimum, operation- and aircraft-specific weight and balance calculations, preflight inspections, emergency and recovery procedures, and parachutist egress procedures for each type of aircraft flown. (A-08-65)

Require initial and recurrent pilot testing programs for parachute jump operations pilots that address, at a minimum, operation- and aircraft-specific weight and balance calculations, preflight inspections, emergency and recovery procedures, and parachutist egress procedures for each type of aircraft flown, as well as competency flight checks to determine pilot competence in practical skills and techniques in each type of aircraft. (A-08-66)

Revise the guidance materials contained in Advisory Circular 105 2C, *Sport Parachute Jumping*, to include guidance for parachute jump operators in implementing effective initial and recurrent pilot training and examination programs that address, at a minimum, operation- and aircraft-specific weight and balance calculations, preflight inspections, emergency procedures, and parachutist egress procedures. (A-08-67)

Require direct surveillance of parachute jump operators to include, at a minimum, maintenance and operations inspections. (A-08-68)

The Safety Board also issued two safety recommendations to the United States Parachute Association.

In response to the recommendations in this letter, please refer to Safety Recommendations A-08-63 through -68. If you would like to submit your response electronically

rather than in hard copy, you may send it to the following e-mail address: correspondence@ntsb.gov. If your response includes attachments that exceed 5 megabytes, please e-mail us asking for instructions on how to use our Tumbleweed secure mailbox procedures. To avoid confusion, please use only one method of submission (that is, do not submit both an electronic copy and a hard copy of the same response letter).

Acting Chairman ROSENKER and Members HERSMAN, HIGGINS, SUMWALT, and CHEALANDER concurred with these recommendations.

[Original Signed]

By: Mark V. Rosenker
Acting Chairman