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AVIATION SAFETY

FAA Has An Opportunity to Enhance Safety and Improve Oversight of Initial Pilot Training

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Why GAO Did This Study

Regional airlines have experienced the last six fatal commercial airline accidents, and pilot performance has been cited as a potential contributory factor in four of these accidents, including the most recent in February 2009 which resulted in 50 fatalities. Public and media concerns about aviation safety escalated as a result about the level of safety across the entire airline industry, particularly about pilot education and training before they can be hired by regional airlines. The Federal Aviation Administration (FAA) is responsible for ensuring that pilots receive the necessary training and undergo the proper certification testing. Once hired, all U.S. commercial airlines are required to provide the advanced training for their pilots. However, to become a certified commercial pilot, which is currently the minimum requirement for being hired by an airline as a first officer; individuals must undergo several steps of pilot training and certification in accordance with FAA regulations.

This statement is based on GAO's November 2011 report on initial pilot training and focuses on (1) the various types of U.S. pilot training organizations, the regulatory training requirements for commercial airline pilots, and how they compare in preparing pilots candidates for commercial airlines, and (2) how and to what extent FAA carries out its oversight role of pilot training and certification of private and commercial pilots.

What GAO Found

FAA's pilot training requirements for certification of commercial pilots are not aligned with airline operations or emphasize skills that airlines consider important for greater aviation safety.

- Requirements do not emphasize training in decision-making, although this skill is essential to the airline pilot profession. According to FAA and other stakeholders, the regulations regarding ground school and flight training, as well as the test standards for a commercial pilot certificate, generally emphasize the development of motor skills to master of maneuvers and individual tasks to determine competence, and not decision making.

- Requirements do not emphasize training in using modern technologies, such as flight simulation training devices. Modern aircraft used by regional airlines have evolved and the operational demands have increased on pilots in high-altitude and complex airline operations. Pilots in today's newer aircraft have to manage automation, advanced avionics and systems, information displays, and other new technologies.

- Requirements and testing do not emphasize situational awareness or understanding risk assessment, or provide a complete understanding of managing the automation of the aircraft.

Many of the key industry stakeholders GAO interviewed said the current training regulations for commercial pilots should be revised to incorporate additional training requirements that would improve the performance capabilities of the first officer applicants that seek employment at airlines. Some of the recommended types of training are provided to pilots when they are hired by airlines to ensure that the newly hired commercial pilots are competent in a range of training areas—some per FAA requirements. However, according to the Air Line Pilots Association, the lack of specific training requirements to be a commercial airline pilot results in a wide range of initial training experiences, not all of which are well suited for the commercial airline industry. To compensate, some regional airlines use various flight training devices to screen pilots during the hiring process to gauge their piloting skills. FAA has an opportunity to ensure that the knowledge and skills it requires of commercial pilots is still relevant.

FAA has an annual inspection program that includes the oversight of pilot schools, pilot examiners, and flight instructors, i.e., the gatekeepers for the initial pilot training process. However, GAO's analysis of FAA inspection data found that the agency does not have a comprehensive system in place to adequately measure its performance in meeting annual inspection requirements for pilot schools and pilot examiners, which could make it difficult to ensure regulatory compliance and that safety standards are being met. GAO's report included recommendations to improve FAA's oversight of pilot certification by developing a comprehensive system that may include modifying or improving existing data systems to: (1) measure its performance in meeting the agency's annual inspection requirements for pilot schools and pilot examiners and (2) better understand the scope of discretionary inspections for flight instructors. FAA generally agreed with the recommendations.

_____ **United States Government Accountability Office**

Chairwoman Cantwell, Ranking Member Thune, and Members of the Subcommittee:

I am pleased to submit this statement on GAO's work related to the U.S. pilot training system. This study was undertaken at the request of the House Committee on Transportation and Infrastructure, its Subcommittee on Aviation, and members of Congress. Although the U.S. mainline airlines are experiencing an unprecedented level of safety, there have been several accidents in recent years involving regional airlines.[1] Specifically, the last six fatal commercial airline accidents involved regional airlines, which account for about 53 percent of the nation's commercial flights. As a result, Congress, the media, and the flying public have raised concerns about the extent that there is "one level of safety"[2] across the entire airline industry. The National Transportation Safety Board (NTSB) cited pilot performance as a potential contributory factor in four of these accidents, including the one in February 2009, in Buffalo, New York, involving Colgan Air, Inc. in which 50 lives were lost.[3] The focus of our study was the initial pilot education and training required before pilots can be hired by airlines, at which time they receive advanced training.[4] The continued safety of the U.S aviation system depends in part on the roughly 3,400 U.S. pilot schools providing well-trained pilot candidates for airlines. This is particularly relevant for regional airlines, which are much more likely to hire and train pilots directly from these schools, whereas large mainline airlines tend to hire and train pilots who already have experience at regional airlines or in the military.

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[1]Mainline carriers operate aircraft seating 90 or more passengers and regional air carriers are airlines that generally operate aircraft seating fewer than 90 passengers.

[2]Since 1995, FAA has imposed the "one level of safety" on the entire airline industry in which all U.S. commercial airlines—mainline and regional—are subject to the same standards and requirements, and receive the same level of safety oversight.

[3]NTSB Aircraft Accident Report, 2010, Loss of Control on Approach, Colgan Air, Inc., Operating as Continental Connection Flight 3407, Bombardier DHC-8-400, N200WQ, Clarence Center, New York, February 12, 2009. NTSB/AAR-10/01. Washington, D.C.

[4]Mainline and regional airlines provide their pilots with 1) advanced training as entry-level indoctrination training when they are hired and 2) continual recurrent training while they are employed.

This statement is based on our November 2011 report[5] and focuses on (1) the various types of U.S. pilot training organizations, the regulatory training requirements for commercial airline pilots, and how they compare in preparing pilots candidates for commercial airlines, and (2) how and to what extent FAA carries out its oversight role of pilot training and certification of private and commercial pilots. To address our objectives in the report, we reviewed and synthesized published literature related to pilot certification and training issues in the United States. We also reviewed the Federal Aviation Regulations related to training and certification for pilots, and legislative provisions that addressed issues related to pilot training. We interviewed officials at Department of Transportation (DOT), Federal Aviation Administration (FAA), and NTSB. We also conducted interviews with representatives from a range of aviation stakeholder organizations, including pilot unions, pilot school associations, general aviation groups, commercial aviation industry associations, international aviation associations, and regional airlines. For a more detailed explanation of our scope and methodology, see appendix I of our full report.

The performance audit on which this statement is based was conducted from March 2010 through November 2011 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

As the federal agency responsible for regulating the safety of civil aviation in the United States, FAA is responsible for the administration of pilot certification (licensing) and conducting safety oversight of pilot training. Regulations for pilot certification and training are found in three different parts of the Federal Aviation Regulations—Parts 61, 141, and 142.[6] All

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[5]GAO, Initial Pilot Training: Better Management Controls Are Needed to Improve FAA Oversight, GAO-12-117 (Washington, D.C.: November 2011).

[6]Part 61 prescribes the minimum training, knowledge, and experience requirements for acquiring a pilot certificate. Part 141 prescribes the requirements for issuing pilot school certificates and the general operating rules applicable to a holder of the certificate. Part 142 prescribes the requirements governing the certification and operation of aviation training centers.

pilots are subject to a series of certification requirements established by FAA, but the requirements vary depending on the type of training environment.[7] Part 61 recognizes six basic types of pilot certification: student, sport, recreational, private, commercial, and airline transport.[8] Part 61 also establishes the core training requirements for each pilot certification, which describes the eligibility requirements, aeronautical knowledge and flight proficiency standards, and the required flight hours. Pilot training can be provided to students by flight instructors under Part 61.[9] Part 141 outlines the specified personnel, aircraft, facilities, curriculum, and other operating requirements that approved pilot training organizations (schools) must meet in order to hold an operating certificate from FAA. Part 142 outlines specific requirements for training centers that primarily relate to the advanced training provided to pilots by employers, such as airlines. As previously stated, our report focused on the initial pilot training that students are provided prior to being hired as airline pilots; thus, advanced training for pilots is not within the scope of our study.[10]

Approximately 3,400 pilot schools exist in the United States and the most basic difference among the types of schools is the training environment provided to the students. For the reporting purposes of our study, we divided them into three categories: (1) non-collegiate flight instructor-

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[7]14 C.F.R. Part 61.

[8]The student pilot certificate is necessary to begin pilot training to work toward a recreational, sport, or private pilot certificate under the direct supervision of a flight instructor. The recreational pilot certificate was introduced in 1989 and limits pilots to stay within 50 nautical miles of their departure airport unless other conditions are met. The sport pilot certificate was introduced in 2004 and allows pilots to fly smaller, light, less complex, one or two-seat airplanes without the limitations of recreational pilots. The private pilot certificate allows the pilot to fly solo and carry passengers in any aircraft for which they are qualified, but not to fly for compensation. The commercial pilot certificate allows a pilot to be compensated for flying and to be hired for a variety of aviation jobs (e.g., air ambulance, law enforcement, agricultural spraying, corporate and charter flights, and banner towing), including first officer positions with airlines. The airline transport pilot certificate is the highest level of pilot certification, requires the highest amount of cumulative flight time, and is necessary to qualify as a captain for an airline.

[9]The holder of a valid flight instructor certificate may provide pilot training and instruction for the pilot certification in any aircraft for which they are qualified. (14 C.F.R. § 181).

[10]The DOT Office of Inspector General (OIG) reviewed FAA's oversight of airline pilot training, pilot fatigue, and professionalism issues. See DOT OIG Audit Report, *New Approaches Are Needed To Strengthen FAA Oversight Of Air Carrier Training Programs And Pilot Performance*, AV-2012-027 (Washington, D.C.: December 2011).

based schools, (2) non-collegiate vocational pilot schools, and (3) collegiate aviation schools.

Non-collegiate flight instructor-based schools (Part 61). Pilot training conducted under Part 61 regulations is often provided by an individual, for-hire flight instructor who can operate independently as a single-instructor school at a local airport with a single aircraft on which to train students. Other flight instructor-based schools operate as a more traditional training school. These schools are the most common type of school and the majority of students that complete training in flight instructor-based schools are generally interested in recreational flying, although most commercial pilots in the United States also undertake this type of training as the initial path toward becoming an airline pilot. These schools are not subject to direct FAA oversight beyond the initial certification and subsequent renewal of the flight instructor's certificate.[11]

Non-collegiate vocational pilot schools (Part 141). Vocational schools elect to apply for an operating certificate from FAA to provide pilot training under Part 141 regulations, which require these schools to meet prescribed standards with respect to training equipment, facilities, student records, personnel, and curriculums.[12] Vocational schools must have structured and formalized programs and a detailed training course outline or curriculum approved by FAA. Curriculums can vary in content, but FAA provides fundamental core training guidelines that must be followed within the curriculum for the school to receive a certificate.[13] These schools do not allow the flexibility of flight instructor-based schools, as the training sequence outlined in the curriculum cannot be altered. FAA requires annual inspections of these schools, unlike flight instructor-based schools.

Collegiate aviation schools (Part 61 or Part 141). Pilot training is also provided through 2- and 4-year colleges and universities, which typically

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[11]However, flight instructors may be inspected by FAA when a triggering event—such as an aircraft accident—occurs.

[12]In August 2011, FAA issued a rule that, among other things, will allow vocational pilot schools to use internet-based training programs without requiring the schools to have a physical ground training facility. The rule will become effective October 31, 2011. 76 Fed. Reg. 54095 (August 31, 2011).

[13]14 C.F.R. § 141.55.

offer an undergraduate aviation-based degree along with the pilot certificates and ratings necessary to become a commercial pilot. In general, most of the collegiate aviation schools provide pilot training under a Part 141 certificate, although they can provide training under Part 61. Collegiate schools that provide training under Part 61 regulations generally offer similar structured, curriculum-based training as collegiate schools with a Part 141 certificate.

For the most part, all pilot schools must provide training that includes both classroom and flight training.[14] Classroom training, or ground school, provides students with the required aeronautical knowledge and cognitive skills necessary to perform the tasks required to become a pilot. Flight training focuses on learning how to manipulate the controls of an airplane and make it perform certain maneuvers. Regardless of the type of school, flight instructors must teach students by demonstrating and explaining, on the ground and in the air, the basic principles of flight (e.g., airspace, aerodynamics, weather factors, and Federal Aviation Regulations). The number of training flight hours required for pilot certification varies by the aviation regulations being used to provide pilot training. Because training under Part 141 regulations requires a school to use an FAA-approved curriculum, fewer hours of actual flight training are required than under Part 61.[15]

To obtain a private, commercial, or airline transport pilot certificate from FAA to perform various aviation activities, after completing the required training, individuals typically have to successfully complete pilot training and pass the following two FAA tests for each pilot certificate and rating obtained:[16]

- A knowledge test assesses applicants' understanding of the aeronautical knowledge areas required for a specific certificate or

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[14]Training under Part 61 regulations for the private and commercial pilot certificates can accomplish the ground school training requirements through instruction from a flight instructor or through an approved home-study course.

[15]For the airline transport pilot certificate, the same number of total hours is required whether pilot training is being conducted under Part 61 or Part 141 regulations.

[16]A rating defines the conditions or specific aircraft in which a pilot certificate may be used. In addition, endorsements may be issued by FAA to further define conditions or specific aircraft not covered by ratings.

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rating and can be administered in written form or by a computer.

- A practical test consists of a flight test and an oral examination. The flight test assesses applicants' knowledge of the areas of operations of an aircraft and the ability to demonstrate the maneuvers in an aircraft while in flight. The oral examination is conducted by having an applicant respond to random questions related to aviation knowledge and aircraft operations before, during, and after the flight test, and typically lasts between 1 and 2 hours.[17]

To become a certified commercial pilot,[18] currently the minimum requirement for being hired by an airline as a first officer, individuals also must undergo several steps of pilot training and certification in accordance with FAA regulations.[19] Once cleared by a medical examination, students obtain a medical certificate and a student pilot certificate from FAA.[20] Figure 1 shows the typical progression of training provided by the pilot schools and the associated certifications required to become an airline pilot.

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[17]Part 61 requires that pilots must be able to read, write, speak, and understand the English language, or a pilot certificate cannot be issued. Each pilot applicant must demonstrate an ability to mentally grasp critical information that often must be read and understood while conducting a variety of aviation operations.

[18]A pilot with a commercial pilot certificate can be employed to tow banners and fly sightseeing operations or can be employed as a first officer for a regional airline.

[19]In commercial aviation, the pilot in command (captain) of an aircraft is the person aboard the aircraft who is ultimately responsible for its operation and safety during all phases of flight, as well as when it is operating or moving on the ground, in accordance with FAA's rules of the air. The second-in-command (first officer) is the second pilot of an aircraft, and has the authority to assume command of the aircraft in the event of incapacitation of the captain. However, control of the aircraft is normally shared equally between the captain and first officer during flight.

[20]To be eligible for a student pilot certificate, an applicant must be at least 16 years of age and hold at least a third-class medical certificate. Student pilots are generally not allowed to operate an aircraft in solo flight unless certain FAA requirements are met.

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Figure 1: The Typical Path to Become a Commercial Airline Pilot

Obtain a **private pilot certificate** from FAA by completing the necessary knowledge and flight training

Obtain an **instrument rating** from FAA by completing the necessary knowledge and flight training (allows a pilot to fly during periods of reduced visibility or when the ground reference is obscured)

Obtain a **commercial pilot certificate** from FAA by completing the necessary knowledge and flight training (required in order to be compensated for performing flying activities)

Obtain a **multi-engine rating** from FAA by completing the necessary knowledge and flight training (required to be qualified to fly aircraft with more than one engine)

Build flight hours and experience as a flight instructor by teaching new pilot students how to fly (optional) or through employment in a variety of commercial aviation jobs

Obtain employment as a pilot for a charter or corporate operation or **first officer** for a regional airline
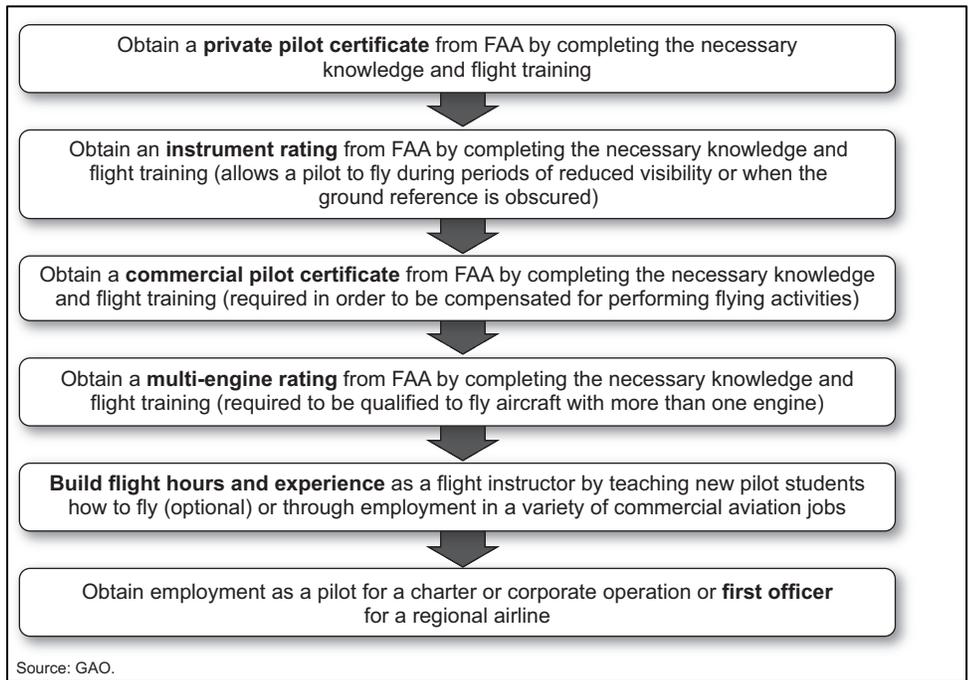
Source: GAO.

Figure 2 shows examples of the progression from single-engine trainer, to multi-engine trainer airplane—used by some pilot schools to provide students with the multi-engine rating—to the much larger, faster jet used by regional airlines. Once commercial pilots complete the process of initial training, they are qualified to apply for a first officer pilot position at an airline. Entry-level positions are typically at regional, and not mainline, airlines; mainline airlines typically draw from regional airlines for their pilots. If hired, pilots then must complete the airline's new hire training, which consists of indoctrination, ground and aircraft systems, simulator training, and the initial operating experience, wherein the pilot applies what they learn in the previous training phases. The airline submits these training programs for approval by the FAA to ensure they meet Part 121 requirements.

Figure 2: Examples of Single- and Multi-Engine Aircraft Used by U.S. Pilot Schools and a Multi-Engine Jet Used by Regional Airlines

Sources: Cessna (single-engine trainer), Piper (multi-engine trainer), and Bombadier (regional jet).

Training Varies and Requirements Are Not Aligned with Airline Operations

Pilot Schools' Training Varies in Applicability to Airline Operations, but All Students Must Pass the Same Tests

As part of its oversight responsibility, FAA develops pilot training and certification requirements for commercial pilots and ensures that the pilots meet them by subjecting the pilots to complete and thorough certification examinations. We found that there has been little other study on this subject and there is no consensus about how well the different types of pilot schools prepare commercial pilots for airline operations.

- On one hand, collegiate curriculums cover a broad range of areas above FAA minimum training requirements. The overwhelming majority of representatives of the regional airlines we interviewed generally told us they strongly preferred, but do not require, first officer candidates trained in collegiate aviation schools because they perform better in their airline's training program when hired. Due to limited screening, training structure, and variability of educational content, according to some of the regional airline officials, flight instructor-based schools are less likely to produce first officers that are prepared immediately upon completing the training to enter the workforce and succeed in an airline environment.

- On the other hand, some stakeholders we interviewed pointed out the large number of pilots that matriculate through flight instructor-based schools and many are hired by regional airlines without any performance issues. Representatives from two of the regional airlines also indicated that the professional pilot experience gained through commercial aviation positions after completing pilot training is more important than the type of pilot school attended.

Many of the collegiate aviation schools also provide specialized training in a flight simulation training device using realistic scenarios, including some coursework and advanced flight training in jet aircraft systems and airline operational procedures. For example, Embry-Riddle Aeronautical University's Aeronautical Science degree program is designed to prepare graduates for a career as a professional pilot in multi-crewmember, jet aircraft. Courses include communication theory and skills, aircraft turbine engines, crew resource management, aviation weather, jet transport systems, and optional upset recovery training. Officials who represented 10 of the 24 regional airlines we interviewed listed some of these types of courses as examples that FAA could require as part of pilot schools' training curriculums that would improve the skill level and competency of applicants seeking to be hired as first officers.

Regardless of the type of pilot schools that students attend, once training has been completed, pilot candidates must pass the same knowledge and practical tests to obtain a pilot certificate.[21] FAA uses a multiple-choice, knowledge test to measure the extent to which applicants for FAA pilot certificates have mastered the required aeronautical knowledge areas provided in ground school. To pass, applicants must achieve an overall score of 70 percent or higher. However, some aviation stakeholders have voiced concerns related to whether the current knowledge test actually requires students to learn the material, as opposed to simply studying sample test questions from publicly available sources. Literature related to pilot certification and training issues and some aviation stakeholders have pointed out that FAA testing is generally

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[21]Some vocational and collegiate aviation schools with a Part 141 certificate are granted examining authority by FAA, as a privilege of their Part 141 certificate, which allows them to recommend their graduates for some of the initial pilot certificates and ratings (except flight instructor certificates, airline transport pilot certificates and ratings, and jet type ratings) without the pilot candidates having to take the FAA knowledge or practical tests or both.

based on rote memorization. They stated that this encourages instructors and students to focus on memorizing test questions to pass the required FAA knowledge test, rather than developing a true understanding of the material. In 2004, the National Aeronautics and Space Administration (NASA) published a study on FAA's pilot knowledge tests.[22] NASA found that many applicants completed the test in far less time than would be required for the average human to even read the questions and answers on the test—indicating that students had memorized the questions and answers—which raises concerns about the extent to which students actually mastered the material.

Several Key Stakeholders Recommended that FAA Introduce Training Needed for Airline Operations into Current Training Regulations for Commercial Pilots

Several industry stakeholders have stated that current training requirements for commercial pilots are not aligned with today's commercial airline environment. FAA requires the same initial training for a pilot hired as a first officer of a regional airline carrying passengers as it does for a pilot hired to fly for a commercial non-airline operation, for example crop dusting.[23] Modern aircraft used by regional airlines have evolved and the operational demands have increased on pilots in high-altitude and complex airline operations. The Air Line Pilots Association (ALPA) has suggested that FAA revise the regulations to make a clear distinction between training and certification requirements for airline operations and those for other types of commercial operations. ALPA contends the regulations were developed in an era in which commercial pilots were hired by airlines in small, slow, propeller-driven aircraft or as flight engineers on jet-powered aircraft. It would traditionally take several years and thousands of flight hours before these pilots were given an opportunity as a first officer of jet transports.[24] However, according to ALPA, it is not uncommon today for newly hired pilots to be hired directly

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[22]NASA, "FAA Pilot Knowledge Tests: Learning or Rote Memorization?" Ames Research Center, Moffett Field, California, January 2004.

[23]In practice, regional airlines do typically require newly hired first officers to have a certain level of experience above the regulatory flight hour minimums required to obtain a commercial pilot certificate, typically hiring pilots that have spent several years working up through commercial non-airline jobs, i.e., on-demand and cargo operations. However, the extent that they do this may vary based on the cyclical dynamics of the supply of and demand for pilots.

[24]A flight engineer is the third crewmember on an aircraft that requires a three-person flight crew, but this position is seen less often as airlines replace older planes with newer aircraft that require only two-person crews.

into airline training programs to become first officers of high-altitude, complex aircraft carrying 50 or more passengers, the type of aircraft that warrants pilots with more knowledge and greater skills than the new-hire airline pilots of the past. Officials from two industry associations and eight regional airlines advocated for a separate pilot certification track with additional training requirements specific to being an airline pilot. Because airline pilots are responsible for the safety of the flying public, according to ALPA, it is reasonable that they should be held to a higher standard of competency, knowledge, and training than pilots in other flight operations. Additionally, requirements for a commercial pilot certificate do not emphasize training in some areas—like decision-making and using modern technologies—that are directly related to the airline pilot profession.

- According to FAA and other stakeholders, the regulations regarding ground school and flight training, as well as the test standards for a commercial pilot certificate, generally emphasize the mastery of maneuvers and individual tasks to determine competence. The emphasis is on development of motor skills to satisfactorily accomplish individual maneuvers—whereas only limited emphasis is placed on decision-making—unlike in scenario-based training that emphasizes improving operational experience.[25]

- In addition to traditional skills of flying, navigating, and communicating, pilots in today's newer aircraft have to manage automation, information displays, and other new technologies. According to the FAA Industry Training Standards' guidance material for the commercial pilot certificate, a growing number of pilots are being hired by regional airlines as first officers to operate aircraft with these advanced avionics and systems.[26] While these pilots may gain

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[25]According to literature we reviewed, scenario-based training uses real-world situation that introduces situations and circumstances that pilots face in routine flight operations as learning experiences. This training method emphasizes the development of critical thinking and flight management skills, rather than solely on traditional maneuvers-based training skills. Maneuvers-based training emphasizes the mastery of individual tasks or elements, such as the development of competency and motor skills to satisfactorily accomplish individual piloting maneuvers.

[26]The FAA Industry Training Standards program (referred to as FITS) is a partnership between FAA, industry, and academia to create scenario-based training materials to help pilot schools train pilots for practical application of knowledge and skills of technically-advanced aircraft. The FITS commercial pilot syllabus, developed in 2007, is the accepted training method to use in developing a specific FITS curriculum.

flying experience and spend years building flight time in commercial non-airline jobs or as flight instructors, this experience may be accumulated in smaller, slower, and less advanced aircraft. Modern aircraft offer advanced avionics and performance capabilities and many of these new aircraft travel faster and further than older generation commercial aircraft. While generally considered enhancements, these modern technologies require increased technical knowledge of newer systems and avionics and new skills for managing automation and computerized flight and navigation systems.

According to literature, as airspace complexity and air traffic density increase, airline pilots must have increased situational awareness, understand risk assessment, and have a complete understanding of managing the automation of the aircraft.[27] The current training requirements and testing for a commercial pilot certificate do not emphasize the development of these skills.

Representatives from 10 regional airlines, 4 pilot schools, and 2 industry associations we interviewed said the current training regulations for commercial pilots should be revised. They suggested that FAA should incorporate additional training requirements that would improve the performance capabilities of the first officer applicants that seek employment at airlines, such as exposure to advanced jet concepts and simulation,[28] aircraft unusual attitude (i.e., upset and stall recovery),[29]

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[27]However, recent concerns have been raised by industry stakeholders that federal regulations and airline operating procedures require airline pilots to have a greater reliance on the computerized flight management and automation of today's aircraft. As a result, the implications of decreased opportunities for pilots to manually fly an aircraft could potentially result in an increase in accidents and incidents for pilots who are suddenly confronted with a loss of computerized controls or emergency situations but unprepared to respond immediately or make errors in doing so.

[28]Advanced jet training is designed to give instruction in airline flight crew operations in a multiengine aircraft, emphasizing the transition of the professionally qualified pilot to a highly skilled member of an airline flight management team. Course topics include crew resource management, flight crew training techniques, high speed and high altitude programming of automatic flight control systems, transport aircraft flight techniques, turbojet operations in all flight regimes and in difficult operating conditions, and use of advanced avionics.

flight crew coordination and environment,[30] and scenario-based training. However, when pilots are hired by airlines, these types of training are provided by the airline to ensure that pilots are adequately competent in these and other advanced training areas—some required by FAA for airline operations. For example, FAA regulations for airline operations require that all pilots are provided crew resource management training as part of the airline's new hire and recurrent training programs. According to ALPA, the lack of specific training requirements to be a commercial airline pilot results in a wide range of initial training experiences, not all of which are well suited for the commercial airline industry. To compensate, some regional airlines, such as SkyWest Airlines, use various flight training devices to screen pilots during the hiring process to gauge their piloting skills. However, if additional training is required by FAA for pilots prior to being hired by an airline, the students would likely be responsible for the extra costs involved and would add to the total costs of pilot training borne by the student.

The industry concerns about current training regulations for commercial pilots and incorporating additional initial training requirements to improve first officer applicants' performance capabilities could be addressed by the Airline Safety and Federal Aviation Administration Extension Act of 2010 for all airline pilots.[31] Currently, while a captain for a commercial airline is required to hold an airline transport pilot certificate—the highest level of pilot certification requiring the highest number of total flight hours—a first officer is required to hold only a commercial pilot certificate, which requires a minimum of 250 flight hours.[32] However, the recent law will require the captain and first officer to have an airline transport pilot certificate, which currently requires a minimum of 1,500 total flight hours.[33] Individuals interested in becoming a first officer for a regional airline generally complete training from pilot schools with a commercial

[29]Aircraft upset is a dangerous condition that occurs when an airplane encounters an unexpected event that threatens loss of control of the aircraft and may result in an accident. Upset recovery training aims at improving a pilot's ability to maneuver and recover an actual airplane from a serious upset to a normal operating condition.

[30]Crew (or cockpit) resource management training is designed to improve pilots' team management, situational awareness, communications, task allocation, and decision-making skills in an airline crew environment.

[31]Pub. L. No. 111-216, §217 (c) (1), 124 Stat. 2348, 2368 (2010).

[32]14 C.F.R. § 61.129(b).

[33]Pub. L. No. 111-216, §217(c)(1),124 Stat. 2348,2368 (2010).

pilot certificate and possess about 300 to 500 flight hours. The 2010 law directs FAA to conduct a rulemaking and effect the changes no later than August 2013.[34] FAA issued a notice of proposed rulemaking regarding the increased requirements in February 2012.[35] The proposed rule would require airline first officers to hold an airline transport pilot certificate and to have a type rating for the aircraft being operated. Representatives of the regional airlines we interviewed were concerned this legislation will reduce airlines' hiring flexibility and make it harder to find qualified first officers that possess an airline transport pilot certificate. Many other stakeholders argued that the key factor that should be considered when revising the commercial pilot training requirements is the quality and educational content of the training rather than the quantity of flight hours.

As another potentially relevant factor, the law stated that the FAA Administrator may allow specific academic training courses—beyond the additional courses required by the legislation to raise the minimum requirements for the airline transport pilot certificate—to be credited in lieu of flight hours needed to obtain an airline transport pilot certificate. In the proposed rule, FAA also would allow pilots with an aviation degree or military pilot experience to obtain an airline transport pilot certificate with restricted privileges with fewer than 1,500 hours total time as a pilot.[36] According to FAA's First Officer Qualifications Aviation Rulemaking Committee Report,[37] well-structured training programs that feature integrated academic content and flight experience optimize the pilot learning process, and the committee supported new, higher-level minimum certification requirement for first officers. To support the concept that academic training courses should be credited for some of the

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[34]Pub. L. No. 111-216, §217(f), 124 Stat. 2348, 2368 (2010).

[35]77 Fed. Reg. 12374 (Feb. 29, 2012).

[36]FAA is proposing that pilots must 1) be at least 21 years old, 2) pass the airline transport pilot knowledge and practical tests, and 3) military pilots must have a minimum of 750 hours total time as a pilot and a graduate of an aviation degree program must have a minimum of 1,000 hours total time as a pilot.

[37]FAA, *The First Officer Qualifications Aviation Rulemaking Committee Report: Recommendations Regarding Rulemaking on Flight Experience, Training, and Academic Requirements Prior to Operating as a First Officer in Part 121 Air Carrier Operations*, September 10, 2010. The committee was composed of representatives of AABI, ALPA, Air Transport Association, AOPA, Coalition of Airline Pilots Associations, National Air Disaster Alliance-Foundation, National Business Aviation Association, Pilot Career Initiative, Regional Air Cargo Carriers Association, and RAA.

additional total flight hours, the report outlined a system for crediting academic training courses based on the sources of pilot training, e.g., vocational pilot schools, collegiate aviation schools, or military. The Coalition of Airline Pilots Associations (CAPA) and National Air Disaster Alliance-Foundation presented dissenting opinions to this approach in the report and suggested that academic courses, while necessary, should not replace an increase in total flight hours required in the law.[38]

Better FAA Management Controls Are Needed to Ensure That All Required Inspections Are Completed

FAA has an oversight framework in place for guiding and tracking inspections. FAA uses the National Program Guidelines (NPG) to guide its annual oversight activities, including pilot schools, pilot examiners, and flight instructors—the gatekeepers for the initial pilot training process.[39] The NPG identifies required inspections and optional inspections.[40] As part of this oversight process, FAA uses the Program Tracking and Reporting Subsystem (PTRS)[41] and the Enforcement Information System (EIS).[42]

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[38]CAPA is a trade association, established in 1997, comprised of over 28,000 professional pilots to address safety, security, legislative and regulatory issues affecting the individual member unions. The National Air Disaster Alliance-Foundation was founded by air crash survivors and victims' family members in 1995, to raise the standard of safety, security, and survivability for aviation passengers, and to support victims' families.

[39]FAA's NPG, developed annually, was initiated in 1985 as the oversight policy guidelines for its eight regional offices and their associated local district offices for oversight of pilot schools, pilot examiners, and flight instructors. FAA appoints individuals as designated pilot examiners to conduct various pilot certification-related activities on behalf of FAA.

[40]Required inspections are identified by FAA's headquarters as the mandatory core inspections necessary for FAA to fulfill its statutory and regulatory oversight responsibilities. Accomplishment of these inspections is essential to provide reasonable assurance of continued compliance with regulations, standards, and safe operating practices. Planned inspections are identified at the regional and district levels and are comprehensive targeted inspections. They make up the depth and substance of each office's annual work and FAA district offices tailor them to the changing local aviation environment.

[41]PTRS was implemented in 1990 and is one of FAA's data management and analysis systems used, among other things, to record inspection records and findings for NPG of flight instructors, pilot schools, pilot examiners, and other job functions.

[42]EIS is the primary internal tool for FAA in initiating enforcement actions and for tracking of enforcement and compliance cases and their outcomes.

The Extent that Required Inspections of Pilot Schools Were Completed Is Unclear

As part of its oversight role, FAA monitors pilot schools with a Part 141 certificate (vocational schools and most collegiate aviation schools) to ensure that they meet the required safety and training regulations. To fulfill NPG requirements, FAA requires its inspectors to conduct on-site inspections of each of these schools at least once a year. The inspections focus on five areas related to pilot school operations and the airworthiness of training aircraft. Under operations, an inspection must cover the school's facility and student records. Under airworthiness, an inspection must cover the pilot school facility, compliance with FAA's airworthiness directives, and a Part 141 ramp check.[43] Inspectors enter the details and results of their monitoring in FAA's PTRS data system.

In reviewing PTRS data for fiscal years 2006 through 2010, we were unable to determine the extent that required inspections of pilot schools with a Part 141 certificate were completed for several reasons.

- In the fiscal years prior to 2010, due to limitations in tracking the number of pilot schools that existed in each fiscal year, we were unable to determine whether the data were missing because they were entered incorrectly into PTRS, or because the inspections did not take place as required.[44] FAA does not maintain a historical listing of the active pilot schools with a Part 141 certificate for a given fiscal year and, thus, we could not define the universe of pilot schools that was required to be inspected during fiscal years 2006 through 2009. As a result, we could not determine the identity and number of schools that needed to be inspected. While FAA officials recognized that all required NPG inspections are expected to be completed within each fiscal year time frame, they provided several reasons to potentially explain why some of the required inspections are not recorded in PTRS. FAA officials said that inspectors may have conducted the

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[43]A ramp check for a pilot school with a 141 certificate typically involves an inspection of the paperwork and exterior of the aircraft used by the school for training to ensure each meets all regulatory requirements. FAA inspectors conduct various types of ramp checks to ensure that aviation activities are being conducted safely and in compliance with the Federal Aviation Regulations.

[44]For fiscal year 2010, our analysis of FAA's PTRS data found that FAA completed about 78 percent of the required inspections for the 545 pilot schools with a Part 141 certificate. However, based on one year, we cannot generalize this completion rate to be representative of the extent that FAA carries out its oversight role for completing the required inspections of pilot schools with a Part 141 certificate.

required inspections for some schools but incorrectly entered the details in PTRS. For example, some FAA inspectors may conduct full inspections of schools that cover the five inspection areas, but may enter only two of the five inspection numbers into PTRS. The officials also said that inspectors had additional duties—such as following up on previously identified issues or addressing the need for additional oversight for certain inspection areas—in conducting inspections for some schools, which can make covering all five inspection areas difficult.

- Similarly, many of the required inspections for pilot schools with a Part 141 certificate by NPG are incorrectly recorded as discretionary inspections in PTRS. As a result, this made it difficult to use PTRS to determine if FAA had conducted all of the required inspections of part 141 pilot schools for a given year. Specifically, 35 percent of the 4,551 part 141 pilot school inspections required by NPG in fiscal year 2010 were listed incorrectly in PTRS as discretionary inspections, and 32 percent of the required inspections were listed as discretionary from fiscal year 2006 through 2010. As a result, those inspections would not show up in a list generated in PTRS of required inspections for fiscal year 2010. FAA officials said that this problem is likely caused by the program that populates PTRS with the NPG requirements.
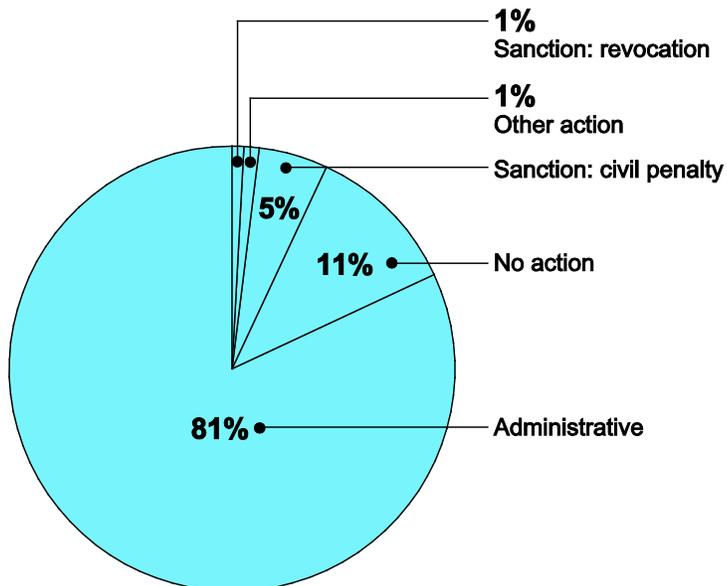
When inspections or other sources revealed compliance issues or violations, FAA uses a variety of actions to enforce safety standards and regulatory compliance, such as oral or written counseling, administrative action, legal enforcement action, and referral for criminal prosecution. When an FAA inspector identifies a potential violation, he or she initiates an investigation and if FAA determines that a violation has occurred, FAA has a wide range of options available for addressing it. From fiscal years 2006 through 2010, our analysis of FAA's EIS data found that FAA initiated 230 enforcement cases against pilot schools with a Part 141 certificate. The majority of these cases resulted from an inspection of a school, but others may have resulted from other sources. During fiscal years 2006 through 2010, FAA used a wide range of enforcement actions against pilot schools with a Part 141 certificate (see fig. 3).

- *No action*: FAA can determine that **no action** is warranted. In 26 of the 230 cases (about 11 percent), no enforcement action was taken.

- *Administrative Actions*: In 186 cases (about 81 percent), FAA used **administrative actions** to address violations. These actions refer not

only to warning notices and letters of correction but also informal actions, such as oral or written counseling, which can also be used by inspectors to address an apparent violation, provided that certain criteria are satisfied and the apparent violation is a low safety risk.

- *Enforcement actions*: We found that FAA rarely used punitive means such as revoking licenses and assessing penalties against pilot schools with a Part 141 certificate. FAA assessed monetary **civil penalties** in 12 cases (about 5 percent) for pilot schools with a Part 141 certificate and the fines ranged from $500 to $20,000. FAA **revoked the operating certificates** of schools in 3 cases, or slightly more than one percent. To illustrate the severity of an action that leads to revoking operating certificates, these include knowingly permitting school training aircraft to be used to carry illegal controlled substances or an intentional action to improperly credit training to or graduate students.

Figure 3: FAA's Outcomes for the 230 Enforcement Cases for Pilot Schools with Part 141 Certificates from Fiscal Years 2006 through 2010

- 1% Sanction: revocation
- 1% Other action
- 5% Sanction: civil penalty
- 11% No action
- 81% Administrative

GAO analysis of FAA data.

Note: Numbers do not add up to 100 percent due to rounding.

It Is Unclear Whether Required Inspections for Pilot Examiners Were Completed Because FAA's Data System Lacks Historical Information

From fiscal years 2006 through 2010, our analysis of FAA's PTRS data found that FAA completed 9,016 inspections of pilot examiners, but it is unclear whether FAA met all of its oversight requirements in this area. FAA uses private individuals or organizations to supplement its workforce and to provide certification activities such as examining and testing of pilot applicants for a fee paid for by the applicant.[45] Known as designees, pilot examiners are generally appointed by FAA's local district personnel for either 3 years (for an individual) or 5 years (for an organization).[46] As part of its oversight role, FAA requires each pilot examiner to be inspected by FAA inspectors at least once annually and high activity pilot examiners must be inspected at least twice annually, as outlined in the agency's oversight policy and NPG directives.[47] Additionally, several other circumstances may require an FAA inspector to inspect a pilot examiner, such as noncompliance with the applicable certification policies, an excessively high certification passing rate, or involvement in an accident, incident, or other violation.[48] Although we know the number of inspections conducted for each fiscal year, we could not determine the completion percentage of the required inspections for either the routine annual or additional inspections for high activity or special circumstances for each fiscal year due to limitations in available data for the population of pilot examiners.

Although we could not determine the completion percentage of the required inspections for pilot examiners, our analysis of PTRS inspection data showed 1- and 2-year gaps in the oversight of some pilot examiners.

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[45]FAA uses a broad pool of designated personnel nationwide to act as representatives of the agency to conduct many safety certification activities, such as administering practical tests to pilots and many other activities.

[46]Part 61 provides the regulatory basis for the conduct of practical tests for pilot certification. Section 183.23 of title 14 (subpart C) provides the regulatory basis for the designation of pilot examiners. FAA Order 8900.2 contains procedures for the selection, appointment, oversight, training, renewal, termination, and appeal of designees.

[47]High activity pilot examiners are defined as conducting 50 or more practical tests per quarter.

[48]These circumstances may include a designee: (1) who does not comply with the applicable certification policies; (2) whose certification passing rate is excessively high; (3) who exceeds the allowable amount of certification activity on a given day; (4) who conducts any certification activity that requires prior permission from the managing FAA office without obtaining that permission in advance; (5) whose certification file error rate is excessively high; (6) who is the subject of a valid public complaint; or (7) who has been involved in an accident, incident, or violation of federal aviation regulations.

For instance, we found 114 pilot examiners with a 1-year gap between inspections, and 11 pilot examiners with a gap of 2 years. This may indicate that required inspections of pilot examiners were not completed by FAA in a given fiscal year or that inspections were unnecessary due to inactivity of the examiners during that year. FAA officials told us that, until recently, FAA had not analyzed the extent to which it has conducted all required pilot examiner inspections on a national level. However, FAA has previously taken steps to improve oversight of pilot examiners, but still faces issues in this area. In 2005, FAA developed 14 recommendations to improve pilot examiner compliance, 11 of which were implemented. Three recommendations were not implemented due to having a low impact on oversight and the administrative workload for implementation for district offices.

Nevertheless, FAA officials acknowledged they still face some issues in oversight of pilot examiners, due, in part, to the FAA's current data systems' difficulty compiling inspection data at the regional or national level. In September 2010, FAA began developing quarterly assessment reports covering 12-month periods on the oversight of its designees, including pilot examiners, to assist in identifying oversight gaps and potential areas of concerns. We reviewed the quarterly reports that covered July 2009 through March 2011 and found they identified a number of areas of concern regarding the oversight of pilot examiners. For example, some pilot examiners with the highest activity had not been inspected over the previous 12 months. FAA began creating the quarterly assessment reports to better inform management officials at the national office level. For example, in the most recent report provided by FAA officials, five high-activity pilot examiners were identified who had performed a total of 1,623 pilot practical tests, but for whom no inspections were conducted for the previous 12 months. Conversely, the report found that FAA conducted 218 inspections of the 171 pilot examiners with the lowest testing activity during the same period.[49] Based on this report, FAA is not conducting most of its inspections of pilot examiners that are responsible for conducting the largest numbers of practical tests, and conducting more oversight on the examiners conducting significantly fewer tests.

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[49]Low-activity pilot examiners were those with seven or less activities between the third quarter of 2010 and the second quarter of 2011.

FAA officials said that the quarterly assessment reports are a temporary way of assessing the extent to which it is conducting all required inspections, and the agency is in the process of developing a new designee management system that it expects to be operational by July 2012. FAA officials told us that the new system is being designed to provide more comprehensive data on designees, including pilot examiners, by combining data that FAA currently maintains in various data systems.

While Not Required, FAA Conducts Optional Oversight Inspections for Flight Instructors, but to What Extent Is Unclear

Unlike oversight of pilot schools with Part 141 certificates and pilot examiners, annual inspections of individual flight instructors (i.e., under Part 61 regulations) are not required by FAA. From fiscal years 2006 through 2010, our analysis of FAA's PTRS data found that FAA completed 1,761 inspections of flight instructors. Oversight for flight instructors is generally limited to initial and subsequent certification renewal, but additional oversight of flight instructors is conducted as an optional work activity by FAA. According to FAA policy, flight instructor certificates are renewed every 24 months. Inspections of flight instructors and their training activities should take place on a random basis in the interim, but should be prioritized based on, for instance, observations of noncompliance made during a pilot school inspection, an instructor or student is involved in an accident or incident, or when an instructor has a student failure rate of 30 percent or greater on FAA's certification tests. The oversight of flight instructors is critically important because, like the examiners, this population serves as a gatekeeper for ensuring that pilot students are being properly trained as they seek certification. However, similar to pilot examiners, we could not determine the extent of oversight that FAA provided for the entire flight instructor population or the specific reasons that inspections were conducted during the 5 fiscal years covered in our analysis.
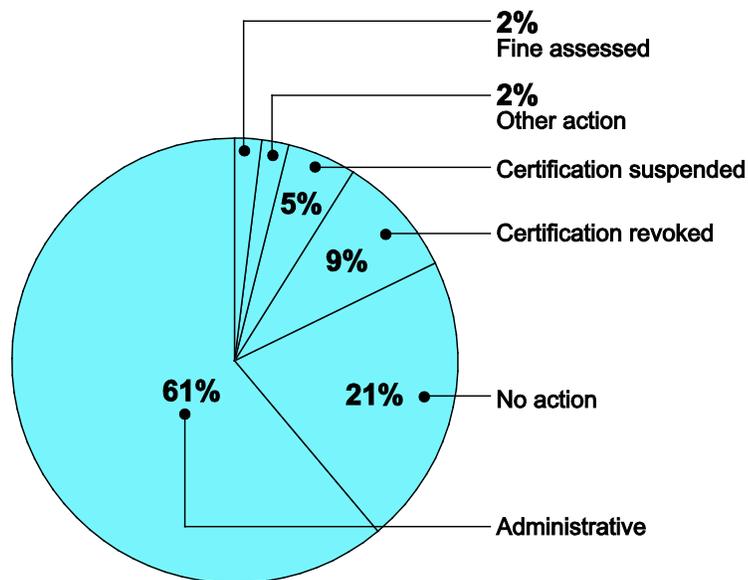
Similar to pilot schools, when inspections or other sources revealed compliance issues or violations, FAA uses a variety of actions to enforce safety standards and regulatory compliance. For fiscal years 2006 through 2010, our analysis of FAA's EIS data found 178 cases against flight instructors (see fig. 4).

- *No action*: FAA can determine that **no action** is warranted. In 38 of the 178 cases (about 21 percent), no enforcement action was taken.

- *Administrative Actions*: In 109 cases (about 61 percent), FAA used **administrative actions** to address violations. These actions refer not

only to warning notices and letters of correction but also informal actions, such as oral or written counseling, which can also be used by inspectors to address an apparent violation.

- *Enforcement actions*: We found that FAA rarely used punitive means such as suspending or revoking licenses and assessing penalties against flight instructors. FAA **suspended licenses** in 9 cases (about 5 percent) and **revoked licenses** in 16 cases (about 9 percent). FAA also assessed monetary **civil penalties** in three cases (about 2 percent).

Figure 4: FAA's Outcomes for the 178 Enforcement Cases for Flight Instructors from Fiscal Years 2006 through 2010

2% Fine assessed	
2% Other action	
Certification suspended	
Certification revoked	
No action	
Administrative	

5%
9%
61%
21%

Source: GAO analysis of FAA data.

FAA Efforts to Address Issues Associated with Pilot Training

FAA has initiated several efforts to address issues related to pilot certification testing and training.

- In 2010, FAA began revising the standard set of questions the agency uses to create its knowledge tests for pilot certification. FAA found that a significant percentage of applicants tested on the new questions failed the test compared to those that took the test with the previous questions. FAA plans to cooperate with industry representatives on future changes to the questions for the

knowledge tests and would likely implement any further changes over the next 2 years.

- FAA plans to establish a government and industry working group during fiscal year 2012 to address issues related to pilot certification testing standards and training. The group will make recommendations to FAA on a variety of issues, including knowledge content (i.e., ground school training for understanding the aeronautical knowledge areas), knowledge test guides, and practical test standards (i.e., guidance used for conducting the flight test portion of a practical test).

- FAA is currently updating its national guidance and associated handbook for FAA inspectors on the recurrent training required for flight instructors. Based on the guidance, the aviation industry provides refresher training courses for flight instructors that are designed to keep them informed of changes to pilot training.

- FAA is also updating its guidance on the review process for the 24-month certification renewal for pilots and flight instructors. According to FAA, the current guidance is outdated and the revised version will provide more detailed guidance for the renewal review process, updated terminology and references, and reorganized review content.

- FAA plans to make changes to the practical test standards to incorporate required testing for runway incursions. FAA's goal with the revised standards is to reduce runway incursions by 2 percent annually from the current level.[50]

- FAA has also initiated efforts to partner with the aviation academic community through a 5-year plan initiative, working through AABI and the University Aviation Association (UAA), to leverage academic expertise and develop best practices for improving all pilot training.[51]

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[50]Runway incursions, which are precursors to aviation accidents, are instances where collisions are narrowly avoided on an airport's runways or taxiways. GAO has reported that general aviation aircraft were involved in over 70 percent of the most serious runway incursions from fiscal year 2001 through the second quarter of fiscal year 2011. For more information on runway incursions, see GAO, *Aviation Safety: Enhanced Oversight and Improved Availability of Risk-Based Data Could Further Improve Safety*, GAO-12-24 (Washington, D.C.: October 2011).

[51]UAA is the representative voice of college aviation education to the aviation industry, government agencies, and the general public.

The goal is to identify specific non-regulatory measures that can be used to improve training and reduce accidents.

In our November 2011 report, we did not make recommendations for specific improvements to initial pilot training because FAA has initiated some efforts and has plans for other efforts to address pilot training issues. Our report indicated that FAA has an opportunity to ensure that the initial pilot training process is still relevant for producing candidates who have the necessary knowledge and skills for airline positions. Therefore, we encouraged FAA to continue its efforts, with industry and academia collaboration to review the initial pilot training process, including ground school content, training hour requirements, and knowledge testing for commercial pilot certification under the Part 61 regulations. However, we made two recommendations to the Secretary of Transportation to improve FAA's oversight of pilot certification and training.

Specifically, we recommended that FAA develop a comprehensive system that may include modifying or improving existing data systems to:

- measure performance for meeting the annual National Program Guidelines' inspection requirements for pilot schools with a Part 141 certificate and pilot examiners and
- better understand the nature and scope of the discretionary, planned inspections for flight instructors.

In responding to our recommendations, FAA officials said that they agreed that improvements in oversight data were needed and indicated that they believe efforts already in existence or under way address our recommendations.

Chairwoman Cantwell, Ranking Member Thune, and Members of the Committee, this completes my written statement.

Contacts and Acknowledgments

If you or your staff have any questions about this testimony, please contact me at (202) 512-2834 or by email at dillinghamg@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this testimony include Keith Cunningham, Assistant Director; Vashun Cole; and Amy Rosewarne.

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