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THE REGULATORY FRAMEWORK

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LEARNING OBJECTIVES

After completing this chapter, you should be able to

- Describe some of the key ICAO developments that helped shape international aviation.
- Identify some of the important results of the Chicago Convention of 1944.
- Describe some of the early federal legislation that helped shape the airline industry in its formative years.
- Discuss some of the factors that led to the passage of the Federal Aviation Act of 1958.

- Identify some of the safety provisions of the FAA Act of 1958.
- Recognize the important legislation that followed airline deregulation in 1978.
- Distinguish between FAR Part 121 and 135 air carriers.
- Discuss the importance of the Colgan Air crash and its aftermath.
- Describe the important features of the Airline Safety and FAA Act of 2010.
- Discuss the evolution of EPA.
- List and discuss major EPA laws that are of importance to aviation operations.
- Discuss the evolution of OSHA.
- List and discuss major OSHA standards that are of importance to aviation operations.

This chapter reviews the development and regulatory framework of the four major safety-related agencies that regulate today's commercial aviation sector. The International Civil Aviation Organization is discussed first, followed by the Federal Aviation Administration next, followed by the Environmental Protection Agency and the Occupational Safety and Health Administration.

THE INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO)

OVERVIEW

The International Civil Aviation Organization is a United Nations specialized agency, which serves as the global forum for international civil aviation. The ICAO was established by the Chicago Conference in December 1944, and was originally known as the Provisional International Civil Aviation Organization (PICAO). It underwent a name change to ICAO in 1947, and Montreal, Canada, became its permanent headquarters. The ICAO's vision as mentioned on its Web site is to achieve "safe, secure, and sustainable development of civil aviation through cooperation amongst its member states." To implement this vision, ICAO has the following strategic objectives for 2005–2010:

- *Safety.* Enhance global civil aviation safety
- *Security.* Enhance global civil aviation security
- *Environmental Protection.* Minimize the adverse effect of global aviation on the environment
- *Efficiency.* Enhance the efficiency of aviation operations
- *Continuity.* Maintain the continuity of aviation operations
- *Rule of Law.* Strengthen law governing international civil aviation

BACKGROUND

The ICAO set forth aims and objectives at the Chicago Convention of 1944 to develop "the principles and techniques of international air navigation and to foster the planning and development of international air transport." These aims and objectives are reproduced from the ICAO Web site from Article 44 of the convention to

- Ensure the safe and orderly growth of international civil aviation throughout the world
- Encourage the arts of aircraft design and operation for peaceful purposes
- Encourage the development of airways, airports, and air navigation facilities for international civil aviation
- Meet the needs of the peoples of the world for safe, regular, efficient, and economical air transport
- Prevent economic waste caused by unreasonable competition
- Ensure that the rights of Contracting States are fully respected and that every Contracting State has a fair opportunity to operate international airlines
- Avoid discrimination between Contracting States
- Promote safety of flight in international air navigation
- Promote generally the development of all aspects of international civil aeronautics

CHRONOLOGY OF KEY ICAO DEVELOPMENTS

The roots of ICAO date back before World War I to a period shortly after the Wright Brothers' historic flight in December 1903. The development of ICAO and its history is well-documented on the ICAO Web site; therefore, only the major milestones will be discussed here.

THE PARIS CONVENTION OF 1910. At the invitation of France, the first important conference to establish an international air law code was convened in Paris in 1910. Eighteen states from Europe attended to begin the long path of this international aviation body.

The Paris Convention of 1919 establishes the International Commission for Air Navigation (ICAN). Of course World War I completely changed the development path of aviation, so it is not surprising that international aviation was on the agenda in Versailles, France, at the proceedings to end the war in 1919. Once again at the invitation of France, the postwar Allied powers convened in Paris to deal with the technical, operational, and organizational aspect of civil aviation. This 1919 Paris Convention was ultimately ratified by 38 states and consisted of 43 articles that served as the major starting point for the regulation of air navigation. This marked the beginning of the International Commission for Air Navigation, which remained headquartered in Paris for the next 25 years.

CONVENTIONS AND REGIONALISM BETWEEN THE WORLD WARS. Although ICAN had great prospects for aviation global development and cooperation, international meetings between the world wars focused on regional, not global issues. These international meetings focused on various political and regional differences with the *Paris Convention* of 1910 (ICAN). Major meetings and their topics during this period are as follows:

- 1926 The Madrid Convention (Equality of States)
- 1927 The Hague Conference (First Air Mail provision)
- 1928 The Havana Convention (Mutual Freedom of Air Passage)
- 1928 The International Civil Aeronautics Conference, Washington, D.C. (Celebration—25 years after Kitty Hawk)
- 1929 Warsaw Convention (International Liability)
- 1937 Pan American Conference—Lima (Final meeting of series of Pan American conferences held in the United States and South America 1916–1937)

THE CHICAGO CONVENTION OF 1944—THE BIRTH OF THE ICAO. Toward the end of World War II, the leaders of the United States and Great Britain began studies of probable postwar civil aviation problems with a view toward promotion of economic development to heal the wounds of war. These studies resulted in U.S. invitations to 55 states to attend an International Civil Aviation Conference in Chicago. One of the goals of this conference was to obtain uniformity in international regulations and standards that was lacking under the split between ICAN and the Havana Convention. Important work was accomplished in the technical field because the Chicago Convention paved the way for a common air navigation system throughout the world. The major accomplishments of the Chicago Convention include the following:

- The Convention on International Civil Aviation provided the basis for a complete modernization of the basic public international law of the air.
- Twelve technical annexes were drafted to cover the technical and operational aspects of international civil aviation such as airworthiness of aircraft, air traffic control, telecommunications, and air navigation services.
- Regions and regional offices were established in specific areas where operating conditional and other relevant parameters were comparable.
- The Provisional International Civil Aviation Organization (PICAO) was established until the permanent ICAO organization came into force in April 1947.
- ICAN was dissolved when the Chicago Convention came into force with ICAO, and the Havana Convention was superceded. At last, the international commu-

THE GROWTH OF ICAO—POST WORLD WAR II DEVELOPMENTS AND NEW CHALLENGES. As aircraft grew in size, speed, and dependability following the war, it was clear that air transportation was quickly becoming a major economic force. Under U.S. leadership, civilian and military aircraft aviation operations were blended into a common system of air navigation and communication procedures. Montreal, Canada, was chosen as the new ICAO headquarters and Dr. Edward Warner of the United States was chosen as ICAO President. He served in this capacity for 10 years.

During this postwar period, several major technical decisions were reached regarding air navigation and communication matters, such as

- The standard aid for aircraft approaches and landing was the Instrument Landing System (ILS).
- The standard short-range navigation aids were chosen as the VHF omnidirectional radio (VOR) supplemented with Distance Measuring Equipment (DME); while standard long-range navigation was chosen as the Long Range Air Navigation (LORAN) radio system.
- VHF voice communication was chosen as the primary means of air to ground communication.
- Air traffic corridors were adopted to ensure safe aircraft separation. This concept would evolve into our modern airway system.
- As the speed of jet aircraft increased, more air traffic cooperation was required between states and ICAO regional offices. Under the new ICAO organization, congested air routes were efficiently managed.

ICAO—FUTURE SAFETY CHALLENGES. Today ICAO has grown to encompass 190 countries on a global basis. At its 37th triennial assembly held in Montreal in October 2010, ICAO has listed the following safety challenges:

- To proactively improve safety in a complex operating environment with a wide range of technologies, from older and latest generation (NextGen) aircraft flying in the same airspace to the progressive introduction of remote-controlled airborne vehicles
- To focus on these regions of the world with the highest level of safety risks

ICAO safety strategy will be based on the following three areas considered by the assembly:

- Transparency and sharing of safety information
- Greater involvement of regional safety organization
- Increased cooperation between regulators and industry stakeholders

THE FEDERAL AVIATION ADMINISTRATION (FAA)

OVERVIEW

The Federal Aviation Administration is a U.S. government agency with primary responsibility for the safety of civil aviation. The FAA was established by the *Federal Aviation Act* of 1958 and was originally known as the Federal Aviation Agency. It underwent a name change (Agency changed to Administration) in 1967 when the FAA became part of the Department of Transportation. The FAA's major roles and responsibilities as stated on its Web site include

- Regulating civil aviation to promote safety
- Encouraging and developing civil aeronautics, including new aviation technology
- Developing and operating a common system of air traffic control (ATC) and navigation for both civil and military aircraft
- Researching and developing the National Airspace System and civil aeronautics
- Developing and carrying out programs to control aircraft noise and other environmental effects of civil aviation
- Regulating U.S. commercial space transportation

BACKGROUND

The FAA is responsible for performing several activities that are in support of its above-mentioned functions. These activities as reproduced from the FAA Web site include

- *Safety regulation.* The FAA issues and enforces regulations and minimum standards covering the manufacture, operation, and maintenance of aircraft. The agency is responsible for the rating and certification of airmen and for certification of airports serving air carriers.
- *Airspace and air traffic management.* The safe and efficient utilization of the navigable airspace is a primary objective of the FAA. The agency operates a network of airport towers, air route traffic control centers, and flight service stations. It develops air traffic rules, assigns the use of airspace, and controls.
- *Air navigation facilities.* The FAA is responsible for the construction and installation of visual and electronic aids to air navigation, and for the maintenance, operation, and quality assurance of these facilities. Other systems maintained in support of air navigation and air traffic control include voice/data communications equipment, radar facilities, computer systems, and visual display equipment at flight service stations.
- *Civil aviation abroad.* The FAA promotes aviation safety and encourages civil

foreign authorities; certifying foreign repair shops, airmen, and mechanics; providing technical aid and training; negotiating bilateral airworthiness agreements; and taking part in international conferences.

- *Commercial space transportation.* The agency regulates and encourages the U.S. commercial space transportation industry. It licenses commercial space launch facilities and private sector launching of space payloads on expendable launch vehicles.
- *Research, engineering, and development.* The FAA does research on and develops the systems and procedures needed for a safe and efficient system of air navigation and air traffic control. The agency supports development of improved aircraft, engines, and equipment. It also does aeromedical research and conducts tests and evaluations of specified items such as aviation systems, devices, materials, and procedures.
- *Other programs.* The FAA provides a system for registering aircraft and recording documents affecting title or interest in aircraft and their components. Among other activities, the agency administers an aviation insurance program; develops specifications for aeronautical charts; and publishes information on airways airport services, and other technical subjects in aeronautics.

CHRONOLOGY OF MAJOR FAA REGULATIONS

The roots of today's aviation safety programs extend back to the early days of commercial aviation following World War I. Many returning pilots bought surplus war aircraft and went into business. These happy-go-lucky barnstormers toured the country, putting on shows and giving rides to local townsfolk. By the mid-1920s, uses of aircraft included advertising, aerial photography, crop dusting, and carrying illegal shipments of liquor during prohibition. Initial efforts to establish scheduled passenger service were short-lived, as service catered primarily to wealthy east coast tourists. This service was expensive compared to the country's well-developed rail and water travel networks.

AIR MAIL SERVICE. Growth of commercial aviation was greatly stimulated by the establishment of the U.S. Air Mail Service in the early 1920s. Regulations established by the Post Office Department required its pilots to be tested and to have at least 500 hours of flying experience. The Post Office set up aircraft inspection and preventive maintenance programs for the pilots. These early regulatory requirements improved air mail carrier safety. In 1924, commercial flyers experienced one fatality every 13,500 miles, while the Air Mail Service had one fatality every 463,000 miles.

In 1925, Congress enacted the *Air Mail Act* of 1925, authorizing the Post Office Department to transfer air mail service to private operators. Twelve carriers, some of which evolved into today's major airlines, began air mail operations in 1926 and 1927. These carriers offered limited passenger service, which was much less profitable than carrying mail. Initially, air mail contractors were paid a percentage

of postage revenues. In 1926, however, an amendment to the Air Mail Act required payment by weight carried. Small independent operators, using Ford and Fokker trimotor airplanes, handled most of the passenger service in the late 1920s, the forerunners of today's commuter airlines and air taxis.

EARLY SAFETY LEGISLATION. No federal safety program existed, which prompted a number of states to pass legislation requiring aircraft licensing and registration. In addition, local governments enacted ordinances regulating flight operations and pilots, creating a patchwork of safety-related requirements and layers of authority. Despite strong industry support for federal legislation, Congress was unable to reach agreement on the scope and substance of a statute until 1926, when the *Air Commerce Act* was passed. Key issues debated by Congress included whether to separate military and civil aviation activities, what responsibilities should be left to state and local governments, and how to provide federal support for airports.

The new law gave the Department of Commerce regulatory authority over commercial aviation and responsibilities aimed at promoting the fledgling industry. The major provisions of the act authorized the regulation of aircraft and pilots in interstate and foreign commerce; provided federal support for charting and lighting airways, maintaining emergency fields, and making weather information available to pilots; authorized aeronautical research and development programs; and provided for the investigation of aviation accidents. Local governments were left with jurisdiction over airport control.

Within the Department of Commerce, a new Aeronautics Branch, comprising existing offices already engaged in aviation activities, was formed to oversee the implementation of the new law. Nine district offices of the Regulatory Division of the Aeronautics Branch were established to conduct inspections and checks of aircraft, pilots, mechanics, and facilities. District offices also shared licensing and certification responsibilities with the Washington, D.C., office. The basic allocation of responsibilities survives to this day, although the Department of Commerce responsibilities now rest with the Department of Transportation (DOT) and its branch, the FAA.

The first set of regulations was drafted with substantial input from aircraft manufacturers, air transport operators, and the insurance industry. Compared with current standards, pilot requirements were minimal. In addition to written and flight tests, transport pilots were required to have 100 hours of solo flight experience, while industrial pilots needed only 50 hours. Current procedures for certifying aircraft and engines also originated under these early regulatory programs. Aircraft manufacturers were required to comply with minimum engineering standards issued by the Department of Commerce in 1927, and one aircraft of each type was subject to flight testing to obtain an airworthiness certificate.

The Aeronautics Branch also collected and analyzed data from aircraft inspection reports, pilot records, and accident investigations. Data were made accessible to the insurance industry, which allowed for the development of actuarial statistics. A direct consequence of this step was a significant reduction in insurance

to promote the aviation industry, was reluctant to make public disclosures about the results of individual accident investigations despite a provision in the Air Commerce Act directing it to do so. Eventually, in 1934, the Air Commerce Act was amended, giving the Secretary of Commerce extensive powers to investigate accidents, including a mandate to issue public reports of its findings. This congressional policy put safety considerations ahead of protecting the industry's image.

As additional regulations to improve safety were implemented, accidents involving passenger carriers and private aircraft decreased significantly. Between 1930 and 1932, the fatality rate per 100 million passenger-miles declined by 50 percent. Updated regulations established more stringent requirements for pilots flying aircraft in scheduled interstate passenger service, including flight-time limitations.

Pilots were restricted to flying 100 hours per month, 1000 hours during any 12-month period, 30 hours for any 7-day period, and 8 hours for any 24-hour period. A 24-hour rest period was also required for every 7-day period. These requirements, which were established in 1934 and are virtually the same today, upgraded earlier restrictions that limited pilots to 110 hours of flight time per month. In addition, a waiver of the 8-hour limitation for a 24-hour period could be granted by the Department of Commerce. The 8-hour waiver rule was ultimately eliminated following a fatal accident involving a pilot who had exceeded 8 hours of flight and pressure from the Air Line Pilots Association.

Other requirements specified the composition of flightcrews, established standards for flight schools, improved takeoff and landing procedures, set minimum flight altitudes and weather restrictions, and required multiengine aircraft to be capable of flying with one inoperative engine. In addition, certification of carriers providing scheduled passenger service in interstate commerce began in 1930.

EARLY ECONOMIC LEGISLATION. During the 1930s, industry expansion and the development of aircraft and communication technologies required continuous improvements of regulations, airways, and airports. However, budget constraints prevented the Department of Commerce from conducting sufficient inspections and keeping up with airway development needs. Moreover, a series of fatal accidents in 1935, 1936, and 1937, including one in New Mexico that killed a New Mexico senator, called into question the adequacy of existing regulations. The fatality rate rose from 4.78 per 100 million passenger-miles in 1935 to 10.1 per 100 million passenger-miles in 1936.

The *Civil Aeronautics Act* of 1938 marked the beginning of economic regulation. It required airlines with or without mail contracts to obtain certificates authorizing service on specified routes if the routes passed a test of public convenience and necessity.

The Civil Aeronautics Act created the *Civil Aeronautics Authority* (CAA), which was responsible for safety programs and economic regulations that included route certificates, airline tariffs, and air mail rates. Within the CAA, a separate Administrator's Office, answering directly to the president, was responsible for civil

airways, navigation facilities, and air traffic control. Increasing air traffic between Newark, Cleveland, and Chicago prompted a group of airlines to establish an air traffic control system in 1934. By 1936, however, the Department of Commerce assumed control of the system and issued new regulations for instrument flight.

However, in June 1940, under the Reorganization Act of 1939, the CAA was transferred back to the Department of Commerce. The *Civil Aeronautics Board* (CAB) was created. The CAB was responsible for regulatory and investigatory matters.

Federal responsibilities for airway and airport development grew tremendously during World War II, leading to passage of the *Federal Airport Act* of 1946. Federal financial assistance to states and municipalities was also initiated at this time. The federal government assumed responsibility for ATC. However, the inspector force could not keep pace with the rapidly increasing numbers of new airplanes, pilots, and aviation-related facilities. As early as 1940, the CAA had designated certain parts of the certification process to industry. For example, flight instructors were permitted to certificate pilots, and a certificated airplane repaired by an approved mechanic could fly for 30 days until it was checked by an available CAA inspector. After the war, the CAA limited its aircraft certification and inspection role to planes, engines, and propellers. Manufacturers were responsible for ensuring that other aircraft parts met CAA standards.

Regulatory and organizational changes also took place during and after the war. Regional offices of the CAA, reduced in number to seven in 1938, became more autonomous in 1945. Regional officials became directly responsible for operations in their regions, although technical standards and policies were still developed in Washington, D.C. Except for a brief return to more centralized management in the late 1950s, regional autonomy with the FAA has persisted to this day.

Fatal crashes in the late 1940s and early 1950s prompted revised standards setting minimum acceptable performance requirements that were designed to ensure continued safe flight and landing in the event of failure of key aircraft components. These standards also distinguished small and large airplanes based on existing airplane and power plant design considerations. Small airplanes were those with a maximum certificated takeoff weight of 12,500 pounds or less; airplanes above 12,500 pounds were defined as large. This distinction is still applied by the FAA today despite significant changes in aircraft design.

INDUSTRY GROWTH AFTER WORLD WAR II. Surplus war transport airplanes and a new supply of pilots led to the development of the nonscheduled operator, or air taxi. Exempt from economic regulation by the Civil Aeronautics Act of 1938, these operators transported people or property over short distances in small airplanes, often to locations not serviced by the certificated airlines. The CAA, at the time sympathetic to private and small operators, applied less-stringent safety regulations to air taxis. In 1952, exemption from economic regulation became permanent, even for carriers using small aircraft to provide scheduled service.

The decade following World War II witnessed enormous industry growth. Pressurized aircraft traveling at greater speeds and carrying more passengers were

introduced. Initially, Lockheed produced the Constellation, which carried 60 passengers and was 70 miles per hour faster than the DC-4. To compete with Lockheed, Douglas developed the DC-6. Subsequently, upgraded versions of each aircraft, the DC-7 and the Super Constellation, were introduced.

In addition to scheduled passenger service, air freight operations expanded when the CAB granted temporary certificates of public convenience and necessity to four all-cargo airlines in 1949. The four carriers were Air News, Flying Tigers, Slick, and U.S. Airlines. Certification and operating rules for commercial operators—those offering air service for compensation or hire—were also adopted in 1949.

However, despite continuing increases in air traffic and the need for better airports to accommodate larger and faster aircraft, federal support for ATC facilities, airport development, and airway modernization was insufficient. The CAA, faced with budget reductions in the early 1950s, was forced to abandon control towers in 18 small cities and numerous communications facilities, postpone jet development and navigation improvements, and curtail research efforts. In addition, the number of CAA regional offices was reduced from seven to four, 13 safety inspection field offices were eliminated, and the industry designee program was expanded.

THE FEDERAL AVIATION AGENCY. The impending introduction of jet aircraft and a 1956 midair collision over the Grand Canyon involving a DC-7 and a Super Constellation helped promote congressional authorization of increased levels of safety-related research and more federal inspectors. In 1958, Congress passed the *Federal Aviation Act*, which established a new aviation organization, the Federal Aviation Agency. Assuming many of the duties and functions of the CAA and the CAB, the agency was responsible for fostering air commerce, regulating safety, all future ATC and navigation systems, and airspace allocation and policy. The CAB was continued as a separate agency responsible for economic regulation and accident investigations. However, the Federal Aviation Agency Administrator was authorized to play an appropriate role in accident investigations. In practice, the Federal Aviation Agency routinely checked into accidents for rule violations, equipment failures, and pilot errors. Moreover, the Civil Aeronautics Board delegated the responsibility to investigate nonfatal accidents involving fixed-wing aircraft weighing less than 12,500 pounds to the Federal Aviation Agency.

The safety provisions of the 1958 act, restating earlier aviation statutes, empowered the Agency to promote flight safety of civil aircraft commerce by prescribing

- Minimum standards for the design, materials, workmanship, construction, and performance of aircraft, aircraft engines, propellers, and appliances.
- Reasonable rules and regulations and minimum standards for inspections, servicing, and overhauls of aircraft, aircraft engines, propellers, and appliances, including equipment and facilities used for such activities. The agency was also authorized to specify the timing and manner of inspections, servicing, and overhauls

and to allow qualified private persons to conduct examinations and make reports in lieu of agency officers and employees.

- Reasonable rules and regulations governing the reserve supply of aircraft, aircraft engines, propellers, appliances, and aircraft fuel and oil, including fuel and oil supplies carried in flight.
- Reasonable rules and regulations for maximum hours or periods of service of pilots and other employees of air carriers.
- Other reasonable rules, regulations, or minimum standards governing other practices, methods, and procedures necessary to provide adequately for national security and safety of air commerce.

In addition, the act explicitly provided for certification of pilots, aircraft, air carriers, air navigation facilities, flying schools, maintenance and repair facilities, and airports. In the years following creation of the agency, federal safety regulations governing training and equipment were strengthened despite intense opposition from industry organizations. The number of staff members also grew in the early 1960s, and inspection activities were stepped up, including en route pilot checks and reviews of carrier maintenance operations and organizations. The FAA staff grew from 30,000 in 1959 to 40,000 in 1961.

In 1966, the Federal Aviation Agency became the *Federal Aviation Administration* (FAA), when it was transferred to the newly formed Department of Transportation (DOT). The *National Transportation Safety Board* (NTSB) was also established to determine and report the cause of transportation accidents and conduct special studies related to safety and accident prevention. Accident investigation responsibilities of the CAB were moved to the NTSB.

Renewed support for improvements to airports, ATC, and navigation systems was also provided by the *Airport and Airway Development Act of 1970*. The act established the Airport and Airway Trust Fund, which was financed in part by taxes imposed on airline tickets and aviation fuel. This act has been reauthorized in subsequent years.

AIRLINE DEREGULATION. Prompted by widespread dissatisfaction with CAB policies and the belief that increased competition would enhance passenger service and reduce commercial airline fares, Congress enacted the *Airline Deregulation Act of 1978*. Congress believed that fares would drop based on the record of intrastate airlines, where fares were 50 to 70 percent of the Civil Aeronautics Board-regulated fares over the same distance. In addition, the Civil Aeronautics Board had already reduced restrictions on fare competition in 1976 and 1977 and allowed more airlines to operate in many city-pair markets.

Specifically, in a 6-year period, the act phased out CAB control over carrier entry and exit, routes, and fares. In 1984, the remaining functions of the CAB were transferred to DOT. These functions include performing carrier fitness evaluations and issuing operating certificates, collecting and disseminating financial

data on carriers, and providing consumer protection against unfair and deceptive practices.

During the 60-year history of federal oversight, federal regulatory and safety surveillance functions have been frequently reorganized and redefined. Moreover, public concerns about how the FAA carries out its basic functions have remained remarkably constant despite a steadily improving aviation safety record.

The *Airport and Airway Improvement Act of 1982* reestablished the operation of the Airport and Airway Trust Fund with a slightly revised schedule of user taxes. The act authorized a new capital grant program, called the Airport Improvement Program (AIP). In basic philosophy, the AIP was similar to the previous Airport Development Aid Program (ADAP). It was intended to support a national system of integrated airports that recognizes the role of large and small airports together in a national air transportation system. Maximized joint use of underutilized, nonstrategic U.S. military fields was also encouraged. The 1982 act also contained a provision to make funds available for noise compatibility planning and to carry out noise compatibility programs as authorized by the *Noise Abatement Act of 1979*.

The *Aviation Safety and Capacity Expansion Act of 1990* authorized a passenger facility charge (PFC) program to provide funds to finance airport-related projects that preserve or enhance safety, capacity, or security; reduce noise from an airport that is part of such a system; or furnish opportunities for enhanced competition between or among air carriers by local imposition of a charge per enplaned passenger. This act also established a Military Airport Program for current and former military airfields, which should help improve the capacity of the national transportation system by enhancement of airport and ATC systems in major metropolitan areas.

COMMERCIAL AVIATION EVOLVES. The Commuter Safety Initiative of 1995 (Commuter Rule). An *air carrier* is a commercial operator or company that has been certificated by the FAA under *FAR Part 121* or *FAR Part 135* to provide air transportation of passengers or cargo. These operators possess operations specifications and an air carrier certificate, which is a document that describes the conditions, authorizations, and limitations under which the air carrier operates.

Before December 14, 1995, FAR Part 121 included the regulations that govern air carriers in multiengine airplanes with more than 30 seats or 7500-pound payload. As authorized by the operations specifications, FAR Part 121 operations can be *domestic air carrier* (scheduled passenger service, generally within the United States), *flag air carrier* (scheduled passenger service in international operations), or *supplemental air carrier* (all cargo and charter operations).

As of December 14, 1995, all airplanes with 10 or more passenger seats and all turbojets operated in scheduled passenger service had to operate under FAR Part 121. Commuter operations with 9 or fewer seats and on-demand air taxi airplanes with 30 or fewer seats and all rotorcraft still operated under FAR Part 135. To operate under FAR Part 121, the aircraft had to meet additional standards involving operational and airplane certification and equipment and performance upgrades.

The Commuter Rule required the regional (commuter) air carriers to comply with nearly all FAR Part 121 operational and safety requirements, just like the large, mainstream airlines. During the years after 1995, the regional air carriers grew rapidly using codeshare agreements with their large airline partners to provide one face to the traveling public. Unfortunately, the regional air carriers did not enjoy the same safety record as the major air carriers as shown by future events.

THE NEW CENTURY. As the FAA began the 21st century, it was quickly apparent that modernization of its organization and infrastructure was required to bring the agency up to date. In April 2000, the *Wendell H. Ford Aviation Investment and Reform Act* for the 21st century had two major provisions. The first created the FAA's Air Traffic Organization (ATO), which provided a new business structure that focused on efficient operation of the air traffic control system under a new ATO Chief Operating Officer. The second major provision of this act set up an FAA Whistleblower Protection Program to protect employees who reported safety problems in the field.

THE NEXT GENERATION AIR TRANSPORTATION SYSTEM (NEXTGEN). In December 2003, this ambitious new law was signed to create an integrated program to improve the FAA air traffic technical infrastructure which was woefully out of date. Among the goals of the NextGen legislation are

- Improve the level of safety, security, efficiency, quality, and affordability of the National Airspace System and aviation services and
- Take advantage of data from emerging ground-based and space-based communications, navigation, and surveillance technologies.

This latter goal emphasizes use of the Department of Defense created Global Positioning System (GPS) cluster of satellites for navigation. NextGen will be more fully discussed in Chapter 8, Air Traffic Safety Systems.

THE COLGAN AIR CRASH AND ITS AFTERMATH. In early 2009, a regional commuter flight from Newark Liberty International Airport to Buffalo crashed while on final approach, causing 50 fatalities (Colgan Air Flight 3407). The details of this accident will be further explored in Chapter 5 entitled Review of Safety Statistics. This single accident has had a profound effect on commercial aviation safety though sweeping new legislation passed in its wake.

The Airline Safety and Federal Aviation Administration Act of 2010 passed August 1, 2010, mandates broad changes in Airline Safety and Pilot Training Improvement. Title II of the Act requires the FAA to issue new regulations in a variety of areas:

- Establishment of a comprehensive FAA Pilot Records database to ensure that airlines have access to all relevant pilot training information.

- Establishment of a special FAA Task Force on Air Carrier Safety and pilot training to evaluate best practices in the industry and provide recommendations.
- High-level review of FAR Part 121 air carriers by the Department of Transportation Inspector General.
- Establishment of a flight crewmember mentoring, professional development, and leadership program to emphasize the highest standards of professional performance with special focus on strict compliance with the "sterile cockpit rule" to eliminate nonessential voice communications between crewmembers during the critical phases of flight.
- A study of aviation industry best practices with regard to flight crewmember pairing, crew resource management, and pilot commuting to and from airline hubs from their place of residence.
- Implementation of specific Colgan crash NTSB remedial training recommendations regarding aircraft stall and recovery training, stick pusher, and weather event training including icing conditions, microburst, and wind shear weather events.
- Establishment of a multidisciplinary panel to recommend best practices in FAR Parts 121 and 135 training methods including initial and recurrent testing requirements for pilots; classroom instruction requirements; the best methods to allow specific academic training courses to be credited toward an Airline Transport Pilot Certification, among other priorities.
- Random, onsite safety inspections of Regional Air Carriers by the FAA at least once each year.
- Special emphasis on combating pilot fatigue through specific limitations on the hours of flight and duty time allowed for pilots. Part 121 air carriers must now submit a "Fatigue Risk Management Plan" and update it every 2 years.
- Bolstering of four industry voluntary safety programs in the following areas:
 - Aviation Safety Action Plan (ASAP)
 - Flight Operational Quality Assurance Program (FOQA)
 - Line Operations Safety Audit (LOSA)
 - Advanced Qualification Program (AQP)
- Specific development and implementation of ASAP and FOQA programs is now required by FAR Part 121 air carriers.
- Safety Management Systems (SMS) are now legislatively required for all FAR Part 121 air carriers. This is indeed a revolutionary change which will have a profound effect on the commercial aviation industry. Under this section of the Act, each carrier's SMS program shall consider ASAP, FOQA, LOSA, and AQP concepts.
- Enhanced Air Transport Pilot (ATP) Certificate requirements. Under the act, all flight crewmembers must hold an ATP certification which is the highest pilot rating available under FAA regulations. This requirement is also a major change for the regional (commuter) airlines which previously allowed a pilot with a

commercial rating to serve as first officer on their aircraft. The Act provides a default clause which requires an ATP certificate for all FAR Part 121 pilots by 3 years from enactment of this Act (July 31, 2013).

The minimum requirements for a pilot to be qualified to receive an ATP are proposed as at least 1500 flight hours and flight training, academic training, or operations experience to

- Function effectively in a multipilot environment
- Function effectively in adverse weather conditions, including icing
- Function effectively during high altitude operations
- Adhere to the highest professional standards
- Function effectively in an air carrier operational environment

An expert panel has been established to assess and recommend credit for specific academic training courses which may enhance safety more than requiring the pilot to fully comply with the 1500 flight hour requirement. The FAA must issue final rules within 3 years of August 1, 2010 to ensure compliance with the sweeping legislation.

THE ENVIRONMENTAL PROTECTION AGENCY (EPA)

OVERVIEW

On December 2, 1970, the *Environmental Protection Agency (EPA)* was established in the executive branch of government as an independent agency pursuant to President Nixon's Reorganization Plan No. 3 of July 9, 1970. The EPA was created to enable coordinated and effective government action on behalf of the environment. The agency strives to abate and control pollution systematically, by integrating a variety of research, monitoring, standard-setting, and enforcement activities. To complement its other activities, EPA coordinates and supports research and antipollution activities by state and local governments, private and public groups, individuals, and educational institutions. The EPA also reinforces efforts among other federal agencies with respect to the impact of their operations on the environment. The EPA is specifically charged with making public its written comments on environmental impact assessment proposals and lobbying against proposal/projects that are unsatisfactory from the standpoint of public health, community welfare, or environmental quality. The EPA's mandate is to serve as the nation's advocate for a quality livable environment.

BACKGROUND

Before the establishment of the EPA there was no single integrated agency to systematically address air, water, and land pollution, an issue that affected the daily lives of every person in the United States. The agencies that existed at that time were segregated primarily along pollution medium domains of air, water, and land. However, these domains are interrelated and

interchangeable and overlap more than one medium. For example, a single source such as a power generating station may pollute the air with smoke and chemicals, the land with solid wastes, and a river or lake with chemical and other wastes. Also, controlling air pollution may produce solid wastes, which then pollute the land or water. Conversely, treating wastewater effluents may generate solid wastes, which must be disposed of on land or burned in an incinerator, which could cause air pollution problems. Finally, some pollutants such as radiation and pesticides can appear in all three media at once. Controlling this multifaceted problem required the coordinated efforts of a variety of separate agencies and departments which often resulted in ineffective regulatory action. Thus, the need to integrate the various departments into a single entity, the EPA, was established. Per the dictates of Reorganization Plan No. 3, the following agencies' functions were consolidated in the Environmental Protection Agency:

- The National Air Pollution Control Administration which resided within the Department of Health, Education, and Welfare.
- The Department of the Interior's Federal Water Quality Administration.
- The Council on Environmental Quality, which has the authority to perform studies relating to ecological systems.
- The Food and Drug Administration's pesticides division, which was part of the Department of Health, Education, and Welfare.
- The Department of the Interior's pesticide studies' division.
- The Department of Agriculture's Research Service group dealing with pesticides registration and related activities.
- The Bureau of Solid Waste Management and the Bureau of Water Hygiene. Also included here were duties carried out by the Bureau of Radiological Health of the Environmental Control Administration, which was part of the Department of Health, Education, and Welfare.
- The Atomic Energy Commission and the Federal Radiation Council's radiation criteria and standards division.

CHRONOLOGY OF MAJOR ENVIRONMENTAL LAWS AFFECTING AVIATION OPERATIONS

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA). The *National Environmental Policy Act* of 1969 was significant in that it was among the first laws to establish a broad national framework for protecting the environment. NEPA's fundamental policy was to make certain that all branches of government gave careful consideration to the environment before any major federal undertaking such as airports, military complexes, highways, parkland purchases, and other federal activities that are proposed. The Act requires *Environmental Assessments (EAs)* and *Environmental Impact Statements (EISs)* on the impact of all major undertakings and alternative courses of action on the environment.

CLEAN AIR ACT (CAA). The *Clean Air Act* of 1970 now 40 years old, regulates air emissions from area, stationary, and mobile sources. By virtue of this law the Environmental Protection Agency is authorized to establish National Ambient Air Quality Standards (NAAQSs) to protect public health and the environment. The goal of the Act was to achieve NAAQSs in every state in the nation by 1975. The Act set upper limits for pollution levels and at the same time required the states to develop specific plans (also called SIPs) for controlling pollution from each industrial pollution source within the state. The act was amended in 1977 to give the states more time to comply with the NAAQS requirements. In 1990, the Clean Air Act was amended again to address special pollution problems of acid rain, ground-level ozone, stratospheric ozone depletion, and air toxics. Sample aviation operations coming under the jurisdiction of this law would include exhaust emissions of smoke from aircraft engines and venting of fuel emissions into the atmosphere.

In recent years, global warming has become a significant issue, and aircraft emissions have become important to the environmental movement. Aircraft are producers of "greenhouse gases," i.e., compounds that trap the sun's heat within the earth's climate. The EPA has existing authority to regulate greenhouse gas emissions under the Clean Air Act, or Congress could address aviation legislation through cap-and-trade or carbon tax proposals. Foreign countries, particularly the European Union, may attempt to control aviation emissions as well. In this era of "green energy" production, aviation greenhouse gas emissions will remain an issue for the foreseeable future.

CLEAN WATER ACT (CWA). First established as the Federal Water Pollution Control Act Amendments of 1972 to address public concerns for controlling water pollution, this act was amended in 1977 and came to be known as the *Clean Water Act*. The Act gave the EPA the authority to implement pollution control programs such as setting wastewater standards for industry and water quality standards for surface waters. Under the Act, it was unlawful for anyone to discharge pollutants into navigable waters, unless a permit was obtained. It also established grants to fund the construction of sewage treatment plants. In 1981 the municipal construction grants process was streamlined, and treatment plants were required to have enhanced capabilities if funded under the program. In 1987 the funding strategy changed to build on the partnerships developed between EPA and the state. This caused the construction grants program to be phased out and replaced with the State Water Pollution Control Revolving Fund, more commonly known as the Clean Water State Revolving Fund.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA). This Act by far is the most far-reaching of all and is of major importance to the aviation industry. By virtue of the RCRA of 1976, the EPA has the authority to control hazardous waste from "cradle to grave." This cradle-to-grave approach governs all phases of the waste from generation and transportation through treatment, storage, and disposal. Hazardous

wastes can be solids, liquids, or contained gaseous materials that could pollute the environment. For the purposes of this regulation, wastes are categorized into two groups: listed wastes and characteristics wastes. Over 400 specific substances are regulated under the "listed" category. Wastes that are ignitable, corrosive, reactive, or toxic are regulated under the "characteristics" category. Sources of hazardous wastes in aviation operations include these:

- Painting, degreasing, and cleaning of aircraft generate paint wastes, phenols, organic solvents, acids, and alkalis
- Plating, stripping, rust prevention, and stain removal generate cyanides, chromium, and other toxic metals
- Spills and leaks from fuel systems and storage tanks generate fuels, oils, and grease
- Spent or leaking batteries from aircraft, ATC tower backup, and other power supply sources generate toxic (lead, lithium, nickel, and cadmium) and reactive (acid) wastes
- Miscellaneous wastes include glycol used for deicing and other detergents

RCRA focuses only on active and future facilities and does not address abandoned or historical sites. Historical and abandoned sites are addressed by CERCLA.

HAZARDOUS AND SOLID WASTE AMENDMENTS (HSWA). The federal *Hazardous and Solid Waste Amendments* of 1984 added major changes to RCRA. These amendments required the phasing out of land disposal of hazardous waste, tightened restrictions on waste recycling and pollutant releases from old abandoned facilities, increased enforcement authority for EPA, and required more stringent hazardous waste management standards. HSWA, under Subtitle I of RCRA, also comprehensively addressed environmental issues of underground storage tanks (USTs) that stored petroleum and other hazardous substances. The greatest potential hazard of USTs is that their contents could leak, seep into the soil, and contaminate groundwater. Leaking USTs can cause fire and explosions in addition to posing other health and environmental risks. HSWA also addressed management of hazardous wastes in aboveground storage tanks and their transportation. In addition, RCRA references the Department of Transportation's Hazardous Materials Transportation Act (HMTA), which governs the packaging, labeling, and transportation of hazardous materials by air, water, rail, or highway. Fuel storage facilities and ramp fueling operations are sample aviation operations governed by this regulation.

TOXIC SUBSTANCES CONTROL ACT (TSCA). In 1976, the *Toxic Substances Control Act* was enacted by Congress to give the EPA the ability to track industrial chemicals produced or imported into the United States and to ban their manufacture and

import if those chemicals pose an unreasonable risk. In addition, EPA incorporated the mandate and infrastructure to track the thousands of new chemicals developed by industry each year that may have unknown or dangerous characteristics. With this ability the EPA could monitor and control these chemicals as needed to protect human health and the environment. TSCA supplements the Clean Air Act and the Toxic Release Inventory under EPCRA. Aircraft manufacturing and assembly processes, discharges, and effluents are controlled by this regulation.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) OR "SUPERFUND." *Comprehensive Environmental Response, Compensation, and Liability Act* of 1980 gave to federal authority broad powers to respond directly to releases or potential releases of hazardous chemicals that posed risks to public health or the environment. The Act established requirements concerning closed and abandoned hazardous waste sites and provided for liability of individuals responsible for contaminating sites with hazardous wastes. The Act also gave EPA the power to seek out the parties that were responsible for the pollution and force them to clean up. Finally, this Act created a tax on the chemical and petroleum industries to generate funds to provide for cleanup when a responsible party could not be identified. Hence this Act is also known as the *Superfund*. This fund generated about \$1.6 billion in its first 5 years of existence and was mainly used to cleanup abandoned hazardous waste sites. Sample applications of this law would be to aircraft burial (retirement) sites and old (discontinued) fuel dumping/storage facilities involving underground fuel storage.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA). As a result of the complex administering requirements of Superfund, changes and additions were made to the program which resulted in the enactment of the *Superfund Amendments and Reauthorization Act* of 1986. Several site-specific amendments, definitions, clarifications, and technical requirements were added to the legislation, including additional enforcement authorities. The size of the fund was increased to \$8.5 billion to pay for cleanup activities around the country. Some of the other salient features of the Act were that it required states to get involved in all phases of the Superfund program, stressed human health concerns posed by hazardous waste sites, and encouraged greater community involvement in the site cleanup decision-making process. Title III of SARA also authorized the *Emergency Planning and Community Right-to-Know Act* (EPCRA) and is discussed next. Most businesses in the United States are affected by SARA Title III.

EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (EPCRA). Also known as Title III of SARA, EPCRA was passed by Congress in 1986. This law was enacted to help local communities protect public health, safety, and the environment from chemical hazards. As required by the Act, each state was required to appoint a state emergency response commission (SERC), divide the state into emergency planning districts, and name a local emergency planning committee (LEPC) for each district.

that were considered essential to managing emergencies. Groups to be given due consideration include firefighters, health officials, government and media representatives, community groups, industrial facilities, and emergency managers. Aircraft rescue and fire fighting (ARFF) and airport fires unrelated to aircraft are governed by this regulation.

THE OIL POLLUTION ACT (OPA). The *Oil Pollution Act* of 1990 was adopted after the Exxon Valdez oil spill and was passed to strengthen EPA's ability to prevent and respond to catastrophic oil spills. A trust fund, financed by a tax on oil, was established to clean up spills when the responsible party was unable or unwilling to do so. Oil storage facilities and transport vessel operators are required to submit detailed plans to the federal government on how they will manage large-scale inadvertent discharges. The EPA also has specific requirements for aboveground storage facilities. This regulation applies to aviation fueling and storage operations. EPA has jurisdiction for inland oil spills and the U.S. Coast Guard responds in coastal waters.

Of course, the Oil Pollution Act became very important to the U.S. Government in the wake of the British Petroleum Oil Rig disaster that occurred in the Gulf of Mexico near the mouth of the Mississippi River in Louisiana on April 20, 2010. The Oil Pollution Act of 1990 provides that the responsible party must pay for oil spill damages, and British Petroleum agreed to establish a \$20 billion trust fund to pay for these damages. The cataclysmic nature of the BP oil spill to the Gulf Coast region will have an impact on subsequent aviation oil spills for years to come. New safety standards for oil production will certainly be forthcoming in the near future.

THE NOISE CONTROL ACT. By virtue of the *Noise Control Act* of 1972, which created the Office of Noise Abatement and Control (ONAC), the EPA was required to submit to the FAA proposed aircraft noise control regulations that promoted and protected public health and welfare. The FAA would then be required to publish the proposed regulations in a notice of proposed rulemaking and invite community comments through public hearings. The *Quiet Communities Act* of 1978 expanded the scope of the Noise Control Act of 1972 to include setting specific decibel limits for civil aircraft; tightening noise emission standards; coordinating federal noise abatement research; working with industry, state, and local regulators to develop consensus standards; and sponsoring research on the effects of noise and abatement strategies. The Act also established a nationwide Quiet Communities Program. The *Aviation Safety and Noise Abatement Act* of 1979 authorized the FAA, under the Airport Improvement Program (AIP), to award noise mitigation and control grants to state and local governments. In 1981, however, Congress, while keeping the Noise Control Act intact, ceased funding for the ONAC. As a result, the EPA was unable to stay on top of its noise abatement and control regulatory effort despite the advancement of relevant science and technology that demonstrated a better understanding on how noise affected people. This led to outdated EPA emission and labeling standards. The *Federal Aviation Reauthorization Act* of 1996

required the FAA to appoint an aviation noise ombudsman to serve as a liaison with the public on issues regarding aircraft noise and to be consulted when the FAA administrator proposed changes in aircraft routes that included flying over populated areas.

Legislative interest in noise abatement and control of aircraft noise resurfaced in the 106th Congress through the introduction of several bills. Three bills of particular interest included the mitigation of noise levels from aircraft flights over national parks, the banning of commercial operation of certain types of supersonic aircraft due to the high noise levels, and the reduction of noise resulting from takeoffs and landings at airports in metropolitan areas. The Reform Act for the 21st century proposed an increase in the amount of funding set aside for noise mitigation from 31 to 34 percent. Public Law 106-81 set aside nearly \$207 million for fiscal year 2000 for AIP noise mitigation. Among other things, this law directed the FAA to develop more stringent aircraft noise standards and develop (with the National Parks Service) air tour management plans for national parks and monuments, to minimize the effects of aircraft noise on the natural environment. In addition to the above legislation, a bill has been introduced to reestablish EPA's Office of Noise Abatement and Control and support its activities with an annual funding of \$21 million for fiscal years 2000 through 2004. The important functions of this reestablished office would be to provide states and local communities with technical assistance and grants to develop noise control programs and to fund research on the health effects of noise on humans.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OVERVIEW

The *Occupational Safety and Health Administration Act* (OSHA Act) was signed into law by President Nixon on January 29, 1970 (took effect April 28, 1971), to ensure safe and healthful working conditions for working men and women. This was to be accomplished by authorizing enforcement of the standards developed under the Act, assisting and encouraging the states in their efforts to ensure safe and healthful working conditions, and providing for research, information, education, and training in the field of occupational safety and health. The Act established the Occupational Safety and Health Administration, the regulatory body that promulgates and enforces safety and health regulations in the United States. The Act also created the *National Institute for Occupational Safety and Health* (NIOSH) and the *Occupational Safety and Health Review Commission* (OSHRC). NIOSH is responsible for conducting research and making recommendations for the prevention of work-related disease and injury. The function of the OSHRC, which is comprised of three judges appointed by the President and confirmed by the Senate, is to resolve disputes between OSHA and

OSHA were created by the same Act of Congress, they are two distinct agencies with separate responsibilities. NIOSH is in the U.S. Department of Health and Human Services and is a research agency. OSHA is in the U.S. Department of Labor and is responsible for creating and enforcing workplace safety and health regulations. NIOSH and OSHA often work together toward the common goal of protecting worker safety and health.

The OSHA Act covers all employers and employees who do business in the United States except workplaces already protected by other federal agencies under other federal statutes. This means that OSHA's jurisdiction does not extend into the aircraft, but would apply to all ground, ramp, and airport operations. While state and federal agencies are not covered by the Act, Order 3900.19B requires the FAA to establish and maintain an agencywide occupational safety and health program that is consistent with the OSHA Act of 1970. In a separate agreement, OSHA and FAA signed a *memorandum of understanding* (MOU) on August 7, 2000, in which they pledge to work together to improve the working conditions of flight attendants while aircraft are in operation. By virtue of this MOU, a joint FAA/OSHA team will review the application of OSHA standards to flight attendant safety and health on issues of recordkeeping, bloodborne pathogens, noise, sanitation, hazard communication, and access to employee exposure and medical records. The team will also address whistleblower protections. FAA will issue a new policy statement and request public comment on the team's recommendations. OSHA, for its part, will consult with the FAA before proposing a standard that could compromise aviation safety. Under the MOU, OSHA will continue to enforce its standards for other aviation industry employees, such as maintenance and ground support personnel, while the FAA will continue to cover the flight deck crew, pilots, and copilots.

BACKGROUND

Before OSHA was established, the responsibility for occupational safety and health rested mainly with individual states. Regulations and enforcement were sporadic, varied by state, and were ineffective for the most part. The few federal laws that did exist at that time were limited in scope and application. For example, the *Walsh-Healey Public Contract Act of 1936*, the forerunner of the OSHA Act, applied only to federal contracts in excess of \$10,000. The industrial sector was rampant with exposures ranging from exposed equipment and unguarded moving parts that maimed or killed workers to electrocutions and blocked/locked exits that trapped individuals during emergencies. Most notable of all was New York City's Triangle Factory fire of 1911 that killed 146 textile workers as they were prevented from escaping because of exits that had been locked to prevent theft. The Pittsburgh Survey of 1907, a one-year study of industrial accidents in Allegheny County, Pennsylvania, found that there were almost two deaths for each day of the entire year of the study. The above are two of the many commonly cited examples that mobilized the nation to call for federal intervention to protect citizens in the workplace. Common law doctrine and lack of any worker's compensation laws left

few incentives for employers to improve working conditions as survivors and/or their families had the burden of carrying medical costs and losses due to wages. As a result of this failed system, the annual occupational death rate leading up to the Act reached 14,300 with disabling injuries totaling 2.2 million.

CHRONOLOGY OF MAJOR OSHA STANDARDS AFFECTING AVIATION OPERATIONS

During OSHA's 40-year history, the agency has helped to save many thousands of lives and reduce occupational injury and illness rates by more than half. OSHA's regulatory development and enforcement process has been credited with this feat. What follows is an aviation-related subset of OSHA's regulations that were promulgated over the past 40 years to improve working conditions for employees in the United States.

- **May 29, 1971.** Comprehensive standards were first adopted to provide a baseline for safety and health protection in occupational environments. A majority of standards were incorporated from other standard-setting organizations such as the American National Standards Institute (ANSI), National Fire Protection Agency (NFPA), and American Conference of Governmental Industrial Hygienists (ACGIH). All private sector employees are covered by the OSHA Act. Sample aviation operations that are regulated include aircraft manufacturing and assembly, hangar and other maintenance shop operations, painting and stripping, ramp and flight line operations, baggage handling, cleaning crew activities, and airport operations.
- **November 14, 1978.** The lead standard was introduced to protect workers from occupational exposure to lead, an element that is known to cause damage to human nervous, urinary, and reproductive systems. It was estimated that about 835,000 workers were exposed to lead in its various forms and that this standard would reduce lead exposure risk by 75 percent. Aviation applications of this standard include battery maintenance and aircraft painting and stripping.
- **May 23, 1980.** By virtue of the medical and exposure records standard being finalized, workers and OSHA would be able to access employer-maintained medical and toxic exposure records. Records may include, but are not limited to, personal and area exposure monitoring, baseline measurements, preplacement physicals, and postexposure testing. This regulation would apply to baseline monitoring and audiometric testing for noise exposures for ramp operators and manufacturing and assembly workers, and testing for blood and other potentially infectious material (OPIM) exposures for flight attendants and aircraft cleaning crew.
- **September 12, 1980.** The fire protection standard was updated to include specific procedures for fire brigades that were responsible for extinguishing major workplace fires. Typical applications in aviation would be aircraft manufacturing

are stored; where welding and brazing operations occur; and where testing and maintenance of sprinkler systems are required.

- **January 16, 1981.** The electrical standards were updated to make compliance easier and adopt a performance-based approach. These standards apply to most businesses. Applications in aviation would include aircraft manufacturing and assembly, and hangar and other maintenance shop activities.
- **November 25, 1983.** The hazard communication standard was passed to require information, training, and labeling of toxic materials handled by employers and employees. Any employee who has the potential of coming in contact with a chemical used at the workplace must be trained in its safe use, handling, and decontamination procedures, if exposed to the chemical. All chemicals must have a material safety data sheet (MSDS) on site within easy access, and all containers must be labeled with their contents. Aviation applications would include aircraft manufacturing and assembly jobs, cleaning crew tasks, and hangar and other maintenance shop activities.
- **March 6, 1989.** The hazardous waste operations and emergency response standard (HAZWOPER) was promulgated to protect 1.75 million public and private sector workers exposed to toxic wastes from spills or at hazardous waste sites. Aircraft refueling, battery maintenance and disposal, deicing operations, and manufacturing process discharges are covered by this standard.
- **September 1, 1989.** The control of hazardous energy sources standard, also known as the *lockout/tagout* (LOTO) standard, was promulgated to protect workers (especially during maintenance) from unexpected energizing or start-up of equipment. It was estimated that by implementing this standard 120 deaths and 50,000 injuries would be prevented annually. Individuals who maintain baggage and cargo handling equipment and manufacturing and assembly equipment are covered by this standard.
- **December 6, 1991.** The bloodborne pathogens standard was introduced to prevent occupational exposure to AIDS, hepatitis B, and other infectious diseases. Flight attendants, the members of the go-team, baggage and cargo handlers, aircraft cleanup crew, and high-exposure-potential manufacturing and assembly jobs are covered by this standard. At the very least, employees in these positions require basic training on exposure prevention to blood and other potentially infectious material (OPIM).
- **January 14, 1993.** The confined spaces (and permit-required confined spaces) standard was promulgated to prevent more than 50 deaths and more than 5000 serious injuries annually. Employees who perform maintenance and fabrication work in elevators, bulkheads, and cargo holds are covered by this standard. Manufacturing facilities requiring employees to enter and work in spaces that have a limited means of entry, can engulf the employee, and are not designed for normal continuous work are covered by this standard.
- **November 6, 2000.** The Needlestick Safety and Prevention Act required OSHA to revise its Bloodborne Pathogens standard to include new exposure control

plans, an injury log, and safer medical devices to protect employees from inadvertent injury from sharp objects.

- *November 14, 2000.* The ergonomics program standard was initiated to prevent a painful and debilitating category of musculoskeletal injuries that affect more than 102 million workers. These injuries develop from jobs requiring excessive repetitive motion and/or high forceful applications and/or awkward postures. Sample aviation jobs that could lead to repetitive-motion injuries are those performed by flight attendants, baggage handlers, data entry personnel, and aircraft assembly workers. Although this standard was repealed by Congress in March 2001, OSHA's "Effective Ergonomic Strategies for Success" program remains viable in today's workplace.

KEY TERMS

International Civil Aviation Organization (ICAO)
 Provisional International Civil Aviation Organization (PICAO)
 Chicago Convention of 1944
 Paris Convention of 1910 and 1919
 International Commission for Air Navigation (ICAN)
 The Havana Convention of 1928
 Next Generation Air Transportation System (NextGen)
 Air carrier
 Air Mail Act of 1925
 Air Commerce Act of 1926
 Air taxi operators
 Civil Aeronautics Act of 1938
 Civil Aeronautics Board (CAB)
 Federal Airport Act of 1946
 Federal Aviation Act of 1958
 Federal Aviation Administration (FAA)
 Department of Transportation (DOT)
 National Transportation Safety Board (NTSB)
 Airport and Airway Development Act of 1970
 Airline Deregulation Act of 1978
 Airport and Airway Improvement Act of 1982

Commuter Safety Initiative of 1995 (Commuter Rule)
 FAR Part 119
 FAR Part 121
 FAR Part 135
 Domestic air carrier
 Flag air carrier
 Supplemental air carrier
 Commuter air carrier
 Regional air carrier (Commuter)
 Wendell H. Ford Aviation Investment and Reform Act for the 21st Century
 FAA Air Traffic Organization (ATO)
 Global Positioning System (GPS)
 Airline Safety and Federal Aviation Administration Act of 2010
 Aviation Safety Action Plan (ASAP)
 Flight Operational Quality Assurance Program (FOQA)
 Line Operations Safety Audit (LOSA)
 Advanced Qualification Program (AQP)
 Safety Management Systems (SMS)
 Air Transport Pilot (ATP)
 National Environmental Policy Act
 Clean Air Act (CAA)
 Clean Water Act (CWA)
 Resource Conservation and Recovery Act (RCRA)
 Hazardous and Solid Waste Amendments (HSWA)
 Toxic Substances Control Act (TSCA)
 Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
 Superfund Amendments and Reauthorization Act (SARA)
 Emergency Planning and Community Right-to-Know Act (EPCRA)
 Oil Pollution Act
 Noise Control Act
 OSHA the Agency
 National Institute for Occupational Safety and Health (NIOSH)
 Occupational Safety and Health Review Commission (OSHRC)
 Needlestick Safety and Prevention Act

REVIEW QUESTIONS

1. List three strategic objectives of ICAO and discuss their importance in international aviation.
2. Discuss the significance of The Paris Convention of 1919.
3. What were the important accomplishments of the Chicago Convention of 1944?
4. List three major functions of the FAA and discuss some of the activities that support these functions.
5. What was the significance of the Air Mail Act of 1925?
6. Describe the major provisions of the Air Commerce Act of 1926, and discuss the role of the aeronautics branch.
7. Distinguish between the Civil Aeronautics Authority (CAA) and the Civil Aeronautics Board (CAB).
8. Discuss some of the factors that led to the passage of the Federal Aviation Act of 1958, and identify several of the safety provisions of this Act.
9. What was the primary reason for the passage of the Airline Deregulation Act of 1978?
10. Describe the major provisions of the Airline Safety and Federal Aviation Administration Act of 2010.
11. List the four industry voluntary safety programs described in the Airline Safety and FAA Act of 2010.
12. Explain the evolution of the EPA.
13. Highlight the major environmental acts relevant to aviation, giving examples of each.
14. Explain the evolution of OSHA.
15. Discuss the major OSHA acts that are relevant to aviation, giving examples of each.

REFERENCES

- Briddon, Arnold E., Ellmore A. Champie, and Peter A. Marraine. 1974. *FAA Historical Fact Book: A Chronology 1926–1971*. DOT/FAA. Washington, D.C.: U.S. Government Printing Office.
- Davies, R. E. G. 1972. *Airlines of the United States Since 1914*. Washington, D.C.: Smithsonian Institution Press.
- Freer, Duane W. 1986. Chicago Conference (1944)—Despite uncertainty, the spirit of internationalism soars. *ICAO Bulletin*, 41(9), 32–33.
- Jenkins, Darryl (ed.). 1995. ALPA's One Level of Safety (Chapter 73). *Handbook of Airline Economics*. New York: McGraw-Hill.
- Komons, Nick A. 1978. *Bonfires to Beacons*. DOT/FAA. Washington, D.C.: U.S. Government Printing

- Krieger, G. R., and J. F. Montgomery. 1997. *Accident Prevention Manual for Business and Industry—Engineering and Technology*, 11th ed. Itasca, Ill.: National Safety Council.
- McCarthy, James E. 2020. *Aviation and Climate Change*. Washington, D.C.: Congressional Research Service.
- Rochester, Stuart I. 1976. *Takeoff at Mid-Century: Federal Aviation Policy in the Eisenhower Years, 1953–1961*. Washington, D.C.: U.S. Government Printing Office.
- U.S. Congress, Office of Technology Assessment. 1988. *Safe Skies for Tomorrow: Aviation Safety in a Competitive Environment*, OTA-SET-38. Washington, D.C.: U.S. Government Printing Office.
- Wells, Alexander T. 2003. *Air Transportation: A Management Perspective*, 5th ed. Belmont, Calif.: Wadsworth Publishing Company.
- . 2004. *Airport Planning and Management*, 5th ed. New York: McGraw-Hill.
- Wilson, John R. M. 1979. *Turbulence Aloft: The Civil Aeronautics Administration amid Wars and Rumors of Wars, 1938–1953*. DOT/FAA. Washington, D.C.: U.S. Government Printing Office.

WEB REFERENCES

- <http://www.icao.int/>
<http://www.faa.gov/>
<http://www.epa.gov/>
<http://www.osha.gov/>