In the Beginning...
The Federal Aviation Administration: A Historical Perspective, 1903-2008

By Theresa L. Kraus
1911, Henry Atwood flies over the White House
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1927, the agency acquired a De Havilland DH4B, a former mail plane. Left: William P McCracken, Jr. Assistant Secretary of Commerce for Aeronautics. Right: Clarence Young, Deputy Assistant Secretary of Commerce for Aeronautics.
Bessie Coleman, one of the first African American pilots.
Author's Preface

I am grateful that I had the opportunity to contribute, in a small way, to the celebration of FAA's fiftieth anniversary. In its short history, the agency has faced a number of challenges such as global security threats, a need for greater capacity, an aging airspace system infrastructure, union unrest, aircraft and system safety concerns, and environmental issues. No matter the challenge, however, the men and the women of the FAA have always kept the system safe for the flying public. Their dedication and hard work have made the FAA into what it is today — a strong agency proud of its heritage and ready and willing to confront any future challenges. Our legacy is one of safety, efficiency, and global leadership; a tradition we will carry into the future.

I would like to thank the approximately 48,000 FAA employees who work 24/7 to ensure the U.S. national aerospace system remains the best in the world. They are the inspiration for this work.

It is important to recognize Dr. Wilson Felder, Gerald Lavey, Kerry Long, and James Whitlow — FAA executives who proposed this work and provided invaluable support and encouragement. They are true champions of the FAA and saw the need to document its history. I am also grateful to my managers, Victoria Cox, Barry Scott, and Dr. Paul Krois, who allowed me time away from my regular duties in the Air Traffic Organization’s Operations Planning office to prepare this history. I also want to thank FAA’s lines of business, Air Traffic Organization, Aviation Safety, Airports, and Commercial Space for providing the resources to publish this work.

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And, last, but not least, thanks to my father, Walter L. Kraus, a career Air Force historian who will always be my role model, and to my husband, John Henry King, whose encouragement and support knows no bounds.

Theresa L. Kraus, Ph.D.
One of the first airmail pilots, Jack Knight
In 1903 Orville and Wilbur Wright made the first powered flight. These two brothers from Ohio used experimentation, exacting science, and perseverance to achieve their historic breakthrough. Their twelve-second flight on December 17 led to the development of the first practical airplane in 1905 and launched worldwide efforts to build better flying machines.

The early twentieth century witnessed myriad aviation developments as new planes and technologies entered service and early pilots, male and female, pushed one another to set, and then break, a host of aviation records for speed, flight duration, and aerobatics. During World War I, the airplane also proved its effectiveness as a military tool and, with the advent of early airmail service, congressionally authorized in 1918, it showed great promise for commercial applications.

Still, despite limited postwar technical developments, early aviation remained a dangerous business — the realm of daredevils. Flying conditions proved difficult since the only navigation devices available to most pilots were magnetic compasses. They flew 200 to 500 feet above ground so they could navigate by roads and railways. Low visibility and night landings were made using bonfires on the field as lighting. Fatal accidents were routine.

Realizing the need for better navigational tools for its airmail pilots, in 1921 the Post Office Department installed ten radio stations along the New York-San Francisco air route to transmit weather forecasts. Two years later, the department began work on a transcontinental airway of beacons placed on towers. Spaced ten miles apart, the beacons were bright enough to be seen for 40 miles in clear weather.

The Air Mail Act of 1925 authorized the Post Office Department to contract with airlines to carry the mail. This legislation facilitated the creation of a profitable commercial airline industry, and airline companies such as Pan American Airways, Western Air Express, and Ford Air Transport Service began commercial passenger service. The postmaster general used his influence to encourage the manufacture of passenger aircraft, rather than cargo aircraft, to carry mail. By the mid-1930s, his work helped to create the four major domestic airlines that dominated commercial travel for most of the twentieth century: United, American, Eastern, and Transcontinental and Western Air. He also proved instrumental in giving Pan American a monopoly on international routes.
Early Air Carriers

April 15, 1926: Charles Lindbergh, Robertson Aircraft Corporation’s chief pilot, flew a bag of mail in a De Havilland DH-4 biplane from Chicago to St. Louis. This flight is regarded as the first regularly scheduled flight of what was to become American Airlines. On January 25, 1930, four holding companies (Universal Aviation Corporation, Colonial Airways, Incorporated, Aviation Corporation, and Southern Air Transport, Incorporated) were consolidated into American Airways, the immediate forerunner of today’s American Airlines.

June 2, 1927: Juan Trippe formed Aviation Corporation of America. Atlantic, Gulf, and Caribbean Airways formed on October 11, 1927, and several army officers, including Major Henry H. “Hap” Arnold, founded Pan American Airways. On June 23, 1928, the three airlines merged into the Aviation Corporation of America with Pan American Airways as the main operating subsidy.


September 15, 1927: Pitcairn Aviation was created. Clement Keys bought the airline in early 1929 and then sold it to North American Aviation, a holding company for a number of airline and aircraft companies of which he was a major shareholder. On January 17, 1930, Pitcairn’s name was changed to Eastern Air Transport, which ultimately became Eastern Airlines.

May 18, 1929: Transcontinental Air Transport was formed. On July 24, 1930, Transcontinental merged with Western Air Express to create Transcontinental and Western Airlines, which later became Trans World Airlines (TWA).
As air travel increased, some airport operators, hoping to improve safety, began providing an early form of air traffic control (ATC) based on visual signals. Early controllers stood on the field and waved flags to communicate with pilots. Archie League, one of the system’s first flagmen, began work in the late 1920s at the airfield in St. Louis, Missouri.

Leaders of the fledgling aviation industry believed the airplane could not reach its full commercial potential without federal action to improve and maintain safety standards. At their urging, President Calvin Coolidge signed the Air Commerce Act in 1926. This landmark legislation charged the Secretary of Commerce with fostering air commerce, issuing and enforcing air traffic rules, licensing pilots, certifying aircraft, establishing airways, and operating and maintaining aids to air navigation.

A new Aeronautics Branch in the Department of Commerce assumed primary responsibility for aviation oversight. William P. MacCracken, Jr., who played a key role in convincing Congress of the need for this new governmental role, became the first head of the Aeronautics Branch. In fulfilling his new responsibilities, MacCracken initially concentrated on safety rulemaking and the certification of pilots and aircraft. His organization took over the building and operation of the nation’s system of lighted airways, a task begun by the Post Office Department. The Department of Commerce also worked to improve aeronautical radio communications and introduced radio beacons as an effective aid to air navigation.

As more aircraft were fitted for radio communication, radio-equipped airport traffic control towers began to replace the flagmen. In 1930 the first radio-equipped control tower in the United States began operating at the Cleveland Municipal Airport.
In 1934 the Department of Commerce renamed the Aeronautics Branch the Bureau of Air Commerce to reflect the growing importance of aviation to the nation. In one of its first acts, the bureau encouraged a group of airlines to establish the first air traffic control centers (Newark, New Jersey; Cleveland, Ohio; and Chicago, Illinois) for providing en route air traffic control. In 1936 the bureau took over the centers and began to expand the ATC system.

When the bureau assumed control of the centers, it hired fifteen employees to become the original federal corps of airway controllers. These pioneer controllers tracked the position of planes using maps and blackboards and little boat-shaped weights that came to be called “shrimp boats.” The bureau personnel had no direct radio link with aircraft, but used telephones to stay in touch with airline dispatchers, airway radio operators, and airport traffic controllers. Although en route ATC became a federal responsibility, local government authorities continued to operate airport towers.

While the Department of Commerce worked to issue civil air regulations to improve aviation safety, a number of high profile accidents called the department’s oversight responsibilities into question. The 1931 crash of a Transcontinental and Western Air Fokker trimotor airplane that killed all on board, including popular University of Notre Dame football coach Knute Rockne, elicited public calls for greater federal oversight of aviation safety. Four years later a DC-2, also flown by Transcontinental and Western Air, crashed and killed U.S. Senator Bronson Cutting of New Mexico. While the report for the second tragedy placed most of the blame on the airline, a congressional investigation highlighted problems with the bureau’s procedures and navigation aids.

Members of Congress believed the bureau worked too closely with the commercial airlines and aircraft manufacturers to be objective when investigating accidents. These critics pointed out that bureau employees divided their time promoting commerce through aviation and investigating the causes of accidents. To ensure a focus on aviation safety, President Franklin Roosevelt signed the Civil Aeronautics Act in 1938. The legislation established the independent Civil Aeronautics Authority (CAA), with a three-member Air Safety Board that would conduct accident investigations and recommend ways of preventing accidents back to the main body. The legislation also expanded the government’s role in civil aviation by giving CAA power to regulate airline fares and determine the routes individual carriers served.

In 1940 President Roosevelt split the CAA into two agencies, the Civil Aeronautics Administration,
which went back to the Department of Commerce, and the Civil Aeronautics Board (CAB). The offshoot of the original CAA retained responsibility for ATC, airman and aircraft certification, safety enforcement, and airway development. CAB responsibilities included safety rulemaking, accident investigation, and economic regulation of the airlines.

On the eve of America’s entry into World War II, CAA began to extend its responsibilities to takeoff and landing operations at airports. For defense purposes, CAA extended its air traffic control system to include operation of airport towers. In the postwar era, ATC became a permanent federal responsibility at most airports.

In 1944 a CAA national airport plan sparked congressional interest in postwar airport needs. As a result, Congress passed the Federal Airport Act, signed on May 13, 1946, by President Harry Truman. The act, the first peacetime program of financial assistance aimed exclusively at promoting development of the nation’s civil airports, provided for $500 million in grants for airport projects paid over seven years.

World War II brought significant technical advances to aviation. The development of radar during World War II, for example, led to the use of this new technology to help in air traffic control. In 1946 the CAA unveiled an experimental radar-equipped tower for control of civil flights. By 1948 transponder-based distance measuring equipment was co-located with the very high frequency omnidirectional range (VOR) station to provide range information for the VOR. The agency installed airport surveillance radars at a number of airports in the mid-1950s, having begun its first routine use of radar for approach and departure control in 1952. New technologies also allowed CAA to begin consolidating some airport traffic control towers at smaller airports with airway communication stations, the forerunners of today’s flight service stations.
The postwar era witnessed the advent of commercial jets. The British Overseas Aircraft Corporation introduced the first commercial jet service on May 2, 1952, with the 36-seat Comet that flew at 480 miles per hour. The top cruising speed of the DC-3 piston aircraft, in comparison, was about 180 miles per hour. The Comet had a number of high profile accidents and did not remain in service. By the mid-1950s, however, U.S. companies began designing and building their own jet airliners.

**FAA DC-3**

The DC-3 first flew in 1935 and quickly became the workhorse of the U.S. commercial fleet. By 1939 about 75 percent of all air travelers flew on DC-3s. During World War II many DC-3s were converted into C-47s for military service, and Douglas Aircraft Company manufactured approximately 10,000 additional aircraft as C-47s (or variants) for the military. Less than 600 of the aircraft actually started down the production line as DC-3 airliners. After the war, a large number of surplus C-47s joined the commercial fleet, and FAA acquired a number of them for flight inspection work. Although no longer conducting inspections of navigation aids, FAA still owns a DC-3, built in 1945, which it uses for educational programs and to promote FAA history. The aircraft is kept at the FAA Mike Monroney Aeronautical Center in Oklahoma City, Oklahoma.

In 1956 CAA convened a “jet age” symposium as an initial step toward planning for the introduction of jets in civil operations. It subsequently established a Jet Age Planning Group to work with industry and government on potential civil jet transport problems.

The same year, the Legal and Monetary Affairs Subcommittee of the House Committee on Government Operations began extensive hearings on the federal role in aviation. The hearings centered on the adequacy of the federal-aid airport program, problems in air traffic control and with air navigational aids, the introduction of commercial jets, the operational efficiency of CAA, and the problem of joint military and civil use of airports, a significant concern at the time.

While public debate on civil aviation continued, a major accident spurred calls for changes to federal aviation regulations. On June 30, 1956, a Trans World Airlines Super Constellation and a United Air Lines DC-7 collided over the Grand Canyon, Arizona, killing all 128 occupants of the two airplanes. The collision occurred while the aircraft were flying under visual flight rules (VFR) in uncongested
airspace. The accident dramatized the fact that, even though U.S. air traffic had more than doubled since the end of World War II, little had been done to mitigate the risk of midair collisions.

In fact, sixty-five such collisions had occurred in the United States between 1950 and 1955. This was partly because the ATC system did not have the ability to segregate VFR traffic from instrument flight rules (IFR) traffic, or slow-moving flights from faster ones. Many experts recognized a need to institute a form of positive control that would require instrument flight over certain portions of the airspace. In the wake of mounting public pressure, Congress opened hearings to probe the general problems of airspace and air traffic control management.

As a result of the Grand Canyon collision, President Eisenhower signed the Airways Modernization Act in August 1957. The act established an interim organization, the Airways Modernization Board, and charged it with the development and modernization of the national system of navigation and air traffic control facilities that would serve the current and future needs of civil and military aviation. The board was to select the systems, procedures, and devices necessary to promote maximum coordination of air traffic control and air defense systems. The three-member board comprised a chairman, appointed by the president with the advice and consent of the U.S. Senate, the Secretary of Defense, and the Secretary of Commerce. The law mandated the disestablishment of the Airways Modernization Board on June 30, 1960, and called for the establishment of an independent aviation authority once the board was dissolved.

On May 21, 1958, Senator A. S. “Mike” Monroney (D-OK) introduced S 3880, a bill to create an independent Federal Aviation Agency to provide for the safe and efficient use of national airspace by both civil and military operations, and to provide for the regulation and promotion of civil aviation in such a manner as best would foster its development and safety. The following day, 33 senators joined Monroney as sponsors of the bill, and Representative Oren Harris (D-AR) introduced the same bill as HR 12616. In a message to Congress on June 13, President Eisenhower recommended early enactment of legislation to consolidate all essential management functions necessary to support the common needs of civil and military aviation.
The new FAA opens for business
Chapter 2: Birth of FAA

The approaching introduction of jet airliners and a series of midair collisions spurred passage of the Federal Aviation Act on August 23, 1958. Taking a comprehensive approach to the federal role in fostering and regulating civil aeronautics and air commerce, the new law repealed the Air Commerce Act of 1926, the Civil Aeronautics Act of 1938, the Airways Modernization Act of 1957, and those portions of various presidential plans dealing with civil aviation. The legislation assigned the functions exercised under these repealed laws to two independent agencies — a new Federal Aviation Agency (FAA) and a Civil Aeronautics Board (CAB).

Although FAA technically came into existence with the passage of the act, the new agency actually assumed its functions in stages. Under the provisions of the act, FAA would begin operations 60 days after the appointment of the first FAA Administrator. On November 1, 1958, retired Air Force General ELWOOD “PETE” QUESADA [TERM: 11/01/58 – 01/20/60] became the first FAA Administrator. On December 31, 1958, FAA began operations. It inherited the organization and functions of the Civil Aeronautics Authority as well as those of the National Aviation Facilities Experimental Center in Atlantic City, New Jersey, formerly operated by the Airways Modernization Board. Upon becoming the first administrator of the agency that he had helped to create as Eisenhower’s principal advisor on aeronautics, Quesada worked quickly to organize the new FAA and to mediate the growing conflict between those advocating military control of the airspace and those advocating civil airspace control.

Agency Order 1, issued on January 15, 1959, established FAA’s basic organizational structure. Three staff offices headed by assistant administrators for management services, personnel and training, and plans and requirements (shortened to “plans” on July 10, 1960) assisted the administrator and his deputy. Other staff officials reporting to the administrator included the general counsel, the civil air surgeon, and the heads of the offices of public affairs, congressional liaison, and international coordination. Four bureau directors ran the agency’s major programs: research and development (testing and development of new
equipment); flight standards (certification of airmen, aircraft, and air carriers); air traffic management (planning and operation of the airspace system); and facilities (acquisition and maintenance of air navigation facilities and related equipment).

FAA's initial field structure retained the Civil Aeronautics Administration's system of six numbered regions headed by regional directors reporting to the agency administrator. Three large field facilities were exempt from regional control: the National Aviation Facilities Experimental Center; the Aeronautical Center in Oklahoma City, Oklahoma; and Washington National Airport outside of Washington, DC.

With the new agency's organizational structure in place, the administrator mounted a vigorous campaign to improve aviation safety. The fledgling agency faced an enormous task in updating decades-old safety standards that covered flight operations, maintenance procedures, and physical and proficiency requirements for pilots. In March 1959 Administrator Quesada announced plans for a concentrated aviation safety drive.

The following month, understanding that technology would help to improve safety, Quesada announced a contract award for the development of an air height surveillance radar. This new technology would automatically provide air traffic controllers with information on aircraft altitudes up to a range of 50 nautical miles. Shortly thereafter, FAA commissioned UNIVAC file computers for air traffic control use at the New York and Washington air route traffic control centers (ARTCCs). The agency later installed additional computers at the Pittsburgh, Cleveland, and Boston ARTCCs. Controllers used these computers to prepare flight progress strips, exchange information with one another, and aid them in their routine “bookkeeping chores.”

To aid in the control of civil and military air traffic, Quesada also put into operation, in the New York area, a 64-code air traffic control radar beacon system that became known as secondary radar. A descendant of the World War II IFF (identification, friend, or foe), the new equipment reinforced primary radar signals and permitted positive identification of individual aircraft carrying transponders. By May 1960, 20 radar beacons were in operation at 16 ARTCCs.
In April 1960 FAA announced a contract award totaling nearly $6 million for advanced experimentation on automated air traffic control. This award went to the MITRE Corporation, a research institution recently created by the Massachusetts Institute of Technology (MIT) Lincoln Laboratories to facilitate work across traditional military, industry, and academia boundaries. Work performed under the contract included research and experimentation on joint use of military equipment and facilities for air traffic control, as well as for air defense purposes. That same month, the agency announced a contract with the General Instrument Corporation for 38 bright display radar consoles for ARTCCs. The equipment used a dual purpose scan converter/storage tube to present a brighter display that would help controllers work more efficiently in lighted rooms. FAA had already installed similar systems in 10 ARTCCs and 4 towers.

FAA commissioned its first airport surface detection equipment (ASDE) at Newark, New Jersey, in 1960. Originally developed for the Air Force, the ASDE radar system provided air traffic controllers with information on the position of aircraft and other vehicles on the ground, even during darkness and fog. FAA planned to install the system at nine other airports: New York International [also called Idlewild and later renamed John F. Kennedy International Airport], Washington — Washington National and later Dulles International — Boston, Seattle, San Francisco, Cleveland, Los Angeles, and Portland.

In addition to his efforts to enhance system safety, and, in part, at the urging of the American Airlines president, Administrator Quesada moved to ensure airline pilot proficiency. On March 15, 1960, FAA’s “age-60 rule” went into effect, barring individuals who had reached their 60th birthday from serving as pilots on aircraft engaged in certified route air carrier operations or on large aircraft engaged in supplemental air carrier operations. The rule did not apply to commuter or on-demand air taxi operations that employed smaller aircraft. In adopting the rule, FAA declared that a progressive deterioration of certain physiological functions normally occurred with age and that sudden incapacity due to certain medical defects such as heart attack and strokes became significantly more frequent in any group reaching age 60.

Quesada also appointed 21 of the nation’s leading forensic pathologists as consultants to help determine involvement of human factors in aircraft accidents. The nationwide system of consultants supplemented an existing workforce of aeromedical accident investigators employed by FAA’s civil air surgeon’s office and augmented by pathologists from the Armed Forces Institute of Pathology.

In April 1960 Quesada placed in effect the first of a series of regulations designed to minimize aircraft noise at major airports. He carefully designed these early environmental actions in response

1962, passengers board a Lockheed Electra

1966, FAA researchers take noise measurements on top of FAA headquarters building, Washington, DC

to community concerns, while retaining safety as the agency’s primary objective. Special Civil Air Regulation 438 set up rules for both civil and military aircraft operating at Los Angeles International Airport that included minimum altitudes, preferential runways, and approach and departure routes over the least populated areas. The administrator subsequently issued similar special regulations for operations at New York International and at Washington National Airport.

Nearing the end of his tenure, in December 1960, Administrator Quesada faced a major challenge when a United DC-8 and a TWA Super Constellation collided in midair over Brooklyn, New York. All 128 occupants aboard the planes and eight persons on the ground were killed. Civil Aeronautics Board investigators determined that the United flight had proceeded beyond its clearance limit and the airspace assigned to it by air traffic control. The DC-8’s high speed, coupled with a change of clearance that reduced the distance the aircraft needed to travel by approximately 11 miles, contributed to the crash. CAB concluded that the crew did not take note of the change of time and distance associated with the new clearance. Although the plane’s inoperative VHF radio increased the crew’s workload, the pilot did not report the malfunction to controllers.

As a result of this accident, FAA quickly moved to require that pilots operating under instrument flight rules (IFRs) report malfunctions of their navigation or communications equipment. The agency also announced a program to equip all turbine-powered aircraft with distance measuring equipment. A new speed rule prohibited civil aircraft from exceeding 250 knots when they were within 30 nautical miles of a destination airport and flying below 10,000 feet.

When John F. Kennedy became the 35th president of the United States on January 20, 1961, FAA administrator Elwood Quesada resigned his position and Deputy Administrator James Pyle became acting administrator until the new President could select a permanent replacement.

As Administrator Quesada left office, the 40,000 employees of his two-year-old agency were operating and maintaining 9,500 air navigation and traffic control facilities, including 425 flight service stations, 228 airport traffic control towers, 41 long-range and 21 precision approach radars, 53 airport surveillance radars, and 35 air route traffic control centers. By 1961 U.S. scheduled air carriers were transporting 60 million passengers a year. A number of new and larger airports were opened or under construction to accommodate increasing jet traffic. The integration of civil and military airspace needs was well along. And, the space age had begun — ushering in new technologies ready for adoption by the aviation community.
1961, aerial view of Washington National Airport
1960s, passengers at the airport terminal ticket counter
On March 3, 1961, **NAJEEB HALABY [TERM: 03/03/61 – 07/01/65]** became the second FAA Administrator. A lawyer with significant experience as a military and civilian pilot, and a Kennedy family friend, Halaby took over an agency reputed, after just two years in existence, to be one of the strongest in the U.S. Government.

During the new administrator’s swearing in ceremony, President Kennedy asked Halaby to define the technical, economic, and military aviation objectives of the federal government, for the next decade and for a broad spectrum of aviation interests. Five days later, Kennedy requested the administrator to also conduct a scientific, engineering review of aviation facilities and related research and development (R&D) and to prepare a long-range plan to ensure efficient and safe control of all air traffic within the United States. To undertake the resulting studies (called Project Horizon and Project Beacon, respectively), Administrator Halaby quickly created two separate task forces comprised of recognized experts in aeronautic and related technologies.

Within six months, the White House released both the Project Horizon and Project Beacon reports. The 239-page Project Horizon report defined 24 national aviation goals and outlined various programs to achieve the objectives. The major recommendations included:

- Maintaining U.S. leadership in world aviation;
- Reorienting the federal government’s approach to the economic regulation of the airlines to avert the threatened collapse of the industry’s financial structure;
- Developing a Mach 3 supersonic commercial transport;
- Emphasizing the aeronautical, as opposed to astronautical, aspects of the federal R&D effort;
- Undertaking a comprehensive study of international aviation relations; and
- Continuing efforts to achieve a common civil-military air traffic control and air navigation system.

The Project Beacon task force on air traffic control concluded that substantial improvements were needed to meet the future challenge of aviation’s projected growth. The report urged expanded use of general purpose computers rather than special computer systems formerly under development for air traffic control. The task force also recommended a variety of changes involving airports, the segregation of controlled traffic, navigation and all-weather landing systems, a new category of flight known as controlled visual rules, and the extension of positive air traffic control.

The agency found itself faced with an unexpected challenge in 1961 when the first series of aircraft hijackings in the U.S. occurred. In May 1961 a passenger on a flight to Key West, Florida, forced the pilot to fly to Cuba. Four other skyjacking incidents took place over the next few months. In August, for the first time, the federal government began employing armed guards, border patrolmen recruited from the U.S. Immigration and Naturalization Service, on civilian planes.
In concert with other agencies, FAA actively supported congressional efforts to remedy a lack of criminal laws applicable to hijackings and other threats to air safety. In September President Kennedy signed Public Law 87-197, an amendment to the Federal Aviation Act of 1958, which made it a crime to hijack an aircraft, interfere with an active flight crew, or carry a dangerous weapon aboard an air carrier aircraft.

The law prescribed death or imprisonment for no fewer than 20 years for interfering with aircrew members or flight attendants in the performance of their duties.

To help enforce the act, a special corps of FAA safety inspectors began training for duty aboard airline flights. In March 1962 Attorney General Robert Kennedy swore in FAA’s first “peace officers,” as special U.S. deputy marshals. All of these men, who graduated from a special training course at the U.S. Border Patrol Academy, worked as safety inspectors for the FAA flight standards organization. They carried out their role as armed marshals on flights only when specifically requested to do so by airline management or the Federal Bureau of Investigation (FBI).

**Reorganization**

During his first year in office, Administrator Halaby focused attention on restructuring FAA. In May 1961 he disclosed his intention to decentralize the agency’s operational responsibilities and broaden the authority of regional executives. He selected FAA Region One, with headquarters in New York, for a pilot program, and chose the head of the agency’s bureau of flight standards to develop a transition plan that would be used as a model for reorganizing the other regions. A few weeks later, Halaby announced plans for a new regional office headquartered in Atlanta, Georgia. The Southern Region office had responsibility for FAA activities in Georgia, Florida, North Carolina, South Carolina, Tennessee, Alabama, Mississippi, Puerto Rico, the Virgin Islands, and Swan Island — areas currently under the supervision of FAA Region 2 headquartered at Fort Worth, Texas. At the same time, the administrator changed the way FAA identified its regional offices. The offices were now identified by geographical rather than numerical designations. Thus, Region 1 became the Eastern Region; Region 2, Southwest Region; Region 3, Central Region; Region 4, Western Region; Region 5, Alaskan Region; and Region 6, Hawaiian Region (subsequently changed to Pacific Region).

By July an extensive agency reorganization began. With the changes, termed evolutionary and keyed to a revised
concept of Washington-field relationships, Administrator Halaby centralized the development of programs, policies, and standards in Washington and delegated broad operational responsibilities to

the regional offices. The seven regional offices, headed by assistant administrators, had responsibility for the executive direction of all FAA programs in the field. To assist in the overall management of specific functional areas, Halaby created the posts of deputy administrator for plans and development and deputy administrator for administration. The statutory deputy administrator served as general manager of the agency’s operations and coordinated the activities of the regional offices as well as the operating programs in Washington. Except for the bureau of national capital airports, Halaby redesignated as “services” the former bureaus and the office of international coordination. Other changes involved the former budget division of the office of management services, which became the office of budget.

With no dedicated office space for the FAA, employees of the growing agency were housed in several widely dispersed buildings around Washington, DC, including some “temporary” buildings of World War II vintage. Halaby and his team worked to obtain a headquarters building to consolidate employees in one location. They succeeded in their efforts, and on November 22, 1963, FAA’s Washington headquarters staff began moving into the newly completed Federal Office Building 10A, at 800 Independence Avenue, SW. Excitement about the new building quickly evaporated on move day as employees heard the news that President Kennedy had been assassinated in Texas.

**Improving Safety and Capacity**

Upon assuming office, President Lyndon Johnson convinced Kennedy appointees, including Najeeb Halaby, to remain in his administration for the interim. In the early years of the Johnson Administration, Halaby continued to stress the need for continued safety enhancements and system modernization. For example, in September 1964, FAA mandated more rigorous safety standards for air-taxi operators and commercial operators of small aircraft weighing...
12,500 pounds or less. A large increase in the complexity and volume of air taxi operations necessitated the new rules. The scheduled air taxi had become a popular means of transportation at small airports located near industry or population centers, or where scheduled carriers did not meet local need. Aircraft manufacturers also contributed to the growth by designing small aircraft especially suited for air taxi operations.

Realizing the need for continued air traffic control system modernization to keep up with technological developments, Administrator Halaby lobbied long and hard for increased funding. In September 1964 the Bureau of Budget released the first significant amount of procurement funds for modernizing the national airspace system (NAS). The funds were specifically designated for installing the first complete NAS En Route Stage A configuration (a semiautomated system for en route air traffic control) at the air route traffic control center (ARTCC) at Jacksonville, Florida.

NAS En Route Stage A was based on the military defense system known as SAGE (semi-automatic ground environment). Designed to protect the United States from long-range bombers and other weapons, the SAGE system sent information from geographically dispersed radars over telephone lines and gathered it at a central location for processing by a newly designed, large-scale digital computer. As the system evolved, SAGE broke new ground in radar, communications, computer, information display, and computer programming technologies.

The civilian air traffic control system being replaced by NAS En Route Stage A was essentially a manually operated system employing radar, general purpose computers, radio communications, and air traffic controllers. In the mid-1960s only five ARTCCs (New York, Boston, Washington, Cleveland, and Indianapolis) had computers capable of processing flight data, calculating flight progress, checking for errors, and distributing flight data to air traffic controllers. The old system used a two-dimensional radar display, which permitted controllers to view only an aircraft’s range and bearing. They obtained information such as altitude and identity through voice contact with the pilot or from the flight plan. To retain the correct identity of an aircraft target, controllers placed plastic markers (known as “shrimp boats”) on the radar display and moved the markers by hand. When completed, the new system would electronically perform these functions faster and more accurately than the manual procedures. Properly equipped
Aircraft would report their altitude, identity, and other flight data automatically at any given time. The computer-processed messages would appear on the radar display next to the aircraft they identified, in the form of alphanumeric symbols.

Prior to leaving the agency, Administrator Halaby also oversaw completion of the codification of previous aviation regulatory issuances into a single body of rules, the federal aviation regulations (FARs). FAA reorganized and streamlined the regulations to eliminate duplicate, obsolete, and unnecessary provisions of multiple regulatory systems inherited from the Civil Aeronautics Board and the Civil Aeronautics Administration. The FARs consolidated and simplified the former civil air regulations, civil aeronautics manuals, and regulations of the administrator.

Federal Aviation Administration

On July 1, 1965, retired Air Force General WILLIAM F. MCKEE [TERM: 07/01/65 – 07/31/68] became the third FAA Administrator. A career military officer, McKee was the first FAA Administrator with no aviation experience. Known for his integrity and management skills, McKee quickly surrounded himself with technical aviation experts.

McKee began his tenure during a boom period for the aviation industry. The introduction of jets had dramatically increased the capacity and efficiency of airline operations. Lower fares lured many Americans to the skies. Industry success, however, produced challenges for FAA. Rapid growth brought both airway and airport congestion. Flight delays became a part of the air travel experience. Air traffic controllers, who bore the responsibility to keep aircraft in the crowded skies safe and separated, began to lobby for better equipment, working conditions, and benefits.

President Johnson soon began developing an overarching transportation policy to tie all transportation modes together.

The president noted that the United States lacked a coordinated transportation system permitting travelers and goods to move conveniently from one means of transportation to another. The responsibility for transportation within the federal government, he observed, was fragmented among many agencies resulting in a series of uncoordinated policies. He believed a single department was needed to develop and carry out comprehensive transportation policies and programs across all transportation modes.
On October 15, 1966, President Johnson signed the Department of Transportation Act (Public Law 89-670), bringing 31 previously scattered federal elements, including FAA, under the wing of one Cabinet-level Department. The new Department of Transportation (DOT) had responsibility to:

- Ensure the coordinated, effective administration of the transportation programs of the federal government;
- Facilitate the development and improvement of coordinated transportation service, to be provided by private enterprise to the maximum extent feasible;
- Encourage cooperation of federal, state, and local governments, carriers, labor, and other interested parties toward the achievement of national transportation objectives;
- Stimulate technological advances in transportation;
- Provide general leadership in the identification and solution of transportation problems; and
- Develop and recommend to the president and the Congress national transportation policies and programs to accomplish these objectives with full consideration of the needs of the public, users, carriers, industry, labor, and the national defense establishment.

The legislation provided for five initial major operating elements within the new department. Four of these organizations were now headed by an administrator: the Federal Aviation Administration (previously the independent Federal Aviation Agency), the Federal Highway Administration (FHWA), the Federal Railroad Administration, and the Saint Lawrence Seaway Development Corporation. The new DOT also contained the U.S. Coast Guard, which was headed by a commandant and had previously been part of the Treasury Department.

The act also created within DOT a five-member National Transportation Safety Board (NTSB). It charged NTSB with determining the clear or probable cause of transportation accidents and reporting the facts, conditions, and circumstances relating to such accidents; and reviewing on appeal the suspension, amendment, modification, revocation, or denial of any certificate or license issued by the secretary or by an administrator. In the exercise of its functions, powers, and duties, the board was independent of the secretary and the other DOT offices and officers. The new department began operations on April 1, 1967.

While the president worked to consolidate management of the transportation modes, improving air traffic control and aircraft safety remained priorities for FAA. In July 1967 a midair collision near Hendersonville, North Carolina, between a Piedmont Airlines Boeing 727 and a Cessna 310 killed all 82 people aboard the two aircraft. The fatalities included secretary-designate of the Navy John McNaughton. NTSB listed the probable cause as the Cessna’s deviation from its instrument flight rules (IFR) clearance. Although the accident investigators could not specifically identify the reason...
for the Cessna’s deviation, they cited the minimum control procedures used by FAA in handling the Cessna as a contributory factor in the accident. As a result, NTSB recommended improving the air traffic control system and imposing more stringent IFR requirements upon pilots.

Prevention of accidents, such as that in North Carolina, became a high agency priority. The mix, in terminal airspace, of high-performance aircraft operating in a radar-based system, and general aviation aircraft operating under the “see and be seen” principles of visual flight rules (VFR), created the potential for midair collisions. The aviation community agreed about the need to improve safety in terminal areas.

To help alleviate congestion around airports, the agency mandated new procedures. It banned special VFR operations by fixed-wing aircraft at 33 major airports. Special VFR operations allowed visual operations conducted under less than basic VFR weather minimums. The new rule continued to permit such operations in the control zones of other airports served by a radar-equipped control tower, though priority would be given to aircraft operating under IFR.

FAA also moved to improve crashworthiness and passenger evacuation standards in transport airplanes. New rules required air carriers, other commercial operators, and aircraft manufacturers to demonstrate that the crew of an airplane capable of holding more than 44 passengers could evacuate a full load of passengers through only half the aircraft’s exits within 90 seconds. The previous rule, which did not require demonstration by aircraft manufacturers, had set a time limit of 120 seconds. Other rules developed in this era related to: the distribution and type of exits and their ratio to passengers; improved access to overwing exits; evacuation slides deployable in ten seconds; improved interior lighting and new exterior lighting; cabin linings with self-extinguishing qualities; stowage of carry-on baggage; slip-resistant and clearly marked escape routes; and better protection of fuel and electric lines.

International Activities

FAA’s predecessor agency had begun working with international aviation authorities immediately after World War II. After the war, in addition to already established offices in Brazil, Peru, and Panama, the Civil Aeronautics Administration (CAA) had established new offices in France, the United Kingdom, Egypt, China, and Mexico.
to help train air traffic controllers, install and maintain navigation aids, and improve safety. The agency also took over responsibility for the operation and maintenance of airports on the islands of Guam, Midway, and Wake. In 1949, under an agreement with the Greek government, CAA sent an aviation mission to Greece to help establish and maintain aviation facilities.

During its first year of operation, FAA expanded civil aviation work overseas. It increased the number of its representatives overseas to 139 and established an international field service division. FAA responsibilities included flight inspection of some facilities serving international routes, as well as certification of airmen and aid to foreign flag carriers to ensure compliance with U.S. air regulations. In addition, it worked with the State Department to train aviation attachés that represented the U.S. in foreign cities.

FAA also continued CAA’s technical assistance program which had begun in 1949. Agency technical experts traveled to a number of foreign countries to aid in airport construction, installation of navigation aides, air traffic control, and flight inspection. In 1965, for example, FAA technical advisors supported activities in over 20 countries. In many cases, FAA provided technology such as communications equipment, instrument landing systems, and radars as part of its program to encourage wider adoption of U.S. technology, procedures, and rules.

**Labor Unrest**

By the late 1960s air traffic controllers began to protest publicly about the aging air traffic control system and their own working conditions. In January 1968 New York controllers formed an employee organization, the Professional Air Traffic Controllers Organization, or PATCO. Within six months, PATCO had a national membership of over 5,000 controllers. To highlight difficult working conditions and growing NAS congestion, on July 3, 1968, the PATCO chairman announced “Operation Air Safety,” which he described as a campaign to maintain FAA prescribed separation standards between aircraft. He said that FAA supervisors had been violating the standards to accommodate high levels of traffic.

FAA had been looking for new technologies that would help to increase capacity and developing new procedures that would rely on improved inter-facility communications to help handle increasing volumes of traffic. On July 15, 1968, the New York Common Instrument Flight Rules Room at John F. Kennedy International Airport began limited operations. The new facility consolidated the manual IFR operations controlled by the Kennedy, La Guardia, and Newark terminal radar approach control (TRACON) facilities. Prior to consolidation,
each of three control facilities controlled flights within airspace delineated by inviolable boundaries and separated by large buffer zones. Because of the slowness of communications between the facilities, boundaries and buffer zones could not be easily shifted to meet changes in traffic flow. In the Common IFR Room, however, controllers who worked different control areas were within easy reach of each other, and, when necessary, they could shift boundaries and buffers almost instantaneously.

Four days after the Common IFR facility opened, 1,927 aircraft in the vicinity of New York City faced major delays in taking off or landing, some for as long as three hours. Local air traffic congestion reached critical proportions, and the jam spread to other major transportation hubs. The inability of the air traffic control and airport system to accommodate the heavy tourist season traffic exacerbated the situation. A PATCO slowdown on that day contributed to the problem.

Despite unstable and shrinking budgets, growing labor unrest, and an outdated air traffic control system, when William McKee resigned as FAA Administrator on July 31, 1968, the commercial aviation accident rate was declining and the commercial aviation industry was growing. Upon McKee’s departure, the first Secretary of Transportation, Alan Boyd, quickly designated FAA deputy administrator David Thomas as acting administrator. With just five months left before a new president would assume office, Thomas remained in this role through the remaining months of the Johnson Administration.
The presidential candidates in the 1968 campaign did not focus on aviation as a national priority. Although they understood the immediate concerns faced by FAA and the aviation community, they could not foresee the new problems the agency would have to solve as it entered its second decade of operation. In addition to growing concerns about national airspace system (NAS) modernization and air traffic controller unrest, the FAA found itself facing new airport, security, and environmental challenges.

In November 1968 President-elect Richard Nixon announced that an urgent priority of his administration would be to strengthen the air traffic controller workforce, improve their working conditions, and provide them with new equipment needed to keep the airways safe. Heartened by these remarks, the Professional Air Traffic Controllers Organization (PATCO) became more vocal in its calls for system modernization and better working conditions. On January 15, 1969, the Civil Service Commission ruled that PATCO was an employee organization, not a professional society, because it had sought and obtained a dues withholding agreement. FAA had agreed to permit a voluntary payroll deduction plan for the payment of PATCO dues with the understanding that PATCO would remain a professional society. As a result, PATCO became subject to the Standards of Conduct and the Code of Fair Labor Practices and eligible for formal recognition as a labor bargaining organization.

On January 20, 1969, Richard Nixon became President of the United States, succeeding Lyndon Johnson. Two days later, John Volpe became Secretary of Transportation. On March 24, 1969, John Shaffer became the fourth FAA Administrator. A West Point graduate and World War II pilot, Shaffer left the military in 1954 for a civilian career. He came to FAA from TRW, a corporation involved in a number of businesses, most defense-related, but including aerospace, where he had served as a corporate vice president.

**Labor Issues**

Labor issues occupied Administrator Shaffer’s early months in office. On June 11, 1969, PATCO’s western coordinator notified his organization’s Southwest delegates of upcoming FAA testimony before Congress on a controller career bill. “If testimony [is] not favorable,” he wrote, “D-Day is June 18th!” The June 17 congressional hearings focused on legislation to provide higher pay, early retirement, and other benefits for controllers. In testimony to a congressional committee, Administrator Shaffer opposed the proposed legislation and characterized controllers as well paid, considering their educational level. That evening, PATCO counsel
F. Lee Bailey appeared on the NBC “Tonight Show” and reportedly told host Johnny Carson, “I’d start walking if I were you.” From June 18-20, a number of FAA facilities felt the effects of a work slow down by PATCO-affiliated air traffic controllers, who claimed illness and did not report for work. Of 477 controllers who took sick leave during the job action, FAA suspended 80 of them anywhere from three to fifteen days.

On July 27 FAA terminated its dues-withholding agreement with PATCO, stating that it was not in the public interest to assist an organization taking part in an illegal job action. Hoping to alleviate labor tensions, on August 8, Secretary of Transportation John Volpe established an Air Traffic Controller Career Committee. The seven-member group headed by professional consultant John Corson, investigated controller employment practices, employee compensation, work environment, training, and employee-management relations. The committee gave special attention to controller occupational stress.

As the Corson committee began its work, PATCO fought Administrator Shaffer’s decision to terminate its dues withholding agreement. PATCO now sought formal FAA recognition as a labor union. On October 27 FAA denied PATCO’s request because of its participation in the June sickout. Two days later, however, President Nixon issued Executive Order 11491, replacing Executive Order 10988 as the basis for federal employee-management relations. The order, which went into effect on January 1, 1970, gave the Labor Department authority to grant exclusive recognition to unions comprised of federal workers.

A new round of tensions between PATCO and FAA began in October 1969. In reaction to the involuntary transfer of three controllers from the Baton Rouge, Louisiana, combined station-tower, PATCO threatened a national demonstration. Rhetoric and threats bounced back and forth between PATCO and FAA for several months with no resolution. At a January 15, 1970, press conference, PATCO threatened a national strike beginning on February 15. In the meantime, FAA reexamined the basis and legality of the transfer of the three controllers from Baton Rouge and submitted a fact-finding report to the Secretary of Transportation in March.

As the controversy over the transfer of the three controllers intensified, on January 29, 1970, the Corson committee submitted its report to Secretary Volpe. The committee recommended that the secretary:
Reduce the overtime work required of controllers in high-density areas;
Reduce the consecutive hours spent by controllers in operational positions to two, and the total hours per day on such positions to six;
Detail qualified journeyman controllers to high-density facilities with critical manpower shortages;
Develop a more mobile controller work force so that the needs of the system, rather than the preferences of controllers, determine assignments;
Develop incentives to attract the most talented controllers to the most difficult positions;
Pay special rates for employment in facilities located in high-cost-of-living areas;
Accelerate and improve training of developmental controllers;
Seek legislation providing for the early retirement of controllers who attain a certain age and cannot be retained or reassigned to less arduous duty — e.g., retirement at age 50 after 20 years of air traffic control service with 50 percent of high-three average salary; and
Designate a single official immediately responsible to the FAA Administrator to handle all relationships with employee organizations at the national level.

Several of the committee’s recommendations — including detailing journeyman controllers to facilities with critical manpower shortages and providing developmental controllers with “updated” training — received immediate attention. In addition, FAA established nine groups to consider the remaining recommendations and develop programs for their implementation.

Unfortunately, the report and subsequent actions by FAA and Department of Transportation (DOT) came too late to stop the planned PATCO sickout, called an illegal strike by DOT.

Hoping to prevent the strike threatened for February 15, Secretary Volpe entered into discussions with PATCO. Both sides agreed to let the Department of Labor Mediation and Conciliation Service arbitrate the controversial transfers. Three days later, PATCO filed a petition, as permitted by Executive Order 11491, with the Federal Labor Relations Council for certification as exclusive bargaining representative for all non-supervisory air traffic control specialists.

On March 17, acting on the FAA fact finding report regarding the transfer of the three Baton Rouge controllers, Secretary Volpe upheld the FAA order calling for the transfer. On March 23 FAA appointed a director of labor relations per recommendation of the Corson Committee. Two days later, approximately 3,000 air traffic controllers participated in a PATCO-organized sickout. All but a few of those involved were en route, rather than terminal, controllers. Some remained absent for a day or two, others for the full 17-day sick out period. Long delays and flight cancellations ensued. FAA Administrator Shaffer refused to
negotiate with the controllers, and instead asked for a federal court injunction to force PATCO to order its members back to work.

Although the absentees claimed sick leave, DOT viewed their action as a strike against the U.S. Government and hence illegal. [The Labor Management Relations Act of 1947 had codified the long-standing prohibition of federal employee strikes.] The government obtained temporary restraining orders against PATCO. When the union failed to comply with these orders, a show-cause order was obtained against its officers. The heavy fines levied on the union by the court ended the sickout on April 10. FAA then suspended nearly 1,000 controllers and fired 52 for their role in the affair. [On February 5, 1981, the United States Court of Appeals, District of Columbia Circuit, reversed the suspensions.]

On April 23 PATCO elected a new president, John Leyden. Within a month, he appeared at a Department of Labor hearing stemming from his organization’s February request to be certified as the exclusive bargaining representative for all non-supervisory air traffic control specialists. It took the Labor Department almost a year to pass judgment on the PATCO petition. Meanwhile, PATCO faced strong protests from the aviation community over the strike. The Air Transport Association, for example, filed a $50 million damage suit against the union. As part of a September 10, 1970 order, the court placed PATCO under a permanent injunction against any future job action.

As the conflict with PATCO began to ease, FAA worked to implement more of the Corson Committee recommendations. In November 1970 the agency established a national en route air traffic training program for center controllers joining the workforce. The program used the FAA Academy for qualification training and FAA facilities for proficiency training. Its objectives included shortening the training, reducing the high attrition rate among trainees, and making more efficient use of resources. The training itself was conducted in three phases. The first phase, indoctrination and precontrol, took place at an en route facility and covered duties unrelated to air traffic control. The next phase, control, was conducted at the FAA Academy and consisted of a nine-week non-radar and radar control procedures course. The final phase, sector qualification, took place at an en route facility. Previously, controller trainees had been sent directly to the FAA Academy for a nine-week indoctrination course, and then to the centers for on-the-job training running from two to three years.

The Department of Labor ruled on PATCO’s petition to become a bargaining representative on January 29, 1971. Because PATCO had called a strike against the federal government, the Department of Labor stripped it of its organizational status for sixty days and required it to post a notice declaring that it would not engage in illegal job actions. Only then would it be re-considered for recognition as a labor organization.
PATCO took this and other steps to comply with the Labor Department’s decision. On June 4 the Department of Labor again allowed PATCO to seek recognition to represent the labor interests of all air traffic controllers under Executive Order 11491. Three days later PATCO filed a new petition.

**National Association of Air Traffic Specialists**

On December 27, 1971, the Department of Labor gave the National Association of Air Traffic Specialists (NAATS) approval to serve as the national bargaining unit for all flight service station specialists, those controllers who supported general aviation pilots. Following a nationwide election in February 1972, NAATS received Department of Labor certification as the national exclusive representative for all flight service station specialists, some 3,000 employees. FAA and NAATS concluded an agency-wide collective bargaining agreement on June 1, 1972, the first such contract between FAA and a national labor organization and the first in a series of FAA/NAATS contracts. The NAATS contract gave PATCO hope for approval of its second petition, and by the end of fiscal year 1973, PATCO earned recognition as a national bargaining unit.

A presidential reelection campaign that courted labor support was underway. On February 2, 1972, under White House pressure, FAA announced that air traffic controllers fired for their activist roles in the 1970 strike could apply for re-employment. Of the 52 controllers dismissed, 46 applied and were rehired. Three months later, President Nixon signed into law the Air Traffic Controllers Career Program Act (Public Law 92-297). An outgrowth of a Corson committee recommendation, the law permitted controllers to retire after 25 years of active duty, or at age 50 if they had 20 years of active service. The legislation also established a mandatory age for retirement at 56, with exemptions at the discretion of the Secretary of Transportation up to age 61. Furthermore, it provided for a “second career program” of up to two years of training at government expense for controllers who had to leave their previous work because of medical or proficiency disqualification.

**National R&D Policy**

Although aviation provided a safe and reliable form of transportation, many in the federal government believed that more could and should be done to explore new technologies. Research and development (R&D) of new systems would benefit aviation by increasing safety and efficiency and reducing aviation’s environmental impact. In 1969 FAA teamed with DOT and
the National Aeronautics and Space Administration (NASA) to undertake a study on civil aviation research and development, known as the CARD study. The three-year study resulted in a comprehensive review of national policies affecting civil aviation.

Researchers preparing the study reported that R&D had been a major contributor to civil aviation's growth and had produced significant improvements in safety, economy, speed, capacity, and range. Since World War II, aircraft productivity [measured in seat-miles per hour] had increased by a factor of 20; direct operating costs reduced by a factor of 3; and accident rates reduced by a factor of about 5. In the same period, revenue passenger-miles increased by a factor of about 30, revenue ton-miles by about 50, the number of aircraft handled in the airways system by about 8, and the general aviation fleet by about 4. Overall, aviation had increased from a 0.2 percent gross national product contribution in 1949 to a one-percent contribution in 1969.

The study team found a number of federal agencies, including the Office of Management and Budget, the National Aeronautics and Space Council, the Office of Science and Technology, DOT, FAA, the Departments of Commerce and Defense, and NASA, influenced civil aviation R&D policies and priorities. Team members recommended organizational and policy changes to improve intragovernmental cooperation and coordination in civil aviation matters. Other conclusions, included:

- R&D was too narrowly defined by the federal government, which tended to isolate R&D from policy and economics.
- Civil aviation R&D should be redefined to include both “hard” and “soft” sciences.
- Agencies should receive continued and consistent federal funding of aeronautical research to ensure the maintenance of a strong civil aviation technical base.
- The federal government should consider committing substantial resources to “market demonstration programs” that would provide a unique opportunity to overcome institutional inertia and test possible solutions to civil aviation problems (needs), without committing resources to a full blown system which might not succeed.
- The need for new aviation technology should be translated into a clear market to which private enterprise could respond (i.e., technology transfer).

The CARD study, released in March 1971, recommended immediate R&D emphasis on aircraft noise abatement and the relief of
congestion. Solving the noise problem required balanced R&D programs to reduce noise generated by aircraft, optimize the flight path of aircraft through use of steep descent and curved approaches, and develop better plans for the use of land adjacent to airports. The congestion solution necessitated an organized effort directed at the combination of air traffic control, runway capacity, and airport development. The airways system had to be upgraded to increase both capacity and safety as well as to bring rising operating costs under control. A new short-haul system was also proposed as a way to relieve congestion at existing airports, especially those in areas of high traffic density.

The study concluded that a healthy civil aviation industry and transportation system provided a variety of significant benefits to the United States. Hence, the federal government should take an active role in developing a national aviation policy and conducting R&D to benefit civil aviation.

The ad hoc air traffic control panel of the President’s Science Advisory Committee also released a report, “Improving the Nation’s Air Traffic Control System,” in March 1971. The panel’s report started with a quote from Richard Nixon:

“Years of neglect have permitted the problems of air transportation in America to stack up like aircraft circling a congested airport. The challenge confronting us is not one of quality, or even of technology. Our air traffic control system is the best in the world; our airports among the finest anywhere. But we simply do not have the capacity in our airways and airports ample to our present needs or reflective of the future. . . . development for the 1980s and beyond cannot be neglected. Technology is moving rapidly and its adaptation to provide future solutions must keep pace. [See http://fas.org/rlg/PSAC_ATC_Report2.pdf.]”

Panel members pointed out that the demand for air traffic services would increase threefold by 1980 and eightfold by 1995. They recommended development of a satellite-based navigation system. In this new system, FAA’s strategic control of aircraft would be automated and each properly equipped aircraft would exercise tactical control of its own flight path through the use of accurate three dimensional navigation, air ground datalink, all-weather landing systems, and suitable aircraft displays. To achieve this new system, the panel recommended immediate improvements to the current system and the development of a future system based on higher levels of automation and the use of satellites. They said broad-based R&D programs were needed to provide near-term improvements and new technology for the long term to improve control automation, data acquisition, navigation, landing, and communication subsystems, airports, and airborne equipment.

Aviation and the Environment

An economic boom in the 1960s brought with it growing concerns about pollution and noise. Aviation, on the cutting edge of technological innovation, became an early area of concern for the public, especially as more and more airplanes traversed the NAS. Between 1966 and 1968 FAA researchers had worked to understand the physical and psychological characteristics of noise and the state of the art in noise reduction techniques. The research produced
tools such as a noise exposure forecast, which measured the noise imprint of jet aircraft. Researchers developed the effective perceived noise level in decibel scale (EPNdB), incorporating the frequency and duration of noise into an index of the psychological impact of noise at certain frequencies and intensity levels. The agency also worked with NASA to conduct basic research in engine nacelle design and muffling, quiet engine technology, and flight procedures designed to minimize noise.

By July 21, 1968, when President Johnson signed the Aircraft Noise Abatement Act (Public Law 90-411), the agency’s R&D program had started a number of noise abatement programs. The new act vested in the FAA Administrator the power, after consultation with the Secretary of Transportation, to prescribe and amend standards for the measurement of aircraft engine noise and sonic boom, prescribe noise standards as criteria for aircraft certification, require the retrofit of existing aircraft with quieter engines or noise-abating devices, enforce operating procedures that reduce noise, and ban overland supersonic flights of civil aircraft.

With these measures in place, when Administrator Shaffer came to the FAA in 1969, the agency was poised to begin its new mandate to regulate aircraft noise. On December 1, 1969, FAA added a new Part 36 to the Federal Aviation Regulations that established allowable engine-noise levels as part of the criteria for transport aircraft type-certification. The new rule was the first issued under Public Law 90-411. The rule applied to all subsonic aircraft in the transport category and all subsonic turbojets, regardless of category, for which an application for a type certificate was made after January 1, 1967. The allowable noise levels varied with aircraft size and type, ranging from 93 to 108 EPNdB. The noise limits also varied according to the type of aircraft operation — between 102 and 108 EPNdB on approach, and between 93 and 108 EPNdB during takeoff. The agency further limited sideline noise — noise created along the runway or taxiway during idling or taxiing — to a range between 102 and 108 EPNdB.

A FAA reorganization in December 1970 reflected the growing importance of understanding and regulating aviation’s impact on the environment. The agency established the office of environmental quality and simultaneously abolished the office of noise abatement. This organizational change reflected FAA’s expanding responsibilities in such areas of environmental quality as aircraft noise abatement, sonic boom, emissions, pollution, and aircraft waste. The reorganization came just in time to implement a new law. President Nixon signed the Clean Air Amendments (Public Law 91-604) on December 31, 1970. The legislation gave the recently created Environmental Protection Agency (EPA) responsibility.
For developing aircraft engine emission standards to control air pollution.

While environmental research continued, FAA implemented new procedures to reduce noise. On February 4, 1971, the agency instituted the “Keep-’Em-High” program. Applying this procedure, the agency instructed controllers to keep flights as high as possible during landings and takeoffs, delaying turbojet aircraft in their final descent until relatively close to their destination airport and climbing them out as rapidly as possible after takeoff. Where aircraft performance capabilities and considerations of passenger safety and comfort permitted, FAA required turbojet aircraft to be kept at 10,000 feet or higher until within 30 miles of the airport. Within five months, the program had been implemented at 387 airports, nearly all those airports serving scheduled air carrier and turbojet aircraft.

In a companion program implemented on August 1, 1972, FAA began a new “Get-’Em-High Earlier” departure procedure to reduce jet aircraft noise over airport communities nationwide. The new departure procedure, developed jointly with the Air Transport Association, was used by 23 U.S. airlines while operating out of most of the nation’s air carrier airports. The pilots would climb at full power to 1,500 feet, instead of 1,000 feet under the old system. Noise relief due to the higher altitude would be most noticeable from three to six miles from lift-off.

To define the FAA and EPA roles, on October 27, 1972, President Nixon signed the Noise Control Act of 1972 (Public Law 92-574). Under the act, EPA recommended noise standards to FAA based on considerations of public health and welfare. FAA, in turn, considered the recommendations, and determined whether the standards proposed by EPA were consistent with safety, economically reasonable, and technologically practicable. FAA had responsibility to implement and enforce the EPA’s feasible recommendations.

In the first major test of the new law, on July 6, 1973, EPA issued air pollution standards for aircraft engines and a timetable for their implementation. Formulated after considerable consultation with FAA and industry, the new standards applied to nearly all civil subsonic aircraft, and limited emission of smoke, carbon monoxide, hydrocarbons, and nitrogen oxides. To begin implementation of the standards, on October 26, 1973, FAA published a rule requiring newly produced aircraft of older type designs, such as the DC-9 or Boeing 727, to meet noise standards for turbojet and transport aircraft. The standards had previously applied only to newly type-certified aircraft.
Airport Development

With continued growth in the nation’s airspace, it quickly became evident that airport capacity had to be increased to reduce system delays. Between mid-1959 and mid-1969, the number of aircraft handled by FAA’s air route traffic control centers had increased by 110.6 percent, and the number of aircraft operations at FAA’s airport traffic control towers had increased by 112 percent. Federal airport and airway development programs, less than adequately funded, failed to keep pace with the growth in aviation activity, resulting in a severe strain on the air traffic control system. Schedule delays cost the air carriers millions of dollars annually, not to mention the cost to passengers over and above inconvenience and discomfort.

Shortly after Administrator Shaffer took office, FAA issued a report recommending ways of relieving congestion at 18 of the nation’s busiest airports. The short-range recommendations included improving traffic flow on the airfield through additional runway exits, access taxiways, holding and staging aprons, expanded terminal aprons, and creating additional runway capacity. Long-range recommendations included review of noise-abatement procedures and restrictions, construction of new general aviation airports and new air carrier airports, installation of navigation aids, and installation of landing aids at reliever airports to attract general aviation traffic.

Key to easing airport congestion was the need for a new and stable source of funding to finance airport improvements and new construction. On June 16, 1969, the Nixon Administration submitted legislative proposals to Congress to expand and improve the nation’s airway and airport systems. The legislation, known as the Aviation Facilities Expansion Bill of 1969, proposed ways to raise the necessary revenue to support this expansion. The proposals included:

- Increasing the outlay for airway facilities and equipment to $250 million a year over the next ten years. (During the decade of the sixties, annual appropriations for airway facilities and equipment averaged $93 million.)
- Increasing the average yearly federal outlay for airport development to $250 million over the next ten years. (In the past, Congress had appropriated approximately $65 million a year in Federal Aid to Airport Funds.)
- Imposing an 8 percent tax on domestic airline passenger tickets, a $3 surcharge on passenger tickets for international flights originating in the United States, a five percent tax on air-freight waybills, and a 9¢ per-gallon tax on gasoline and jet fuel used by general aviation aircraft.
- Placing the revenues generated by the new taxes in the U.S. Treasury, in a designated account that would be used exclusively for airway and airport development.
After considerable debate, especially on funding issues, Congress approved many of the president’s recommendations. On May 21, 1970, President Nixon signed Public Law 91-258. Title I of the law was the Airport and Airway Development Act of 1970, and Title II was the Airport and Airway Revenue Act of 1970. The new legislation assured a fund of about $11 billion over the next decade for airport and airway modernization. Establishing an Airport and Airway Trust Fund modeled on the Highway Trust Fund freed airport and airway development from having to compete for General Treasury funds. Revenues for the new trust fund came from a number of levies on aviation users:

- An eight percent tax on domestic passenger fares;
- A $3 surcharge on passenger tickets for international flights originating in the United States;
- A 7¢ per gallon tax on both gasoline and jet fuel used by aircraft in noncommercial aviation;
- A five percent tax on airfreight waybills; and
- An annual registration fee of $25 on all civil aircraft, plus (1) in the case of piston-powered aircraft weighing more than 2,500 pounds, a charge of 2¢ for each pound of maximum certificated takeoff weight, or (2) in the case of turbine powered aircraft, a charge of 3.5¢ for each pound of maximum certified takeoff weight.

The act authorized $280 million for each of the next five fiscal years and provided a new distribution formula improved in the light of the experience under the Federal Airport Act. To relieve congestion at airports serving other segments of aviation, $250 million would be distributed, as matching funds, among airports serving air carriers certified by the Civil Aeronautics Board (CAB) and airports primarily serving general aviation. The remaining $30 million of the annual $280 million would be apportioned by the Secretary of Transportation for developing airports in the several states and in Puerto Rico, Guam, and the Virgin Islands serving segments of aviation other than certified air carriers.

The new law authorized the Secretary of Transportation to make grants of funds to appropriate agencies for airport system planning and to public agencies for airport master planning. On July 1, 1970, FAA accepted the first applications for federal assistance under the Airport Development Aid Program (ADAP). The agency announced the first three grants under the program on August 6: Detroit Metropolitan-Wayne County Airport (Michigan), Hector Field (Fargo, North Dakota), and Minneapolis-St. Paul International Airport (Minnesota).
When the Nixon Administration proposed to obligate less than the minimum annual levels specified in the Airport and Airway Development Act for airport-airway capital investments in its fiscal year 1972 budget proposal, Congress amended the act. In the November 1971 amendment, Congress specified that:

- No trust fund money could be appropriated to carry out any program or activity under the Federal Aviation Act other than “acquiring, establishing, and improving air navigation facilities;”
- Any excess of trust fund receipts over airport-airway capital investments could be applied toward the cost of administering the airport and airway development programs; and
- Funds equal to the minimum amounts authorized for each fiscal year for airport and airway development must remain available in the trust fund until appropriated for airport-airway development.

An important provision of Airport and Airway Development Act gave FAA a new responsibility — safety certification of airports served by air carriers. The law mandated that by May 21, 1973, all U.S. airports serving scheduled air carriers holding CAB certificates of public convenience and necessity must have FAA operating certificates as well. The new legislation also set standards for the marking and lighting of areas used for operations, firefighting and rescue equipment and services, the handling and storing of hazardous materials, the identification of obstructions, and safety inspection and reporting procedures. In addition, it required airport operators to have a FAA-approved operations manual. FAA awarded the first operating certificate to Boston Logan airport on September 1, 1972, and had certified nearly 500 airports by the May 1973 deadline.

FAA issued its first national airport system plan in September 1973. The new document replaced the former national airport plan, last published in 1967. The replacement plan defined the relationship of each airport to the local transportation system, to forecasted technological developments in aeronautics, and to developments forecasted in other modes of intercity transportation. It also included a discussion of those factors affecting the quality of the natural environment. To keep pace with the projected growth of air

**New facilities and equipment help controllers meet growing needs**

*Airport improvements aid both commercial and general aviation pilots*
traffic, the plan forecast a need for 700 new airports in the United States over the next ten years. The agency estimated the overall cost of building the new airports and upgrading existing facilities at $6.3 billion.

The Airport Development Acceleration Act of 1973 (Public Law 93-44) amended the Airport and Airway Development Act of 1970. The changes increased the annual funding level for ADAP from $280 million to $310 million, raised the federal share for the program’s development of general aviation airports and smaller air carrier airports (identified as those that enplaned less than one percent of the passengers serviced by all the air carriers certified by the Civil Aeronautics Board) from 50 percent to 75 percent, and obligated the federal government to pay 82 percent of the costs of safety equipment required for airport certification, as compared to the 50 percent for which it had previously taken responsibility. The amendment also prohibited states and localities from levying a “head tax” on passengers.

**Air Traffic Control System Modernization**

In a December 1969 report to the Secretary of Transportation, the FAA Air Traffic Control Advisory Committee predicted a continued rise in the demand for air traffic control services during the decades ahead. Committee members stated that if FAA expected to accommodate the anticipated growth in aviation traffic, three critical problems required solutions: the shortage of terminal capacity, the need for new means of assuring separation, and the limited capacity and increasing cost of air traffic control. The committee believed that major improvements in airport capacity could be achieved through the use of parallel runways, high speed turnoffs, advanced terminal automation, and reduced longitudinal separation between aircraft on final approach for landing. For the safe separation of aircraft, the committee recommended further efforts to upgrade radar beacon transponders for tracking aircraft. It also noted that a higher level of automation would enable the system to handle perhaps two or three times the 1969 traffic with the same controller work force.

Like airports, airway modernization received a big boost from increased funding authorized by the Airport and Airway Development Act of 1970. Throughout the decade of the sixties, appropriations for airway facilities and equipment had averaged $93 million a year. The Airport and Airway Development Act authorized not less than $250 million a year for the next five fiscal years for acquiring, establishing, and improving air navigation facilities.

To help monitor and even restrict flights moving from one air route traffic control center (ARTCC) to another, FAA established the Central Flow Control Facility at its headquarters as a permanent part of the air traffic control (ATC) system. Opened in April 1970, the new facility relieved the ARTCCs of some...
responsibility for restricting the number of aircraft moving between them. Central Flow Control collected and correlated systemwide air traffic and weather data, using the information to prevent isolated clusters of congestion from disrupting the overall traffic flow. Linked by teletypewriter and telephone to all 21 ARTCCs, the facility detected potential trouble spots and suggested such solutions to the centers as flow-control restrictions or rerouting. While the individual ARTCCs retained the authority to accept or reject the Central Flow Facility’s recommendations, the decisions were now based on broad information about the overall condition of the ATC system. On July 29 FAA established the Air Traffic Control Systems Command Center to integrate the functions of the Central Flow Control Facility, Airport Reservation Office, the Air Traffic Service Contingency Command Post, and Central Altitude Reservation Facility. [On April 15, 1994, the Air Traffic Control System Command Center officially began operations in its new facility at Herndon, Virginia. The facility moved from FAA Headquarters because of size and technological constraints.]

FAA introduced major changes in the New York metropolitan area’s air traffic patterns and procedures in June 1970. Collectively known as New York Metroplex, the new procedures reduced traffic congestion in and around New York airports, and accelerated the movement of aircraft along major north-south routes. Under Metroplex, primary holding patterns, or arrival fixes, for area airports were moved farther out from the center of the city. This enabled FAA to add five new en route corridors, which increased the number of departure routes, improved traffic distribution, and reduced bottlenecks.

FAA also established the terminal control area (TCA) concept in June 1970. The agency hoped the use of TCAs would minimize the midair collision hazard around the nation’s busiest airports. A TCA consisted of controlled airspace within which all aircraft would be subject to special operating rules and requirements affecting pilots and equipment. While the boundaries of each TCA would be determined separately, the general shape would tend to resemble an inverted wedding cake with its smallest layer touching the ground. TCAs were broken into two categories, with the most congested locations designated as Group I. The rules for Group I required:

- Air traffic control clearance for all operations.
- Large turbine-powered aircraft to stay above the TCA’s floor unless otherwise authorized by air traffic control.
- The speed limit beneath the TCA’s lateral limits to be 200 knots (230 mph).
- Takeoffs and landings by solo student pilots to be banned.
- Aircraft to carry an operable two-way radio.
- Fixed-wing aircraft to carry an operable receiver for standard navigation aids such as the very high frequency omnidirectional range (VOR) or tactical air navigation (TACAN), as well as a radar beacon transponder. The transponder requirement did not apply to instrument flight rules (IFR) operations to and from secondary airports within the TCA.

For Group II TCAs, the rules were the same as for Group I except that solo student operations were permitted and aircraft using visual flight rules (VFR) did not have to carry transponders.
FAA made great strides in automating the air traffic control centers in the 1970s. Ceremonies at the Memphis Air Traffic Control Center in February 1973 celebrated the center’s switch over to computer processing of flight-plan data. This achievement entailed completing phase one of the NAS En Route Stage A, FAA’s decade-long program to automate and computerize the nation’s en route air traffic control system. With the new computer installation at Memphis, each of the twenty ARTCCs in the contiguous 48 states gained an automatic capability to collect and distribute information about each aircraft’s course and altitude to all the sector controllers along its flight path. Pilots still had to file flight plans at flight service stations and military operations offices, but now computers would handle the functions of assigning and printing out controller flight strips.

The new computers recorded and distributed any changes registered in en route aircraft flight plans. The system eventually tied in with the third version of the Automated Radar Terminal System (ARTS) units, then being installed at major airports. The ARTS III system electronically tagged radar blips on the controller’s scope with luminous letters and numbers called alphanumerics that provided the target aircraft’s identity and altitude. Phase two of the en route automation program, then underway, would provide controllers at the twenty centers with new radar displays that would show such vital flight information as altitude and speed directly on the screen.

Securing the Airways

In January 1969 FAA faced a growing airline security problem. During the month, eight U.S. airliners were hijacked to Cuba. In February, FAA created an eight-man Task Force on the Deterrence of Air Piracy that combined a broad spectrum of expertise under the leadership of the deputy federal air surgeon. Systematic study by the task force revealed that a hijacker profile could be constructed from behavioral characteristics shared by past perpetrators. When used in conjunction with a FAA-developed magnetometer weapons screening device, the profile system offered a promising method of preventing potential hijackers from boarding aircraft. Eastern Air Lines began using the profiling system on October 15. By June 15, 1970, four U.S. air carriers employed the system.

Initially, FAA’s new screening procedures added increased security. In the first three months of 1969 there had been 14 hijackings, but only three occurred in the same period in 1970. Not a single flight covered by FAA screening had been the subject of a hijacking attempt. But, Administrator Shaffer soon faced a new
type of hijacker — individuals choosing destinations outside of the Americas and willing to kill to have their demands met.

On August 29, 1969, in the first hijacking of a U.S. aircraft outside of the Western Hemisphere, two terrorists seized control of a TWA 707 bound for Israel and diverted it to Syria. Once there, they deplaned the occupants and threw hand grenades into the cockpit. Two months later, on October 31, Rafael Minichiello, a U.S. Marine absent without leave, commandeered a TWA 707 bound for San Francisco and embarked on a 17-hour journey that ended in Rome, Italy. He was the first hijacker to force a crew to land and refuel repeatedly. On March 17, 1970, the first death in a domestic U.S. aircraft hijacking incident occurred when a hijacker shot and killed the copilot on an Eastern Air Lines shuttle en route from Newark to Boston. Although fatally wounded, the copilot still managed to shoot and severely wound the hijacker with the latter’s gun. The aircraft’s captain, himself wounded in both arms, landed the DC-9 safely in Boston.

In the wake of increased violence, FAA expanded its screening program. FAA selected New Orleans as a model for a more rigorous passenger screening system. On July 17, 1970, New Orleans’ Moisant International Airport became the first U.S. airport to subject all passengers to the FAA-developed anti-hijacking screening system based on a behavioral profile used in conjunction with a magnetometer. If a person identified as a possible risk could not satisfactorily resolve matters with airline personnel, the individual was investigated further by a U.S. marshal or deputy marshal.

In addition to deploying new security technologies to airports, FAA also strengthened its security organization. Administrator Shaffer dissolved the security task force created in 1969 and replaced it with a permanent organization, the Office of Air Transportation Security. The new office quickly found itself combating an even more violent breed of hijacker.

Between September 6-9, 1970, members of the Popular Front for the Liberation of Palestine hijacked four airliners over Europe, blew them up, and held many passengers hostage. The hijackers originally planned to seize two Israeli, one Swiss, and one U.S. aircraft, and take the planes to a level stretch of Jordanian desert dubbed “Revolution Airstrip.” When the hijackers failed to seize the first Israeli plane, they hijacked a U.S. aircraft. Discovering the wide-body jet was too large to land at Revolution Airstrip, they ordered it to Cairo, where they blew it up after deplaning its occupants. Front members did succeed in boarding one Israeli
The part of the original plan involving U.S. and Swiss airliners succeeded, and on September 6 these aircraft landed at Revolution Airstrip with all passengers. To gain bargaining power for the release of their member arrested in London, the Front hijacked a British airliner and forced it to land at Revolution Airstrip three days later. The Front blew up the three empty airliners on September 12 and freed all but six hostages on September 27. Those six were freed two days later, in return for the release of the hijacker under arrest in London and six other Front members held by the Swiss and West Germans.

In reaction to those hijackings, President Nixon announced, on September 11, a comprehensive antihijacking program that called for:

- Placement of armed guards, provided and specially trained by the U.S. Government, on American commercial airline flights;
- Extension, under DOT auspices, of electronic and other surveillance techniques by U.S. flag carriers to all gateway airports in the U.S., and in other countries wherever possible;
- Acceleration of efforts by U.S. federal agencies to develop security measures, including new methods for detecting weapons and explosives devices;
- Consultation between the U.S. State Department and other appropriate agencies and foreign carriers on anti-hijacking techniques; and
- Acceptance by all countries of a multilateral convention, to be considered at a conference held under the auspices of the International Civil Aviation Organization (ICAO), regarding the extradition or punishment of hijackers.

In addition, the president called on the international community to suspend airline service to countries refusing to extradite or punish hijackers involved in international blackmail. He stated that it was U.S. policy to hold nations that permitted the landing of a hijacked plane responsible for taking appropriate steps to protect the lives and property of U.S. citizens.

Two weeks later, the Departments of Justice and Transportation signed a memorandum of understanding dividing responsibilities for responding to hijackings. The FBI had jurisdiction when an aircraft was neither airborne nor moving on the runway for purposes of takeoff or landing. The pilot retained command at other times, and FAA’s recommendations to the captain had precedence. A further agreement in December 1971 assigned the pilot the responsibility of signaling whether the aircraft should be disabled or stormed.

In October 1970 the Departments of Transportation and Treasury agreed that the Bureau of Customs would recruit and train a permanent force of customs security officers who would be assigned to FAA for service aboard commercial passenger flights. After rigorous training at Fort Belvoir, Virginia, 1,784 men and women became Customs Air Security Officers, more familiarly known as sky marshals, on December 23, 1970. By May 1971 they had completely replaced the interim force.
organized in accordance with the program announced by President Nixon on September 11, 1970. In June 1974 DOT announced the end to the joint Departments of Treasury and Transportation program.

Hoping to bring diplomatic pressure on nations to prevent hijackings, on December 16 the United States and 49 other nations signed the Convention for the Suppression of Unlawful Seizure of Aircraft (known as The Hague or Hijacking Convention) at a diplomatic conference held under ICAO auspices. The U.S. was an active participant in developing the convention, which declared the hijacking of civil aircraft to be an offense punishable by severe penalties. The convention obligated contracting states to extradite hijackers or to submit their cases to prosecutorial authorities. The U.S. Senate approved ratification on September 8, 1971, and the U.S. deposited its instruments of ratification on September 14. This completed the ten ratifications needed to bring the convention into force among participating states 30 days later, and it became effective on October 14, 1971.

On September 23, 1971, the United States and 29 other nations signed the Convention for the Suppression of Unlawful Acts Against the Safety of Civil Aviation (known as the Sabotage or Montreal Convention) at an ICAO conference. This agreement was directed against offenders who commit acts of violence against persons aboard civil aircraft in flight, or who destroy or endanger such aircraft through means that include sabotage, interference with air navigation facilities, and communication of false information. It placed an obligation on contracting states to extradite such offenders or submit their cases to prosecutorial authorities. The convention would go into force 30 days following deposit of instruments of ratification by ten of the original signatory states. The U.S. deposited its instruments of ratification on November 1, 1972, and the treaty went into force on January 26, 1973.

Despite a coordinated international effort, the air piracy problem persisted. On June 12, 1971, the first passenger death in a domestic hijacking incident occurred on a TWA aircraft bound from Albuquerque to New York. The hijacker forced his way aboard the Boeing 727 aircraft during a scheduled stop at Chicago’s O’Hare International Airport, seized a stewardess, and demanded to be flown to Vietnam. A passenger was killed attempting to aid the stewardess. When the medium-range aircraft landed at New York’s Kennedy International Airport for substitution of a long-range aircraft, the hijacker was wounded and arrested.

In November 1971 the first in a series of hijackings involving extortion occurred when a passenger on a flight from Portland to Seattle successfully demanded $200,000 and four parachutes,
and then parachuted from the rear stairway of the Boeing 727. The hijacker — who used the name Dan Cooper, but became known as D. B. Cooper in the press — was never found. Another incident involving a demand for ransom and parachutes occurred on December 24, 1971, and 17 more extortion attempts on U.S. air carriers were made during the next six months.

In 1972 FAA worked to make its voluntary screening system mandatory. On February 2 the agency published a rule requiring scheduled air carriers, and certain commercial operators of large aircraft, to implement a passenger and baggage screening system acceptable to the administrator within four days. On the same day, at FAA request, the Federal Communications Commission (FCC) issued a notice informing broadcasters and FCC licensees that the Communications Act of 1934 prohibited unauthorized broadcast of FAA air-to-ground communications. This action followed instances in which FAA’s communications were monitored and rebroadcast, seriously hampering the agency’s efforts to control aerial piracy.

Another series of incidents between March 7-9, 1972, prompted new FAA security measures. On March 7 a bomb planted as part of an extortion plot against Trans World Airlines was discovered and defused aboard an airliner at New York’s Kennedy Airport. Two days later, another bomb damaged a TWA airliner parked at Las Vegas, and a third was found aboard a United Air Lines jet at Seattle. That same day, President Nixon ordered into immediate effect a FAA rule published on March 7 that required scheduled air carriers and certain commercial operators of large aircraft to submit written security programs. The president’s directive required the airlines to implement their programs immediately, and to submit them to FAA by May 8 for formal approval. Intended to prevent or deter unauthorized persons, baggage, or cargo from entering the carrier’s aircraft, these measures also mandated the use of a passenger screening system and specified certain procedures to be followed in the event of a bomb or air piracy threat.

Maintaining the momentum of increased security actions, on March 15 a cabinet-level task force formed by President Nixon and chaired by Transportation Secretary Volpe approved the following steps:

- Increase numbers of personnel for FAA’s Security Task Force.
- Deploy sky marshals from airborne duty to posts at major airports.
- Increase R&D funding for weapons and explosives detection systems.
- Use trained dogs for detection of explosives at major airports and assist in the training of additional dogs.
- Expedite prosecution of extortion and hijacking suspects.
These measures failed to prevent a new series of hijackings. On October 29, 1972, four fugitives killed a ticket agent and hijacked an Eastern Air Lines Boeing 727 at Houston, Texas, and forced it to fly to Cuba. This was followed by an even more sensational incident on November 10-12 when three wanted criminals hijacked a Southern Airways DC-9 at Birmingham, Alabama. During the following 29 hours, they flew to: Jackson, Mississippi; Cleveland, Ohio; Toronto, Ontario; Lexington, Kentucky; Chattanooga, Tennessee; Havana, Cuba; Key West, Florida; and Orlando, Florida. In a desperate attempt to keep the DC-9 on the ground at Orlando, FBI agents shot out its tires. The hijackers responded by seriously wounding the copilot and ordering a takeoff. The pilot succeeded in clearing the runway and making a second and final landing in Havana. The four hijackers were initially imprisoned in Cuba, but were released. U.S. officials subsequently arrested all four, the last being sentenced in 1994.

On December 5 FAA issued a landmark emergency rule that required U.S. air carriers, beginning on January 5, 1973, to inspect all carry-on baggage for weapons or other dangerous objects and scan each passenger with a metal detector before boarding or, if a detector was not available, conduct a physical search, or pat down. If a passenger refused to consent to a search, he or she would not be permitted to board. The rule further required, beginning on February 5, 1973, that the nation’s 531 air carrier airports have a law enforcement officer in the boarding area during the screening and boarding process. The critical difference between this rule and previous anti-hijacking measures was the universality of the new regulation. Previously, FAA had required air carriers to conduct a weapons scan of only those passengers who fit a hijacker profile — about one percent of the 500,000 passengers boarding airliners daily.

On August 5, 1974, President Nixon signed the Anti-Hijacking Act of 1974 into law. The act:

- Authorized the President to suspend air transportation between the United States and nations that aided terrorist groups who used the illegal seizure of aircraft as an instrument of policy.
- Empowered the Secretary of Transportation, with the approval of the Secretary of State, to impose sanctions against the carriers of nations that failed to maintain minimum security standards in the transportation of persons, property, and mail, as required by the Convention on International Civil Aviation.
- Required air carriers to refuse to carry persons unwilling to submit to personal search, and any article that a passenger did not allow to be inspected.
- Required FAA to keep passenger and baggage screening procedures in effect.
- Allowed FAA to use, for as long as needed, federal personnel, including FAA personnel, to supplement state, local, and private law enforcement officers in airport security programs. [In anticipation of this responsibility, FAA drew upon resources of the defunct anti-hijacking and cargo security section of the office of air transportation security to establish a new unit, the civil aviation security service.]
The passenger screening program and other precautionary measures proved effective in combating the hijacking menace. During calendar years 1973 and 1974, not a single airliner was hijacked in the United States.

Transitions

In January 1973 Richard Nixon began his second presidential term. On March 14, 1973, ALEXANDER BUTTERFIELD [TERM: 03/14/73 – 03/31/75] became the fifth FAA Administrator, succeeding John Shaffer, whose resignation was one of many accepted by President Nixon in a reorganization of the Executive Branch. Butterfield’s selection had been announced on December 19, 1972, and his nomination submitted to the Senate on January 4, 1973. Questions were raised about his eligibility, however, since he was a retired Air Force colonel and the FAA Administrator was prohibited by law from having a military affiliation. When congressional exemption from this statute appeared unlikely, Butterfield resigned his Air Force commission. President Nixon resubmitted Butterfield’s nomination to the Senate on February 26. The Senate confirmed him on March 12. A twenty year Air Force veteran, Butterfield had retired from the Air Force in 1969 to become deputy assistant to President Nixon.

Nixon’s new appointees, including Administrator Butterfield, quickly became entwined in the Watergate scandal. /Watergate became the general term for a series of political scandals during the re-election campaign and second presidential term Richard Nixon that began with five men being arrested after breaking and entering into the Democratic National Committee headquarters at the Watergate hotel complex in Washington, DC, on June 17, 1972. / The Senate Select Committee on Presidential Campaign Activities, or Watergate Committee, began highly publicized hearings in May 1973. While Nixon compelled the resignations of some of his appointees during the inquiry, Butterfield remained FAA Administrator. Many former administration officials gave dramatic testimony at the hearings, held from May 17 to August 7. On July 16, during his testimony, Administrator Butterfield disclosed the existence of a White House audio taping system. After listening to the tapes, prosecutors had undeniable evidence, in Nixon’s own words, that the president had obstructed justice and attempted to cover up the break-in.

Facing insurmountable evidence against him and probable impeachment hearings, on August 9, 1974, Richard Nixon resigned the presidency. Vice President Gerald Ford assumed the presidency, and on September 8, granted his predecessor a full and unconditional pardon for any crimes he might have committed as president. Alexander Butterfield remained as administrator until March 31, 1975. Deputy Administrator James Dow served as acting administrator until November 24, 1975, when JOHN McLUCAS [TERM: 11/24/75 – 04/01/77] became the sixth FAA Administrator. President Ford had

Administrator Alexander Butterfield

Administrator John McLucas
persuaded McLucas to give up his position as Secretary of the Air Force in favor of the FAA post. McLucas had a Ph.D. in physics and had held a number of technical management positions prior to entering government service.

PATCO

On March 17, 1973, negotiators signed the first labor contract between FAA and PATCO, the organization representing air traffic controllers. Effective on April 4, the one-year agreement contained 56 articles that included provisions on a variety of issues including payroll deduction of union dues and “familiarization flights” by controllers in airline cockpits.

FAA and PATCO reached agreement on a two-year contract on May 7, 1975 (effective July 8). The contract’s 74 articles covered a range of items, such as an expansion of familiarization flight privileges, working conditions, and career enhancement. The new contract, however, proved ineffective in preventing disruptive PATCO-initiated actions. For example, on July 28-31, 1976, a slowdown by PATCO-affiliated air traffic controllers disrupted traffic around the country. The PATCO president ordered the slowdown to protest the U.S. Civil Service Commission’s delay in completing a pay reclassification study for controllers. The union also protested a Civil Service proposal to downgrade controllers at certain low-activity facilities. The slowdown ended when the Civil Service Commission agreed to reconsider its position and expedite the review, while Administrator McLucas publicly confirmed his support of upgrading controllers at certain facilities. FAA took no disciplinary action against PATCO.

On November 12, 1976, the U.S. Civil Service Commission, in a reversal of a position taken earlier, announced support for upgrading air traffic controller positions to higher pay grades at eight of the nation’s busiest air traffic control facilities. The commission also approved upgrading lower pay graded controllers at approximately 23 other installations, but insisted on downgradings at a few facilities. PATCO continued to demand better terms, backing its position with the threat of renewed slowdowns. On January 13, 1977, the commission dropped its insistence on downgradings and approved promotions at some 45 facilities.

Safety Concerns

In 1970 there were no passenger or air crew fatalities in U.S. scheduled domestic airline service. Two widely publicized charter accidents, however, raised a number safety concerns. On October 2 a chartered Martin 404 carrying members of the Wichita State University football team crashed near Silver Plume, Colorado,
1970s Major Aviation Accidents

June 6, 1971: A DC-9 airliner and a U.S. Marine Corps F-4B collided in midair over Duarte, California, killing all 49 occupants of the DC-9 and one of the two occupants of the F-4B.

September 4, 1971: An Alaska Airlines Boeing 727 struck a mountain slope while attempting a non-precision instrument landing approach to Juneau airport, killing all 111 persons aboard.

December 29, 1972: An Eastern Air Lines Lockheed L-1011 crashed in the Everglades northwest of Miami, Florida, killing 99 of the 176 persons aboard. Two survivors died later as a result of their injuries in this first fatal crash of a wide-body airliner.

December 31, 1972: The crash of a DC-7 on takeoff from San Juan, Puerto Rico, killed baseball star Roberto Clemente and four other persons on a relief mission to Nicaragua.

July 23, 1973: An Ozark Airlines Fairchild-Hiller 227B crashed 2.3 miles from St. Louis airport, killing 38 of the 44 persons aboard.

December 17, 1973: An Iberia Airlines DC-10 crashed on landing at Boston's Logan Airport, causing injuries but no fatalities.

January 30, 1974: A Pan American Boeing 707 crashed short of the runway during a rain storm at Pago Pago, American Samoa. Only ten of the 101 persons aboard escaped the post-crash fire. Six of these survivors died within nine days.

March 3, 1974: A McDonnell Douglas DC-10 wide-body airliner crashed shortly after takeoff from Paris, France, killing all 346 people on board in the worst air disaster up to that time.

July 31, 1974: A Delta Air Lines DC-9 crashed against a sea wall while making an instrument approach to Logan International Airport in Boston, Massachusetts, with the loss of 89 lives.

September 11, 1974: An Eastern Air Lines DC-9 crashed 3.3 miles short of a runway at Charlotte, North Carolina, while approaching through patchy fog. All but ten of the 82 persons aboard lost their lives.

December 1, 1974: A Northwest Airlines Boeing 727 crashed near Thiells, New York, killing all three persons aboard.

December 1, 1974: Approaching Dulles International Airport under conditions of poor visibility, a Trans World Airlines Boeing 727 descended too soon and crashed into a mountain near Berryville, Virginia, killing all 92 persons aboard.

June 24, 1975: An Eastern Air Lines 727 crashed into approach lights while attempting to land during a thunderstorm at New York's Kennedy airport, causing fatal injuries to 113 of the 124 persons aboard.

April 27, 1976: An American Airlines Boeing 727 crashed on landing at Charlotte Amalie on St. Thomas in the Virgin Islands, killing 37 of 88 persons aboard.
killing 32 of the 40 persons aboard. One month later, on November 14, Southern Airlines Flight 932 on approach to the airport in Huntington, West Virginia, crashed killing all 75 persons on board, including the Marshall University football team.

As the result of a series of high profile scheduled airline accidents beginning in 1971, FAA implemented a number of rules and initiated a number of new programs to enhance safety. For example, in the midst of growing concerns over midair collisions, on June 18, 1971, FAA announced a joint program with the military designed to minimize the number of military aircraft flying under VFR conditions. The purpose of the program was to bring military flights under the direct control of FAA’s air traffic control facilities to enhance the efficiency of the common civil-military airspace system and reduce the midair-collision hazard.

In August 1971 FAA expanded requirements for the installation of an anti-collision system of flashing aviation-red or aviation-white lights on aircraft for night operations. The agency mandated the system be installed on all powered U.S. civil aircraft with a standard airworthiness certificate. Later in the month, the agency required airline passengers and crew to fasten safety belts during takeoff and landing. The rule excepted occupants of airships and children under two years if held by an adult. The new rule required the pilot in command to ensure that all persons aboard had been notified to fasten their safety belts prior to takeoff or landing.

New crashworthiness and passenger evacuation standards for transport category aircraft became effective in May 1972. The action upgraded requirements in areas that included: seats, berths, safety belts, and harnesses; stowage compartments; items in the passenger or crew compartments that might cause injury in turbulence or interfere with

Research and development helps mitigate injuries
A HISTORICAL PERSPECTIVE

evacuation; cabin interior fire protection; emergency evacuation procedures; emergency exits (their arrangement, marking, lighting, and access); emergency lighting; briefing passengers before takeoff; and structural elements designed to minimize fire hazard due to fuel spillage in the event of partial or complete failure of the landing gear. In June 1973 FAA published a rule requiring aircraft in designated airspace to carry an improved radar beacon transponder that was capable of automatically reporting altitude and able to transmit identity codes. A new rule requiring air carriers and air taxi operators to establish training programs for personnel having responsibilities for the safe carriage and handling of hazardous cargo followed, as did a rule requiring air carriers, air travel clubs, and air taxi operators to have electronic public address systems and interphone systems in all aircraft equipped with more than 19 passenger seats.

November 1974 brought tougher new rules covering the training, testing, and certification of pilots and new certification and operating standards for FAA-approved pilot schools. As a result of the crash near Berryville, Virginia, on December 1, 1974, FAA mandated that all large turbojet and turboprop airliners install ground proximity warning system by December 1, 1975. This date was subsequently extended because of technical difficulties. As a result of the Transportation Safety Act, signed by President Ford on January 3, 1975, FAA prohibited air carriage of hazardous materials unless the container had been inspected.

On May 1, 1975, FAA instituted the aviation safety reporting program, designed to provide the agency with information on potentially unsafe conditions in the NAS. To encourage the reporting of violations, the program granted immunity from disciplinary action to pilots or controllers who filed a timely report. Changes to the program came in August 1975, when FAA and NASA signed an agreement under which NASA operated a third-party reporting system that guaranteed anonymity to persons providing information about safety hazards and incidents. NASA agreed to: receive and process reports; delete information that would reveal the identity of the informants; analyze and interpret the data; and provide the results to FAA and the aviation community. NASA, however, directed information concerning criminal offenses directly to FAA and the Justice Department. The system became operational on April 15, 1976.

Increased pilot training requirements improve safety
Chapter 5: An Evolving Agency in a Changing World

On January 20, 1977, Jimmy (James E.) Carter became President of the United States. Brock Adams became his first secretary of transportation, John McLucas resigned as FAA Administrator on April 1, 1977, and LANGHORNE BOND [TERM: 05/04/77 – 01/20/81] succeeded him, becoming the seventh FAA Administrator. The son of a vice president of Pan American Airways, Bond had a law degree from the University of Virginia. He had been a member of the task force that developed the legislation establishing the Department of Transportation (DOT) and then served one-year appointments as a special assistant to the first DOT secretary and then as assistant administrator for public affairs in DOT’s Urban Mass Transportation Administration. He left federal service in 1969 to become executive director of the National Transportation Center, a nonprofit research organization in Pittsburgh that managed bus technology projects for transit authorities. In March 1973 Bond became the Illinois Secretary of Transportation, the position he held when selected for the FAA position.

Deregulation

When President Carter assumed office, airlines faced severe economic distress as passenger demand fell and ticket and fuel prices rose. Since 1938 the Civil Aeronautics Board (CAB) had regulated all domestic air transport as a public utility, setting fares, routes, and schedules. CAB also ensured the airlines had a reasonable rate of return. Since the creation of CAB, no airline had failed economically. Technological developments in the 1960s and 1970s, such as the wide-body aircraft, however, had created strains on the airline industry. While new aircraft significantly increased airline capacity on many routes, they made it harder for airlines to recover the cost of extra seats without adjusting pricing. The 1973 Arab oil embargo resulted in skyrocketing fuel costs that lowered airline profits.

Airline regulation guaranteed profits for most of the major airlines. Although the airlines favored federal regulation, passengers forced to pay escalating fares did not. Small communities that subsidized air service at ever increasing rates lobbied for deregulation. Leading economists had long argued that airline regulation resulted in inefficiency and higher costs. President Carter believed an unregulated industry would attract new carriers and increase competition among airlines. This, in turn, would result in lower fares and improved service.
In November 1977 President Carter tested deregulation theories when he signed legislation that ended economic regulation of air cargo operations. Almost a year later, on October 24, 1978, he signed the Airline Deregulation Act of 1978 (Public Law 95-504). The new law allowed immediate air fare reductions of up to 70 percent without CAB approval, and the automatic entry of new airlines into routes not protected by other air carriers. It also phased out federal control over airline pricing and routes. CAB’s authority over fares, routes, and mergers would be removed entirely before 1983, and — unless Congress acted — CAB itself would shut down on January 1, 1985.

The Airline Deregulation Act created a highly competitive airline industry. The early effects of deregulation included bankruptcies, mergers, acquisitions, and furloughs. Between 1978 and the end of 1983, the number of scheduled interstate carriers in the United States increased from 36 to 123. During the same period, 34 carriers went bankrupt and another 69 ceased operations. Prior to 1978, during the time they were protected by the government from competition, the major carriers had become high-cost, unionized operations. When competition began in 1978, the new carriers generally employed relatively cheap nonunion labor and used smaller crews on their aircraft than the established airlines. Deregulation also increased FAA workload exponentially. FAA had to certify every new airline and there were hundreds of applications after deregulation that FAA had to review and approve or disapprove. In the immediate years after the deregulation act, FAA flight standards and other offices focused primarily on the new applicants.

By the time airline deregulation became law, FAA had achieved a semi-automated air traffic control system based on a marriage of radar and computer technology. By automating certain routine tasks, the system allowed controllers to concentrate more efficiently on the vital task of keeping aircraft safe and separated. Data appearing directly on their scopes provided controllers the identity, altitude, and groundspeed of aircraft carrying radar beacons. Despite its effectiveness, however, the air traffic control system required enhancement to keep pace with the increased volumes of traffic that resulted from the new, deregulated competitive environment. New fare and route competition in the air passenger industry and the entry of new domestic carriers required long-term FAA planning.
Controller Relations

On March 15, 1978, a three-year labor-management agreement between the Professional Air Traffic Controllers Organization (PATCO) and FAA went into effect. Since the controllers’ pay had been adjusted by a 1976 Civil Service Commission ruling, the contract dealt primarily with their working conditions. The agreement contained 75 articles, including provisions for overtime pay. In the past, airlines had always provided free familiarization flights for eligible controllers, but now the principal overseas air carriers balked at the prospect of providing cockpit space on international flights for all air traffic controllers at a certain pay level. Previously, only controllers who handled international flights could take the overseas familiarization trips, but now FAA allowed most controllers to take international familiarization flights. The agency also agreed to pay controllers their salaries while they were on such flights.

Despite FAA concessions, some U.S. flag carriers refused to provide controllers with overseas familiarization flights. On May 25, 1978, PATCO staged a day of intermittent slowdowns to protest against these companies. Then, on June 6-7, the union began another slowdown. Resulting delays in the national aviation system were especially severe because of the increased air travel resulting from new low transatlantic and domestic fares. FAA asked for, and received, help from the U.S. court system to stop this slowdown. On June 21 PATCO agreed to obey a federal-court injunction and end the “work to rule” delays. The union also agreed to pay a fine of $100,000 to the Air Transport Association for violating the permanent injunction won in a 1970 law suit against air traffic slowdowns.

A new federal law in late 1978 established new federal offices to oversee civil service rules, including the relationships between federal agencies and employee unions. On October 13, 1978, President Carter signed the Civil Service Reform Act (Public Law 95-454) in fulfillment of a campaign promise. Among other things, the law created the U.S. Office of Personnel Management (OPM), the Federal Labor Relations Authority (FLRA), and the U.S. Merit Systems Protection Board (MSPB). The legislation provided the first statutory basis for collective bargaining between the federal government and employee unions.

Concerned that FAA would take disciplinary action against controllers taking part in work slowdowns, PATCO established a national controller subsistence fund in May 1978. Believing the union created the fund as a war chest for financing illegal job actions, FAA quickly filed an unfair labor practice complaint. On May 4, 1979, the regional director of the Washington Office of the FLRA ruled the fund legal. The ruling held that, while federal statute prohibited strikes or other overt job actions by federal employees, it did not prohibit strike funds. A three-member FLRA panel upheld the regional director’s ruling in December 1980.
PATCO President John Leyden resigned in February 1980 after a bitter struggle with Robert Poli for control of the organization. Both men had submitted their resignations to the PATCO board, but the board accepted only the president’s resignation. The regional vice president became interim president and subsequently was elected to a three-year term on April 24.

Controller unrest did not diminish under the new leadership. On April 15, 1980, PATCO distributed an educational package to its members that FAA considered to be, in effect, a strike plan. These materials provided: information on how to establish communications networks and committees on security, welfare, and picketing; recommendations for a variety of financial preparations in case of the loss of wages during a job action; and advice to local PATCO organizations to make arrangements for bail bondsman and for other legal services. The union followed this with an August 15 slowdown at Chicago’s O’Hare International Airport that caused 616 delays of 30 minutes or more and cost air carriers more than $1 million in wasted fuel. The slowdown followed FAA’s refusal to meet a demand by O’Hare controllers for an annual tax-free bonus of $7,500.

Two days after the Chicago slowdown, FAA brought suit for preliminary and permanent injunctions against the controllers. The following day, a U.S. District Court judge issued a temporary restraining order prohibiting PATCO and its O’Hare affiliate from taking part in any work stoppage or slowdown. Subsequently, FAA pressed its plea for permanent injunctive relief. On December 15 a U.S. District Court judge in Illinois dismissed the court action brought by FAA against PATCO and its Chicago O’Hare Local No. 316 for the August slowdown. The judge considered such a slowdown an unfair labor practice, but noted that Title VII of the Civil Service Reform Act of 1978 gave jurisdiction in such controversies to the FLRA, not to U.S. district courts.

Protecting the Environment

Increased noise and air pollution proved a consequence of more flights and larger aircraft. In March 1977 FAA defined three stages of aircraft noise levels for subsonic large transport aircraft and subsonic turbojets. Stage 1 aircraft did not meet

then-current noise standards and had to be modified or replaced according to a previously established schedule. Stage 2 aircraft met the current standards, while Stage 3 aircraft met the more rigorous noise standards established for the next generation of jet transports. The agency judged that improved noise-reduction technologies made it economically reasonable to apply the new standards, which became effective on October 1, 1977.

Researchers conduct an emissions test
FAA also reduced noise limits on landing approaches from the old standard of 102-108 effective perceived noise decibels (EPNdB) to 98-105 EPNdB, depending on aircraft weight. For the first time, the agency based the standards for takeoff and sideline noise levels on number of engines as well as weight. FAA reduced takeoff noise limits from the old standard of 93-108 EPNdB to 90-106 for four-engine jets, 90-104 for three engines, and 89-101 for one and two engines. In addition, the agency reduced sideline noise limits from 102-108 EPNdB to 96-103 for three and four engines and 94-103 for one and two engines. In addition, the agency reduced sideline noise limits from 102-108 EPNdB to 96-103 for three and four engines and 94-103 for one and two engines. In addition, the agency reduced sideline noise limits from

102-108 EPNdB to 96-103 for three and four engines and 94-103 for one and two engines. A November 1980 FAA rule required foreign operators of aircraft over 75,000 pounds serving the U.S. to comply with the same noise standards as U.S. operators. The rule generally required final compliance by 1985.

In January 1980 the Environmental Protection Agency (EPA) established a schedule for reducing air pollution from older transport aircraft using the JT3D jet engine (mostly used on DC-8s and Boeing 707s). EPA required the replacement of one-fourth of these stage 2 engines by January 1, 1981; one-half by January 1, 1983; and all by January 1, 1985. The rule postponed earlier requirements established in 1973. The emissions standards also applied to foreign-owned aircraft serving U.S. airports.

On January 20, 1983, EPA eliminated the requirement that the remaining in-use JT3D engines be retrofitted to meet the standards. The legislation also authorized funds for noise planning and land use compatibility.

Residents of Santa Monica, California, express concern about airport noise
projects and, in certain circumstances, barred law suits for damages resulting from airport noise.

FAA published a rule in early 1980 eliminating the allowable amount of ozone gas in airliners flying above 18,000 feet. The agency restricted ozone concentration in the cabin to a maximum of 0.25 parts per million. In addition, the average exposure on flights of more than four hours could be no more than 0.1 parts per million. FAA gave airlines the choice of achieving these standards through air filters, use of engine heat to break down ozone, or selection of routes that avoided ozone concentrations. The agency expected that about 500 large transport aircraft used at high altitudes in northern latitudes would require modification. FAA set a compliance deadline of February 20, 1981. The same rule amended airworthiness standards for new transport aircraft to provide protection against ozone depletion.

Safety

The Airline Deregulation Act authorized the use of larger aircraft by commuter airlines. The rule helped boost the already booming growth rate of commuter airlines and led to important new FAA regulations. Hoping to bring the safety level of commuter airlines in line with that of the major airlines, in December 1977, FAA promulgated a comprehensive revision of Federal Aviation Regulations Part 135, governing air taxi and commuter airline operations. Under the new rules, depending on the size of the operations and aircraft, FAA required commuter airlines to have a director of operations, a chief pilot, and a director of maintenance, as well as more stringent training and maintenance programs. In addition, FAA required commuter airliners, depending on their size, to have equipment such as a ground proximity warning indicator, thunderstorm detection equipment, and a third attitude gyro (to indicate the orientation of the aircraft’s axes relative to some reference line, such as the horizon). Because the new requirements were tied to the size and complexity of operations, they enabled commuter airlines to fly aircraft with a seating capacity of up to 30 passengers or a payload of up to 7500 pounds as allowed by the Airline Deregulation Act.

On March 27, 1977, the worst accident to date in aviation occurred when two Boeing 747s collided on a runway at Tenerife, Canary Islands, under conditions of limited visibility. Controllers had instructed one of the aircraft, a Pan American jet, to move down the runway toward an assigned taxiway, but they also ordered the other jet, belonging to KLM Royal Dutch Airlines, to wait at the end of the same runway. The Dutch crew, approaching the legal flight duty time limit, apparently misinterpreted a message from the tower as clearance to take off. Disregarding the doubts of a crew member, the captain began the takeoff roll. The resulting collision killed all 248 persons aboard the KLM jet and 335 of the 396 persons aboard the Pan American. An intense fire engulfing both aircraft caused most of the casualties.

A few days later, on April 4, a Southern Airways DC-9 crashed near New Hope, Georgia. The pilot attempted an emergency landing on a highway, but the aircraft broke apart and caught fire. The accident killed 62 of the 85 persons aboard, as well as eight persons on the ground. In addition, one passenger and one person injured on the ground died about a month later.
In June 1977 FAA established the Special Aviation Fire and Explosion Reduction (SAFER) Advisory Committee to examine the topic of post-crash survival of aircraft cabin occupants. The committee’s 24 members came from airlines, aircraft manufacturers, universities, research organizations, as well as flight and cabin crews. Formation of the committee resulted from two public hearing held by FAA to discuss four rulemaking proposals concerning fire hazards in transport aircraft. The hearings reflected public consensus that the issues addressed in the four rules were interrelated and should be addressed as one problem. Deciding to wait for the SAFER committee’s recommendations, FAA withdrew the four rulemaking proposals. One of those would have required fuel tank explosion prevention systems. The other three concerned the effects of fire on compartment interior materials, toxic gas emission standards, smoke emission standards, and replacement of existing materials that did not meet flammability standards.

The agency also intensified research on post-crash fires. In late 1977 it signed an agreement with the United Kingdom to help develop an anti-misting kerosene fuel, known as AMK. In November 1978 FAA announced that a new fire research laboratory would be built at its National Aviation Facilities Experimental Center in Atlantic City, New Jersey.

As the SAFER committee continued its investigations, two more accidents raised concerns about post-crash fires. On May 25, 1979, an American Airlines DC-10 crashed into an open field near Chicago’s O’Hare airport after its left engine and pylon assembly separated from the aircraft on takeoff. The ensuing crash and fire killed all 272 persons aboard the flight and two people on the ground. An August 1980 in-flight fire on a Saudi Arabian Airlines L-1011 intensified fears about aircraft fires. Smoke inside the aircraft prompted a return to Riyadh shortly after takeoff. The aircraft landed normally, but was destroyed by fire on the taxiway. All 301 persons aboard died in the fire.

The SAFER Committee released its final report in September 1980. The committee found that over the previous 15 years fatalities due to post-crash fire in U.S. scheduled air carrier operations averaged about 32 per year. The SAFER group urged FAA to expedite the investigation and validation of anti-misting kerosene. Other recommendations included:
• Requiring mandatory fuel tank vent protection,
• Maximizing the probability of engine fuel shut-off in potential fire situations,
• Conducting research on lowering the flashpoint of kerosene fuels,
• Improving accident investigation and reporting,
• Undertaking research to establish the contribution of cabin interior materials to the post-crash fire hazard,
• Developing fire-blocking layers for seats,
• Accelerating toxicity research,
• Establishing radiant heat resistance standards for evacuation slides, and
• Developing improved fire-resistant cabin windows.

The committee also urged FAA to create a standing advisory committee to provide regular expert advice in the field of fire and explosion research. FAA subsequently set up working groups to examine the SAFER recommendations and take rulemaking action when feasible.

Security

The number of hijacking attempts throughout the world doubled in 1977 and resulted in the death of 129 persons. The most spectacular incident of 1977 was the five-day odyssey of a Lufthansa Boeing 737 hijacked in October over the Mediterranean and flown to various places in the Near East. The hijackers murdered the pilot, and later, in Somalia, threatened to massacre the other 86 people on board. Just 90 minutes before their deadline, West German commandos stormed the aircraft and rescued all the hostages. After this incident, the International Federation of Air Line Pilots threatened a two-day international pilots’ strike unless the United Nations took immediate action on air piracy. Just two month later a Malaysian Airlines Boeing 737 crashed after being hijacked, killing all 100 persons aboard.

During the Carter Administration, the U.S. continued to work with its international partners to improve aviation security worldwide. At a July 17, 1978, economic summit conference in Bonn, Germany, representatives from the United States, West Germany, France, Great Britain, Japan, Canada, and Italy announced a joint resolution to isolate from international air traffic all countries harboring air hijackers. The resolution stated their intent to stop all flights to any country that refused to extradite or prosecute those who have hijacked an aircraft and/or failed to return such an aircraft. The resolution also called for a ban on incoming flights from an offending nation, as well as a ban on any traffic to that nation by airlines of participating countries. The conferees informally agreed to make no exceptions, not even for persons escaping from totalitarian governments. Diplomatic efforts began immediately to gain the agreement of as many other countries as possible.

In July 1978 a new FAA regulation extended to both domestic and international charter operations security screening procedures already in effect for scheduled airlines. Less than a year later, in
March 1979, FAA revised its rules for airport security. In a departure from previous rules, the agency permitted police officers assigned to security checkpoints in some airports to patrol other areas of the terminal, as long as they could respond quickly to trouble at their checkpoints. In another major change, FAA made it a regulatory violation for anyone, passenger or not, to carry guns or explosives into the sterile areas beyond the checkpoints. Prior to that, regulations only prohibited carrying weapons on board aircraft. The revised airport security regulations represented increased concern for the safety of people in airport terminals as well as aboard airliners.

During 1978 U.S.-registered aircraft experienced eight hijacking attempts — the highest level since FAA began screening passengers and carry-on luggage in 1973. None of the hijackers, however, had been able to slip firearms or explosives through airport screening points. That changed on January 25, 1980, when the first U.S. air carrier hijacking occurred in which real weapons or high explosives passed through the passenger screening system. On that date, a hijacker armed with a pistol and pretending to have a bomb diverted a Delta Airlines L-1011 to Cuba. Once in Cuba, he demanded to be flown to Iran, but eventually surrendered to Cuban authorities.

In July 1980 a hijacker, holding what seemed to be a small handgun to the back of a flight attendant, diverted another Delta Air Lines L-1011 to Cuba. This incident was the first in a series of hijackings by Cuban refugees who had arrived in the U.S. during the boat lift, beginning in April, from the port of Mariel. These refugees returned to their homeland in ten additional hijackings between August 10 and September 17. During the last quarter of 1980, however, no successful “Marielista” hijackings occurred.
President Ronald Reagan talks to reporters about the PATCO strike.
Chapter 6: A System in Turmoil

On January 20, 1981, Ronald Reagan began his first presidential term. The resignation of Langhorne Bond as FAA Administrator became effective on this date. Three days later, Drew Lewis became Secretary of the U.S. Department of Transportation (DOT), the first of three to hold this position under President Reagan. Elizabeth Dole succeeded Lewis on February 7, 1983, and James Burnley became Secretary on December 3, 1987.

**J. LYNN HELMS [TERM: 04/22/81 – 01/31/84]** became the eighth FAA Administrator on April 22, 1981. He had received his flight training as part of the U.S. Navy’s V-5 program during World War II, then entered the Marine Corps to serve as both a test pilot and instructor pilot. After leaving the Marine Corps with the rank of Lt. Colonel in 1956, he went to work as a design engineer for North American Aviation. In 1963 he joined the Bendix Corporation eventually becoming vice president. Helms then accepted the presidency of the Norden Division of United Aircraft in 1970. He joined Piper Aircraft Corporation in 1974, serving as president, chairman, and chief executive officer before retiring from the company in 1980.

**DONALD ENGEN [TERM: 04/10/84 – 07/02/87]** served President Reagan as the ninth FAA Administrator. He began flying with the Navy during World War II and participated in the air and sea battles that accompanied the recapture of the Philippines and attacks on Iwo Jima, Okinawa, and other Pacific Islands. After a brief return to civilian status following the war, Engen rejoined the Navy in 1946. He was deputy commander-in-chief of the U.S. Atlantic Command and U.S. Atlantic Fleet at the time of his retirement from the Navy in 1978. He served as general manager of the Piper Aircraft Corporation plant in Lakeland, Florida, from 1978-80, and then became a senior associate with Kentron, a consulting firm in Alexandria, Virginia. He was appointed a member of the National Transportation Safety Board (NTSB) in June 1982, and remained in that position until joining FAA.
T. ALLAN McARTOR [TERM: 07/22/87 – 02/17/89] was the tenth FAA Administrator. He served as a fighter pilot in Vietnam, logging 200 combat missions and winning the Silver Star and Distinguished Flying Cross. McArtor flew with the Air Force Thunderbirds precision flying team from 1972 to 1974. He joined the Federal Express Corporation in 1979, and was senior vice president for telecommunications at the time of his selection to head FAA. He had also chaired the DOT Commercial Space Transportation Advisory Committee from June 1986 to June 1987.

**PATCO Strikes**

The labor contract between FAA and Professional Air Traffic Controllers Organization (PATCO) expired on March 15, 1981. In accordance with Article 75 of the contract, all of its provisions except one (immunity under the aviation safety reporting program) remained in force until a new contract was put in place. PATCO had submitted its bargaining proposals to FAA in early January 1981, and negotiations had begun the following month. After 37 negotiating sessions with FAA, however, PATCO representatives walked out of the contract talks, claiming that the agency was not responsive to their proposals. PATCO’s proposals for a 32-hour work week and separate pay scale for controllers, then embodied in proposed legislation before Congress, faced opposition by the Office of Management and Budget. When formal contract talks ended on April 28, irregularly scheduled and informal talks began under the auspices of the Federal Mediation and Conciliation Service (FMCS).

On May 23, at its annual convention, PATCO set a June 21 deadline for reaching agreement on a new contract with FAA. The PATCO president said if an agreement could not be reached by that date, the union would poll its members for a strike vote. Newspapers quoted him as vowing that the “the skies will be silent” if FAA’s negotiators did not “come to their senses.” PATCO President Robert Poli threatened that a nationwide strike would begin on Monday, June 22.

PATCO broke off informal talks on June 17, when it rejected a Reagan Administration contract proposal. The following day, the U.S. District Court rejected a PATCO motion to vacate the injunction restraining the union from engaging in illegal job actions or strikes. PATCO moved to have the injunction lifted on the grounds that it had been superseded by the Civil Service Reform Act of 1978, which gave the Federal Labor Relations Authority (FLRA) original jurisdiction in federal labor-management disputes.
Secretary of Transportation Drew Lewis and Robert Poli went back to the bargaining table Friday evening, June 19, at the behest of Representative James Howard (D-NJ), chairman of the House Public Works Committee. The resumption of talks may have been prompted by a letter to PATCO from 36 U.S. Senators, stating that a strike by PATCO would do nothing to further the union’s goals of increased pay and changes in working conditions. Federal mediator Kenneth Moffett joined the bargaining sessions, which took place at the offices of the FMCS and lasted more than 25 hours, with the last session running past 3:00 am, Monday, June 22.

The marathon bargaining session resulted in agreement on a tentative new contract. The agreement contained four key provisions, which the Reagan Administration agreed to recommend to Congress:

- A “responsibility” differential that would give controllers 42 hours pay for each normal 40-hour week worked.
- An increase in the night differential from 10 to 15 percent of base pay.
- The exclusion of overtime, night differential, and Sunday and holiday pay from the limitations of the federal pay cap.
- A retraining allowance equivalent to 14 weeks of base pay for controllers who became medically disqualified after five consecutive years of service at the journeyman level or above and who were ineligible for retirement or disability compensation.

The first-year cost of the total package, which included a cost-of-living raise of 4.8 percent due federal civil service employees in October, came to approximately $40 million or, on the average, $4,000 per controller per year. PATCO had been seeking a package that would have cost the government, initially, in excess of $700 million per year.

On July 2 PATCO’s nine-member executive board recommended unanimously that union members reject the tentative contract. Robert Poli also voted to reject the contract, although he had stated that he was pleased with the settlement at the time of its negotiation. After a membership vote, on July 29, PATCO announced that its members rejected the tentative contract by a vote of 13,495 to 616. Two days later, the PATCO president announced at a press conference in Washington, DC, that his union would begin a nationwide strike beginning on Monday, August 3, unless the government met PATCO’s demands.

After the failure of last minute negotiations, which began 2:00 pm Sunday, August 2, and continued, with one break, past 2:00 am on August 3, the union carried out its threat. On August 3 approximately 12,300 members of the 15,000-member PATCO
went on strike, beginning at 7:00 am eastern standard time, grounding approximately 35 percent of the nation’s 14,200 daily commercial flights. Approximately four hours after the strike began, President Reagan, at an impromptu news conference, issued the strikers a firm ultimatum — return to work within 48 hours or face permanent dismissal.

The Reagan Administration moved swiftly on three fronts — civil, criminal, and administrative — to bring the full force of the law to bear on the strikers. In a series of legal steps, federal officials:

- Asked FLRA to revoke the certification of PATCO as the bargaining agent for the 17,200 controllers and controller staff members. [FLRA revoked the exclusive recognition status of PATCO on October 22. Following a temporary stay by a federal appeals court, the revocation became effective on October 27. In a subsequent appeal, on June 11, 1982, a federal appeals court chose not to vacate the earlier decision to uphold the revocation order.]
- Moved to impound the union’s $3.5 million strike fund.
- Filed criminal complaints in federal courts in eleven cities against twenty-two PATCO officials.
- Sought restraining orders against the strikers in thirty-three courts.

Even before the 7:00 am walkout, the U.S. District Court for the District of Columbia signed an order directing the controllers to return to work. Late in the evening on August 3, another judge of the same court found the union in contempt for failing to obey the first order and imposed an accelerating schedule of fines totaling $4.75 million if the controllers failed to report to work [$250,000 for Tuesday, August 4; $500,000 for Wednesday; $1 million a day for the next four days]. That judge also fined the PATCO president $1,000 a day for each day the strike continued, through Sunday, August 9. Approximately 875 controllers returned to work during the 48 hour grace period granted. After expiration of the grace period, FAA fired approximately 11,400 controllers. On December 9, 1981, President Reagan rescinded a three-year prohibition of any federal employment of controllers dismissed for participation in the PATCO strike; however, the fired controllers were still barred from employment with FAA. Most of those fired appealed the action, and FAA eventually reinstated 440 as a result of their appeals.

The strike and dismissals drastically curtailed FAA’s controller workforce. The firings reduced the number of controllers at the full performance or developmental levels from about 16,375 to about 4,200. To keep the airways open, approximately 3,000 air traffic controller supervisory personnel worked at controlling traffic. FAA assigned assistants to support the controllers, and accelerated the hiring and training of new air traffic personnel. Military controllers arrived at FAA facilities soon after the strike began, and about 800 were ultimately assigned to the agency. On September 4 FAA announced it would hire approximately 1,500 temporary employees to assist in replacing air traffic controllers fired for striking. The
temporary employees would not control traffic, but would perform duties related to flight strip distribution and other controller support functions. The combined force proved sufficiently large to handle traffic without activating the national air traffic control contingency plan, which called for FAA to establish rigid, severely curtailed airline schedules and to prescribe routes and altitudes.

The day the strike began, FAA adopted Special Federal Aviation Regulation 44, establishing provisions for implementing an interim air traffic control operations plan. That plan, developed by former FAA Administrator Langhorne Bond, allowed FAA, among other things, to limit the number of aircraft in the national airspace system (NAS). On August 5 the agency implemented a plan dubbed “Flow Control 50,” whereby it required air carriers to cancel approximately 50 percent of their scheduled peak-hour flights at 22 major airports. FAA maintained en route horizontal spacing between aircraft under instrument flight rules (IFR) of up to 30 miles. The agency kept aircraft on the ground, as necessary, to maintain this spacing. FAA gave priority to medical emergency flights, presidential flights, flights transporting critical FAA employees, and flights dictated by military necessity. General aviation flights operated under the severest restrictions. Aircraft with a gross takeoff weight of 12,500 pounds or less were prohibited from flying under IFR. Aircraft flying under visual flight rules were prohibited from entering terminal control areas (TCAs). Other general aviation aircraft were served, as conditions permitted, on a first-come-first-served basis.

PATCO President Robert Poli resigned on December 31, and the newly elected president, Gary Eads assumed his duties on January 1, 1982. Seven months later, on July 2, 1982, PATCO filed a request for liquidation under Chapter 7 of the Federal Bankruptcy Act. At that time, the union had about $5 million in assets but owed $40 million, including $33.4 million to the airlines for violating a 1970 federal
court anti-strike injunction. The controllers remained without a union until June 19, 1987, when the FLRA certified the National Air Traffic Controllers Association as the exclusive representative of terminal and center controllers.

During this time, FAA electronics technicians unionized. On December 29, 1981, FLRA certified the Professional Airway Systems Specialists (PASS) as the exclusive representative of the technicians. PASS had defeated the Federal Aviation Science and Technological Association (FASTA) in a July election, but a protest by FASTA delayed certification of PASS. FAA and PASS concluded their first national labor agreement during fiscal year 1984.

Modernization

The new competitive environment created by airline deregulation resulted in greater demand for service, a change in flying routes as airlines formed hubs at major cities, and growing congestion in the aviation system. Congestion resulted from the interaction of many factors. The combination of fare decreases and hubbing led to increased air travel, while the limitations of the air traffic control equipment and long lead times for airport expansion held back increases in system capacity.

Aviation system disruptions in the aftermath of the PATCO strike led many in FAA to realize the need for a fully automated air traffic control system. Such a system could help compensate for increasing system complexity and lessen controller workload. Although it had been fielding new technology incrementally as new tools and resources became available, during the strike the agency realized it needed a systematic, long-term plan for modernization.

On January 28, 1982, Administrator Helms publicly released the first annual National Airspace System Plan (commonly known as the Brown Book), a comprehensive 20-year blueprint for a state-of-the-art traffic control and air navigation system to accommodate projected growth in air travel over the next 20 years. The 450-page document had been printed the previous month and bore the date December 1981. The plan spelled out specific improvements to be made to facilities and equipment to meet the projected demands of air transportation. Key elements of the plan included:

- **Computers**: FAA would first replace the IBM 9020 computers at the air route traffic control centers (ARTCCs) with more powerful systems that could use existing software packages. The agency would then proceed with development of new software as well as new consoles and displays known as “sector suites.”

- **Facility consolidation**: ARTCCs and terminal radar control rooms would be consolidated from approximately 200 into about 60 by the year 2000. Flight service stations would be consolidated from about 300 into 61 automated facilities.

- **Radar**: a new secondary radar system would interrogate aircraft transponders on an individual basis, paving the way for automatic data link air-ground communications. This Mode S equipment (“S” for “selective address”), in combination with a new generation of Doppler weather radar, would also permit the replacement of the existing primary en route radar system. Primary radar would
be retained in terminal areas, however, and be improved with the addition of a separate weather channel.

- **Weather services**: would be upgraded by such means as direct pilot access to computer weather data via remote terminals or touchtone telephones. Automated sensors at airports would generate radio broadcasts on surface conditions, improving safety and allowing lower weather minimums for landing.

- **Microwave Landing System (MLS)**: full production procurement was to be initiated in fiscal year 1983, with over 1,250 systems to be in place before century’s end. FAA expected the new equipment to provide precision guidance over a much broader area than the existing Instrument Landing Systems (ILS), thus allowing greater operational flexibility.

Authorization to fund modernization came with the Tax Equity and Fiscal Responsibility Act (Public Law 97-248) signed by President Reagan on September 3, 1982. The act raised the airline passenger ticket tax from five to eight percent, increased the general aviation gasoline tax from 4¢ to 12¢ per gallon, levied a jet fuel tax of 14¢ per gallon, and reimposed the five percent air cargo tax and the $3 international departure fee. These taxes were earmarked as renewed funding for the Airport and Airway Trust Fund, which had received no tax revenues since September 30, 1980. Title V of the tax bill, designated the Airport and Airway Improvement Act of 1982, authorized FAA to use a total of $6.327 billion from the Trust Fund for airway facilities and equipment over the six years beginning with fiscal 1982. In addition, $1.169 billion from the Trust Fund was authorized for the agency’s research, engineering, and development activities during the same six years. The act also reestablished FAA’s
airport grants program for development and noise compatibility projects. Formerly known as the Airport Development Aid Program, this function was now renamed the Airport Improvement Program.

With approved funding, FAA moved quickly to acquire new systems. In December FAA upgraded the computer at its Central Flow Control Facility at its Washington headquarters. Physically located at the Technical Center in Atlantic City, New Jersey, the new IBM 4341 computer was connected by landline to terminals used by Central Flow personnel at headquarters. The IBM 4341 had 14 times more memory and was 70 percent faster than the IBM 9020A it replaced. In addition, it allowed two-way data communication between the Flow Control Facility and air route control centers (ARTCCs). Controllers used the computer to monitor the number of aircraft in flight, as well as their destinations and times of arrival, as part of Central Flow’s mission of keeping air traffic running smoothly.

In September 1984 FAA announced the award of a construction contract to expand the Seattle ARTCC, the first in a program to expand all 20 en route centers in the 48 contiguous states. The construction would allow the facilities to accommodate more sophisticated computers and radar displays being developed under the advanced automation program. A contract award for design of the Oceanic Display and Planning System (ODAPS) quickly followed. ODAPS automatically provided controllers with flight data for aircraft flying in oceanic sectors, thus eliminating time-consuming procedures involving use of flight strips and repeated voice communications.

FAA also announced a contract for ground stations for the new Mode S radar beacon system, a secondary radar system employing advanced ground sensors and radar beacon transponders aboard aircraft. Two corporations participated in the joint contract to produce 78 of the stations, with an option for another 59 units. The discrete address capability of the new system enabled controllers to interrogate aircraft individually and selectively determine their position, identity, and altitude, without using voice communications. This eliminated the overlapping and garbled signals that sometimes proved problematic in busy terminal areas.

FAA awarded a contract to IBM for replacement of the IBM 9020 computers at the nation’s 20 ARTCCs in July 1985 as part of the agency’s advanced automation program. The new system, designated the host computer system, would provide greater speed, reliability, and storage capacity. The system consisted of two units, one serving as the primary processor and the other providing support and backup. FAA commissioned the first host computer at the Seattle ARTCC on May 29, 1987, and commissioned the last host system at the Salt Lake City ARTCC on June 23, 1988.

In addition to installing the host systems at the ARTCCs, IBM agreed to supply the system to teams working on the other major element of the advanced automation program, the Advanced Automation System (AAS). Under a pair of contracts announced in August 1984, IBM and Hughes Aircraft Company were competing to produce the best AAS design. Among the key elements of AAS were controller work stations, called “sector suites,” that
would incorporate new display, communications, and processing capabilities. AAS would also include new computer hardware and software to bring the air traffic control system to higher levels of automation. Once the full AAS system was operational, FAA planned to integrate en route and terminal radar control services into 23 area control facilities. Future enhancements to AAS included an automated en route air traffic control function that automatically examined aircraft flight plans to detect and resolve potential conflicts. [On July 26, 1988, FAA announced it had awarded IBM a $3.55 billion contract to develop, deploy, and service AAS. The announcement ended almost four years of competition between IBM and Hughes Aircraft Company.]

**Increasing Security**

While it worked to rebuild the air traffic control system in the aftermath of the PATCO strike, FAA faced a number of other challenges, including growing security concerns. The agency had previously adopted new security rules in January 1981 that subjected commuter aircraft with a seating capacity of 60 or more passengers to the same anti-hijacking programs as the aircraft of larger airlines. In September Federal Aviation Regulation Part 108, a new rule on airline security, went into effect. The regulation levied airline security requirements according to the perceived threat facing different types of operations and sizes of aircraft, and established security safeguards appropriate to the various types of commercial passenger operations.

A new wave of aviation piracy began in mid-1983. On May 1 a hijacker succeeded in reaching Havana by locking himself in a lavatory during an airline flight and issuing notes threatening to blow up the aircraft. The incident began a renewed upsurge of hijackings to Cuba, many perpetuated by Mariel boat lift refugees who had come to the United States by boat between April 15 and October 31, 1980. By September 22 hijackers had diverted ten additional airliners to Cuba, prompting FAA to increase security measures at airports in selected areas. Hijackings to Cuba began to decline in the last quarter of 1983, although three such diversions took place in 1984.

As hijackings to Cuba decreased, international terrorism in the sky increased. Four Arab hijackers diverted a Kuwait Air Airbus A-310 to Iran on December 4, 1984, where they murdered two

![Ticket agents serve as the first line of aviation security](image)
On June 14, 1985, two Lebanese Shiite Muslims hijacked a TWA Boeing 727 departing Athens and diverted it to Beirut, where additional hijackers joined them. During a two-week confrontation, they demanded the release of Shiite prisoners held by Israel. The hijackers murdered one passenger, a U.S. Navy diver. They released the other 155 hostages (including 39 Americans) in stages, the last being freed on June 30. Lebanese authorities held the aircraft in Beirut until August 16. In response to the hijacking, President Ronald Reagan directed the Secretary of Transportation, in cooperation with the Secretary of State, to explore expansion of the armed sky marshal program for use on U.S. air carrier international flights.

An Air India Boeing 747 crashed into the North Atlantic on June 23 during a flight from Montreal to London, killing all 329 persons aboard. Investigation reports released the following year concluded that a bomb contained in luggage in the forward cargo hold destroyed the aircraft. In July 1992 Indian authorities arrested a Sikh extremist allegedly involved in the bombing.

In November 1985 an unusually bloody hijacking began when three men seized control of an Egyptair Boeing 737 with 98 persons aboard shortly after takeoff from Athens. In a midair gunfight, one hijacker was killed and an Egyptian security guard and two flight attendants wounded. The hijackers demanded to fly to Libya or Tunisia, but agreed to refuel at Malta. In an attempt to force Maltese authorities to supply the fuel, the hijackers shot five hostages, killing two of them, including an American woman. After 22 hours of negotiation, an Egyptian military force stormed the plane. During the rescue action, 57 persons died and about 30 others were injured.

Near-simultaneous Arab terrorist attacks on airports in Rome and Vienna on December 27 caused the death of 20 persons, including four terrorists, and injured approximately 120. Five of the victims killed were U.S. citizens. The attacks centered on the check-in counters of the Israeli airline El Al. Libyan leader Muammar Qaddafi praised the terrorists, thus contributing to tensions between his nation and the United States.

The TWA hijacking in June and an upsurge in Middle East terrorism prompted a series of U.S. actions:

- On June 27, 1985, Transportation Secretary Elizabeth Dole urged the International Civil Aviation Organization (ICAO) to act immediately to enhance airport security. The
ICAO Council met on an accelerated schedule, and on December 19 adopted amendments strengthening international security standards and recommended practices.

- On July 1 President Reagan suspended airline travel between U.S. and Lebanon.
- During July FAA issued an emergency regulatory amendment requiring airlines to carry Federal Air Marshals on certain flights. Eight days later, the agency issued another emergency rule that required airlines to expand security training for crew members and to provide a ground security coordinator and an in-flight security coordinator for every flight.
- Between mid-August and early November, FAA personnel assisted by law enforcement officers from other agencies inspected U.S. air carrier security procedures at 79 foreign airports.
- FAA also issued a number of emergency amendments to the agency-approved security programs of both airlines and airport operators.
- On August 8 President Reagan signed the International Security and Development Cooperation Act of 1985 (Public Law 99-83). The Act authorized the use of $5 million from the Airport and Airway Trust and for research on and development of airport security devices and explosives detection techniques. It also mandated a system for conducting security assessments at foreign airports, and authorized Federal Air Marshals as a permanent FAA workforce. FAA reorganized its office of civil aviation security to reflect its expanded responsibilities under the Act, creating an international civil aviation security division and an intelligence division.

A new wave of international incidents began in 1986. On April 2 a bomb hidden under a seat cushion exploded aboard a TWA Boeing 727 on approach to Athens, Greece, creating a hole in the fuselage four feet in diameter. The blast killed four passengers and injured nine others, but the aircraft landed safely.

On September 5, at Karachi, Pakistan, four men dressed as security guards stormed a Pan American Boeing 747. The flight crew escaped, but the four terrorists demanded a crew to fly them to Cyprus. They killed an American passenger during the ensuing 17 hour negotiations. When the lights aboard the aircraft failed, the terrorists began a massacre, killing 22 persons and injuring 125 before being arrested.

As a result of continued security incidents, beginning December 19, 1987, FAA required a positive baggage/passenger match on all international flights by U.S. airlines. FAA had placed the same requirement on selected international flights in the summer of 1985. On November 7, 1988, the agency announced award of a contract for five operational models of a new thermal neutron activation (TNA) explosives detection system. The TNA device measured the gamma rays produced by energy neutrons.
passed through luggage and cargo and triggered an alarm when components of explosives were detected. FAA had first become involved in TNA research in 1976. After testing a prototype TNA device, the agency awarded competitive design contracts in September 1985 and began testing a prototype system at San Francisco International Airport in June 1987.

On December 21 an explosion destroyed Pan American World Airways Flight 103 near Lockerbie, Scotland, killing all 259 persons aboard and 11 on the ground. The Boeing 747 had been bound for New York Kennedy from London Heathrow. Investigators later concluded that a bomb concealed inside a radio-cassette player and loaded into a forward luggage compartment in Frankfurt had caused the explosion. The attack had been planned by the Libyan government and carried out by Libyan intelligence agents. FAA quickly began an inspection of Pan American’s security procedures at Heathrow and Frankfurt airports, and later proposed $630,000 in civil penalties against the airline for alleged violations of security regulations.

Eight days after the Lockerbie tragedy, FAA announced new security measures for U.S. carriers at all airports in Europe and the Middle East. These included requirements that the airlines X-ray or physically search all checked baggage, conduct additional random checks of passengers and baggage, and achieve a positive match of passengers and their baggage to keep unaccompanied bags off airplanes. FAA also ordered a sixth TNA device and accelerated the TNA delivery schedule.

In early January 1989 FAA issued a rule requiring airport operators to supplement their procedures for limiting entry into secure areas by installing a computer-controlled access system, or a similar approved system. FAA followed this with a new rule in March that required foreign air carriers that land or takeoff in the U.S. to submit a written security program to the agency. It also adopted a mandatory minimum
Safety Improvements

Administrator Helms took over FAA at a time when the agency’s new safety rules and procedures and technological improvements began to prove successful. In fact, December 31, 1981, marked completion of the second consecutive calendar year with no fatal airplane crashes by scheduled air carriers operating under Federal Aviation Regulations Part 121. This unprecedented two-year safety record, however, would soon be broken.

On January 13, 1982, a Boeing 737 operated by Air Florida crashed near Washington National Airport shortly after taking off during snowfall. The aircraft hit a bridge, killing four persons in vehicles, and plunged into the Potomac River. Of the 79 persons aboard the jet, only four passengers and one flight attendant survived. Ten days later, in a night landing too far down an icy runway at Boston’s Logan airport, a World Airways DC-10 slid over the edge of a seawall and into shallow harbor water. The nose section separated from the fuselage, and two passengers seated at the separation point were later identified as missing and presumed drowned.

As a result of these accidents, FAA and the aviation industry took a number of actions to increase awareness of cold weather hazards and the proper response to them. The creation of a Joint System Program Office representing the National Weather Service, FAA, and the Air Force led to the award of two competitive contracts to develop pre-production models of the Next Generation Weather Radar (NEXRAD). These initial contracts remained in effect until July 1986, when the FAA awarded a production contract for the system. NEXRAD had the ability to see inside storms and measure the velocity and direction of wind-driven precipitation and other particles suspended in the air. After testing the Hazardous Inflight Weather Advisory Service in the areas of the Jacksonville and Miami ARTCCs, FAA adopted it for national implementation. The system provided continuous broadcast of information on dangerous weather. By September 1989 the agency had completed delivery of sufficient equipment to provide nationwide coverage at or above 4,000 feet.

A third 1982 accident focused FAA attention on another weather phenomenon. On July 9 a Pan American Boeing 727 crashed shortly after takeoff from New Orleans International Airport, killing all 145 aboard and eight persons on the ground. NTSB listed the accident’s probable cause as the airplane’s encounter with microburst-induced wind shear, a phenomenon that imposed a downdraft accompanied by a decreasing headwind. As a contributory factor, board members listed the limited ability of the
current Low Level Wind Shear Alert System (LLWAS) to provide definitive guidance for controllers and pilots in avoiding the hazard.

Concerned over the accident, Congress passed legislation in December requiring FAA to contract with the National Academy of Sciences for a study of the wind shear hazard. The resulting report, completed by the Academy’s National Research Council in September 1983, urged FAA to establish an integrated wind shear program to address all aspects of the problem. The recommendations included the improvement and wider use of LLWAS, which the investigators considered the only detection system available in the near term for operational use. In October 1983 FAA ordered 51 additional LLWAS systems.

A series of accidents in 1983 resulted in a number of new FAA safety initiatives. On June 2 an in-flight fire aboard an Air Canada DC-9 filled the cabin with smoke and prompted an emergency landing at Greater Cincinnati airport in Covington, Kentucky. A flash fire enveloped the aircraft interior about 60 to 90 seconds after the exits were opened, killing 23 of the 46 persons aboard. On October 11 an Air Illinois accident near Pinckneyville, Illinois, caused by the loss of electrical power, killed all ten persons aboard. In December, attempting to takeoff at Anchorage, a Korean Airlines cargo DC-10 collided on the ground with a Piper Navajo operated as a commuter by SouthCentral Air. Disoriented in heavy fog, the DC-10 captain had selected the wrong runway. The accident caused no fatalities, but seriously injured three persons and destroyed both aircraft.

On March 4, 1984, FAA began a 90-day national air transportation inspection (NATI) of 237 major and commuter airlines and 25 air transportation support organizations. The NATI began with “white glove” examinations to identify deficiencies that became the focus of in-depth inspections during the second phase of the program, which ran April 7-June 5. In December DOT announced that the NATI had shown 95 percent of the airlines to be in compliance with safety rules. Sixteen airlines, however, revealed deficiencies sufficient to warrant revocation or voluntary surrender of their certificates, suspension or curtailment of their operations, aircraft groundings, or withdrawal of pilots from service for a period of time. [On February 10, 1986, FAA formally established the National Aviation Safety Inspection Program to continue, on a more systematic basis, the kind of in-depth inspections begun under the NATI.]

In addition, FAA began a Safety Activity Functional Evaluation (Project SAFE), a proactive review of the agency’s safety inspection program. During the course of the project, its scope broadened from an initial focus on inspectors to a comprehensive review of the flight standards function. The findings of the review, announced in November 1985, included a plan for revamping the safety inspection program. The plan, portions of which had already been implemented, included increased standardization of inspection
practices and interpretation of rules, a high-priority effort to update safety regulations, increased use of the automated Aviation Safety Analysis System, and strong management oversight.

Following the successful NATI, in June 1984 Transportation Secretary Dole announced that FAA would conduct a General Aviation Safety Audit. Beginning on July 22 the inspections focused on: pilot schools, instructors, and examiners; repair stations; non-airline operators of large aircraft; older large jet aircraft scheduled to be phased out because of failure to meet the new noise standards; and on-demand air taxis. During the program, a number of operators voluntarily surrendered their certificates. FAA submitted the results of the audit to DOT between August 1985 and February 1986. Only four percent of findings were reported as significant unsatisfactory conditions, many of which involved air taxis. As a result of the audit, FAA revised its guidelines to include stepped-up inspections of air taxis, repair stations, and such operators of large aircraft as travel clubs, contract cargo carriers, and corporations with executive fleets.

To increase the survival chances of airline passengers encountering fire and smoke, FAA published two new rules on October 26, 1984. One rule called for the installation, within three years, of seat cushions possessing an outer layer of highly fire-resistant material. FAA research showed that the cushions would provide as much as 40 additional seconds before flashover, the deadly ignition of accumulated vapors. The requirement applied to operators of aircraft weighing 12,500 pounds or more and having over 29 seats. The second rule required emergency escape path marking at or near floor level that would provide evacuation guidance even when all sources of illumination more than four feet above the cabin aisle floor were totally obscured by smoke. With the exception of aircraft types having been certified before 1958, all airliners operated by major lines were required to have such lighting within two years.

As part of a joint program to increase aircraft safety, FAA and NASA conducted a controlled impact demonstration (CID) in December 1984. Researchers remotely piloted a Boeing 720 to a prepared crash site at Edwards Air Force Base, California. The aircraft carried instrumented test dummies, high-speed cameras, and more than 350 sensors to transmit data to ground recorders. The project involved many experiments on the crash behavior of the aircraft’s structure and of internal features such as seats, seat belts and harnesses, storage compartments, and galleys. Researchers also tested fire-blocking seat cushion layers, fire-resistant windows, cockpit voice recorders,
and flight data recorders. In addition, the aircraft’s fuel tanks carried anti-misting kerosene (AMK), an experimental fuel designed to prevent or minimize the fireball that sometimes resulted when fuel spilled from a ruptured tank formed a volatile mist and ignited.

At the impact site, eight steel wing cutters were installed to ensure fuel would spill from the tanks. Touching down 300 feet short of the cutters with its left wing low, the aircraft slid forward at an angle ensuring that the first cutter would slash into the right inboard engine before ripping open the wing tank. A spectacular fireball resulted. The use of AMK reduced the heat of the fire, and an estimated 20 percent of the passengers would probably have escaped had the aircraft contained human occupants. The AMK test proved disappointing, however, and in September 1985 FAA announced that it had dropped plans to require airline use of the special fuel. Despite this, other experiments conducted as part of the CID produced a wealth of useful information.

FAA fire research led to a March 29, 1985, rule to improve cabin fire protection for passengers aboard aircraft operated by major airlines. The rule required that each lavatory be equipped with a smoke detector, or equivalent, and that each lavatory trash receptacle be equipped with an automatic fire extinguisher. It also increased the number of hand fire extinguishers required in the cabins of aircraft with more than 60 seats, and specified that at least two of these use Halon 1211 or an equivalent extinguishing agent. Additional fire safety measures came in May 1986, when FAA established new fire test requirements for cargo or baggage compartments in future transport aircraft. A July rule set stricter flammability standards for materials used in cabins of existing and future airliners with 20 or more passenger seats. The new rule required use of fire resistant and slower-burning materials for cabin sidewalls, ceilings, partitions, storage bins, galleys, and other interior structures. In August 1988 FAA refined fire test procedures and apparatus and set a new requirement for smoke emissions testing. The agency expected the new flammability standards would also lessen the release of toxic gas during a fire.

Weather re-emerged as a topic of concern when a Delta Air Lines aircraft encountered wind shear and crashed during a landing approach to Dallas-Fort Worth International Airport in August 1985. The accident killed 134 of the 163 persons aboard and one person on the ground. The fact that wind shear did not reach the sensors of the LLWAS until after the crash demonstrated the system’s limitations. On November 27 FAA announced the award of a contract for development of a comprehensive wind shear training program for pilots. The agency received the completed program in February 1987 and distributed it to industry.
FAA also developed an Integrated Wind Shear Program plan. In addition to better pilot training, the plan featured development of: improved ground-based detectors, including: enhanced LLWAS; NEXRAD; Terminal Doppler Weather Radar, also known as TDWR; and sensors for airborne detection systems using microwave Doppler, laser, or infrared radiometer technology. FAA issued a rule in September 1988 requiring that all turbine-powered airliners seating 30 passengers or more carry equipment to warn pilots who are about to encounter low-altitude wind shear and provide them with information needed to escape safely. Two months later, in November 1988, FAA announced it had awarded a contract to Raytheon for 47 TDWR systems.

A year after the Delta crash in Texas, a DC-9 from Mexico and a Piper PA-28 collided in clear sky over Cerritos, California. The Piper had inadvertently made an unauthorized entry into the Los Angeles terminal control area, and its radar return was not observed by the controller providing service to the Mexican flight. The accident killed 82 persons – all 64 aboard the DC-9, all three aboard the Piper, and 15 on the ground. The Cerritos accident was the first midair collision to occur within a TCA. On September 15, 1986, FAA Administrator Donald Engen appointed a special task force to study ways to better protect the TCAs. On October 27 the agency announced plans to implement the group’s 40 recommendations, which included a minimum 60-day license suspension for pilots violating TCA boundaries, expanded requirements for altitude encoding transponders, and action to simplify and standardize the design of TCAs.

The Cerritos accident also led to a 1987 FAA mandate for aircraft to use a traffic alert and collision avoidance system (TCAS). The rule continued a requirement that aircraft be equipped with a transponder for operation in TCAs and in the airspace of the 48 contiguous states above 12,500 feet above ground level. The requirement for automatic pressure altitude reporting (Mode C) equipment was extended to include Group II TCAs effective December 1, 1987. The rule also contained provisions intended to provide for transition from the older Air Traffic Control Radar Beacon System (ATCRBS) transponders to Mode S transponders. All transponders newly installed in U.S.-registered aircraft were required to be Mode S transponders after January 1, 1992, a deadline that was subsequently extended to July 1, 1992. In January 1989 FAA published a rule requiring the TCAS II on all airliners with more than 30 passenger seats operating in U.S. airspace. The airlines were to phase in TCAS II by December 30, 1991. On April 9, 1990, however, FAA extended the TCAS II compliance schedule completion date to December 30, 1993. The rule also required turbine-powered commuter aircraft with 10 to 30 passenger seats to install the simpler TCAS I by February 9, 1995, a deadline later extended to December 31, 1995.

The TCAS system was an evolutionary improvement of the beacon collision avoidance system (BCAS) that the agency had been developing. Like BCAS, TCAS worked in conjunction with the ATCRBS transponder already in wide use. It was also compatible with the next-generation transponder, originally designated the Discrete Address Beacon System that later became known as Mode S. TCAS I, intended for general aviation use, simply alerted the pilot to
In the proximity of another aircraft carrying TCAS I or a conventional ATCRBS transponder. TCAS II provided more sophisticated advisories, including data on range and bearing of transponder-equipped aircraft. When the transponder aboard the threat aircraft had altitude-reporting capability, TCAS II advisories also included altitude data. In the case of two aircraft equipped with TCAS II, coordinated advisories were provided.

FAA Administrator T. Allan McArtor announced a new safety plan during his public swearing in ceremony on July 27, 1987. His safety initiative, dubbed Impact 88, focused on airline accountability, aircrew performance, airspace capacity, advanced technology, aviation awareness, air transportation security, airport development, and agency effectiveness. Impact 88 was just getting underway when, on August 16, 1987, a Northwest Airlines MD-80 crashed on takeoff at Detroit, killing all but one of the 157 persons aboard as well as two persons on the ground. FAA actions in response to the accident included required changes to MD-80 warning systems and steps aimed at improving flight crew performance. In addition, Administrator McArtor announced FAA would begin a special inspection of the U.S. aircraft manufacturing industry to ensure that the companies were following proper procedures and had updated their techniques to keep abreast of advances in technology.

An April 1988 crash raised a heretofore unrecognized problem — the continuing airworthiness of aging aircraft. An 18-foot gap opened in flight in the fuselage of a 19-year old Boeing 737 operated by Aloha Airlines. Decompression swept a flight attendant through the opening and seriously injured eight other persons. The plane made an emergency landing on the Hawaiian island of Maui. In the immediate aftermath of the accident, FAA ordered inspections of Boeing 737-100 and 737-200 jets logging more than 55,000 landings to look for fatigue damage and restricted those planes to 23,000-foot altitude until inspected.

FAA opened a three-day international conference on the problems of aging airliners on June 1, and over 400 participants attended the meeting. The gathering led to the establishment of a government-industry task force on the issue and to FAA actions that included increased research and development (R&D) in the aging aircraft field, acquisition of expertise in non-destructive inspection techniques, consideration of new structural inspection programs for older commuter aircraft, the use of FAA teams to monitor maintenance checks on older aircraft, and rulemaking projects aimed at improving the safety of high-service airliners. The conference became the first in a series of annual meetings.

Aircraft cockpit with TCAS II and other safety technologies

1988, Aloha Airlines accident
The Aviation Safety Research Act (Public Law 100-591), signed into law by President Reagan on November 3, 1988, broadened FAA’s role in aircraft-related research. The act authorized the agency to develop new technologies and conduct data analyses in such fields as the effects of wear and fatigue on aircraft structures, aircraft maintenance, materials resistant to smoke and fire, low flammability fuels, and methods of containing in-flight and post-crash fires.

Organizational Changes

In September 1981 FAA Administrator Lynn Helms announced a regional consolidation plan under which the number of regions would be reduced from eleven to nine. Under the plan, FAA combined the existing Pacific-Asia and Western Regions into a new Western-Pacific Region with headquarters in Los Angeles, and closed the Honolulu regional office. The agency combined the existing Rocky Mountain and Northwest Regions into a new Northwest Mountain Region with headquarters in Seattle, and closed the Denver regional office. It also reassigned the states of North and South Dakota from the Rocky Mountain to the Great Lakes Region.

Later in the year, Helms continued decentralization efforts when he created four aircraft certification directorates. The directorates assumed the certification responsibilities previously assigned to the lead regions. They also had additional responsibilities to strengthen and streamline the certification process. The directorates included: Central (for aircraft under 12,500 pounds), Northwest Mountain (for transport aircraft), Southwest (for rotorcraft), and New England (for engines and propellers). The authority of the directorates extended beyond regional boundaries. For example, aircraft certification offices in the Central, Southern, and Great Lakes regions reported directly to the Small Airplane Certification Directorate at the Central Region headquarters. FAA formally established the directorates by an order dated February 1, 1982.

Another major organizational change occurred in 1987, when Washington National and Dulles International Airports passed from FAA management to that of an authority representing multiple jurisdictions. President Reagan signed Public Law 99-591, including Title VI, the Metropolitan Washington Airports Act of 1986 on October 30, 1986. The legislation authorized the transfer of control of Washington National and Dulles International Airports to an independent regional authority. An agreement between Virginia and the District of Columbia established the regional authority, which would be governed by a board of 11 members.
appointed by the Governor of Virginia (5), the Mayor of the District of Columbia (3), the Governor of Maryland (2), and the President (1).

The Metropolitan Washington Airport Authority (MWAA) took over management of National and Dulles airports from FAA on June 7, 1987. Under the terms of a lease agreement with the federal government, the new authority would operate the two airports for 50 years and would pay the government a total of $150 million for the lease period. Almost 700 FAA employees left the agency to join MWAA, and a directive issued on October 26, 1987, abolished FAA’s Metropolitan Washington Airports organization.

On March 9, 1988, James Burnley, Secretary of the Department of Transportation, announced the creation of a task force on FAA reform, co-chaired by FAA Administrator T. Allan McArtor and the DOT Assistant Secretary for Administration, to recommend improvements in the operations within FAA and between FAA and the Office of the Secretary. A subgroup of the task force was asked to recommend changes to improve FAA’s safety rulemaking process. That subgroup proposed the establishment of an advisory committee to serve as a forum for FAA to obtain input on major regulatory issues. The Secretary approved the proposal, and on February 15, 1991, the FAA Administrator established the Aviation Rulemaking Advisory Committee (ARAC) to assist FAA in the rulemaking process. ARAC included representatives of air carriers, manufacturers, general aviation, labor groups, universities, associations, airline passenger groups, and the general public.

Secretary Burnley also asked the task force to find a way to eliminate marginal, non-safety expenditures and to improve the procurement process. On April 28 DOT and FAA announced that the task force’s recommendations would include a variety of improvements in practices and procedures, including “straightlining” of reporting relationships. Under this arrangement, regional division managers in key programs would report to associate administrators at national headquarters rather than to the regional directors.

Administrator McArtor announced a reorganization of FAA’s senior management structure on June 16, 1988, as part of efforts to: improve communications, coordination, and management oversight of FAA’s technical modernization and other activities; reduce unnecessary reporting relationships; and give Washington headquarters more authority over field operations. FAA increased the number of
executive director positions from one to four and consolidated most of the agency’s functions under these individuals:

(1) Executive director for policy, plans, and resource management. Reporting to this position were the:

- Associate administrator for policy, planning, and international aviation;
- Associate administrator for human resource management;
- Associate administrator for administration;
- Regional administrators; and the
  Director, aeronautical center.

(2) Executive director for systems operations, who oversaw the efforts of the:

- Associate administrator for air traffic;
- Associate administrator for airway facilities;
- Director of operations planning and policy; and the
  Director of operations resource management.

(3) Executive director for regulatory standards and compliance, who oversaw the efforts of the:

- Associate administrator for regulation and certification;
- Associate administrator for aviation standards; and the
  Director of program and resource management.

(4) Executive director for system development, who oversaw the efforts of the:

- Associate administrator for advanced design and management control;
- Associate administrator for NAS (national airspace system) development;
- Associate administrator for airports; and
  Director, technical center.

In addition to the executive directors, other positions reporting to the Administrator included: associate administrator for aviation safety; the chief counsel; and three assistant administrators for public affairs, civil rights, and government and industry affairs. Administrator McArtor also implemented a straightline reporting system under which regional division program managers for air traffic, airway facilities, aircraft certification, flight standards, civil aviation security, medical, and airports reported to associate administrators at national headquarters instead of the former regional directors. Under the new arrangement, the regional and center counsels reported solely to the chief counsel.
FAA's first priority - passenger safety
George H. W. Bush became President of the United States on January 20, 1989. On February 6 Samuel Skinner became his first secretary of transportation. FAA Administrator T. Allan McArtor resigned on February 17, 1989, and Robert Whittington, executive director for policy, plans, and resource management, became the agency’s acting administrator. In that capacity, Whittington helped to engineer the first labor agreement between FAA and the National Air Traffic Controllers Association (NATCA), to which the union agreed on May 1, 1989.

The following month, JAMES BUSEY [TERM: 06/30/89 – 12/04/91] became the eleventh FAA Administrator. During a 37-year military career, this U.S. Navy officer had risen from enlisted ranks to become a four-star admiral. An experienced pilot and a winner of the Navy Cross for combat action in Vietnam, Busey also had served for two years as Commander-in-Chief of U.S. Naval Forces in Europe and the North Atlantic Treaty Organization’s Commander-in-Chief of Allied Forces in Southern Europe. Busey retired from the service shortly before assuming his new appointment. Although he had been on active duty when selected by President Bush, enactment of Public Law 101-47 exempted him from the legal provision barring active or retired military officers from becoming FAA Administrator.

Organizational Changes

In February 1990 Administrator Busey announced a major FAA reorganization. He established an executive director for acquisition, a move designed to streamline the agency’s procurement process. The action brought the number of executive directors to five. The position managed two new offices: acquisition policy and oversight and independent operational test and evaluation oversight. Another reorganization in September 1991 reduced the number of executive directors to three by abolishing the roles of the executive director for administration and resource management and the executive director for regulatory standards and compliance.

On November 20, 1991, the White House announced Administrator Busey had been selected to become Department of Transportation (DOT) deputy secretary. Two days later, the White House announced the choice of Jerry Curry to succeed Busey as FAA Administrator. A retired U.S. Army major general, Curry was then serving as administrator of the National Highway Traffic Safety Administration. On March 20, 1992, however, Curry withdrew as a nominee for the FAA post.

Prior to beginning his new duties as deputy secretary, in late November 1991, Administrator Busey announced another reorganization at FAA headquarters. He created positions for an assistant administrator for information technology and a new assistant administrator who would oversee the offices of budget and accounting. In addition, he changed the title of the former executive director for acquisition to that of executive director for acquisition and safety oversight.

Upon James Busey’s departure from the FAA, deputy administrator Barry Harris became the agency’s acting administrator. On
December 6, 1991, President Bush announced the choice of DOT Secretary Samuel Skinner to become his chief of staff on December 16, replacing John Sununu. Admiral Busey became acting secretary upon Skinner’s departure.

On June 27, 1992, General (USAF, Ret.) THOMAS RICHARDS [TERM: 07/27/92 – 01/20/93] became FAA’s twelfth administrator. President Bush had first announced his candidate on March 31, following the withdrawal of Jerry Curry, and formally nominated him on May 1. The Senate confirmed Richards’ nomination the following month, and the full Congress later passed legislation exempting him from the statute barring military officers from serving as FAA Administrator.

General Richards received a B.S. from Virginia Polytechnic Institute, a M.A. from Shippensburg State College, and also graduated from the U.S. Army War College. His military career began with the infantry in 1948 and included combat service in the Korean War. He received a commission as a distinguished graduate of the Air Force Reserve Officer Training Corps program at Virginia Polytechnic Institute in 1956 and earned his pilot’s wings in 1957. During his Air Force career, he flew over 600 combat missions as a forward air controller in the Vietnam War. Upon retiring from the military in 1989, he became a corporate consultant and served on the President’s Commission on Aviation Security and Terrorism.

Globalization of the Airways

In late 1989 a revolutionary wave swept across Central and Eastern Europe that ended in the overthrow of Soviet-style communist states within the space of a few months. On December 2-3, 1989, a few weeks after the fall of the Berlin Wall, President Bush met with Soviet leader Mikhail Gorbachev in Malta. During this meeting, the two leaders declared an end to the Cold War. On February 16, 1990, representatives of FAA and the Soviet aviation ministry signed a memorandum promoting cooperation on air navigation between Alaska and the Soviet Far East.

With peace returning to Europe, the president turned his attention to the Middle East. On August 2, 1990, Iraq invaded and seized control of Kuwait. President Bush immediately placed restrictions on air transportation between the U.S. and Iraq. Six days later, the United States began to deploy Army, Navy, Marine, Air Force, and Coast Guard units to Saudi Arabia (Operation Desert Shield), while at the same time urging other countries to send their own forces to the scene. On August 9 President Bush extended the air transportation prohibitions to include occupied Kuwait.

To speed the movement of increasingly large numbers of U.S. troops to the Middle East, for the first time in history, the Department of Defense (DoD) activated the Civil Reserve Air Fleet (CRAF) on August 17, 1990. Comprised
entirely of domestic commercial airliners and cargo aircraft, this fleet included 78 aircraft drawn from 22 companies. On January 16, 1991, one day after the expiration of a United Nations deadline for Iraqi withdrawal from Kuwait, military aircraft of the American-led coalition began Operation Desert Storm, striking targets in Iraq and occupied Kuwait. Shortly after the attacks began, FAA declared Level 4 airport/airline security, the highest domestic level ever imposed. On January 17 the DoD activated Level 2 of the CRAF program, calling upon U.S. airlines to provide additional transport aircraft. By the time Operation Desert Shield/Storm ended, 27 U.S. carriers had flown 5,441 CRAF missions, carrying 709,000 people and 126,000 tons of equipment and supplies. American and allied troops routed Iraqi forces in a ground assault that began on February 24, and a ceasefire took effect at midnight on February 27.

Even before the Gulf war ended, DOT began negotiating aviation agreements with counterparts around the world. For example, a March 1991 agreement between the United States and the United Kingdom included permission for United and American Airlines to succeed Pan American and Trans World Airways in serving London Heathrow. In return, airlines based in Great Britain gained increased access to U.S. airports. In November Secretary Skinner and his Mexican counterpart signed an agreement expanding aviation opportunities. The accord permitted each country to designate a carrier to fly between any U.S. city and any Mexican city, a level of flexibility unique in U.S. international aviation relations.

In April 1991 FAA oversaw a series of Northwest Airlines 747 test flights in Soviet airspace as part of a cooperative program to develop a satellite navigation system in which aircraft would receive signals from both the Soviet Global Orbiting Navigation Satellite System and the U.S. Global Positioning System (GPS), then being developed by DoD. The test flights proved so successful that the Soviet Union agreed to open its Far East airspace. Northwest Airlines became the first western airline to operate scheduled flights through Russian airspace when it flew from Detroit to Tokyo on October 8, 1992. The new route saved thousands of dollars in fuel and flight time.

Aviation collaboration with Russia continued throughout the Bush Administration. On June 17, 1992, Department of Transportation Secretary Andrew Card and Russia’s Foreign Minister signed a memorandum of understanding on airspace use, air navigation, and air traffic control. Features of the agreement included joint cooperation in opening shorter Far Eastern routes and FAA assistance in establishing a joint civil-military air traffic system for Russia. In September Secretary Card announced the U.S. and the Netherlands had agreed to open their international aviation markets to one other’s airlines — the first such agreement under DOT’s “Open Skies” initiative.

On March 31, 1992, DOT announced the United States would explore aviation agreements with all European countries willing to allow free access to their markets. In the past, the United States had offered such agreements to only a few of its largest aviation partners.
On August 5 the Department established a definition of “open skies” that included:

- Unrestricted entry to all U.S. routes,
- Unrestricted capacity and frequency on all U.S. routes,
- Flexibility in setting fares,
- Liberal charter arrangements,
- Liberal cargo arrangements,
- Open code-sharing opportunities,
- Nondiscriminatory operation of and access to computer reservations systems,
- Rights of foreign carriers to enter into commercial transactions related to their flight operations,
- Rights of foreign carriers to perform their own ground handling in host countries,
- Freedom from restrictions on converting earnings into hard currency or returning a carrier’s earnings to its homeland, and
- Rights of foreign carriers to operate between any U.S. airport and any point in the European country without restriction.

In response to the announcement, Northwest Airlines and KLM Royal Dutch Airlines agreed to create what they called “a unified global airlines system.” Although KLM already had a 20 percent stake in Northwest, the agreement enabled the two carriers to integrate their operations worldwide. On January 11, 1993, DOT gave Northwest and KLM immunity from antitrust laws so they could operate as one airline. The trend toward greater collaboration with foreign carriers was further illustrated by cooperative plans announced in 1993 by the following U.S. airlines: Delta (with Swissair); Continental (with Air France); United (with Lufthansa); and USAir (which announced a scaled-back version of a plan for partnership with British Airways that had first been proposed in July 1992).

**Security**

In the aftermath of the December 1988 Pan American Flight 103 bombing, FAA instituted a number of measures designed to prevent future acts of terrorism. In March 1990 FAA assigned its first
permanent, overseas civil aviation security liaison officer (CASLO) to the American Embassy in London. This was followed by the establishment of 12 more CASLO positions at key international locations to assist in the timely implementation of new security requirements.

Recommendations from the President’s Commission on Aviation Security and Terrorism, created in 1988, also spurred FAA activity. In its final report, released on May 15, 1990, the commission recommended FAA elevate its security division to a position reporting directly to the administrator, appoint federal security managers to manage security at domestic airports, launch a research and development (R&D) program to produce techniques and equipment to detect small amounts of plastic explosives, and make public notification of threats to civil aviation under certain circumstances. FAA and DOT moved quickly to carry out the recommendations.

On June 14, 1990, Secretary Skinner announced plans to create a DOT office of intelligence and security. At the same time, FAA Administrator Busey announced the new FAA position of assistant administrator for civil aviation security. In November he revealed the structure of this new organization, which included a scientific staff and four offices: policy and planning, program and resource management, operations, and intelligence.

President George H. W. Bush signed the Aviation Security Improvement Act of 1990 (Public Law 101-604), in November 1990. Among its provisions, the law empowered FAA to conduct an accelerated R&D program in support of aviation security. On August 13, 1991, FAA broke ground for an aviation security laboratory at its Technical Center in New Jersey. The new research facility opened in 1993. During the remainder of 1990s FAA sponsored research on new equipment to detect bombs and weapons and made incremental improvements to aviation security that included efforts to upgrade the effectiveness of screening personnel at airports.

In June 1991 FAA issued a security regulation for foreign air carriers operating into or out of airports in the United States. The new rule required such carriers to provide a level of protection similar to that of U.S. carriers serving the same airports. Two months later — as mandated by the Aviation Security Improvement Act — FAA issued a rule prescribing more stringent standards for hiring, training, and performance of airline and airport security personnel. Then, in October, FAA inaugurated the Federal Security Manager (FSM) program. Senior FAA security employees selected as FSMs approved airport security programs, acted as focal points for FAA security operations at airports, and provided security information to the aviation community at each of the largest airports where they were assigned. Officials sponsored by this program approved airport security programs, acted as focal points for FAA
security operations at airports, coordinated government and law enforcement activities in domestic security areas, and provided security information to the aviation community at each of the 18 airports where FAA stationed FSMs.

On November 14, 1991, the U.S. Justice Department indicted two Libyans for the bombing of Pan American Flight 103. Because Libya reportedly detained the suspects but refused to extradite them, on April 15, 1992, the United Nations imposed sanctions on Libya, including a cut-off of air transportation links. The next day, FAA issued a special regulation implementing a presidential order prohibiting any aircraft on a flight to or from Libya from taking off from, landing in, or overflying the United States. Since commercial air links with Libya had already been prohibited for several years, the action expanded the ban to business and private aircraft and to overflights of U.S. territory.

Mother Nature Disrupts Air Traffic

While FAA officials worked together with their colleagues at DOT to increase international safety and security, a number of natural disasters immediately commanded the agency’s attention. On September 17, 1989, Hurricane Hugo slammed into the U.S. Virgin Islands before moving on to Puerto Rico and then South Carolina. Many FAA facilities in the storm’s path suffered damage and service interruption. Destruction was especially heavy in the Virgin Islands, where heavy rain and wind badly damaged two airport towers and destroyed a radar facility.

FAA Southern Region Headquarters took charge of the recovery effort, which included establishing temporary mobile towers on the islands. The agency’s DC-9 carried relief supplies to the disaster zone and evacuated four FAA employees and 35 dependents, as well as other federal personnel and their families. Damage to FAA facilities on the mainland proved less severe than in the Caribbean, although many employees suffered personal losses. Agency personnel established a relief fund to assist their co-workers affected by the storm. By the end of September most airports in the devastated areas had resumed operation.

Exactly one month after Hurricane Hugo hit the Virgin Islands, an earthquake registering 7.1 on the Richter scale shook northern California, damaging runways, disrupting airline service, and causing approximately $50 million damage to FAA facilities and equipment. The affected facilities included the San Francisco tower cab, which lost windows and its ceiling, and the San Jose tower, which lost a window and air conditioning unit. Despite the damage, controllers remained on duty to ensure the safety of flights aloft.

Two months later, on December 14, 1989, Alaska’s Redoubt Volcano began a series of eruptions, emitting ash that hampered aviation. FAA used a satellite-based system, recently developed with the
National Oceanic and Atmospheric Administration, to track the ash and warn aviators. On December 15, however, a Boeing 747 temporarily lost all engine thrust after encountering an ash cloud from Redoubt and the ash damaged four other airliners during the following three months.

Another volcano erupted on June 15, 1991. Ash from Mt. Pinatuba damaged airports within the Philippines and emitted a huge cloud that disrupted aircraft operations over a wide area. Ash damaged at least 17 airliners in flight, most at distances over 600 miles from the volcano. The eruption lent urgency to the First International Symposium on Volcanic Ash and Aviation Safety, held on July 8-12 in Seattle, Washington. FAA, one of the symposium’s sponsors, reported on its work to improve volcanic hazard notification procedures. The problem was illustrated again in Alaska, when Mt. Spurr erupted on August 18, 1992, depositing almost a quarter inch of ash on Anchorage airport. One of the airport’s runways reopened the following afternoon, and the other reopened two days later.

On August 24, 1992, Hurricane Andrew swept through south Florida, causing devastation that included damage to airports. Among the worst hit FAA facilities were the Richmond Long Range Radar site and the tower and International Automated Flight Service Station at Tamiami airport, all of which were severely damaged. Facilities at Key West lost communication lines, and other agency installations experienced significant damage, power loss, and outages. By the following day, however, Miami, Key West, West Palm Beach, and Fort Lauderdale Executive airports reopened. The hurricane moved into Louisiana on August 26. During the height of the storm, most FAA facilities in the affected part of that state shut down or were placed on standby status, and several airports were temporarily closed.

The hurricane destroyed or badly harmed the homes of about 144 FAA employees in the Miami area, and the agency organized an airlift to provide emergency relief. A committee representing local agency organizations coordinated the distribution of supplies and of funds donated by FAA workers throughout the country, while the agency provided such benefits as administrative leave, counseling, and emergency loans. At the same time, FAA rushed the restoration of airspace system facilities and supported the overall federal relief program.

Typhoon Omar struck Guam on August 28, 1992, with winds of up to 150 miles an hour, causing major damage to an estimated 75 to 90 percent of all buildings. The island completely lost power. By August 30 FAA helped reopen the airport for daylight operations. No FAA families were injured, although the typhoon severely damaged the housing area. Less than a month later, Hurricane Iniki hit parts of the state of Hawaii severely damaging the control tower cab at Kauai’s Lihue airport.
Modernization

FAA continued to address a variety of technical issues and pursue its strategic goal to modernize the air traffic control system during the Bush Administration. Acquisition and deployment of new technologies designed to automate the air traffic system, enhance capacity, and improve safety kept pace with the rapid evolution of aeronautics. The agency worked steadily to connect airplanes by radio and satellite link to a global information system that could provide controllers and operators with information on the weather and aircraft in their immediate vicinity. Controllers gained the ability to view, on their radar screens, information generated by aircraft transponders. By automating some routine tasks, the system allowed controllers to focus their attention on the critical task of providing aircraft separation services.

FAA continued work on the Microwave Landing System (MLS), an all-weather, precision landing system originally intended to replace or supplement the Instrument Landing System (ILS). The new MLS had a number of operational advantages over the older system, including a wider selection of channels to avoid interference with nearby airports, excellent performance in all weather, and a much smaller space requirement at the airports. The improved system was designed to allow pilots to enter a path to land from more directions than with the ILS and descend at a choice of paths best matched to their type of aircraft. Different landing patterns facilitated reducing noise around airports and keeping small aircraft away from the dangerous vortices behind large aircraft.

FAA commissioned the first permanent, federally-funded MLS at a commercial airport in April 1989. The Hazeltine Corporation delivered the system to the Lebanon, New Hampshire, airport under a contract for 178 MLS units. In August, however, FAA notified Hazeltine that it was terminating the contract because of the company’s failure to meet the specified delivery schedule. Although many European nations adopted MLS as a replacement for ILS, the FAA subsequently halted development of MLS because of funding issues, aircraft equipage concerns, and uncertain developments from competing technologies such as the GPS.

In May 1989 FAA commissioned the first operational airport surveillance radar-9 (ASR-9) installation. The new radar employed advanced Doppler technology to filter out radar reflection to detect a one square meter target at a distance of 60 nautical miles. FAA planned to equip every major airport with ASR-9 capabilities. Also in May, another agency-sponsored technology, the National Data Interchange Network 1A, became fully operational. This innovation supplanted several independent communications networks with a single, efficient means of transmitting weather and flight plan data.
To gain greater congressional and public support for its modernization efforts, FAA released its first strategic plan on September 25, 1990. Presented as part of Secretary of Transportation Samuel Skinner’s National Transportation Policy, this pivotal document presented 169 guidelines and 65 legislative, regulatory, budget, and program initiatives to improve the nation’s transportation network. Among other things, the plan outlined a path for aviation in the 21st Century.

The advanced automation program FAA began in the early 1980s, was a key program in the new transportation policy. Under this ambitious development and acquisition program, FAA set out to replace its aging air traffic control system with improved communications and computer networks, and provide new tools and displays to aid controllers. When completed, the program would modernize the functions at two FAA facilities. Not only would the innovations improve the terminal radar approach control (TRACON) facilities that handled airport arrivals and departures, they also would upgrade the air route traffic control centers (ARTCCs) that handled the en route portion of a flight. To help speed these developments, on September 28, FAA and the MITRE Corporation signed a five-year agreement under which MITRE was to operate a new Center for Advanced Aviation System Development at the firm’s facility in McLean, Virginia.

Funding for work on the advanced automation program was among the provisions authorized by the Omnibus Budget Reconciliation Act of 1990 (Public Law 101-508). Title IX of the legislation included three subparts specifically addressing aviation:

- The Aviation Safety and Capacity Expansion Act — authorized FAA to draw on the Aviation Trust Fund, supported by user fees, for up to 75 percent of the agency’s operations and maintenance costs and authorized $5.5 billion for modernization of air traffic facilities and equipment over two years. It also empowered DOT to allow airports to levy Passenger Facility Charges of up to $3.00 per enplaning passenger and gave FAA greater flexibility in negotiating procurement contracts.
- The Federal Aviation Administration Research, Engineering and Development Authorization Act — further defined FAA’s research functions. It included a mandate to establish a Catastrophic Failure Prevention Program that would develop technologies to prevent the failure of parts and equipment that could result in aircraft accidents.
- The Airport Noise and Capacity Act — required airlines to phase out most stage 2 noise-level jets by mid-1999, stipulating that only those carriers that met this deadline for 85 percent of their fleet might apply to operate their remaining stage 2 aircraft until the end of 2003. The law also directed the Secretary of Transportation to prepare a national noise policy by mid-1991 and placed limitations upon airports’ authority to impose noise restrictions.

In February 1991 FAA issued its first annual Capital Investment Plan (CIP), which replaced the National Airspace System Plan. While the Advanced Automation System (AAS) remained the cornerstone of FAA’s long-range modernization plans, the new CIP included...
timely projects designed to provide higher levels of automation as well as urgently needed radar, communications, and weather forecasting systems.

In the following month, March 1991, FAA began construction of the Development Demonstration Facility in Gaithersburg, Maryland. The agency would use the new facility to assess the operational suitability of segments of the AAS. FAA accepted delivery of the facility on May 31, and the first feasibility demonstration began on August 13. On the same day, FAA held ground-breaking ceremonies for a new AAS laboratory at its Technical Center.

FAA commissioned the first operational element of the advanced automation system on October 1, 1991, at the Seattle ARTCC. The Peripheral Adapter Module Replacement Item (PAMRI) combined radar and flight plan information for display on air traffic controller computers. PAMRI, the only part of the AAS implemented, became operational at the remaining 20 ARTCCs in May 1993.

While work on the advanced automation program continued, FAA also began to consolidate and upgrade its TRACON facilities. In October 1991 FAA began building a new Southern California TRACON to consolidate five existing TRACONs in the area. FAA also began planning several similar TRACON consolidations. A ceremony at the Salt Lake City ARTCC in March 1992 commemorated the completed installation of meteorologist weather processors at the 21 ARTCCs and the central flow control facility in Washington, DC. The system helped air traffic controllers by combining data from the National Weather Service, FAA radars, and a satellite.

By late 1992 the advanced automation program was plagued with cost overruns and delays. Early in November IBM informed FAA that, because of software difficulties and other problems, the Initial Sector Suite System (ISSS) would not be ready for delivery and acceptance until September 1994. This added another 14 months to an already delayed timetable. On November 10 FAA gave a “cure notice” to IBM stating that, unless the company provided a plan to remedy deficiencies within 10 calendar days, the government would withhold progress payments under the contract. IBM quickly submitted an initial and then later a final cure plan. Steps to remedy the situation required the project to change its management structure and to seek no further changes in user requirements for the ISSS.

Safety

A July 1989 crash highlighted the need for careful inspection of rotating engine parts. After debris from a failed engine damaged its control system, a United Airlines DC-10 crashed while attempting an emergency landing in Sioux City, Iowa, killing 110 of the 296 people on board. Preliminary investigation of the accident indicated that one of the two titanium disks holding the engine’s fan blades had separated, either intact or in fragments, from the rest of the engine. FAA moved quickly to find a way to prevent the recurrence of this type of accident. On August 3 the agency announced formation of an agency/industry task force on improving aircraft survivability following major in-flight
structural damage. Then, on September 15, FAA issued the first of several directives requiring fan disk inspections.

Soon after that several incidents pointed out the need for a more robust human factors research program. On January 18, 1990, during a landing at Atlanta Hartsfield airport, an Eastern Air Lines Boeing 727 collided with a Beechcraft King Air 100 that had landed just before it. The accident killed the pilot of the King Air. On April 2, 1991, the majority of the National Transportation Safety Board (NTSB) members cited controller error as the accident’s probable cause. The following month, NTSB announced a revised finding expanding the probable cause to include the failure of air traffic control procedures to take into consideration occasional lapses in human performance.

On January 25, 1990, while attempting to land at New York Kennedy airport, a Boeing 707 operated by the Colombian airline, Avianca, ran out of fuel and crashed on Long Island, fatally injuring 73 of the 158 people on board. NTSB subsequently cited the probable cause of the accident as the crew’s failure to manage their fuel load or alert controllers to their fuel emergency. It pointed to a lack of clear, standardized terminology on fuel emergencies, as well as inadequate traffic flow management as contributing factors. FAA’s actions in response to the accident included steps to both address NTSB concerns and stress the need for clear pilot/controller communication.

In a night approach to Los Angeles International Airport, on February 2, 1991, a USAir Boeing 737 landed atop a Sky West commuter Fairchild Metroliner III. Both planes were engulfed in flames as they slid into a nearby building. Fatalities included all 12 persons aboard the commuter flight and 22 of the 89 aboard the USAir flight. NTSB listed the accident’s probable cause as air traffic control management deficiencies that led a controller to issue inappropriate clearances. FAA actions after the accident included assigning additional controllers to the tower and adjusting runway lights to prevent glare from obstructing the view from the tower. In addition, FAA announced a runway incursion plan that would test advances in runway marking, lighting, and signs at the Boston, Seattle-Tacoma, and Pittsburgh airports, and the new Denver airport (then under construction). The agency also amended its air traffic control handbook to prohibit controllers from authorizing aircraft to hold at a taxiway/runway intersection at night or when the intersection was not visible from the tower.

To study the effects of aging on aircraft structures, in August 1991, FAA joined Sandia National Laboratories in opening an aging aircraft nondestructive inspection validation center at Albuquerque International Airport, New Mexico. The agency dedicated the center on February 10, 1993. FAA also established the Center of Excellence in Computational Modeling of Aircraft Structures as a joint effort with Rutgers University and Georgia Institute of Technology. This was the first Air Transportation Center of Excellence created by the agency through a program in which selected institutions received long-term matching grants to conduct research under cooperative agreements.

The Aging Aircraft Safety Act (Public Law 102-143), enacted in October 1991, required FAA to research and impose new rules
requiring certain airworthiness reviews and inspections for airliners in service more than 15 years. The act also directed FAA to establish programs to ensure that U.S. air carriers properly maintained their older aircraft and to encourage foreign airlines to do the same. Although the legislation did not specifically address commuter aircraft, FAA later extended its aging aircraft program to that sector.

As the result of an accident in March 1992, FAA began studying ways to combat aircraft icing. A USAir Fokker F-28 4000 jet crashed at New York’s La Guardia Airport while taking off during a snowstorm, killing 27 of the 51 persons aboard. NTSB cited the probable cause as a combination of failures. The airline industry and FAA had failed to provide flight crews with procedures and requirements compatible with departure delays in conditions conducive to icing, but the flight crew had also failed to exercise caution, deciding to take off without positive assurance that the airplane’s wings were ice-free after 35 minutes exposure to precipitation following deicing.

In May FAA opened a two-day international conference on airplane ground deicing. The conference reflected global concern about icing and produced a series of recommendations for combating this hazard. On September 25 FAA announced a requirement for airlines using large aircraft (Part 121) to have an approved ground de-icing/anti-icing program in place by November 1, 1992. On December 29, 1993, FAA announced stronger deicing requirements for commuter and air taxi pilots to check aircraft surfaces before taking off in adverse weather. The agency also mandated certain new training and checking requirements for pilots for commuter aircraft and larger private planes.

New aircraft deicing rules improve safety
Ice is particularly hazardous to commuter aircraft.
Maintenance and inspection keep the fleet safe
Chapter 8: Into the 21st Century

On January 20, 1993, William Jefferson Clinton became the forty-second President of the United States, succeeding George H.W. Bush. FAA Administrator Thomas Richards left office with the Bush Administration, and Joseph Del Balzo became acting administrator. The following day, Federico Peña became Secretary of the Department of Transportation (DOT), succeeding Andrew Card. He served as DOT secretary until February 14, 1997, when President Clinton nominated him to become Secretary of Energy. Rodney Slater then became Secretary of Transportation on February 17, 1997.

DAVID HINSON [TERM: 08/10/93 – 11/09/96], a former naval aviator, became the thirteenth FAA Administrator. Holding a bachelor’s degree from the University of Washington, Hinson had been a pilot for Northwest Airlines and flight instructor for United Airlines. He later was a captain and director of flight training for West Coast Airlines, eventually becoming director of flight standards and engineering for West Coast’s successor, Air West. In 1973 he founded Hinson-Mennella, Incorporated, a partnership whose acquisitions included Flightcraft, Incorporated, the Beech aircraft distributor in the Pacific Northwest. He was one of four founders of Midway Airlines in 1978, and served as chairman and chief executive officer from 1985 until the airline ceased operations in 1991. When selected to head FAA, Hinson was executive vice president for marketing and business development with Douglas Aircraft, a subsidiary of McDonnell Douglas.

Growing Safety Concerns

David Hinson took over the FAA during one of the safest years in civil aviation history. During calendar year 1993, no major (Part 121) scheduled airline experienced passenger or air crew fatalities. The only fatal accident in Part 121 scheduled operations involved a ground crew-member’s being struck by a propeller — resulting in a fatal accident rate for this segment of aviation of 0.013 per 100,000 departures, the lowest since 1980. The following year, however, ushered in daunting challenges for the new administrator.

On July 2, 1994, a USAir DC-9 crashed while attempting to land at Charlotte-Douglas International Airport, killing 37 of the 57 persons aboard. The accident illustrated the continuing problem of wind shear. As part of ongoing efforts to combat this hazard, FAA commissioned the first Terminal Doppler Weather Radar (TDWR) on July 20. By the end of 1996 the agency commissioned a total of 22 of these systems.

Another USAir tragedy followed the Charlotte crash in 1994. As it approached Pittsburgh airport, a USAir Boeing 737 crashed in Aliquippa, Pennsylvania, on September 8. All 132 persons aboard
died in the accident. Although the cause of this tragedy proved difficult to determine, FAA conducted a critical design review of the 737 flight control system. While the investigating team found no critical flaws, it made a number of recommendations for improving the aircraft’s safety margin.

The following month, on October 31, 1994, an American Eagle commuter flight crashed near Roselawn, Indiana, with the loss of all 68 persons aboard. The aircraft, an Avions de Transport Regional ATR-72, had been in a holding pattern due to weather delays at Chicago. The National Transportation Safety Board (NTSB) subsequently cited the probable cause as a loss of control due to icing, as well as failures by the manufacturer to provide information on the icing hazard to the aircraft and by the French aviation authorities to ensure the flight’s airworthiness under icing conditions. Following the accident, FAA took a variety of steps to reduce hazards to ATR-72 aircraft. On December 9, 1994, the agency prohibited flight by models 72 or 42 into attested or forecast icing conditions. On January 11, 1995, FAA eased this ban, subject to certain requirements, to apply only to freezing rain and freezing drizzle. The agency also required the installation of improved deicing boots on the aircraft by June 1995. Subsequent FAA actions on the broader issue of combating icing included the issuance in May 1996 of 18 new airworthiness directives affecting pilots of 29 different aircraft types.

On December 13, 1994, an American Eagle commuter flight crashed on approach to the Raleigh-Durham, North Carolina airport, killing 15 of the 20 persons aboard the BAE Jetstream 3201 aircraft. Capping a series of fatal airline accidents during 1994, the tragedy heightened public concern about the safety of commuter as well as major air carriers. The day after the crash, Transportation Secretary Federico Peña announced a three-point safety initiative that included accelerating FAA efforts to increase commuter safety standards to the level for large airlines, sponsoring a major government/industry meeting on airline safety, and performing a national airline safety audit (completed in December 1995).

As Transportation Secretary Peña had announced, FAA sponsored a two-day “summit” aviation safety conference in January 1995 to discuss ways to improve safety measures and increase public confidence in airline transportation. More than 950 government and industry representatives attended the event, at which Secretary Peña and Administrator Hinson urged cooperation to achieve a goal of zero accidents. Participants attended workshops and produced recommendations on crew training, air traffic control and weather issues, safety data collection and use, applications of emerging technologies, aircraft maintenance procedures and inspections, and flight operating procedures.
In February 1995 FAA published an aviation safety action plan that identified 173 safety initiatives. Noting that many airlines were voluntarily establishing safety offices that reported directly to their chief executives, the agency stated its intention to require airlines with aircraft seating more than nine passengers to create similar independent safety offices. The action plan emphasized training and called for the increased sharing of safety data. At the same time it released the plan, FAA announced that it had reached agreement with the Air Line Pilots Association and Air Transport Association on a program that allowed the use of information from flight data recorders to analyze safety trends. FAA would have access to the data, with the pilots’ identities having been deleted.

That month FAA also announced a strengthened campaign against the use of suspected unapproved parts (SUP) in aviation. The agency had expanded its SUP program in recent years, but those efforts had been criticized by the DOT Inspector General. FAA published a notice warning of its policy to enforce full compliance with relevant regulations and giving non-compliant firms until May 30 to apply for approval to manufacture aviation parts. On May 24 the agency announced a plan for an industry-operated accreditation program for aircraft parts brokers and distributors. On October 12 FAA issued a task force report that proposed a SUP program plan be developed and a national Suspected Unapproved Parts Program Office be established. FAA created such an office in November 1995.

FAA unveiled the National Plan for Civil Aviation Human Factors, a joint FAA-DoD-NASA initiative, in June 1995. The plan outlined a national agenda to eliminate aviation accidents caused by human error. Its elements included identifying needs and problems involving human performance, guiding research programs to address the human element, involving the nation’s top scientists and aviation professionals, and sharing the resulting information with the aviation community.

In December 1995 FAA announced a commuter safety initiative, a group of new rules aimed at providing a single level of safety for travelers on airliners ranging from ten-seaters to jumbo jets. The new rules required many commuter airlines, formerly operating under Federal Aviation Regulations Part 135, to operate under the stricter Part 121 governing major airlines. This change applied to scheduled passenger operations.
involving airliners having 10 to 30 passenger seats or using turbojets. The rules also contained provisions on standards for airplane performance and for flight crew training and qualifications.

Despite attempts to achieve an immediate decline in aviation accidents, FAA faced a new set of challenges in 1996. On May 11 of that year, a ValuJet DC-9 crashed into the Florida Everglades shortly after takeoff from Miami, killing all 110 persons on board. An intense fire, most likely caused by activation of oxygen generators carried in the forward cargo compartment, caused the crew to lose control of the aircraft. On the day after the crash, FAA announced an expansion of its ongoing review of Valujet. At FAA's urging, on May 23, the DOT Research and Special Programs Administration issued an immediate ban on the transportation of chemical oxygen generators as cargo on passenger airlines.

On June 17, 1996, FAA announced that ValuJet Airlines would cease operations as of midnight, pending safety improvements required under a consent decree. The agency based its action on an intensified inspection of the carrier undertaken since the Florida crash. This heightened scrutiny had revealed serious safety deficiencies in the areas of airworthiness, maintenance, quality assurance of contractors, and engineering capability. FAA returned ValuJet's operating certificate to the airline on August 29, 1996, after the carrier completed the safety improvements outlined in the consent order.

On June 18 Administrator Hinson announced a series of new steps intended to improve aviation safety. He tasked Deputy Administrator Linda Daschle to lead a review of pertinent regulatory issues. The following month, he announced initiatives to improve FAA's oversight of the transportation of hazardous materials by air. The initiatives called for a seven-fold increase in resources devoted to the issue, funding to upgrade the agency's hazardous materials program, and the hiring of 130 additional FAA hazardous materials inspectors and legal personnel.

Two months after the Valujet accident, on July 17, 1996, Trans World Airlines Flight 800 exploded in midair and crashed into the Atlantic after taking off from New York Kennedy airport for Paris. All 230 persons aboard the Boeing 747 died. Initial speculation as to the cause focused on terrorism, and on July 25 President Clinton announced increased security for air travel. New security steps included more intensive screening of passengers on international flights, increased screening of carry-on bags for both international and domestic flights, as well as other actions not disclosed to the public. Clinton also announced Vice
President Albert Gore would head the White House Commission on Aviation Safety and Security, formally established on August 21, 1996, to work with government and industry to make recommendations to improve aviation safety and security.

Despite painstaking recovery and reassembly of the wreckage, the TWA disaster proved difficult to explain. Throughout 1996, NTSB refused to rule out any of three possible causes, a bomb, a missile, or mechanical failure. As the investigation progressed, however, the possibility of an accidental fuel tank explosion received increased attention. On December 13, 1996, NTSB announced recommendations for improving the safety of the Boeing 747 fuel system. FAA, which had been conducting a review of 747 safety issues in the wake of the crash, issued an airworthiness directive ten days later, on December 23, requiring inspection of certain wiring in the fuel systems of older 747s.

On September 2, 1998, another accident rocked confidence in the aviation system. A Swissair jumbo jet en route from John F. Kennedy International Airport in New York to Geneva, Switzerland with 228 people on board crashed off the southern coast of Nova Scotia late at night while trying to make an emergency landing. Canadian aviation officials said the three-engine McDonnell Douglas MD-11 had been diverted to Halifax International Airport after its flight crew reported smoke in the cockpit or passenger cabin about two hours after takeoff.

On July 16, 1999, public attention turned to general aviation safety when John F. Kennedy, Jr., his wife Carolyn Bessette Kennedy, and her sister, Lauren Bessette, were killed as their small aircraft crashed into the Atlantic Ocean. Kennedy, a relatively inexperienced pilot, was flying the Piper Saratoga, a moderately complex plane that he bought the previous April. Investigators determined the probable cause of the accident was pilot error.

Two crashes in 2000 highlighted the need for additional safety measures. On January 31, 2000, Alaska Airlines Flight 261, a MD-83, crashed into the ocean off Point Magu, California, killing all 88 on board. Before the plane suddenly dived 17,900 feet into the water, the crew had reported a stabilizer jammed in a position that pushed the aircraft downward. The subsequent accident investigation determined that the probable cause of this accident was the loss of airplane pitch control resulting from an in-flight failure of the horizontal stabilizer. The component had failed because of excessive wear resulting from the carrier’s insufficient lubrication of the jackscrew assembly.

On March 5, Southwest Airlines Flight 1455, a Boeing 737-300, overran the departure end of Runway 8 after landing at Burbank-Glendale-Pasadena Airport in California. The airplane touched down at approximately 182 knots. About 20 seconds later, at approximately 32 knots, the airplane collided with a metal blast fence and an airport perimeter wall. The airplane came to rest on a city street near a gas station beyond the airport property. Of the 142 persons on board, two sustained serious injuries; 41 passengers and the captain sustained minor injuries; and
94 passengers, three flight attendants, and the first officer sustained no injuries. The airplane sustained extensive external damage and some internal damage to the passenger cabin.

In an effort to improve passenger comfort and to reduce the risk of a cabin fire, in June 2000 DOT banned smoking on all scheduled passenger flights by U.S. airlines and on scheduled passenger flights of foreign carriers into and out of the U.S. In 1990 FAA had banned smoking on all U.S. flights, except for those to or from Alaska or Hawaii and lasting six hours or more.

**A Strengthened Security System**

In January 1994 an explosive device detonated aboard a domestic Philippine Airlines flight. One passenger was killed, but the flight landed safely. Investigators determined the explosive device had been hidden under the seat of the deceased passenger. This incident proved to be a terrorist test that foreshadowed the largest, most complicated plot against civil aviation to date, a plan to destroy 12 U.S. air carrier aircraft flying in East Asia during a 48 hour timeframe. In each case the plan was similar. The terrorist would take the first leg of the flight out of a city in East Asia, plant the device aboard the aircraft, and then get off the plane at an intermediate stop. The aircraft, continuing on a subsequent leg of the flight, would be destroyed en route by the explosive device. A misstep, however, in the manufacture of explosives in a Manila apartment in January of 1995 alerted law enforcement to the plot, codenamed Bojinga by the terrorists. FAA civil aviation security explosives experts joined other federal investigators in Manila and helped identify parts of explosive devices. Details of the plot emerged, and the FAA civil aviation security organization developed and issued security directives (SDs) that required air carriers to implement additional security measures designed to counter the emerging threat. FAA adjusted these SDs almost daily as the agency received new threat information from the Intelligence Community.

FAA aviation security specialists were dispatched to Asia and elsewhere to oversee and coordinate the implementation of the new measures. These security specialists and intelligence analysts worked 24/7 to ensure that the air carriers were
knowledgeable about the threat and armed with effective security counter measures until law enforcement captured the terrorists. In February, Ramzi Yousef, the ringleader, was arrested in Islamabad and subsequently convicted in federal court of charges stemming from the airline bombing plot. Yousef had been on the FBI’s Most Wanted List since summer of 1993 for his role in the bombing of the World Trade Center.

On June 28, 1995, FAA directed airlines and airports in California to increase security measures and warned passengers to be alert for suspicious baggage and parcels. The precautions responded to a threat from the so-called “Unabomber” received by the San Francisco Chronicle the previous day. Postal authorities also implemented certain temporary restrictions on mailing packages from California. This was not the first alleged Unabomber crime related to aviation. He was also believed to be responsible for an explosion in an American Airlines cargo hold in November 1979 that caused twelve persons to suffer smoke inhalation. The mail bomb had been sent from a post office in Chicago and placed aboard an American Airlines flight bound for Washington, DC. The bomb, equipped with a barometer to measure altitude, exploded as the plane reached 34,500 feet. Smoke filled the cabin and the pilots made an emergency landing at Dulles International Airport in Virginia. On April 3, 1996, federal agents detained Theodore Kaczynski as a suspect in the Unabomber cases.

The unexplained crash of TWA Flight 800 in July 1996 sparked new concern about aviation security. The White House Commission on Aviation Safety and Security issued a draft report on September 9, 1996, containing twenty recommendations to strengthen aviation safety and security, including suggested federal funding levels to implement some of them. With the release of the draft report, President Clinton called on Congress to appropriate more than $1 billion for a variety of anti-terrorism measures. Proposed programs related to security included:

- Deploying improved airport bomb-detection equipment,
- Conducting more FAA security research,
- Hiring additional FAA security personnel,
Developing a computerized passenger profile screening system,
Conducting immediate criminal background checks for airport workers with access to secure areas,
Deploying explosive-detection dog teams at airports, and
Testing a system for matching luggage and passengers on all domestic flights.

For fiscal year 1997, Congress appropriated $144.2 million for FAA to purchase and install explosives detection devices at U.S. airports, along with an additional $21 million for associated research and development (R&D) activities. The commission’s final report, issued in February 1997, recommended that FAA be appropriated $100 million annually to continue purchasing security screening devices.

At the beginning of fiscal year 1997, in October 1996, FAA created the Security Equipment Integrated Product Team (IPT) to purchase and deploy explosives detection devices. The IPT brought together FAA staff from the offices of civil aviation security and research and acquisitions, as well as airport and airline industry representatives. On December 26, 1996, FAA announced it had ordered 54 CTX-5000 explosives detection systems. Using computer tomography and high-quality X-ray technology to locate automatically suspicious objects in baggage, the CTX-500 was initially the only explosive detection system to meet the agency’s certification requirements. In November 1998 FAA certified a second system, the eXaminer 3DX 6000 system manufactured by L-3 Communications.

FAA announced plans to purchase more than 150 additional security devices for the nation’s airports in March 1999. The purchase of 21 FAA-certified explosives detection systems and 135 trace explosives detection devices added to the multi-year deployment of innovative security equipment. Total purchases included 95 FAA-certified explosives detection systems, 20 automated dual-energy X-ray machines, two quadrapole resonance devices, and 462 trace explosives detection devices. The trace explosives detectors were being deployed primarily at airport security checkpoints for screening carry-on bags. The other machines were used to examine checked baggage.

The 1999 EgyptAir Flight 990 crash again raised questions about possible terrorism. On October 31 the aircraft plunged into the Atlantic Ocean 60 miles south of Nantucket Island, Massachusetts, in international waters, killing all 217 people on board. Under the International Civil Aviation Organization (ICAO) treaty, the investigation of an airplane crash in international waters fell under the jurisdiction of
the country of registry of the aircraft. At the request of the Egyptian government, NTSB took the lead in this investigation, with the Egyptian Civil Aviation Authority participating. Two weeks after the crash, NTSB proposed declaring the crash a criminal event and handing the investigation over to the FBI. Egyptian government officials protested. On March 22, 2002, NTSB determined that the probable cause of the crash was not a bomb, but rather the result of crew error — the first officer’s flight control inputs. The reason for the first officer’s actions was not determined, although there was speculation that he had intentionally crashed the airplane.

FAA tightened security at the nation’s airports in December 1999 in response to the arrest, the previous week, of a man allegedly trying to smuggle explosives into the United States. The agency announced it would make more use of devices that check airline passengers for trace amounts of explosives. Also, more bomb-sniffing dogs and uniformed police would begin patrolling airports, both inside and outside. The measures came amid concern about the possibility of acts of terrorism in the United States and abroad during the holidays.

On January 5, 2000, FAA proposed a new rule that would require companies performing aviation security screening for air carriers to be certified by FAA. Managers, instructors, and screeners would have to be better qualified, in general, and skilled in the use of new threat image projection associated with all X-ray and explosive detection equipment. The proposed rule would make screening companies directly accountable to FAA, with air carriers continuing to oversee the operations of these service providers. In November President Clinton signed the Airport Security Improvement Act of 2000 (Public Law 106-528), which required FAA to issue a final rule on the certification of commercial screening companies. FAA planned to issue the final rule on the certification of screening companies during the week of September 10, 2001, but the terrorist attacks on September 11, 2001, led to the federalization of the screener workforce.

An incident in mid-2000 put FAA’s enhanced airport security measures to the test. Able to get a gun through security, Aaron Amartei Commey tried to take hostages on a National Airlines Boeing 757 at John F. Kennedy International Airport headed for Las Vegas, Nevada. He demanded to be taken to Miami, Antarctica, or Argentina, and to speak to the Argentinean ambassador. Negotiators from the FBI, the Port Authority of New York and New Jersey, and the New York Police Department joined forces to persuade Commey to release the pilot and then the co-pilot. Passengers and crew had escaped from the plane while Commey was in the cockpit. Some of the 143 passengers aboard the flight to Las Vegas and Los Angeles used an emergency chute deployed by flight attendants to exit the aircraft. A federal magistrate subsequently charged Commey, who authorities said had been planning for months to take over a plane, with one count of air piracy and ordered him held for psychiatric evaluation.
From the Advanced Automation System to Free Flight

Advanced Automation System (AAS)

Upon becoming FAA Administrator David Hinson not only faced a number of critical safety issues, but also had inherited other problems. When he began his tenure, he faced problems with major acquisition programs that were over budget and facing significant delays. With programs undergoing increasing congressional and public scrutiny, the administrator moved quickly to remedy problems. On December 13, 1993, he ordered an extensive review of the Advanced Automation System (AAS), a multi-billion dollar program designed to help modernize the nation’s air traffic control system. The contractor, IBM, was far behind schedule and was logging major cost overruns. Hinson further recommended a review process to determine the impact of the company’s plan to sell its unit in charge of the pending AAS contract to Loral Corporation. On March 3, 1994, FAA announced initial actions as a result of the review that included a new AAS management team and suspension of the portion of the program called the Area Control Computer Complex (ACCC).

Global Positioning System (GPS)

On June 2, 1994, Administrator Hinson announced FAA would halt further development of the Microwave Landing System, saying that the agency instead would concentrate on the development of the U.S. Global Positioning System (GPS). FAA had earlier implemented civil use of GPS and had granted approval for certification of two types of GPS signal receivers.

On June 3 Hinson announced a major overhaul of the AAS program. He terminated the ACCC program and cancelled another AAS element, the terminal AAS, stating that the agency would substitute a new procurement for modernization of terminal radar approach control (TRACON) facilities. In addition, he reduced the number of towers planned to receive the tower control computer complex, a program subsequently cancelled, and revealed plans to review the software for the Initial Sector Suite System (ISSS), a program to provide new workstations for en route controllers. FAA subsequently decided to replace ISSS with a new program, the Display System Replacement (DSR) program.
On June 8 FAA issued a request for proposals for a Wide Area Augmentation System (WAAS) to enhance GPS signals. WAAS would consist of a network of 24 ground stations and associated communications systems. Combined, these systems would enhance the integrity and availability of GPS signals. On July 16 Administrator Hinson and President Phil Boyer of the Aircraft Owners and Pilots Association landed at the Frederick, Maryland, airport using the first FAA-approved public “stand alone” GPS instrument approach. On October 17 the administrator formally offered free use of GPS for ten years to ICAO member states, reconfirming a previous verbal offer. On December 8, 1994, he approved GPS as a primary means of navigation for oceanic/remote operations.

In August DOT announced the availability of a GPS signal specification defining performance standards for civil aviation use. That same month, FAA awarded a contract to a consortium led by Wilcox Electric to develop and field WAAS. On April 26, 1996, however, FAA cancelled the contract with Wilcox Electric because of project management problems and projected cost overruns. On May 1 FAA entered into a letter contract with Hughes Information Technology Systems regarding WAAS. This was followed by the October 29 announcement of a comprehensive contract with Hughes for WAAS development and implementation.

Although FAA moved ahead rapidly to assure the infrastructure and procedures for civil aviation use of GPS would be ready, many system users expressed concern about the availability of the military GPS satellites for civil use. On March 29, 1996, President Clinton issued a presidential directive assuring the availability of GPS signals to civilian users. The new policy included a planned end to the practice of degrading civil GPS signals, within a decade, in a manner that would allow the U.S. military to prepare for this eventuality.

In late February 1997 officials from the Departments of Transportation and Defense (DoD) announced an agreement to provide a second civil frequency for GPS. They also guaranteed uninterrupted availability of the second frequency for civil users. A year later, in March 1998, Vice President Al Gore announced that two civilian GPS signals would be provided by the U.S. free of charge.

FAA announced findings in January 1999 that, with anticipated improvements, GPS could serve safely and reliably as the only navigation system installed in aircraft and the only navigation system provided by FAA. The findings came from an independent assessment of GPS capabilities conducted cooperatively for the FAA by the Johns Hopkins Applied Physics Laboratory, the Aircraft Owners and Pilots Association, and the Air Transport Association. Both WASS and the Local Area Augmentation...
System (LAAS) would provide the improved accuracy, integrity, and availability of the GPS signal.

At this time, Raytheon Systems was already supporting WAAS development, and in April 1999, the firm completed the first of three major system integration tests established for the system. The test proved the ability of WAAS to provide augmentation to the U.S. GPS system. During the test, the system operated continuously for 72 hours using WAAS ground and space components. Raytheon and FAA examined data from several locations, including Denver, Oklahoma City, and Dayton in assessing the test results.

In April 1999 FAA also announced an agreement to join with Raytheon Systems and Honeywell Incorporated, in the development of LAAS. The two commercial firms would provide funding for the development and FAA would provide the specifications and expertise on development and certification. By August FAA, UPS, and the Air Transport Association conducted successful flight tests of the prototype LAAS at the FAA William J. Hughes Technical Center.

In August 2000, after a successful 21-day test of the WAAS signal in space, FAA declared the system immediately available for some aviation uses. The test demonstrated that the system provided a stable and reliable signal and delivered one to two meters horizontal accuracy and two to three meters vertical accuracy throughout the contiguous United States. Raytheon operated the system for FAA on a continuous basis, interrupting it only as needed to install upgrades.

**Free Flight**

With AAS largely cancelled because of cost overruns, lengthy schedule delays, and significant performance shortfalls, Administrator Hinson worked to get the modernization effort back on track. In consultation with the aviation community, FAA determined the best approach to modernizing aviation would be a phased process eventually leading to a new way to manage air traffic. Under an innovative program to be called “free flight,” FAA planned to introduce a host of new technologies and procedures that would remove many restrictions on operators.

The agency would move gradually from its established use of highly structured rules and procedures for air traffic operations to a more flexible system in which decisions for conducting flight operations would be based on collaboration between FAA and aviation system users. New technologies and associated procedures would give pilots and controllers more precise information about the location of aircraft and allow them to exchange information.
more efficiently. With more precise and efficiently exchanged information, pilots would have more flexibility to change route, speed, and altitude (under permitted conditions), thus saving users time and money and allowing FAA to improve system safety and use airspace and airport resources more efficiently.

To address concerns about its modernization agenda, and to develop consensus on and commitment to its future approach to modernization and free flight, the agency focused as never before on partnering with the full aviation community. FAA officials at all levels worked with commercial and private system users, major trade organizations, representatives of air traffic control personnel, equipment manufacturers, DoD, and others to design the free flight initiative. In October 1994, at FAA's request, RTCA, Inc., convened a government/industry committee to study and refine the free flight concept. (In 1935, the Radio Technical Commission for Aeronautics was created when the Department of Commerce invited a group of government and industry representatives to help coordinate R&D of aeronautical radio. As it evolved, the organization made two changes to its name. In 1942 it adopted a constitution and changed the word "Committee" to "Commission." In 1991 it became a non-profit corporation and shortened its name to RTCA, Inc.)

In their January 1995 report, a government/industry committee, under the leadership of RTCA, defined free flight and considered the first steps for its implementation. This initial definition was followed in October by a more detailed report. These early efforts led to a set of recommendations — most of which contained implementing initiatives — and an action plan to gradually move the national airspace system (NAS) to free flight. While working to implement the recommendations, FAA and stakeholders agreed on the need to focus efforts on deploying technologies that would provide early benefits to users.

Confident of free flight possibilities, on January 15, 1997, FAA announced plans for a two-year evaluation, beginning in 1999, of free flight air traffic management concepts and technologies for application in selected aviation environments in Alaska and Hawaii. The goal of this Alaska Free Flight Demonstration Project was to show that existing technologies could support the free flight concept. FAA believed that the demonstration would help identify and mitigate the risks associated with implementing free flight. While many stakeholders agreed with the need to mitigate risks, they had strong reservations about conducting this demonstration in the remote Alaskan locations that had been chosen, believing that the lessons learned there would not transfer well to more complex operations in the continental United States.
FAA and stakeholders — working under the leadership of RTCA — developed a roadmap for restructuring Ha-laska and presented it to FAA in September 1998. Among other things, they recommended that the program be conducted in the Ohio Valley and Alaska, tested with nine major operational capabilities implemented, and renamed the “Free Flight Operational Enhancement Program.” In developing the roadmap, both FAA and stakeholders emphasized the critical role of safety. Ultimately, FAA renamed the demonstration projects Capstone for the Alaska initiative and Safe Flight 21 for the Ohio Valley tests.

Also in 1998, RTCA’s Free Flight Steering Committee recommended, and FAA agreed to, a phased approach for implementing the free flight program, established a schedule for phase 1, and created a special program office to manage this phase. During phase 1, which FAA expected to complete by the end of calendar year 2002, the agency planned to deploy five new technologies to a limited number of locations and carefully measure the resulting benefits. The five selected technologies were: the Surface Movement Advisor, the User Request Evaluation Tool, the Traffic Management Advisor, the passive Final Approach Spacing Tool, and a technology supporting Collaborative Decision Making. All five tools were already under development.

Surface Movement Advisor (SMA). FAA development of SMA began in 1994. The system provided aircraft arrival information to airline ramp towers and operation centers — information that included aircraft identification and position in terminal airspace, and details used to compute estimated time to touchdown to better manage gates and other ground operations. Following system development, testing, and integration, FAA first demonstrated the promise of SMA to the airline industry in February 1996, and commissioned the system at the Atlanta airport tower in January 1997. In December 1999 FAA made SMA available to the Dallas-Ft. Worth, Chicago O’Hare, Newark, and Teterboro (New Jersey) airports. Staff at Northwest Airlines estimated that the enhanced situational awareness they received through SMA allowed them to avoid three to five costly diversions per week at Detroit Metropolitan airport.

User Request Evaluation Tool (URET). MITRE’s Center for Advanced Aviation System Development created the prototype URET for FAA and had deployed it to the Indianapolis and Memphis air route traffic control centers (ARTCCs) for testing by November 1997. Also called a conflict probe, the URET software gave controllers a strategic 20-minute look ahead to detect potential conflicts when considering pilot requests for changes in altitude and route. FAA announced in September 1999 that Lockheed Martin Air Traffic Management would develop and deploy a free flight version of URET. FAA planned to make the system available to controllers beginning in late 2001.
Traffic Management Advisor (TMA). This system being developed by NASA, would assist controllers in planning and managing streams of arrival traffic into selected terminal radar approach control (TRACON) facilities, and to ARTCCs that received traffic from two or more centers. In March 2000 controllers at the Minneapolis TRACON started testing TMA. The tool looked at planes as they came in from all directions, while still several hundred miles from selected airports. As the aircraft got closer, TMA helped controllers develop plans to handle the traffic effectively according to the spacing requirements for each airport. Together with the passive Final Approach Spacing Tool, the new system would comprise about half of FAA’s envisioned Center-TRACON Automation System.

passive Final Approach Spacing Tool (pFAST). The pFAST tool, developed by NASA, was a decision support tool for TRACON air traffic controllers. The TRACON typically encompassed the airspace within approximately 40 nautical miles of a major airport. The tool provided landing sequences and landing runway assignments, as well as speed and heading, to help controllers manage arrival traffic and achieve an accurately spaced flow of traffic on final approach. FAA had begun testing an early prototype in 1996 at the Dallas/Ft. Worth TRACON. The updated, free flight version of the tool began operational testing at the same TRACON on February 1999. FAA never certified the tool for operational use.

Collaborative Decision Making (CDM). FAA had begun development of the CDM tool in 1994. Airlines, government, private industry and specialists from academia worked together to develop the new technology that improved air traffic management through information exchange, data sharing, and improved automated decision support tools. FAA began testing CDM concepts in 1996 with major airlines. In late 2000 the Ground Delay Program Enhancement (GDPE) tool, developed under the CDM program, became fully operational. GDPE significantly reduced delays, improved the flow of air traffic into airports, improved compliance to controlled times of departure, and improved data quality and predictability. FAA estimated that from January 1998 through January 2000, almost 90,000 hours of scheduled delay were avoided thorough the use of GDPE.

With the free flight tools under development and testing, FAA and industry conducted the first large-scale test under the Safe Flight 21 program. On July 10, 1999, FAA and the Cargo Airline Association tested Automatic Dependent Surveillance-Broadcast (ADS-B), a technology designed to enhance safety by giving pilots and air traffic controllers more information about aircraft locations. The Wilmington, Ohio, tests evaluated how well ADS-B helped pilots to be more aware of aircraft in their vicinity. Using an aircraft’s ADS-B display.
GPS sensor, ADS-B equipment sent accurate position information, along with speed and identification data, to other similarly equipped planes and ADS-B ground receiving stations. During the test, participating flight crews used a special cockpit display to monitor aircraft in their area. Air traffic control facilities received combined radar and ADS-B information for evaluation. Ground receiving stations in Wilmington and Louisville, Kentucky, provided coverage throughout the 500-square-mile test area. Approximately 25 planes participated. This ADS-B operational evaluation was the first in a series of tests planned for the next three years under the Safe Flight 21 program. In late October 2000, FAA, again in conjunction with the Cargo Airline Association, conducted a second successful test of ADS-B at the airport in Louisville, Kentucky, to determine the technology’s ability to improve flight safety while increasing capacity.

On January 1, 2001, as part of FAA-industry Capstone partnership, FAA began the first use of ADS-B technology to track and service traffic near Bethel, Alaska — an area that had no radar coverage. The new system used ground-based transceivers to pick up transmissions from ADS-B equipped aircraft. The information was then transmitted via phone line and satellite to the Anchorage ARTCC, where controllers could view it on their screens.

**Building the Infrastructure**

While many of FAA’s modernization efforts, such as replacing controller workstations and supporting equipment, were not a direct part of the free flight initiative, those efforts were still necessary to provide the infrastructure critical for free flight implementation. Hence, in April 1995, FAA announced an agreement with Loral Corporation on contract modifications regarding air traffic control modernization under the former AAS program. Loral would develop and implement the new DSR automated workstations for controllers at ARTCCs. On December 5, 1996, FAA announced that Loral had delivered the first DSR to the Seattle ARTCC, ten months ahead of schedule. By July 2000 FAA dedicated the 20th and final DSR at the Washington ARTCC in Leesburg, Virginia.

FAA awarded another contract to Loral on August 30, 1995, for production and installation of the display channel complex rehost system to replace aging IBM 9020E computers at five ARTCCs: Chicago, Dallas-Fort Worth, Washington, Cleveland, and New York. Those facilities had experienced 20 display channel complex failures in the previous four months.

With work on new DSR workstations for en route controllers underway, FAA focused attention on new technology for its TRACONs. On September 16, 1996, FAA announced the award of a contract, to a team led by Raytheon, to build the Standard Terminal Automation Replacement System (STARS). Under a joint FAA/DoD contract, the team would develop and install new computers, displays, and software at up to 172 FAA and 199 DoD facilities. The work on STARS, however, did not proceed as smoothly as that on DSR. On May 28, 1997, FAA sent a letter to Raytheon indicating its concern about delays in the STARS project. FAA proposed to elevate STARS software development to high risk status because of delays in meeting project milestones.
Being over budget and behind schedule were not the only issues troubling the STARS program. Two FAA unions, labor groups that were not involved in the system’s development, but who were expected to use and maintain it, expressed grave concerns about its usability and maintainability. On October 30, 1997, the National Air Traffic Controllers Association (NATCA) president told the Subcommittee on Aviation, a permanent part of the Committee on Transportation and Infrastructure in the U.S. House of Representatives, that problems with STARS had to be rectified before the system could be a workable product within the terminal environment. At the urging of Representative Frank Wolf (R-VA), FAA agreed to work with the DOT Inspector General in an attempt to resolve these issues.

On April 26, 1999, FAA, along with representatives from NATCA and the Professional Airways Systems Specialists, announced a revised implementation plan for STARS. The plan focused on developing the full STARS as soon as possible, while simultaneously meeting short-term requirements for new controller displays at a small number of FAA facilities. Under the revised plan, the first STARS would go into the Syracuse, New York, and El Paso, Texas, TRACONS. Initially, those sites would receive the early display configuration of STARS. Development would continue in parallel on the full STARS, which would include a new computer system. Once STARS had the capability to handle the needs of higher-level facilities, it would be deployed throughout the country. Four months later, the early version of STARS entered operational test and evaluation.

FAA started in December 1999 to manage arriving and departing air traffic in El Paso with the early version of the STARS air traffic controller workstations. This was the first component to become operational as part of a phased strategy to deploy this state-of-the-art, full-service system nationwide. Controllers and technicians at the TRACON successfully integrated the new workstations, featuring high-resolution color monitors, with the existing automation system.

As the new century approached, FAA also fielded a number of innovative technologies in addition to the new ARTCC and TRACON controller workstations. In 1999, for example, FAA began using electronic air/ground communication services for aircraft flying over Pacific Ocean airspace. The multi-sector oceanic data link system provided air traffic controllers two-way electronic communications with aircraft equipped with data link. This system eliminated the need for voice communication and improved the reliability and timeliness of message delivery.

In May 2000 FAA completed the final installation of a new air route surveillance radar that could detect a one-square-meter object out to 250 nautical miles, a 50 nautical mile increase over previous long-range radar models, and also provide weather data to the agency as well as the National Weather Service. That same month, FAA announced operational use of a new tool designed to help reduce delays at major airports in the northeastern part of the U.S. Installation of the departure spacing program was one of the first milestones in the Spring 2000 Initiative, announced in March by President Clinton and Transportation Secretary Rodney Slater. This program drew pertinent air traffic information from airports equipped with a new
coordination and planning tool to separate departing aircraft more evenly. The innovation allowed the best use of existing capacity information to expedite the flow of air traffic and minimize delays.

**A New Way of Doing Business**

In April 1993 President Clinton signed legislation creating a “National Commission to Ensure a Strong, Competitive Airline Industry” to study the problems facing commercial aviation. Former Virginia Governor Gerald Baliles chaired the commission, which had 11 non-voting and 15 voting members. The group met for the first time on May 24, and delivered their final report to the president on August 19. Among their recommendations was the creation of an independent federal corporate entity within DOT to manage and fund air traffic control and related functions. Other recommendations included establishing an advisory committee to further the airlines’ financial health, bankruptcy code reforms, tax breaks for airlines, possible use of oil reserves when needed to control sharp increases in fuel prices, efforts to create a multi-national operating environment for airlines free of discrimination and restrictions, and limiting the liability of general aviation aircraft manufacturers to 15 years from the date of manufacture.

During this time, Vice President Al Gore had been heading the National Performance Review to study federal government operations. On September 7, 1993, he released the findings of the review. The recommendations were intended to streamline government and make it more cost beneficial. Proposals concerning aviation included creating a government-owned corporation to provide air traffic control services.

In a press conference held on January 6, 1994, representatives from DOT, FAA, and the Council of Economic Advisors unveiled the Clinton Administration’s plan to revitalize the aviation industry. The plan entailed action on most recommendations of the National Commission to Ensure a Strong Competitive Airline Industry. Reforming the air traffic control organization became a key component of the aviation plan, which included efforts to move ahead with conversion of the FAA air traffic control function to a government
corporation. Other elements of the proposal aimed at: achieving bankruptcy reform, increasing foreign investment in U.S. carriers (contingent on reciprocal opportunities), encouraging new entrant carriers, heightening scrutiny of airline financial fitness, and promoting employee ownership of airlines.

Within four months, on May 3, 1994, Vice President Gore and Transportation Secretary Federico Peña announced a proposal to create a new Air Traffic Services Corporation to operate, maintain, and modernize the air traffic system. Under the proposal, 38,000 FAA employees involved in providing air traffic services would become part of a new not-for-profit government corporation.

Support for the corporation would be derived from fees levied upon commercial aviation, subject to approval by DOT. On the same day that Gore and Peña unveiled the plan, President Clinton wrote letters urging Congress to make the new corporation a reality. During the following months, however, Congress considered a variety of plans for restructuring FAA. These proposals included calls to make the agency independent of DOT.

President Clinton signed the Federal Aviation Administration Authorization Act of 1994 on August 23. The new legislation provided fiscal year 1994-1996 funding and authorization for FAA’s programs. Also, to give the agency greater leadership stability, it specified a five-year term of office for the FAA Administrator.

While waiting for presidential and congressional action on FAA reform, Administrator David Hinson announced, on November 30, his own reorganization. Hinson restructured the agency along its key lines of business, making better use of resources, consolidating functions, and increasing management accountability. The reorganization abolished the three remaining executive director slots to eliminate an entire layer of management. The remaining positions reporting to the administrator and deputy administrator included the:

- Chief counsel
- Assistant administrator for civil rights
- Assistant administrator for government and industry affairs
- Assistant administrator for public affairs
- Assistant administrator for system safety [a new position charged with analyzing safety data and making recommendations for improvement]
- Assistant administrator for policy, planning, and international aviation
- Associate administrator for administration [a new position assuming the responsibilities of the abolished offices of the assistant administrators for budget and accounting and for human resource management]
- Associate administrator for airports
- Associate administrator for civil aviation security
To ensure life cycle responsibility for programs, in April 1995 the associate administrators for research and acquisition, regulation and certification, air traffic services, and airports signed an agreement that created the Integrated Product Development System. This innovation called for the use of integrated product teams, or IPTs, as part of a tiered system of teams in research, acquisition, and the management of equipment life-cycles. The multidisciplinary IPTs cut across organizational lines to bring together customers and suppliers with the goal of improving products and services and expediting their delivery.

On September 12, 1995, legislation was introduced in the Senate to reform FAA while keeping it within DOT. The proposed legislation would give the agency more flexibility in personnel and acquisition matters. The bill also provided for a system of financing FAA that emphasized fees for services. The Secretary of Transportation and FAA Administrator immediately endorsed the bill, a position that marked the Clinton Administration’s shift away from its drive to create a government corporation for air traffic control. Although the bill never became law, the Clinton Administration continued work to create a more efficient FAA.

President Clinton quickly signed the fiscal year 1996 DOT appropriations bill after receiving it from Congress on November 15, 1995. The legislation provided $8.216 billion for FAA, and included important provisions for FAA personnel and procurement reform. FAA instituted the mandated reforms, and on April 1, 1996, announced creation of a new acquisition management system aimed at reducing the time and cost of acquiring systems and services while making the acquisition workforce more accountable. The new personnel system was intended to speed recruitment and reward outstanding employees while dealing effectively with substandard performance. All FAA employees became part of a new Federal Aviation Service (FAS). While the agency was no longer subject to certain Office of Personnel Management rules, its employees continued to enjoy a range of legal protections that applied to other federal workers. Unionized FAA employees retained their representational status.

On October 9, 1996, President Clinton signed the Federal Aviation Reauthorization Act of 1996 (Public Law 104-264). This legislation established a National Civil Aviation Review Commission to report to Congress on the state of aviation safety and on providing long-term funding for the agency. It also directed the establishment of a Federal Aviation Management Advisory Council to advise the FAA Administrator and function as an oversight resource for management policy, spending, and regulatory matters. The Council ultimately consisted of 18 members, ten appointed by the president
to represent specific aviation interests. Five members, appointed by the Transportation Secretary, served as a subcommittee, with emphasis on air traffic services. There also was one designee each from DOT, DoD, and an air traffic services union. The Secretary of Transportation swore in the first seven members of the FAA Management Advisory Council in September 2000. Initially, advisory council members served from one-to three-year terms. Subsequent appointments were for three years.

To address public perceptions about FAA’s “dual mission,” the Federal Aviation Reauthorization Act of 1996 specified safety as the agency’s highest priority. FAA remained responsible for encouraging and developing civil aeronautics, but references to a promotional role were eliminated from its mandate. The law also contained provisions aimed at expanding FAA’s financial accountability and increasing its autonomy within DOT. As required by the legislation, on February 28, 1997, FAA released an independent 90-day assessment of its financial needs through 2002. The assessment, performed by the Coopers & Lybrand consulting firm, found that the agency lacked a system to account for its costs. In response, FAA agreed to develop a system that could help identify the gap between its projected responsibilities and its anticipated resources.

David Hinson resigned as FAA Administrator on November 9, 1996, and Deputy Administrator Linda Daschle became acting administrator, a post she held until resigning from the agency on January 31, 1997. FAA executive Barry Valentine followed Linda Hall Daschle as acting administrator.

On August 4, 1997, JANE GARVEY [TERM: 08/04/97 – 08/02/02] became the fourteenth FAA Administrator, the first to be appointed to a five-year term. Previously, Garvey had served as deputy administrator, and then, from 1993 to 1997, as acting administrator of the Federal Highway Administration (FHWA). From 1988 to 1991, she was commissioner of the Massachusetts Department of Public Works, and before joining FHWA, she was director of Boston’s Logan International Airport. Garvey received a Bachelor’s degree from Mount Saint Mary College and a Master’s degree from Mount Holyoke College.

Garvey had been in office only four months when, on December 11, 1997, the National Civil Aviation Review Commission, chaired by former Representative Norman Mineta, issued its final report, “Avoiding Aviation Gridlock and Reducing the Accident Rate: A Consensus for Change.” Commission members express concern about the current state of the aviation industry and FAA. They said airline passengers were doomed to massive airport congestion and more dangerous skies unless FAA underwent a radical overhaul. The 21-member panel urged a partial privatization of the agency as well as steps to shield aviation regulation from partisan budget battles — and it called on lawmakers and the White House to improve FAA management and finances.
The Commission’s report recommended FAA and industry work together to develop a comprehensive integrated safety plan to prioritize existing safety recommendations and develop performance measures and milestones to assess progress in meeting safety goals. The Commission also pointed out that the global nature of aviation demanded that safety be addressed worldwide, not just in the United States. In response to those recommendations, Administrator Garvey established the Safer Skies initiative and created the Commercial Aviation Safety Team (CAST). CAST developed an integrated, data-driven strategy to reduce the commercial aviation fatality risk in the United States and promote new government and industry safety initiatives throughout the world. The goal was to reduce the risk of fatal accidents by 80 percent.

Administrator Garvey also took action to address organizational concerns. On June 5, 1998, a reorganization went into effect that:

- Abolished the office of the associate administrator for administration
- Created an assistant administrator for financial services, serving as CFO
- Created a deputy assistant administrator for financial services, serving as the budget director
- Established an assistant administrator for human resource management
- Created an assistant administrator for region/center operations
- Abolished the office of business information and consultation
- Transferred the Freedom of Information Act office to the assistant administrator for region/center operations
- Transferred the headquarters facilities management office to the office of acquisitions under the associate administrator for research and acquisitions
- Moved the Washington flight program office (Hangar Six) to the aviation systems standards office within the airway facilities organization

On June 15, 1998, Transportation Secretary Slater and the NATCA president announced a new labor agreement between FAA and the union. In August FAA and NATCA formally signed the new five-year pact in which a federal labor union negotiated wages, for the first time, with a government agency.

The agency would soon find itself negotiating with other employees. On June 17, 1998, Administrator Garvey unveiled the next part of FAA’s congressionally authorized personnel reform efforts — a test of a new pay plan, called core compensation, for about 1,200 agency employees. The new plan replaced the traditional grade and step based pay method with a structure of pay bands, the value of which were determined by comparison with similar jobs in government and private industry. The program linked compensation with performance.

When the agency announced its intention to expand the pay program, employees at FAA headquarters began to unionize for the first time. When Congress released FAA from many civil service rules, it had said that unionized workers could bargain with management over salaries. It also gave FAA the option of lowering salaries of unorganized workers via a core compensation plan. Despite large numbers of employees joining unions, on April 23, 2000, FAA transferred approximately 6,500 employees into the new market- and performance-based compensation system closely linked to the strategic goals of the agency. An executive compensation system became effective on the same date for senior executives.

FAA reform continued throughout the Clinton Administration. In April 2000 the president signed into law the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century. The bill
contained provisions to advance aviation safety and provided for the appointment of a chief operating officer. In a December executive order, President Clinton directed FAA to create a performance-based organization to focus solely on efficient operation of the air traffic control system, to appoint a group of business and labor leaders from outside of the aviation industry to serve as a board of directors for this new organization, and to conduct a review of impediments to congestion pricing at airports. He also called on Congress to reform the way air traffic control services were financed.

**International Cooperation**

The Clinton Administration continued work started by the Reagan Administration to increase U.S. leadership in aviation and enhance international aviation safety. In September 1995 the United States and the Netherlands signed the world’s first bilateral aviation safety agreement. The document included provisions on increased cooperation in such areas as aircraft certification and the approval and/or monitoring of airmen, training, flight operations, and maintenance facilities. By the end of 1996 the United States had concluded five more such agreements with Great Britain, Germany, France, Malaysia, and Switzerland.

To create a single level of international safety, in February 1996 FAA and Europe’s Joint Aviation Authorities announced they had developed a common set of certification standards for newly designed small airplanes. The achievement was part of an ongoing effort to reduce or eliminate duplicative requirements harmonize international standards.

The following year, as part of a continuing “Open Skies” initiative, DOT announced a U.S.-German agreement relaxing limitations on air travel between the two countries. By February 1996 the United States had concluded ten additional open skies agreements with: the Netherlands, Austria, Denmark, Finland, Iceland, Luxembourg, Norway, Sweden, Switzerland, and Belgium. In addition, the United States and Canada had signed an important agreement on transborder air travel.

**Expanding into Space**

In a move to consolidate all aerospace safety activities into one administration, on August 7, 1995, DOT announced that the office of commercial space transportation would move to FAA. Since the transfer required legislative approval, the move did not take effect until November. The fiscal year 1996 DOT appropriations bill, signed by President Clinton on November 15, 1995, cleared the way for the transfer of the office of commercial space transportation to FAA.
the office to FAA. The transfer became effective the following day, and the director of this new FAA organization became an associate administrator reporting to the administrator.

Originally established within DOT in 1984, the new FAA office regulated the U.S. commercial launch industry, licensed commercial launch operations to ensure public health and safety and the safety of property, and protected national security and foreign policy interests of the United States during commercial launch operations. The first U.S. licensed launch was a suborbital launch of a Starfire vehicle on March 29, 1989; the one-hundredth launch occurred on September 8, 1998. To date, the office has licensed almost 200 launches. The organization had responsibility as well for licensing the operations of non-federal launch sites, or spaceports. On September 19, 1996, FAA issued the first license to Spaceport Systems International, allowing it to open the world's first privately-operated space launch facility, California Spaceport, located at Vandenberg Air Force Base in California.

FAA held its first annual commercial space transportation forecast conference on February 10-11, 1998. The meetings provided a forum for FAA and commercial space industry representatives to discuss a variety of issues that included new technologies, space commerce, and regulatory issues and policies. Two months after the conference, FAA published a final rule on licensing requirements for the launch of expendable vehicles from federal sites.

In August another rule mandated financial responsibility and insurance coverage requirements for commercial space launch activities. The new regulations required a launch licensee to obtain insurance or otherwise to demonstrate financial responsibility to protect itself, the customer, the U.S. Government, and contractors and subcontractors against claims for third-party losses and federal property damage resulting from the licensed launch activities. On a case-by-case basis, the agency would set the insurance requirements according to a risk-based determination of the maximum probable loss that might result from the licensed activities. The new rule required launch participants, whether from industry or government, to enter into reciprocal waivers of claims in which each party agreed to absorb certain losses it might sustain as a result of the licensed activity. In addition, subject to the funds being appropriated, the U.S. Government agreed to consider paying third-party claims in excess of the required insurance, up to a legal ceiling of $1.5 billion. By the end of September 1998 FAA had issued its fourth space launch site operator’s license to the Alaska Aerospace Development Corporation. The license allowed commercial rocket launches on the southern tip of Kodiak Island. Alaska joined California, Florida, and Virginia as states with FAA-licensed state or commercially operated space launch facilities. The Alaska site, however, was the first spaceport not co-located with a federally operated launch range.
A HISTORICAL PERSPECTIVE

FAA issued a launch license to a Boeing-led international consortium to conduct a first-of-its-kind demonstration space launch in March 1999. The consortium launched its rocket from a sea-going platform in the Pacific Ocean. The 40 percent Boeing-owned partnership used a Ukrainian-built Zenit booster rocket and a Russian-built upper stage rocket. The launch platform, a converted self-propelled oil drilling platform, was accompanied to the launch site by an assembly and command ship designed and built by Kvaerner Maritime of Norway, another partner in the undertaking.

On October 19, 2000, FAA issued new rules that established a specific licensing and safety requirement for operating a commercial space launch site, whether the site was located on or off a federal launch range. The regulation outlined who must obtain a commercial launch site operator’s license, set application requirements, and delineated licensee responsibilities. It built upon prior rulemakings that governed operation of reusable launch vehicles (RLVs) and reentry and recovery of RLVs and reentry vehicles. A companion rule covered the financial responsibility requirements, such as insurance, for licensed reentry activities. Together, the rules completed the process of establishing FAA’s responsibility for licensing and regulating reentry of returning space vehicles and reentry sites authorized by congressional legislation passed in 1998. Previously, the Commercial Space Launch Act had provided authority over only the launching of commercial launch vehicles, not their return to Earth.

Environmental Challenges

In the early 1980s, FAA realized that it would be impossible for the existing air traffic routes over the East Coast to handle the growing demand for airline travel brought by deregulation. The biggest delays in the East Coast airspace system was the New York-New Jersey metropolitan area. Bottlenecks in this airspace had a ripple effect...
effect throughout the entire national air traffic system. To ease traffic congestion in the region, FAA developed the Expanded East Coast Plan (EECP) to change the aircraft routes and air traffic procedures in a way that would permit each of the major New York-New Jersey airports to handle air traffic in a more efficient manner. This was an ambitious plan, which required some of the most far-reaching changes FAA ever made to the air traffic system.

Implementation of the EECP reduced delays, resulted in better flight planning, and allowed controllers to handle more traffic without compromising safety. However, the EECP also produced unavoidable consequences. These new air traffic routes began to take aircraft over parts of New Jersey, which, until 1987, had not experienced significant levels of air traffic. As a result, communities throughout northern New Jersey began to experience increases in noise levels they found unacceptable.

Pursuant to the Aviation Safety Capacity Expansion Act of 1990, FAA undertook an environmental impact statement, an EIS, to assess the effects of changes in aircraft flight patterns at altitudes of 3,000 feet above ground level caused by the implementation of the EECP over New Jersey. Believing the EIS process took too long, in late 1992, at the urging of Senator Frank Lautenberg (D-NJ), the Senate prohibited pay raises for approximately 16 FAA employees whose responsibilities included noise abatement policy, aircraft route design or change, or the preparation, management, or oversight of the environmental impact statement until FAA completed the EIS. After an extensive and lengthy process of study, including opportunities for public comment for approximately 500 days and including a public hearing on Staten Island, FAA took final action on the EIS by issuing a record of decision on October 31, 1995. While FAA decided to continue the broad procedures of the EECP, in April 1996 it adopted a specific measure, called the Solberg Mitigation Proposal, to reduce noise for residents of New Jersey. Still, citizens in communities in New Jersey and New York continued to experience levels of noise that they found unacceptable.

Noise remains a concern for communities near airports.

In addition to the Solberg Mitigation Proposal, FAA committed to undertake a follow-on regional study to address the metropolitan New York area. In 1996, based on a request from the Port Authority of New York and New Jersey, a test over a four-month period in 1993, and an environmental assessment, FAA revised the standard instrument departure procedures for Newark's airport. In 1998, again at the request of the Port Authority, FAA examined the viability of changing
the airport’s standard instrument departure. Agency researchers found an industrial area south of Newark Airport where flights could be diverted to reduce noise over the City of Elizabeth. The change required a variation in the heading from 220 degrees to 260 degrees. FAA tested the 260-degree heading from March until September 1998 and then conducted an environmental assessment of the proposed change. At the onset of the preparation of the environmental assessment, FAA requested comments from a variety of public agencies and other interested parties. As a result of the analyses conducted and continued operational evaluation of the departure routing, FAA found no significant environmental benefit derived from the alternative routing to 260 degrees.

In April 1998 Administrator Garvey announced the National Airspace Redesign Project to maintain and improve system safety, improve the efficiency of the air traffic management, and reduce delays. The project would increase system flexibility and predictability, and it would seek to reduce adverse environmental effects on communities in and around our Nation’s airports. The Agency expected the project would take approximately eight years to complete. The New York-New Jersey Metropolitan Airspace Redesign Project portion of the project encompassed the New York, New Jersey, and Philadelphia metropolitan areas and included air traffic affecting Connecticut, Delaware, and Pennsylvania. As part of the study, FAA planned to examine possible revisions to departure patterns at Newark, including an ocean routing concept for day and night traffic, as well as the straight-out departure concept.
Easing airport congestion becomes a 21st Century challenge
Chapter 9: Getting Ready for NextGen

George W. Bush became the forty-third president on January 20, 2001. Five days later, former Member of Congress Norman Mineta (D-CA) took the oath of office as the nation’s fourteenth Secretary of Transportation. The lone Democrat in George W. Bush’s cabinet, Mineta had been Secretary of Commerce in the outgoing Clinton Administration, and was the first Asian Pacific American to hold this cabinet post. Mary Peters succeeded Mineta, who retired on October 24, 2006. Jane Garvey, who had been appointed to a five-year term as FAA Administrator remained in her position until the end of her term on August 2, 2002.

MARION BLAKEY [TERM: SEPTEMBER 13, 2002 - SEPTEMBER 13, 2007] became the 15th FAA Administrator on September 13, 2002. She had served for slightly less than one year as the National Transportation Safety Board (NTSB) chairperson. This native of Gadsden, Alabama, came to the FAA with varied experience both within and apart from the federal government. Her experience in previous Republican administrations included positions with the Department of Commerce, Department of Education, the National Endowment for the Humanities, and the White House. Under President H. W. Bush, she had served in the Department of Transportation (DOT), from 1992-1993, as the head of the National Highway Traffic Safety Administration. Following that, she had run her own public affairs consulting business for eight years.

When Administrator Blakey’s five-year term ended on September 13, 2007, Deputy Administrator Robert A. Sturgell became acting administrator. The congressional elections in 2006 had brought a Democratic Party majority to the House of Representatives and the Senate [the Senate had 49 Democrats, 49 Republicans, and two democratic-caucusing Independents] for the first time in twelve years. The White House announced its intention to nominate Sturgell for his own five-year term as FAA Administrator and the Senate Commerce Committee held a confirmation hearing on February 7, 2008. Following the hearing, however, Democratic New Jersey Senators Frank Lautenberg and Bob Menendez placed the Sturgell nomination on hold, an action that prevented it from going to the Senate floor for a vote.

Security

With his administration less than a year old, President Bush and the transportation and aviation officials who advised him found themselves dealing with a major, tragic breach of aviation security. On September 11, 2001, nineteen radical Islamic extremists with the group al Qaeda penetrated security at three major airports and hijacked four U.S. domestic airliners. Then they turned three of the aircraft into missiles that destroyed the World Trade Center in New York City and damaged the Pentagon in Arlington, Virginia, killing thousands. Passengers on one of the planes fought the hijackers, causing the plane to crash in a Pennsylvania field, killing all on board. To prevent further immediate hijackings, FAA put a ground stop on all traffic for the first time in U.S. aviation history. Actions on September 11 included:

Eastern Standard Time

- 7:59 am: American Airlines Flight 11, a Boeing 767 with 92 people on board, takes off from Boston Logan airport for Los Angeles.
8:14 am: United Air Lines Flight 175, a Boeing 767 with 65 people on board, takes off from Boston Logan airport for Los Angeles.

8:20 am: American Airlines Flight 77, a Boeing 757 with 64 people on board, takes off from Washington Dulles airport for Los Angeles.


8:42 am: United Air Lines Flight 93, a Boeing 757 with 44 people on board, takes off from Newark airport for San Francisco.

8:46 am: American Flight 11 crashes into the north tower of the World Trade Center.

9:03 am: United Flight 175 crashes into the south tower of the World Trade Center.

9:06 am: FAA bans takeoffs of all flights bound to or through the airspace of New York Center from airports in that air route traffic control center and the three adjacent air route traffic control centers — Boston, Cleveland and Washington. This is referred to as a first tier ground stop and covers the Northeast from North Carolina north and as far west as eastern Michigan.

9:08 am: FAA bans all takeoffs nationwide for flights going to or through New York Center airspace.

9:15 am: FAA (New York Center) notifies NORAD’s Northeast Air Defense Sector that United Airlines 175 was the second aircraft that crashed into the World Trade Center.

9:25 am: FAA bans takeoffs of all civilian aircraft regardless of destination — a national ground stop.

9:37 am: American Flight 77 crashes into the Pentagon.

9:45 am: In the first unplanned shutdown of U.S. airspace, FAA orders all aircraft to land at the nearest airport as soon as practical. At this time, there are more than 4,500 aircraft in the air on instrument flight rules (IFR) flight plans.

10:03 am: United Flight 93 crashes in Stony Creek Township, Pennsylvania.

10:39 am: Reaffirming the earlier order, FAA issues a notice to airmen (NOTAM) that halts takeoffs and landings at all airports.

12:15 pm: The airspace over the 48 contiguous states is clear of all commercial and private flights.

2:30 pm: FAA announces there will be no U.S. air traffic until noon eastern standard Time Wednesday at the earliest.

DOT Secretary Norman Mineta announced on September 12 FAA would allow a limited reopening of the nation’s commercial airspace system so that flights that had been diverted the day before could continue to their original destinations. He also said FAA had temporarily extended the overall ground stop order imposed the previous day to make it possible for the agency to initiate additional security measures. FAA permitted flights only in special limited circumstances and under vastly tightened security guidelines. Only passengers on the original flights would be allowed to re-board, and only after airports and airlines had implemented strict screening measures.
FAA instituted a variety of stepped-up security measures at the airports once they re-opened:

- A thorough search and security check of all airplanes and airports before passengers would be allowed to enter and board aircraft
- Discontinuance of curbside check-in at the airport
- Discontinuance off-airport check-in
- Only ticketed passengers would be allowed to proceed past airport screeners to catch their flights
- Vehicles near airport terminals would be monitored more closely

On September 14 Secretary Mineta approved restoration of the next phase of national air service. Effective at 4:00 pm eastern standard time, he allowed certain general aviation flights to resume IFR operations. Temporarily, however, general aviation aircraft would not be allowed to fly within 25 nautical miles of New York City and Washington, DC. On September 19 FAA lifted most restrictions on U.S. registered general aviation (Part 91) aircraft, operating under visual flight rules (VFRs), outside of a 30-mile radius of 30 major U.S. airports.

FAA kept restrictions (except in Hawaii) on the following flying activities:
civil aircraft VFR flight training operations, VFR operations for banner towing, news reporting, traffic watch, airship/blimps, and Part 91 sightseeing. FAA also restricted flying of any kind within 3,000 feet of altitude and three nautical miles of major sporting events or large open-air gatherings of people, such as football and baseball stadiums, race tracks, and concerts. Four days later, FAA, in conjunction with other federal agencies, issued a NOTAM banning agricultural/crop-duster flights from operating. In addition, no aircraft capable of or equipped for agriculture operations could operate during the ban.

In a September 27 speech at Chicago’s O’Hare airport, President Bush announced three measures to enhance aviation safety and security. First, he would continue to expand FAA’s air marshal program and seek congressional approval to make this expansion permanent.

Second, he would ensure that, effective October 1, a fund of $500 million would be established to finance aircraft modifications to deny or delay access to the cockpit. Third, he would work with Congress to put the federal government in charge of airport security and screening services. The president said that fully implementing the extensive security proposal might take four to six months. In the meantime, to ensure that every airport had a strong security presence, he asked the governors of all fifty states to call up the National Guard — at federal expense — to augment existing security staff at every commercial airport nationwide. FAA would provide the necessary training for National Guard personnel.
After the president’s speech, FAA launched a nationwide search for personnel to join the air marshal program. In the interim, FAA trained agents from other federal agencies, including the Customs Service, the Secret Service, the Immigration and Naturalization Service, and the Bureau of Alcohol, Tobacco and Firearms. The existing experience of these law enforcement officials was quickly augmented with schooling on handling situations amounting to warfare in a confined space — aboard a jet at 37,000 feet.

On September 28 FAA alerted civilian pilots of their new responsibilities in light of a recent Department of Defense (DoD) announcement. They were to avoid restricted airspace and, if they were to find themselves near or in prohibited airspace, they were to land immediately if so ordered. The military authorities reserved, as a last resort, the right to use deadly force upon non-compliant aircraft. Furthermore, new security decisions required that additional airspace be barred to civilian aircraft. FAA anticipated announcing new restricted and prohibited areas throughout the United States. This additional airspace would be over areas that required protection for national security reasons.

On November 19, 2001, President George W. Bush signed into law the Aviation and Transportation Security Act. Among other provisions of the new legislation was the establishment of a new agency to be responsible for aviation security — the Transportation Security Administration (TSA) within DOT. FAA remained responsible for aviation security until February 13, 2002, when TSA took over those responsibilities. Before the year was out, however, the November 25, 2002, passage of the Homeland Security Act (Public Law 107-296) brought TSA into the new Department of Homeland Security on March 1, 2003.

While waiting for TSA to begin operations, FAA continued to enforce a number of new security measures. In December 2001, for example, FAA required each airport operator and aircraft operator that had a mandatory security program to conduct fingerprint-based criminal history record checks for individuals who had not already undergone such checks. A new rule followed in January 2002 ordering airlines to inspect all checked baggage for explosives. In this rule, the agency also mandated new standards, authorized under the Aviation and Transportation Security Act, to protect cockpits from intruders and the effects of small arms fire or fragmentation devices, such as grenades.

Operators of more than 6,000 airplanes were told to install reinforced doors by April 9, 2003. As well, FAA issued a special federal aviation regulation (SFAR) requiring operators to install temporary internal locking devices within 45 days on all passenger airplanes and on airplanes equipped with cargo cockpit doors. To compensate for any undue hardship, however, the agency issued a series of SFARs in October 2002 authorizing certain types of short-term door

Prohibited areas would be revised periodically, and new or extended restrictions would be announced.
reinforcements while airlines and cargo operators were struggling to meet the new standards. As a result, the major U.S. airlines voluntarily installed short-term fixes to the cockpit doors of 4,000 aircraft in 32 days.

By October 2001, as a result of the attacks on September 11, 2001, President Bush had announced a global war on terrorism and ordered an invasion of Afghanistan to overthrow the Taliban, destroy Al-Qaeda, and capture Osama bin Laden. In March 2003 he ordered the invasion of Iraq.

Reorganizing for the Future

FAA selected its first Air Traffic Organization (ATO) Chief Operating Officer (COO), Russell Chew, in June 2003. With the COO in place, FAA went forward with a major reorganization of its air traffic and research and acquisition organizations. On November 18, 2003, Transportation Secretary Norman Mineta announced initial details of the new ATO business structure. The ATO consolidated FAA’s air traffic services, research and acquisitions, and free flight program activities into a smaller, more efficient organization with a strict focus on providing the best service for the best value to the aviation industry and the traveling public. The establishment of the ATO had been first recommended by the 1997 National Civil Aviation Review Commission, chaired by Secretary Mineta. In April 2000 Congress had enacted the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century that mandated establishment of a Chief Operating Officer position to oversee the air traffic control system. Executive Order 13180 officially created the ATO with the Chief Operating Officer as its head.

The Vision 100 — Century of Aviation Reauthorization Act (Public Law 108-176), signed by President Bush in December 2003, abolished the Air Traffic Services Subcommittee of the Federal Aviation Management Advisory Council and created, separate from the Council, an Air Traffic Services Committee. This new committee received substantial governmental authority, including the power to approve FAA’s strategic plan for the air traffic control system, approve certain large procurements, appoint and determine the pay of the FAA Chief Operating Officer, dictate major FAA reorganizations, and control FAA cost accounting and financial management structures. The legislation also endorsed the concept of the Next Generation Air Transportation System (NextGen) and directed DOT management to create a Joint Planning and Development Office to facilitate NextGen activities.

The ATO officially began operations on February 8, 2004. FAA realignment gave it responsibility for providing air traffic services and research and acquisition. In line with other agency efforts to improve efficiency, in December 2005 the COO restructured ATO administrative and support functions in the field. By eliminating duplication of administrative and support services, FAA expected to reduce ATO operating costs by an estimated $360-$460 million over the next ten years.

In June 2006 FAA instituted a new ATO Service Center structure. Three service centers replaced the nine service area offices within En Route, Terminal, and Technical Operations. Each of the service centers was made up of five functional groups: administrative services, business services, safety assurance, system support, and
planning and requirements. A sixth group, engineering services, remained in place in the existing locations.

With the ATO structure in place, the agency’s first COO resigned from FAA on February 23, 2007. Administrator Marion Blakey assigned COO responsibilities to Deputy Administrator Robert A. Sturgell as collateral duties until a new COO came on board. On October 1, 2007, Administrator Blakey hired the agency’s second COO, Henry Krakowski.

**Union Negotiations**

In December 2003 FAA and the National Air Traffic Controllers Association (NATCA) signed a two-year contract extension that expanded “pay-for-performance” to include air traffic controllers and provided potential savings of several million dollars. The contract extension increased the number of agency employees whose pay was tied partly to performance from 37 percent to 75 percent. The pay for performance compensation system for over 15,000 air traffic controllers was based on safety and capacity targets set forth in FAA’s strategic plan. The targets included reducing operational errors and runway incursions and increasing on-time performance and arrival efficiency rates. FAA and the union also agreed that, when a provision binding FAA to maintain a fixed number of controllers each year expired at the end of September, the agency could adjust staffing levels based on actual workload.

With the two-year extension scheduled to expire in September 2005, FAA and NATCA began contract negotiations on July 20, 2005. FAA Administrator Marion Blakey called for federal mediation to help the agency reach a voluntary contract agreement with the air traffic controllers union on November 28, 2005. FAA’s request, hand-delivered to NATCA, sought help from the Federal Mediation and Conciliation Service (FMCS) to reach a voluntary agreement after four and a half months of negotiations. NATCA believed mediation was not appropriate at the time, since the two parties were making progress in the negotiations. While the existing contract had technically expired on September 30, an “evergreen” clause had allowed the original contract to remain in place so long as talks continued.

NATCA worked with Congress to have legislation introduced that would change the contract negotiation process. On January 26, 2006, a number of Senators introduced a bill (S 2201) that would deny FAA any ability to impose a contract without the consent of Congress. FAA argued that section 40122 of title 49 of the U.S. Code said that in the event of a breakdown in negotiations — an impasse — FAA could send the contract to Congress, providing legislators the opportunity to get involved. If Congress did not act, then FAA could legally impose its last, best contract offer unilaterally on NATCA. The House of Representatives subsequently sponsored a bill similar to that proposed by the Senate. On June 7 the House of Representatives passed their version of the bill, known as the Fair FAA Act (HR 4755). The Senate, however, did not act on its version of the bill.

To publicly counter NATCA criticism of its contract proposal, FAA released findings from an international accounting firm on January 30, 2006. The agency announced this study had validated...
its calculation that the average 2005 air traffic controller compensation package exceeded $166,000. FAA further noted that other independently validated figures revealed that, between 1998 and 2005, controller compensation had increased by 75 percent and the wage gap between controllers and all other FAA employees had doubled.

As requested by NATCA on February 23, 2006, a two-week session of federally mediated contract negotiations began on March 6. Before these talks ended, FAA called, on March 15, for the FMCS to extend contract talks for up to a week to allow around-the-clock negotiations in an effort to reach an agreement. FMCS agreed to continue talks into the following week.

FAA and NATCA exchanged their final contract proposals on April 3. With neither side satisfied with the proposals, an impasse was reached. Several days later, FAA dismissed public speculation that it was preparing to return to the negotiating table. In a letter to the NATCA President on April 24, Administrator Blakey rejected the union’s call to resume contract negotiations. On April 25, FAA officially ended contract negotiations with NATCA and planned to submit its final proposal to Congress. The legislators would then have 60 days to review FAA’s proposal and NATCA’s objections. By statute, FAA was authorized to implement its own proposal if Congress did not act within the specified review period, which ended on June 4. Receiving no response from Congress, FAA announced on June 5, 2006, it would begin the process of implementing the contract.

NATCA filed unfair labor practices with the Federal Labor Relations Authority (FLRA) in April, July, and September 2006. The charges related to the negotiation and implementation of the contract. In August 2007 FLRA concluded that there was no merit to NATCA’s claims, FAA had bargained in good faith, and the agency’s implementation of the contract was lawful.

Contract negotiations with Professional Airways Systems Specialists (PASS), a labor group representing systems technicians, also proved difficult and forced FAA to seek outside mediation. On January 3, 2006, the Federal Service Impasse Panel ruled that contract negotiations between FAA and PASS would begin on February 6 and continue through July 21. The contract between the disputing parties had expired in July 2005, but no new negotiations had begun because the agency and the union could not agree on a timetable.

On March 30, 2006, the PASS bargaining team accepted FAA’s contract proposal affecting PASS ATO technical employees. The bargaining team made it clear that it did not think the agency’s offer was either fair or reasonable. It would, however, leave the decision to the union’s voting members. Because PASS nominally accepted the agreement, FAA had to await the conclusion of the voting process before taking any other action. FAA system specialists voted to reject the contract offer on August 3 and called for the agency to return to the bargaining table.
Controller Staffing

FAA issued a ten-year air traffic controller staffing plan in December 2004. That plan called for hiring 12,500 controllers over ten years to cover projected total retirement and non-retirement controller losses. In August 2006 FAA released an updated Air Traffic Controller Workforce Plan designed to address the anticipated retirement and replacement of air traffic controllers over the coming decade. The revised document outlined the agency’s plans to hire more than 11,800 new air traffic controllers in this time span. The revised plan was based on updated traffic forecasts, experience with productivity increases, actual retirements, and improved mathematical models. As part of the revised plan, FAA planned to hire 930 controllers by the end of fiscal year 2006. The plan also outlined how FAA would bring on new controllers using a schedule designed to provide adequate training lead-time and to address changing air traffic demands over the coming decade.

NATCA responded to the plan saying FAA had underestimated future controller retirements. The union said that one in four controllers nationwide would reach their retirement eligibility date before the end 2007, and that — because of the imposed contract — many of them would leave as soon as they were eligible.

FAA released an updated air traffic controller workforce plan on March 7, 2007. The new plan provided a range of authorized controller staffing numbers for each of FAA’s 314 staffed facilities across the country. The agency claimed this broad approach increased its flexibility to match the distribution of controllers with traffic volume and workload and revealed that it planned to hire and train more than 15,000 controllers over the next decade.

In February 2008 testimony before the Subcommittee on Aviation, House Committee on Transportation and Infrastructure, a Government Accountability Office (GAO) executive warned that data collected in preparation for 2010 were indicating that controllers were retiring at a faster rate than FAA anticipated. He continued: “For fiscal year 2006, FAA estimated that 467 controllers would retire, but 583 actually retired — about 25 percent more than planned. For fiscal year 2007, FAA anticipated 700 controller retirements, while 828 controllers actually retired — an 18 percent increase over anticipated retirements.”
GAO also warned that by 2010 up to 40 percent of the controller workforce would have less than five years of experience. The high percentage of newly hired controllers would continue for a number of years, making it important for FAA to balance the ratio of trainees to certified controllers carefully at each air traffic control facility. Another challenge would be to train controllers on the current system and on new air traffic management procedures envisioned for the future, such as precise navigation procedures that minimize pilot-controller communication. At the same hearing, the DOT Inspector General raised similar concerns, saying FAA must address attrition and training of air traffic controllers.

**Competitive Sourcing of Flight Service Operations**

When President Bush issued his first “Management Agenda” for fiscal year 2002, he called for federal agencies to complete public-private, or “direct,” conversion competition on not less than five percent of the full-time equivalent employees listed on the 1998 Federal Activities Inventory Reform Act inventories. This legislation mandated that, by the end of the third quarter of each fiscal year, the heads of each executive agency would have to advise the Director of the Office of Management and Budget of activities performed by their federal government sources that were not inherently governmental functions. After completing a careful review, FAA formally announced in December 2003 that its flight service stations met the criteria for competitive sourcing. FAA subsequently conducted a competition under the Office of Management and Budget’s Circular A-76 guidelines for an improved way to provide flight service operations.

In May 2004 FAA released a Screening Information Request for an automated flight service station public-private competition. Per this announcement, potential service providers were required to submit technical proposals in August 2004 and cost proposals a month later. The agency planned to award the contract no later than March 17, 2005.

FAA announced the contract award on February 1, 2005. After evaluating five competing service providers, including the incumbent government organization, FAA selected a team headed by Lockheed Martin to take over services then being provided by the agency’s own automated flight service stations. The total evaluated cost of the five-year contract, with five additional option years, was $1.9 billion — an estimated savings of $2.2 billion over the following ten years. Lockheed Martin assumed operation of the flight service stations on October 4, 2005, and began incremental consolidation of the 58 current flight service stations in April 2006.
Modernization Progress

From Free Flight to the Next Generation Air Transportation System (NextGen)

Although much federal funding during the George W. Bush Administration was focused on national security and the global war on terrorism, FAA was able to maintain sufficient funding to continue deployment of a number of new technologies designed to increase capacity and safety in the national airspace system (NAS). In various stages of development and implementation, those technologies included:

- **En Route Automation Modernization (ERAM)** – planned as a replacement for the en route host computer system at all ARTCCs, the effort would create or improve capabilities affecting such vital operational areas as communications, real-time electronic aeronautical information processing, information security, and surveillance.

- **Weather Systems Processor** – forecast gust-front-induced wind shifts, detected precipitation, and tracked storms to better inform controllers and pilots about potentially hazardous microburst and wind shear weather events.

- **Weather and Radar Processor** – displayed Doppler weather information directly to controllers on the same screen as they used to view aircraft position data to improve their ability to reroute air traffic around areas of severe weather.

- **User Request Evaluation Tool (URET)** – let controllers “see” traffic 20 minutes into the future so they could more safely assign and grant pilot requests for more direct and more fuel efficient routes.

- **Operational and Supportability Implementation System** – provided in-flight planning and up-to-date weather information to general aviation pilots.

- **Airport Surveillance Radar** – provided improved digital aircraft and weather input needed by FAA’s new air traffic control automation systems, such as the Standard Terminal Automation Replacement System (STARS).

- **Advanced Technologies and Oceanic Procedures** – detected conflicts between aircraft and providing satellite data link communication and position information that helped air traffic controllers to safely separate aircraft in areas, such as over the ocean, that were outside radar coverage or direct radio communication.

- **En Route Communications Gateway (ECG)** – consolidated all gateway functions into a single system and provided the foundation to support new communications sources and new radar/surveillance sources, such as Automatic Dependent Surveillance.

- **Adaptive Compression** – developed a new software program that automatically filled vacant arrival slots with the next available flight, helping to reduce airport delays during bad weather.

- **Airport Surface Detection Equipment, Model X (ASDE-X)** – used ground surveillance data collected from a variety of sources, including traditional radar, Automatic Dependent Surveillance-Broadcast (ADS-B), and aircraft transponders to present controllers in the tower with a color display of aircraft and vehicle positions overlaid on a map of the airport’s runways, taxiways, and approach corridors.
Wide Area Augmentation System (WAAS) – improved the accuracy, availability, and integrity of the U.S. Global Positioning System (GPS) in support of a navigation and landing system that could deliver precision guidance to aircraft at thousands of airports and airstrips lacking precision landing capability.

The agency also awarded a number of contracts, such as these, to upgrade the NAS:

- $125 million dollar contract to Lockheed Martin Corporation to develop and field the technology needed to replace dated Peripheral Adapter Module Replacement Item (PAMRI) equipment with the new En Route Communications Gateway. This new ECG would process radar data more efficiently while reducing system outages.
- $16.7 million to Honeywell International to develop and deploy the Local Area Augmentation System (LAAS), a satellite navigation landing system that would allow pilots to guide planes safely into busy airports in bad weather and significantly increase the accuracy, availability, continuity, and integrity of the information received from the GPS constellation of satellites.
- $13.5 million to Computer Sciences Corporation to design an advanced computer platform that would use air traffic data from across the country to predict when the numbers of flights might exceed available routes and capacity.
- $10 million to Lockheed Martin to undertake the risk mitigation phase of the En Route Modernization program designed to replace the existing en route air traffic control automation system and selected en route infrastructure.

Although a number of modernization projects steadily made progress, STARS continued to face delays. In late 1999 and early 2000 El Paso, Texas, and Syracuse, New York, had received an early version of STARS, which attached STARS to the processing system of the Automated Radar Terminal System (ARTS). In May 2002 FAA began operational use of the first true STARS installation in El Paso, Texas. This upgraded version, referred to as full STARS, consisted of state-of-the-art displays and computers providing radar service and a backup service. The full system was being developed in phases so that the concerns of technicians and air traffic controllers could be addressed.

In June 2003 FAA commissioned the first STARS at a large, busy airport — Philadelphia International Airport. FAA planned to replace computers and displays at more than 300 air traffic control facilities nationwide with STARS. In 2004, faced with increasing costs for STARS, FAA rethought its terminal modernization approach and shifted to a phased process. FAA committed STARS to just 50 sites at an estimated cost of $1.46 billion, as opposed to the original plan to deploy STARS at 172 sites at a cost of $940 million. FAA renamed the modernization effort the Terminal Automation Modernization-Replacement (TAMR) initiative. In 2005 FAA approved modernizing five additional small sites with STARS and replacing the aging displays at four large, complex facilities at a cost of $57 million.
A HISTORICAL PERSPECTIVE

Because working with its international partners would provide a common air traffic management system, FAA and Eurocontrol signed a memorandum of cooperation on September 24, 2004, to increase joint air traffic management and research efforts.

Two years later, in July 2006 FAA Administrator Marion Blakey and European Commission Vice President Jacques Barrot signed a memorandum of understanding (MOU) to increase their cooperative efforts to build a more efficient and seamless air traffic system between Europe and the United States. The MOU focused on building administrative bridges between the United States’ and the Commission’s air traffic modernization programs. In addition to annual meetings and regular, informal communications between FAA and the Commission, the MOU formalized pre-existing exchanges for facilitating enhanced understanding of these international programs. The memorandum acknowledged the importance of participation by both European and U.S. industry in each other’s modernization efforts.

NextGen

The Vision 100 — Century of Aviation Reauthorization Act (Public Law 108-176), signed by President Bush in December 2003, endorsed the Next Generation Air Transportation System (NextGen) concept and directed the Department of Transportation to create with the FAA a multi-agency Joint Planning and Development Office (JPDO) to facilitate the process. On January 27, 2004, in a luncheon speech to the Aero Club of Washington, DOT Secretary Norman Mineta announced plans for a new, multi-year, multi-agency effort to develop the air transportation system for the year 2025 and beyond. The new system would have expanded capacity to relieve congestion, prevent gridlock, and secure America’s place as global leader in aviation’s second century. The NextGen system would offer a cleaner, quieter system based on 21st-century technology, seamless security, and added capacity to relieve congestion.

As mandated, Secretary Mineta created a JPDO comprised of representatives from FAA, NASA, the Departments of Transportation, Defense, Homeland Security, Commerce, and the White House Office of Science and Technology Policy. Its mission was to create and carry out an integrated plan for NextGen, spearhead planning, and coordinate research, demonstrations, and development in cooperation with relevant programs of other departments and agencies and with the private sector.

Secretary Mineta unveiled the Integrated Plan for the Next Generation Air Transportation System on December 15, 2004. The plan laid out goals, objectives, and requirements necessary to create an air transportation system for 2025. The document was divided into eight goal areas:

- Network-Enabled Information Access: Usable, secure information would be immediately available to all necessary
parties. Greater accessibility of information would improve the speed, efficiency, and quality of decisions.

- **Performance-Based Operations and Services:** Procedures and regulations would be described in terms of performance, rather than specific technology or equipment. This emphasis would benefit both service providers and users by allowing the former to define capability improvements in terms of users’ existing equipment. Users would be able to continue working with their existing equipment as long as it met certain requirements. This approach would maximize the value of the users’ investments.

- **Weather-Assimilated Decision Making:** Real-time weather information would be available to pilots, controllers, etc., to improve decision making. Directly incorporating weather information into the data bases of tools used to make air traffic management decisions would increase the effective use of weather information. This approach would minimize the adverse effects of weather on the NAS.

- **Layered Adaptive Security:** Security would be built upon “layers of defense,” technology, procedures, and policies that help reduce the overall risk that a threat would harm the system. NextGen security would adapt its systems and procedures to the current risk level, depending on the situation rather than being bound to an inflexible “one-size-fits-all” approach. In sum, this approach would minimize risk.

- **Broad-Area Precision Navigation:** Pilots would receive services where and when they needed them, under nearly all conditions. Geographic and weather constraints would no longer be factors in the system. Instead, pilots would have the ability to define their desired flight paths based on their own objectives.

- **Aircraft Trajectory-Based Operations:** Pilots would gain the ability to tailor individual flight paths based on the four-dimensional trajectories, which would include altitude, longitude, and latitude, plus time, of other aircraft. Each aircraft would both transmit and receive precise positioning information, telling it where and when it and others in the area would cross key points along their respective paths.

- **Equivalent Visual Operations:** With improved information tools and displays, pilots would gain the ability to know the locations of other planes without having to physically see them. This capability would help increase accessibility, both on the ground and during arrivals and departures. Service providers also would have the ability to manage traffic in all visibility conditions, leading to more predictable and efficient operations.

- **Super Density Operations:** New procedures would maximize the amount of traffic through both the busiest airports and airspace. Without jeopardizing safety and security, there would be improved airport ground movement, and reduced spacing and separation standards between aircraft in the sky. Controllers and pilots would better manage the flow of traffic in and around busy metropolitan areas to maximize the use of all airspace.

The development of innovative public-private partnerships was key to accomplishing the NextGen vision. In March 2005 FAA Administrator Blakey announced creation of NextGen air traffic management tools will ease airport congestion
the Next Generation Air Transportation System Institute as the mechanism through which the Joint Planning and Development Office would access world-class private sector expertise, tools, and facilities for application to NextGen activities and tasks. When the JPDO needed industry expertise, it would call on the institute to provide personnel to serve on its various working groups. Co-located with the JPDO, the Institute was fully engaged in day-to-day NextGen activities.

The first phase of NextGen focused on the development and implementation of existing key technologies and capabilities under development by FAA. The initiatives included allowing increased use of precision navigation departures and arrivals as a means to increase capacity and safety while reducing fuel consumption, noise, and emissions. The starting phase also included the essential research and development (R&D) needed to support the evolution of NextGen — such as the development of advanced weather forecasting and traffic flow management tools. The second phase built on this foundation to begin critical implementation of NextGen capabilities. At this point, many aircraft in the fleet would begin using on-board NextGen tools. This technology would allow greater expansion of precision navigation capabilities, implementation of advanced weather capabilities, advanced data communications, and the development of the critical infrastructure for operations in high-density areas. The third phase would see the maturation of core NextGen capabilities into a nationwide system.

In 2006 the JPDO issued its Weather Concept of Operations. This innovation was followed within a year by the NextGen Concept of Operations, the Security Concept of Operations, the NextGen Enterprise Architecture, and the NextGen business case.

Because of the need for global harmonization of NextGen to allow operability across international lines, in May 2007 FAA Administrator Marion Blakey and her counterparts from Canada and Mexico signed a formal agreement establishing a cooperative NextGen strategy group. The agreement encouraged all three countries to share information regarding strategic roadmaps, technologies, and environmental metrics, as well as to coordinate the North American harmonization efforts of the International Civil Aviation Organization (ICAO). FAA signed a similar agreement with China on February 27, 2008.

The JPDO was neither an implementing nor an executing aviation agency, but the new technologies and operational changes required to realize the NextGen vision needed to be developed and deployed on precisely coordinated implementation schedules. As a result, FAA and its JPDO partner agencies worked diligently to improve their levels of teamwork. In June 2007 FAA decided to take the Operational Evolution Plan it had created in 2001 to improve capacity, rename it the Operational Evolution Partnership (OEP), and use it to guide the agency’s own transformation to NextGen. The new OEP laid out the agency’s path to 2025 and tied NextGen initiatives to the agency’s established budget process.

FAA announced, in August 2007, a $1.8 billion contract to ITT Corporation to build ADS-B ground stations — the cornerstone of the NextGen system. The vendor would later own and operate the equipment, collecting subscription fees from the
FAA for broadcasting a wide range of ADS-B data to suitably equipped aircraft and air traffic control facilities. Along with air traffic displays, ADS-B would provide pilots graphical weather information, terrain maps, and flight information, including temporary flight restrictions and notices to airmen. The system would alert controllers and pilots to the precise location of aircraft, enabling them to negotiate more direct flight routes that would enhance airspace efficiency, reduce delays, and — most importantly — improve safety.

In May 2008 FAA established a senior vice president for NextGen and Operations Planning position to provide increased focus on the modernization of the nation’s air traffic control system through the NextGen implementation and delivery plan. The JPDO now reported to the new senior vice president.

Enhancing Capacity

On June 6, 2001, FAA released its Operational Evolution Plan (OEP). Written in collaboration with the aviation industry, the plan outlined a 10-year capacity enhancement plan to allow 30 percent more traffic into the commercial aviation system while easing delays and increasing safety. The OEP focused on four critical problems: arrival/departure rates; airport weather conditions; en route congestion and severe weather. The plan addressed these four problems by concentrating on near-term solutions (2001), midterm solutions (2002 through 2004), and long-term solutions (2005 through 2010). New runway construction and airport infrastructure improvements were a key part of the FAA plan. The plan gave priority to ongoing efforts to redesign the nation’s air space to open up new flight sectors and give pilots and controllers more routes and more options around bad weather. The plan also included an element to exploit technology to bring planes closer together at higher attitudes and when they land by:

- Expanding implementation of area navigation (RNAV) procedures;
- Completing the Wide Area Augmentation System (WAAS) of satellite-based navigation;
- Introducing datalink to reduce voice communications between pilots and controllers; and
- Reducing vertical separation of aircraft at high altitudes from 2,000 feet to 1,000 feet.

Several months after the release of the OEP, the events of September 11 resulted in a down turn in air travel. The industry, however, quickly recovered and air traffic growth in the NAS began to outpace airport and airspace capacity. Constraints in en route airspace and the airspace surrounding U.S. airports began to result in flight delays, schedule disruptions, passenger and operator inconveniences, and inefficient flight operations. Because no one solution would allow the industry to expand service safely and minimize environmental impacts in the face of growing challenges,
FAA began to look for immediate solutions. Understanding the need to integrate viable and affordable solutions to increase capacity, FAA began working to achieve a performance-based system.

On September 9, 2002, FAA announced plans to develop and implement, within the next year, a plan to establish an air navigation concept called Required Navigation Performance (RNP). Under RNP, the NAS would evolve from a ground-based design to one in which aircraft could take full advantage of advanced technologies for precision guidance in the en route (high-altitude) and terminal (about a 40-mile radius of the airport) areas. As promised, in July 2003, the agency released an RNP roadmap identifying steps and milestones that would transition the U.S. airspace system from reliance on airways running over ground-based navigation aids to a point-to-point navigation concept — one that would fully employ advanced automation capabilities aboard aircraft. The plan, which would be updated regularly, contained three implementation timeframes:

- **Near-Term (2003-2006).** FAA and industry would implement a first set of RNP and area navigation (RNAV) procedures for all phases of flight. The agency also would continue to develop criteria and guidance for more advanced RNP/RNAV operations.
- **Mid-Term (2007-2012).** RNAV would become the primary means of navigation in U.S. airspace. Additional RNP procedures would be made available as more aircraft were equipped with advanced technologies. FAA would begin to remove some ground-based navigation aids, routes, and procedures from service starting in 2010.
- **Far-Term (2013-2020).** Based on previous demonstration of RNP/RNAV benefits, the U.S. aircraft fleet would continue to advance its capabilities. By 2020 operators would use RNP and RNAV procedures operationally in all areas. A minimal operational network of ground-based navigation aids would, however, remain in place.

FAA’s Performance-Based Operations Aviation Rulemaking Committee, a government and industry group, released the second version of the Roadmap for Performance-Based Navigation in July 2006. The first roadmap covered concepts and principles, but included very few details. The revised version spelled out how FAA planned to proceed in each of the three time frames, and outlined dates for mandates on the types of equipment that would be needed by the airlines, business aircraft, and general aviation operators. With the release of the plan, FAA began championing the concept of performance-based navigation to facilitate more efficient airspace and procedure design and to improve safety, access, capacity, and operational efficiencies. With performance-based navigation, new technologies and procedures help reduce flight cancellations and delays.
based navigation, aircraft used advanced flight management systems; onboard inertial systems; “heads-up” display systems; and other satellite and ground systems to compute position, speed, and other vital navigation information. Performance-based navigation encompassed both RNAV and RPN concepts. “Area navigation” removed the requirement for a direct link between aircraft navigation and a navigational aid, thereby allowing aircraft better access and permitting flexibility of point-to-point operations. By using more efficient routes for take-offs and landings, RNAV enabled reductions in fuel burn and emissions and increased capacity. During 2005-2007, FAA authorized more than 200 RNAV procedures at over 38 airports.

Required Navigation Performance added an onboard monitoring and alerting function to RNAV. The onboard capability enhanced the pilot’s situational awareness, providing greater access to airports in challenging terrain. RNP increased airport access during marginal weather, thereby reducing diversions to alternate airports. RNP also reduced aviation’s overall noise footprint and aggregate emissions. By the end of 2007 FAA had authorized over 60 RNP procedures at 18 airports.

In addition to its work on RNAV and RNP, FAA also implemented the use of Reduced Vertical Separation Minima (RVSM) to increase airspace capacity. The ICAO-approved procedure was already in effect in Europe and Australia and over most of the North Atlantic and Pacific oceans. In October 2003 FAA issued a rule reducing the minimum vertical separation between aircraft from the 2,000 feet in effect at the time to 1,000 feet for all aircraft flying between 29,000 feet and 41,000 feet. Implementation of these RVSM criteria significantly increased the routes and altitudes available and allowed more efficient routings that would save time and fuel. The rule detailed equipment requirements, including dual altimeters and a more advanced autopilot system. Aircraft equipped with the second version of the traffic alert and collision avoidance system had to be updated with software that was compatible with RVSM operations. FAA planned to implement RVSM on January 20, 2005, to give airlines and other aircraft operators time to install the more accurate altimeters and autopilot systems that would help to ensure the highest level of safety.

As planned, on January 20, 2005, at 4:01 am eastern standard time, air traffic controllers inaugurated RVSM. Although invisible to passengers, the procedural change doubled airspace routes at the affected altitudes and greatly increased the routing options available to pilots and air traffic controllers. Canadian, Mexican, Caribbean, and South American civil aviation authorities also began RVSM on this date.
Reducing Congestion

While new technology would help ensure safe, efficient travel once deployed, the FAA faced a more immediate challenge of how to reduce congestion in the NAS. Air traffic delay, as defined by DOT, included five categories:

- **Air Carrier:** The cause of the cancellation or delay was due to circumstances within the airline’s control (e.g., maintenance or crew problems, aircraft cleaning, baggage loading, fueling, etc.).
- **Extreme Weather:** Significant meteorological conditions (actual or forecasted) that, in the judgment of the carrier, delay or prevent the operation of a flight such as tornado, blizzard or hurricane.
- **National Aviation System:** Delays and cancellations attributable to the national aviation system that refer to a broad set of conditions, such as non-extreme weather conditions, airport operations, heavy traffic volume, and air traffic control.
- **Late-arriving aircraft:** A previous flight with same aircraft arrived late, causing the present flight to depart late.
- **Security:** Delays or cancellations caused by evacuation of a terminal or concourse, re-boarding of aircraft because of a security breach, inoperative screening equipment and/or long lines in excess of 29 minutes at screening areas.

In a June 2003 rule, the Department of Transportation required air carriers that have 1 percent of total domestic scheduled-service passenger revenue to report on-time data and the causes of delay. In 2008, there were 20 carriers reporting these numbers, including two that reported voluntarily. (See Figure 1.)

![NextGen security initiatives will speed passengers to their gates](image)

### Figure 1: Delay Caused by Year

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Carrier Delay</td>
<td>26.30%</td>
<td>25.80%</td>
<td>28.00%</td>
<td>27.80%</td>
<td>28.50%</td>
</tr>
<tr>
<td>Aircraft Arriving Late</td>
<td>30.90%</td>
<td>33.60%</td>
<td>34.20%</td>
<td>37.00%</td>
<td>37.70%</td>
</tr>
<tr>
<td>Security Delay</td>
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<td>0.30%</td>
<td>0.20%</td>
<td>0.30%</td>
<td>0.20%</td>
</tr>
<tr>
<td>NAS Delay</td>
<td>36.50%</td>
<td>33.50%</td>
<td>31.40%</td>
<td>29.40%</td>
<td>27.90%</td>
</tr>
<tr>
<td>Extreme Weather</td>
<td>6.10%</td>
<td>6.90%</td>
<td>6.20%</td>
<td>5.60%</td>
<td>5.70%</td>
</tr>
</tbody>
</table>

Source: Bureau of Transportation Statistics

In addition to deploying new technologies and employing new procedures to decrease delay at major airports, FAA also worked with the airports to increase airport infrastructure — terminals, taxiways, runways, and gates — and began work with airlines to better manage airport capacity.

Between 2001 and 2007, ten miles of new runways opened at ten of the busiest U.S. airports reducing delay by approximately five minutes at these facilities. FAA expected new runway projects to be completed at seven additional airports by 2010. As air
travel demand continued to rise, however, simply adding pavement to the existing airports proved insufficient to ease delays.

In addition to new runways and airport infrastructure, capacity management became crucial in the early part of the 21st Century. An airport’s capacity to handle traffic was a function of its size, the layout of its runways, the air traffic patterns (both arriving and departing), and the time frame in which a surge of traffic had to be dealt with due to airline scheduling. In 1999 FAA began a multi-year effort to redesign the nation’s airspace hoping to reduce delays by optimizing local airspace to increase efficiency for flights in and out of terminal areas.

FAA created new routes along the East Coast in October 2005 to help ease flight delays into Florida. The Florida airspace optimization plan made significant changes to airspace controlled by air traffic control centers (Washington, DC, Jacksonville, and Miami) and by various terminal radar control facilities (TRACONS) in Florida. The emphasis was to create more efficient routings between northern points and Florida airports by implementing new air routes over the ocean. This strategy made it possible to get southeast-bound air traffic off the ground faster, and thus reduce delays at airports in the north and northeastern U.S.

In December 2005 FAA announced four proposals to modify aircraft routes and air traffic control procedures affecting the New York/New Jersey/Philadelphia metropolitan airspace, one of the busiest in the world. The area, in the northeastern corridor of the United States, served as a hub for international, as well as domestic air traffic. Frequent delays in this airspace, often caused by adverse weather, routinely created a ripple effect that slowed down major portions of the NAS.

After holding more than 120 public meetings in New York, New Jersey, Pennsylvania, Delaware, and Connecticut, FAA announced in March 2007 its preferred redesign proposal. The “Integrated Airspace Alternative” would replace the 31 square-mile layered airspace structure over the five state area with one that combined high-altitude and low-altitude airspace to create more efficient arrival and departure routes. Proposed change encompassed new flight patterns and new procedures at 15 FAA facilities. FAA studies showed this alternative would reduce delays, complexity of the
current air traffic system, fuel consumption and carbon emissions, and aircraft noise. In September 2007, after additional public meetings, FAA issued its final decision to implement the plan. Benefits, in the form of reduced delays, were estimated to reach 20 percent by the year 2011 compared to the level of delays the air traffic system would have incurred without the changes.

FAA also initiated an airspace flow program in the summer of 2006 to reduce delays at seven northeast corridor locations chosen for their combination of heavy traffic and frequent bad weather. The program allowed airlines the option of either accepting delays for flights scheduled to fly through storms or flying longer routes to maneuver safely around them. On bad weather days, delays fell by 9 percent compared to the year before. Cost savings for the airlines and the flying public from the program were estimated to be $100 million annually. FAA expanded the program in 2007, adding 11 new locations to the original seven.

Beyond airspace redesign efforts, FAA worked with the airlines to reduce flight congestion. In January 2004, DOT Secretary Norman Mineta announced a new order intended to reduce flight congestion and passenger inconvenience at Chicago’s O’Hare International Airport. Under terms of the order signed by FAA Administrator Marion Blakey, American Airlines and United Airlines both agreed to reduce their operations by five percent during the peak hours between 1:00 pm and 8:00 pm. The reduction of 62 scheduled flights, which took effect in early March and lasted for six months, returned scheduled O’Hare operations to October 2003 levels, the last month prior to significant delays.

In April 2004 Mineta announced new plans by the cooperating airlines to reduce their daily schedules by another 2.5 percent starting in early June. Both carriers rescheduled the majority of their targeted flights to slower times of the day, but each also canceled some operations. By August domestic airlines serving O’Hare agreed to a voluntary limit of 88 scheduled arrivals per hour between 7:00 am and 8:00 pm. The new limit on scheduled arrivals during peak hours, effective November 1, brought schedules more in line with O’Hare’s capacity and cut the amount of time lost due to delays by 20 percent. United and American Airlines, then operating 86 percent of flights at O’Hare, offered the largest reductions. United agreed to reduce 20 arrivals and American canceled 17 incoming flights scheduled between noon and 8:00 pm. Other airlines with fewer operations also reduced or changed schedules to cut delays.

Beginning on March 30, 2008, FAA took steps to reduce a persistent number of flights above capacity during peak hours at New York’s John F. Kennedy International Airport (JFK). After meeting with air carriers and the Port Authority of New York and New Jersey, FAA temporarily limited the number of scheduled operations there. From February 2007 through July 2007, the airport’s average actual airport capacity had been 81 operations per hour. The scheduled demand during the busiest hour, 4:00 pm, was over 110 arrivals and departures during the summer 2007.

Corresponding to the increased operations, on-time performance and other delay metrics declined year after year. The on-time arrival performance at JFK (defined as the aircraft’s arrival at the gate within 15 minutes of the scheduled time) declined from 68.5 percent in fiscal year 2006 to 62.19 percent in fiscal year 2007. On-time arrivals during the peak travel months of June, July, and August...
declined from 63.37 percent in 2006 to 58.53 percent in 2007 while on-time departures declined from 67.49 percent to 59.89 percent. For the entire 2007 fiscal year, the average daily arrival delays exceeding one hour increased by 87 percent over fiscal year 2006 levels. The increased congestion and delays at JFK airport had an adverse effect on other airports in the region and on the NAS. For instance, Newark International Airport and LaGuardia Airport, which share airspace with JFK, were consistently among the nation’s most delay-prone airports. The flight operations limits would be in effect through October 29, 2009.

Mother Nature Disrupts Air Traffic

Efforts to increase capacity and reduce delay were interrupted on August 29, 2005, when Hurricane Katrina, a storm that had formed over the Bahamas on August 23, crossed southern Florida as a Category 1 hurricane. The storm then strengthened in the Gulf of Mexico and made its second and third landfalls as a Category 3 storm in southeast Louisiana and at the Louisiana/Mississippi state line. The storm surge caused severe damage along the Gulf Coast, closing all airports in the region.

FAA immediately went to work to repair air traffic control facilities in the areas hit by the hurricane. On September 1 FAA restored both runways at New Orleans International Airport to 24-hour availability for hurricane relief flights. FAA said New Orleans could handle nine landings per hour, but only in VFR conditions. From September 2-7 FAA personnel supported the largest airlift operation on United States soil, Operation Air Care. By September 8 FAA restored scheduled commercial passenger service to the Gulfport-Biloxi, Mississippi, airport, with two roundtrip flights originating from Memphis, Tennessee. On September 13 FAA restored scheduled commercial passenger service to Louis Armstrong New Orleans airport, with two roundtrip flights originating from Memphis.

With Hurricane Katrina relief and rebuilding operations underway, FAA faced a second challenge with Hurricane Rita. Rita had formed over the Turks and Caicos Islands in the Caribbean on September 18 as a tropic storm and moved toward the Florida Keys. When the storm was re-categorized as a hurricane on September 20, FAA closed the air traffic control tower at the airport in Key West, Florida. FAA reopened the tower two days later. On September 24
Hurricane Rita made landfall between Sabine Pass, Texas, and Johnsons Bayou, Louisiana, as a Category 3 hurricane. The storm surge caused extensive damage along the Louisiana and extreme southeastern Texas coasts and completely destroyed some coastal communities.

The Lake Charles Regional Airport in Louisiana and Beaumont-Port Arthur Airport in Texas closed because of damage. FAA instituted a temporary flight restriction along the Texas and Louisiana coast area to support relief and recovery operations. On September 26 FAA reopened its air traffic control tower at Beaumont-Port Arthur Airport, in Texas, for visual flight operations only. FAA also quickly resumed visual flight operations at the Lake Charles Regional Airport tower in Louisiana, and reopened the TRACON facility at the airport.

**Safety**

Between 2001 and 2007, aviation witnessed one of its safest periods for scheduled air carriers (Part 121). Not counting the terrorist activities of September 11, 2001, there were only three fatal accidents in 2001; none in 2002; two in 2003; one in 2004; three in 2005; two in 2006; and none in 2007. According to NTSB statistics, over the past two decades, the number of flight hours logged by air carriers had almost doubled and the number of departures had increased by 50 percent. For example, in 2006 major air carriers experienced on average only one accident every 266 million miles, 630,000 hours flown, or 368,000 departures. Fatal accidents were rare events with only .01 accidents per 100,000 flight hours or .018 accidents per 100,000 departures.

A number of FAA safety campaigns contributed to the low accident rate early in the new century. The work of the Commercial Aviation Safety Team (CAST), for example, showed great results. Since its creation ten years earlier, CAST analyzed data from approximately 500 accidents and thousands of safety incidents worldwide developing safety enhancements to reduce the leading cause of commercial aviation accidents in the United States. It also reached out to improve aviation safety worldwide by facilitating cooperative regional safety alliances on nearly every continent modeled after the CAST process. In its second decade CAST began transitioning to a fully-incident-based risk methodology that used risk prediction to identify issues and new mitigation strategies before new types of accidents could emerge.

Other safety actions also added to improved safety rates. FAA announced in early 2001 that U.S. airlines had complied with the deadline to retrofit commercial airplanes with fire detection and suppression systems. The agency also required approximately 300 all-cargo airplanes to install fire detection systems. The Enhanced Airworthiness Program for Airplane Systems, a FAA initiative unveiled in April 2001, was designed to enhance the continued safety of aircraft wiring systems from their design and installation through their retirement. This plan combined a variety of near- and longer-term actions to increase awareness of wiring system degradation, implement improved procedures for wiring maintenance and design, and spread that information throughout the aviation community.
In the aftermath of the 1996 TWA 800 tragedy, aviation safety experts focused research on how to prevent center fuel tank explosions. The accident had fundamentally altered the assumptions held not only by FAA and NTSB, but by the entire aviation community. In the years since the accident, FAA issued more than 100 airworthiness directives (ADs) and a special federal aviation regulation to reduce or eliminate ignition sources. The ADs addressed a broad range of issues, including fuel pump manufacturing discrepancies, wear of fuel system wiring, shielding of fuel system components, and the overheating of solenoids. The SFAR, issued in May 2001, changed the way airplanes were designed, operated, and maintained. By the end of 2002 the required manufacturer design reviews resulted in the identification of more than 200 previously unknown ignition sources.

As new potential ignition sources were identified, FAA issued additional directives to address them. FAA research concentrated on a number of different safety options, including how to eliminate ignition sources and how to reduce the flammability of fuel tanks. In May 2002 FAA unveiled a prototype on-board inverting system. The low cost system replaced the oxygen in the fuel tank with an inert gas such as nitrogen, preventing the potential ignition of fuel vapor.

A rare fatal accident occurred on November 12, 2001, when the vertical fin of American Airlines Flight 587 separated from the plane over Queens, New York, shortly after taking off from John F. Kennedy International Airport. All 260 people aboard the plane and five people on the ground were killed. Some witnesses reported that a burning engine fell from the sky before the aircraft did, and others described a midair explosion. The wreckage fell in three places. One cylindrical piece fell onto a Texaco station. Most of the fuselage crashed into an intersection, sending columns of dense black smoke aloft over leaping flames. The third element, a wing section, plunged into Jamaica Bay. Investigators subsequently determined the probable cause of the crash was the in-flight separation of the vertical stabilizer as a result of the loads beyond ultimate design that were created by the first officer’s unnecessary and excessive rudder pedal inputs. Contributing to these rudder pedal inputs were characteristics of the Airbus A300-600 rudder system design and elements of the American Airlines Advanced Aircraft Maneuvering Program. After the accident, FAA immediately ordered inspections of all Airbus A300 composite rudders as part of an enhanced safety initiative.

In January 2003 Air Midwest Flight 5481, a Beechcraft 1900D operating as US Airways Express Flight 5481, crashed into an airport hangar and burst into flames 37 seconds after taking off from Charlotte/Douglas International Airport in Charlotte, North Carolina. All 19 passengers and two pilots aboard were killed in the accident, one person on the ground received minor injuries. NTSB determined that the probable cause of the accident was the airplane’s loss of pitch control during takeoff. This flight condition probably resulted from a combination of an incorrect rigging of the elevator control system together with a weight distribution that caused the airplane’s center of gravity to shift dangerously far aft.
As aircraft became more reliable and technological failures rare, FAA worked to improve human performance. Research indicated that 70-80 percent of aviation accidents were the result of human error. Although the majority of aviation accidents pointed to human error, most investigation and prevention programs were not designed around any theoretical framework of human error. To fill the knowledge gap, FAA research helped develop the Human Factors Analysis and Certification System (HFACS) to assist accident investigators in understanding how and why human errors occur. Originally developed for the U.S. Navy and Marine Corps, HFACS examined human error at all levels from mistakes in the cockpit to failings in personnel communications.

As part of long-term efforts to account for human factors as contributors to aviation accidents, in June 2003 FAA issued the Human Factors Design Standard, a compilation of human factors practices and principles integral to the procurement, design, development, and testing of FAA systems, facilities, and equipment. The guide, which superceded the 1996 Human Factors Design Guide, provided a single easy-to-use source of human factors design criteria, oriented to the needs of FAA mission and systems.

To reaffirm publicly its commitment to safety, FAA published its first five-year strategic plan that included goals and metrics. The Flight Plan, developed in cooperation with the aviation community and linked to the agency’s budget requests, grouped anticipated work into four broad categories: safety, capacity, international leadership, and organizational excellence.

As one safety area garnering significant FAA attention was runway safety. During the Bush Administration, the agency aggressively implemented a number of new technologies and procedures to reduce the risk of runway incursions. FAA installed the Airport Movement Area Safety System at the nation’s top 34 airports and began deploying the Airport Surface Detection Equipment, Model-X (ASDE-X) to airports. This state-of-the-art surface detection system integrated data from a variety of sources, including surface movement radars located on air traffic control towers or remote towers, sensors, and aircraft transponders. Data from the new system gave controllers a more reliable view — especially during bad weather — of airport operations.

FAA also began testing new technologies that alert pilots to potential runway incursions. Runway Status Lights — an advanced series of runway entrance lights — indicate to a pilot whether or not runways are clear. FAA completed the operational evaluation of this system, in conjunction with ASDE-X surface surveillance, in June 2005 at Dallas-Ft. Worth International Airport. Other new technologies that were tested included an experimental system, the Final Approach Runway Occupancy Signal, which might prevent accidents on airport runways by activating a flashing light visible to landing pilots to warn them that the runway was occupied and hazardous.

Believing that safety was also the responsibility of system users, FAA Administrator Marion Blakey held a meeting in August 2007 with over 40
aviation leaders to identify short-term remedies for reducing runway incursions. She asked meeting participants to consider solutions in four areas: cockpit procedures, airport signage and markings, air traffic procedures, and technology. The aviation community agreed to a short-term plan and to implement the first four elements within 60 days:

- Begin safety reviews (by teams of FAA, airport operators, and airline personnel) at the airports where wrong-runway departures and runway incursions were the greatest concern.
- Disseminate information and training across the entire aviation industry.
- Accelerate the deployment of improved airport signage and markings at the top 75 airports, well ahead of the June 2008 mandated deadline.
- Review cockpit procedures and air traffic control clearance procedures.
- Implement a voluntary self-reporting system for all ATO safety personnel, such as air traffic controllers and technicians.

In January 2008 FAA announced aviation community progress towards the runway safety action plan. Among those accomplishments:

- 71 of the targeted 75 airports that had more than 1.5 million annual enplanements completed voluntary enhancements of airport markings.
- 62 airports certified under Part 39 had voluntarily upgraded their markings — 121 airports planned to complete the work by the end of fiscal year 2008, and 25 during fiscal year 2009.
- FAA completed runway safety reviews at 20 airports that resulted in 100 short-term and numerous mid- and long-term initiatives.
- All 112 active air carriers complied with rules to provide pilots with simulator or other training based upon realistic airport scenarios.

**Unmanned Aerial Vehicles (UAVs)**

Because of their ability to operate far beyond manned aircraft in terms of costs and endurances, a UAV offers certain important military and commercial advantages over traditional piloted aircraft. Unmanned aircraft vehicles are fundamentally remote-controlled aircraft. They are operated by pilots who are physically separated from the aircraft. They can be land-, air-, or ship-launched and can be auto-piloted or remotely controlled by pilots on the ground. Generally, a UAV consists of an unmanned aircraft and associated elements required to operate it safely. They range from a hand launched model weighing several-ounces to the size of a commercial jet aircraft. They encompass a broad span of altitude and endurance.
capabilities. Such aircraft have long been used primarily in military applications of intelligence, surveillance, and reconnaissance. Recent rapid growth of UAV industry has broadened their applications to homeland securities, such as border security and war on terror, as well as scientific studies of earth, weather, oceanic, and arctic sciences, and other commercial purposes.

To prepare for the advent of increasing numbers of unmanned aircraft vehicles, FAA has begun work to ensure their full and safe integration into the NAS. The establishment of standards for UAV operations will be key to ingrating these new vehicles in the airspace system. Rigorous regulatory standards governing the existing NAS users will have to be extended to include UAVs. This requires the development of methodologies and tools to define UAV designs, performance characteristics, and operations in the NAS.

In September 2005 the agency issued the first airworthiness certificate for a civil UAV, the General Atomics Altair. The Altair’s FAA airworthiness certificate was in the “experimental” category and limited flights to R&D, operational training, or market survey. The agency specified a number of safety conditions for the Altair’s operation — including weather, altitude, and geographic restrictions, as well as a requirement for a ground-based pilot and observer. FAA also collaborated with manufacturers to collect vital technical and operational data that would improve UAV regulatory processes. In addition, FAA asked RTCA, a group that frequently had advised the agency on technical issues, to help develop UAV standards.

Full and safe integration of UAVs into civil aviation required FAA to work closely with other government agencies, industry, and international entities that had experience in developing and operating such air vehicles. In August 2006, the FAA signed a Memorandum of Agreement with the United States Air Force Research Laboratory Control Science Division to conduct flight tests of technologies developed by the Air Force for Global Hawk and Predator UAV. The objective of this flight test program was to demonstrate the feasibility of technologies that will provide UAVs with the ability to sense conflicting aircraft, determine if there is a collision hazard, and autonomously maneuver to avoid mid-air and near mid-air collisions. Under this agreement, the Air Force Research Laboratory provided a surrogate aircraft to simulate UAV flights and FAA provided airplanes to fly as cooperative and non-cooperative intruding aircraft. To best use the flight test program, the FAA also provided the Air Force with Automatic Dependent Surveillance — Broadcast (ADS-B) equipment to collect and analyze actual operational data.
Commercial Space

Commercial manned space flights became reality in the first decade of the 21st century with wealthy space travelers sparing no expense to rocket to the International Space Station. Creating a market for commonplace spaceflight, however, depended on price and safety concerns. To achieve reliable, safe, and affordable space travel, and to interest the general public in it, private industry began to invest heavily in technical research and promotional campaigns.

In 1996 the X-Prize Foundation announced an international competition to launch a manned, reusable private vehicle into space and return it safely to Earth. The winning submission would win $10 million. FAA required a sub-orbital space flight license for prize contenders and on April 1, 2004, issued the world’s first license for a sub-orbital manned rocket flight. The license was issued to Scaled Composites of Mojave, California, headed by aviation record-holder Burt Rutan, for a sequence of sub-orbital flights spanning a one-year period. On April 23 FAA announced it had issued a second license for a manned sub-orbital rocket flight to XCOR Aerospace Incorporated of Mojave, California, which sought to develop a passenger carrying space vehicle for adventure travelers in the future.

On June 21 Rutan’s SpaceShipOne reached an altitude of 328,491 feet (approximately 62 miles), making pilot Mike Melville the first civilian to fly a private spaceship out of the atmosphere. Melville successfully reached suborbital space again on September 29. On October 4 Brian Binnie successfully flew the second orbital flight in the prescribed timeframe. The X Prize foundation awarded its $10 million prize to Scaled Composites for being the first company to launch a vehicle capable of carrying three people to a height of 100 kilometers (62.5 miles), return them safely to Earth, and repeat the flight with the same vehicle within two weeks.

In the years following 1996, FAA licensed six spaceports in the United States: California Spaceport at Vandenberg Air Force Base; Spaceport Florida at Cape Canaveral Air Force Station; the Virginia Space Flight Center, now known as the Mid-Atlantic Regional Spaceport, at Wallops Island; Kodiak Launch Complex on Kodiak Island, Alaska; the inland Mojave Spaceport in California; and the Oklahoma Spaceport run by the Oklahoma Space Industry Development Authority site at Burns Flat. In July 2004 FAA issued a license to the Mojave Airport in California, which became the first inland commercial space launch site, and the fifth licensed commercial spaceport, in the U.S.
President George W. Bush signed the Commercial Space Launch Amendments Act of 2004 (Public Law 108-492) in December 2004. The legislation gave FAA authority to promote the development of the nation’s commercial space flight industry and to ensure public safety. As a result of its new mandate and in accordance with the rulemaking process, in December 2006 FAA issued final regulations for crew and spaceflight participants. The new regulations required a reusable launch vehicle (RLV) operator to inform space tourists, in writing, about the safety record of the vehicle they would fly in and compare that record with those of other manned space vehicles. After being given time to ask questions about the risks of flight, passengers would have to provide written consent prior to the flight. Each passenger would have to receive safety training on how to respond to emergency situations — which would include cabin depressurization, fire, smoke, and emergency egress.

To ensure optimal performance and safety, FAA needed to develop a better understanding of the physiological challenges of manned space flight. Accordingly, the agency began a research program focused on the health and safety of commercial space passengers. In 2006 its researchers defined and recommended appropriate biomedical parameters for additional pre-flight, in-flight, and post-flight monitoring of space passengers and crews. The research allowed FAA to better specify the types of biomedical data that launch operators need to monitor the physiological effects of short duration spaceflight.

Also in 2006 FAA and the U.S. Air Force Space Command issued new, common federal launch safety standards designed to create consistent, integrated space launch rules for the nation. The rules strengthened public safety by harmonizing launch procedures that identified potential problems early, and by implementing a formal system of safety checks and balances. The regulations governed commercial launch operations at non-federal as well as federal launch sites.

To ensure the continued safety of prototype reusable craft, and to facilitate research, development, and testing of new design concepts, in April 2007 FAA issued guidelines allowing developers to obtain one-year experimental launch permits for reusable spacecraft. These provisions gave businesses the opportunity to fly and test their vehicles before applying for a launch license. A permit covered multiple vehicles of a particular design and could be used for an unlimited number of launches. Applicants had to provide FAA a program description, a flight test plan, operational safety documentation (including a hazard analysis), and a plan for responding to any mishap. None of the flights covered by an experimental permit could be flown for profit, and the permits could only be renewed following a favorable FAA review.

Aviation Goes “Green”

In a 2004 report to Congress, the authors of “Aviation and the Environment: A National Vision Statement, Framework for Goals and Recommended Actions” declared: “Immediate action is required to address the interdependent challenges of aviation noise, local air quality and climate impacts. Environmental impacts may be the fundamental constraint on air transportation growth in the 21st century.” The writers, academicians affiliated with the FAA, advised the nation to “develop more effective metrics and tools to assess and communicate aviation’s environmental effects.”
In response to this recommendation, FAA researchers began developing a comprehensive suite of software tools that would thoroughly assess the environmental effects of aviation. Although the research to develop this analytical tool suite was expected to last a decade, initial capabilities began to come online between 2006 and 2009. The ongoing and intensive development effort involved participation by the FAA, NASA, industry, academia, and Transport Canada and required coordination with foreign counterparts through the ICAO Committee on Aviation Environment Protection (CAEP).

The Partnership for AiR Transportation Noise and Emissions Reduction (PARTNER), a Center of Excellence co-sponsored by the FAA, NASA, and Transport Canada, together with DOT’s Volpe National Transportation Systems Center, had the lead in developing new software tools to assess the effects of aviation on the environment. Ten universities comprised PARTNER, with projects funded at three additional colleges.

The center’s key program involved the development of a new suite of analytical tools: Environmental Design Space (EDS), the Aviation Environmental Design Tool (AEDT), and the Aviation environmental Portfolio Management Tool (APMT).

The Aviation Environmental Design Tool would serve as the central building block of the new suite of tools. When fully developed, AEDT would integrate the FAA’s existing noise and emissions models, including the Integrated Noise Model (INM), the Model for Assessing Global Exposure to the Noise of Transport Aircraft (MAGENTA), the Emissions and Dispersion Modeling System (EDMS), and the System for Assessing Aviation Global Emissions (SAGE). The consolidated result would allow experts to assess the interdependencies between aviation-related noise and emissions. AEDT would use detailed schedule and fleet information as input and provide noise and emissions inventories, both locally and globally. The tool would compute and identify mutual relationships among noise, fuel burn, and various emissions at the local, regional, and global levels — both for base years and for future scenarios.

The Aviation Environmental Portfolio Management Tool would provide the economic analysis component of the comprehensive suite of software tools needed to assess the environmental effects of aviation. To help evaluate policy costs, APMT architecture would use aviation demand and guideline scenarios to simulate producer and consumer behavior. Detailed operational modeling of the air transportation system would provide estimates of the emissions and noise outputs. A benefits valuation module would put a price tag on the health and welfare impacts of aviation noise, local air quality, and climate effects.
FAA also began to make progress in the design of the Environmental Design Space Tool, a mathematical model that would estimate source noise, exhaust emissions, performance, and economic parameters for future aircraft designs incorporating varying levels of technology. EDS was designed to explore trade-offs within current technology, and explore the impacts of potential future technical resources. Once EDS became connected to AEDT and APMT, the FAA expected the combined tool suite to be able to assess operational, policy, and market scenarios.

Early in the new century, with growth in air traffic predicted to double in 15 years, both government and industry were concerned about fuel cost and efficiency. Together, they saw the rising costs of petroleum as, perhaps, the single largest driver for the adoption of alternative fuels.

Commercial aircraft were still using a stringently regulated kerosene-type fuel, refined from oil. At roughly double their historical average, in 2007 fuel costs constituted 20 to 30 percent of total airline operating costs. Approximately 53.4 million gallons of jet fuel per day, or 19.5 billion gallons per year, were required to fuel U.S. airlines. When the price increased by a single penny per gallon, the airline industry incurred an additional $195 million in annual operating costs. As a way to reduce expenses and reduce aviation's environmental footprint, FAA and the airline industry began exploring options for alternative fuels created from sources other than oil.

In the fall of 2005 FAA hosted a long-term strategic brainstorming session with its Research and Engineering Development Advisory Committee (REDAC) subcommittee. Representatives from the airports, airlines, manufacturers, and government communities cited fuel-efficiency, cost, and supply availability as potentially the most challenging issues facing aviation. The committee drafted a series of “scoping” questions to look at the potential of alternative fuels to improve the environment and capacity in civil aviation. The group also urged the FAA to start a modest investment to address this potentially critical issue.

In May 2006 experts from the FAA met in Seattle, Washington, with other concerned groups for a one-day workshop exploring alternative fuels for aviation. Government participants represented DoD, the U.S. Department of Energy, and NASA. Members of the national and international fuel supply, aircraft and engine manufacturers, and airline industries represented their organizations. Primarily sponsored by the FAA, the Air Transport Association of America, Incorporated (ATA), and the Aerospace Industries Association (AIA), the workshop also received support from the Boeing Company and the Port of Seattle. Workshop participants agreed that commercial aviation sponsors and stakeholders should work together with DoD and DOE to pursue alternative fuels for the purpose of securing a stable fuel supply, furthering research and analysis, and quantifying the ability to reduce environmental impacts and improve aircraft operations.

A follow-up meeting held in October 2006 brought together approximately 80 representatives of airlines, aircraft and engine manufacturers, and government agencies to continue the discussion on the potential for alternative fuels. The group agreed to continue working towards a unified approach to the development and implementation of alternative fuels for aviation.

FAA is working with industry to develop environmentally-friendly fuels.
manufacturers, energy companies, and a number of U.S. Government agencies. The creation of the Commercial Aviation Alternative Fuels Initiative (CAAFI) emerged from these discussions. Led by the FAA, AIA, ATA — along with the Airports Council International-North America (ACI-NA) — the membership of this new organization discussed the present state and future requirements of R&D, the process for certification and qualification, environmental benefits and costs, and business cases and policy needs for alternative fuels.

Over the course of two days, the CAAFI founders agreed on a set of high level goals and next steps to pursue going forward. These objectives included:

- Securing a stable fuel supply
- Furthering research and analysis
- Quantifying the ability to reduce environmental impacts
- Improving aircraft operations

CAAFI had developed, and would continue to maintain, roadmaps for advancing and communicating details of alternative aviation fuels, including their adoption status.

The engine and commercial aircraft R&D communities were also investigating the practicality of using alternative fuels in near-, mid-, and far-term aircraft. Research indicated that a “drop in” jet fuel replacement, a fuel alternative that mimicked the properties of the available kerosene jet fuel, might become available for existing and near-term aircraft. Future mid-term aircraft might also use bio- or synthetic blends to fuel new, or possibly existing, airplane designs. But the likelihood remained that the long-term engines and aircraft of the future might have to be specifically designed to use a low or near zero-carbon fuel.

Of the current replacements for kerosene, synthetic liquid fuels manufactured from coal, biomass, or natural gas were not only viable, but they were already in limited use. These alternatives might also reduce serious air pollutants such as particulate matter. DoD embarked on an aggressive program to promote synthetic fuels and, in the summer and fall of 2006, conducted several successful tests with synthetic jet fuel. Since military jet fuel was almost identical to commercial jet fuel, the DoD efforts could stimulate alternative aviation fuel viability for the commercial sector.

To ensure that aviation efficiency and capacity gains did not negatively affect the global environment, in 2007 the United States and the European Commission launched an effort to reduce transatlantic aircraft emissions and noise. The initiative, called the

The U.S. and Europe are working together to reduce aircraft noise and emissions
Atlantic Interoperability Initiative to Reduce Emissions or AIRE, promised to provide a foundation for aviation interests on both sides of the Atlantic to work together on ongoing research with the dual goal of aiding the environment while making air transportation more efficient. In addition to facilitating cooperation among aviation authorities, AIRE also involved industry partners, such as aircraft manufacturers Airbus and Boeing, the operators Air France, Scandinavian Airlines, Delta, and FEDEX, and providers of aviation navigation services, making this a partnership that brought together the global aviation community with a single goal of environmental stewardship.

The first steps in implementing AIRE were to examine the ongoing environmental initiatives on both sides of the Atlantic. The second phase involved combining those efforts. For example, one of the methods being examined by FAA to reduce greenhouse gas emissions and noise was the continuous descent approach (CDA). FAA research had proved the environmental benefits of CDA, which included significant reduction in noise, fuel burn and emissions, and shorter flights.

Continuous descent required an aircraft to begin its final descent to the destination airport from greater distance and altitude than the previously conventional approach to landing. Using CDA, a pilot maintained a steady angle of descent during the approach, as opposed to the staggered descent of the conventional landing, which required additional thrust each time the pilot leveled the aircraft. FAA researchers began demonstrating CDA in 2003. Research results proved so positive that in 2007 Los Angeles International Airport (LAX) implemented the first operational CDA procedure in the United States.

The U.S. and European Commission also focused research on the environmental benefits of oceanic trajectory optimization, using NextGen and Europe’s Single European Sky Air Traffic Management Research Program programs. The goal of this work was to develop new technologies and procedures that would give air traffic controllers the ability to track flow and offer alternative, more fuel efficient routes to aircraft crossing the Atlantic.
NextGen technologies enhance situational awareness

Flying into the future

A variety of aircraft will share the future air transportation system
Chapter 10: Flying Into the Future

Since the Wright brothers’ historic flight, aviation has been a vital national resource for the United States — its strategic, economic, and social importance remains unsurpassed. Aviation is critical to our national well-being and interests. It provides invaluable opportunities for travel, for new business, for jobs, and for the general growth and development of the U.S. economy. It serves an important role in attracting investment to local communities and helps stimulate and sustain growth by opening new markets and supply chains, nationally and internationally.

Thanks to the work of FAA, over the past fifty years aviation has become central to the way we live and do business, linking people from coast to coast and connecting America to the world. In fact, FAA has created the safest, most reliable, most efficient, and most productive air transportation system in the world.

Aviation is an integral part of our daily lives. We travel for work and recreation. Airplanes bring us closer to family and friends. They deliver food and consumer goods. They provide emergency transportation and delivery of medical services and supplies. They link us to the world, facilitating the export and import of products and materials. They provide critical safety services. They serve as our first line of defense in an uncertain world.

New frontiers are opening as commercial space transportation becomes more common. Today this generally refers to private companies launching satellites into space. Tomorrow it may mean vehicles that take private citizens on sub-orbital flights and eventually into orbit. To maintain safe and efficient national airspace system (NAS) operations, FAA will need to accommodate the growing demand for commercial space launches.

To ensure aviation’s future viability, FAA is working with its federal and industry partners to develop a flexible aerospace system that fully responds to the changing needs of businesses, customers, and the general public. The strength of the future system depends on lower costs, improved service, greater capacity, and smarter security measures. That is why FAA has defined a vision of the future that integrates achievements in safety, security, efficiency, and environmental compatibility. Currently under development, the Next Generation Air Transportation (NextGen) System will:

- Enhance economic growth and create jobs,
- Expand system flexibility and deliver greater capacity,
- Tailor services to customer needs,
- Integrate capabilities to ensure national defense,
- Promote aviation safety and environmental stewardship, and
- Retain U.S. leadership and economic competitiveness in global aviation.
A Vision of the Future

Imagine a future where . . .

- Flights cost less and arrive on-time,
- Airport security is fast and non-intrusive,
- Flights depart from and arrive in the communities where we work and live,
- Airplanes are quiet and environmentally friendly,
- Flights are safer and more secure,
- New aircraft types provide flexible transportation solutions,
- The skies are always friendly, and
- Air travel is fun, and getting there is easy.

Achieving this vision involves embracing new ideas and creating new ways for government, industry, and academia to work together. It also requires, according to the “Next Generation Air Transportation System (NextGen) Integrated Plan,” the need to:

- Develop airport infrastructure to meet future demand by empowering local communities and regions to create alternative concepts of how airports will be used and managed in the future.
- Establish an effective security system without limiting mobility or civil liberties by embedding security measures throughout the air transportation system — from curb to curb.
- Create a transparent set of security layers that will deliver security without creating undue delays, limiting access, or adding excessive costs and time.
- Create a responsive air traffic system by devising alternative concepts of airspace and airport operations to serve present and future aircraft. As very light jets, unmanned aircraft systems, and other new vehicle classes emerge — and as new business models, such as spaceports and other innovations appear — the safe and efficient operation of all vehicles in the NAS will be increasingly critical to creating new markets in aviation and related industries.
- Provide each traveler and operator in the system with the specific situational awareness they need to reach decisions through the creation of a combined information network. All users of the system will have access to the air transportation system data they require for their operations.
- Manage safety through a comprehensive and proactive approach that can integrate major changes, such as new technologies or procedures. This will be done in a timely manner and without compromising aviation’s current superior safety record.
- Introduce new policies, operational procedures, and technologies to minimize the impact of noise and emissions on the environment and eliminate ground contaminants at airports. This effort includes exploration of alternative fuels, engine and aircraft designs. These actions will result in reduced environmental impact and sustained aviation growth.
- Reduce the impact of weather on air travel through the integration of a system-wide capability for enhanced weather observations and forecasts into the tools used by air system operators. This capability will substantially improve airspace capacity and efficiency while enhancing safety.
- Harmonize equipage and operations globally by developing and employing uniform standards, procedures, and air and space transportation policies worldwide, enhancing safety and efficiency on a global scale.
FAA understands that building the NextGen system depends on a clear understanding today of what that system will look like. As we look to the future it is easy to imagine the revolutionary advances that will occur in aviation technology, because many of those advances are already on the drawing board. By 2025 technological advances in the use of satellite-based communications and computer technology will work together to keep air traffic moving safely along more efficient routes than are presently available. There will be a steady stream of information flowing from digital computers onboard the aircraft.

These powerful computers will monitor or control virtually every function of the plane, often with very little interaction by the cockpit crew. The flight crew and the air traffic controller will exchange information over high-speed digital data links. Airline and air traffic control computers on the ground will relay weather updates and safety alerts quickly and accurately to the pilot. Onboard collision avoidance and advanced traffic display systems will allow the pilot be an active participant with the controller in ensuring the safe separation of aircraft. The cockpit will be so information-rich pilots will be able to operate their aircraft under conditions where long-term route, speed, or altitude clearances are no longer necessary.

As the U.S. transitions to this future high-tech system, FAA is examining how innovations such as technology improvements, system integration, human-computer interface, and other factors will affect the course of modernization. Research teams at FAA know that even the most advanced technology cannot be effective if it is not integrated carefully into the system and properly used. These professionals are working hard to ensure the NextGen system employs a proactive approach to safety impacts fixing problems before they cause accidents, identifying trends, and using information more powerfully, more creatively, and more collaboratively than ever before.

FAA NextGen Planning Documents

- NextGen Implementation Plan (OEP version 1)
- NAS Enterprise Architecture

See www.faa.gov/programs/oep and www.nas-architecture.faa.gov

Researchers are working today to understand tomorrow’s needs
As the aviation community moves toward NextGen, it is also critical for FAA to coordinate an industry-wide safety strategy and plan to ensure future aviation investment is focused on the most effective means of lowering an already historically low accident rate. This is not an easy task. The worldwide commercial aviation accident rate, after having declined steadily for many years, now remains fairly constant. Many believe that for the accident rate to decrease even further, the worldwide aviation community must continue all of the positive steps that have worked so well for so long. It will, however, also have to revitalize another activity — collecting, analyzing, and sharing aviation safety information. The challenge is to discover problems and fix them before they cause an accident or incident, especially as we move to a highly sophisticated, and technology-driven aviation system.

In partnership with industry, FAA has embarked on a major new initiative expected to improve aviation safety by the exchange of information among all segments of government and the civil aviation industry. The Aviation Safety Information Analysis and Sharing (ASIAS) program will enable government and industry to identify and address proactively safety issues. ASIAS will provide safety experts a better understanding of the factors that contribute to incidents and anomalies, and it will also facilitate the formation of conclusions about causal relationships. Ultimately, ASIAS will allow government and industry to identify and address hazards in aviation before they cause accidents or incidents.

Improving Weather Systems

One of the biggest challenges FAA faces now and in the future is how to collect, process, transmit, and display weather information to users and service providers, both during flight planning and in flight. Weather is one of the leading causes or factors cited in aviation accidents. National aviation forums have repeatedly identified improved weather information in the cockpit, especially...
in a graphical format, as a key strategy to reduce weather-related accidents.

FAA is currently developing key NextGen technologies that will reduce the number of weather-related accidents by improving decision making through increased exchange of timely information. When these innovations are fully implemented in the NAS, service providers and users will receive real-time depictions of hazardous weather simultaneously, enhancing common situational awareness. FAA’s current aviation weather architecture is evolving from present-day separate, stand-alone systems to weather systems that are an integral part of the airspace system.

Almost all in-flight weather information is presently obtained via voice radio. Many weather situations, however, are extremely complex, making them difficult to convey effectively to the cockpit over voice radio. The ability to provide graphical products — reaching pilots over a data link to a cockpit display — will simplify and enhance this information transfer. In addition, improved forecasting in areas critical to safe operations, such as icing, turbulence, visibility, and thunderstorm activity, will provide pilots better information for making better decisions.

Enhancing Human Performance

Providing key information to pilots and controllers in real-time, however, is just one part of ensuring safety into the future. Aviation safety improvements are also dependent on developing an aviation system that is not only technically sophisticated, but also one that responds well to the humans who give it direction. As FAA develops and deploys a variety of new automated technologies, it is important to understand how users will react to that equipment.

It is essential that human factors specialists remain full partners in the development and deployment of advanced aviation technologies. The future NextGen environment will depend heavily on the enhanced exchange of information between people and between people and systems. It will also depend on a greater understanding of how machines and people, on the ground and in the air, work together under normal and critical situations. To ensure safety in this new environment, FAA human factors specialists now are working to identify the most efficient and reliable ways to display and exchange information; determine when, and how particular information can best be displayed and transferred; design the system to reduce the frequency of information transfer errors and misinterpretations; and minimize the impact of errors.
FAA realizes that, while it is vital to understand how pilots and flight crews will react to a new information rich environment, its own researchers also must explore how steady advances in automation will change the role and impact of air traffic controllers. The ongoing development and use of decision support tools will help key agency professionals to work smarter while allowing pilots to fly their preferred routings. New NextGen tools will combine the desirable with the efficient while never sacrificing what is safe. For flight crews and controllers alike, NextGen tools will provide computer assistance in identifying potential conflicts of one aircraft with other, prevent entry into restricted military airspace or adverse weather, and help identify trajectories that will more safely maneuver aircraft. Other decision aids will help controllers to expedite the efficient arrival of aircraft during rush periods at busy airports – helping them to determine the landing sequence of particular aircraft and assign them to land on the safest, most efficient choice of runways.

Safety First, Foremost, and Always

Eliminating human error is just one part of an integrated research and development (R&D) program designed to anticipate potential accidents and prevent them from happening. Other FAA research projects are focusing on things such as aircraft structural integrity, propulsion systems, flight safety, and mechanical and electrical system reliability and integrity. In addition, knowing that preventive measures cannot avert all accidents and incidents, the agency actively supports an R&D program that concentrates on decreasing fatalities of accidents. Scientist working in these activities continually focus on finding new ways to enhance passenger and crew survivability, crash and rescue, and firefighting in the increasingly less likely event of an accident.

FAA safety research and its implementation of promising initiatives is dependent on a network of partnerships with industry, government, and academia to undertake its critical R&D activities. One of FAA’s oldest partnerships has been with the National Aeronautics and Space Administration (NASA). Even as this exciting new century unfolds, FAA and NASA are working together with industry and academia in the area of aging aircraft systems research. Continued development of advanced aircraft inspection technologies will prove to be a critical safety resource in the future as the world’s airline fleets get older. Cooperative projects are also developing improved technologies for detecting aircraft icing, and for predicting wind shears and clear air turbulence (in combination the number one cause of injuries in non-fatal accidents), and on noise mitigation. FAA and NASA have also created an even larger partnership to research and develop new air traffic management technologies necessary for NextGen.
Together with industry, FAA is steadily working to prevent runway incursions and related surface incidents and to ensure safety at NextGen airports. Working with its partners, the agency is providing heightened situational awareness for pilots, controllers, and vehicle operators; mandating specific recurring training for controllers regarding surface operations; implementing a range of procedural initiatives; and improving airport signs, lighting, and surface marking standards. Its research teams are using more sophisticated statistical and trend analysis to identify and correct those factors contributing to runway incursion incidents. It also is implementing new technologies that will help minimize the chance of injury, death, damage, or loss of property due to unavoidable runway accidents.

A Global Partnership

Over the past fifty years, FAA has come a long way in creating a safe and efficient aviation system. Ensuring aviation’s viability well into the future, however, requires partnerships with the national and international aviation community. The aviation community has shown that by staying with a problem, doing whatever is possible at the moment, and constantly looking for better approaches, it can improve safety and efficiency of the NAS. The partnership has also proved to be flexible enough to allow market forces to shape the direction of growth in the industry. At the same time, though, it has assured that this growth occurs within a regulatory framework that demands the highest possible level of safety. This spirit of cooperation has proven effective in the past, and will help lead us into the future as FAA rallies its partners to pursue the domestic and international agreements that ensure the creation and success of the NextGen system. Enhancing safety and efficiency requires a global effort — one that standardizes procedures, technology, and regulations. Only through international cooperation can NextGen and FAA’s vision of the future become reality.

Orville and Wilbur Wright could not have imagined the impact their invention would have on the world. Aviation has grown at an exponential rate since that first flight, and FAA has been there to ensure aviation safety, efficiency, and environmental compatibility. The Wright brothers fostered aviation’s growth in the 20th Century, now FAA, through its NextGen system, will ensure aviation’s growth for the future.

FAA is building tomorrow’s system in cooperation with its international partners

NextGen incorporates new aircraft, manned and unmanned, in the aerospace system
Passengers take flight on a TWA DC-2
References

and

Photo Credits
References


Photo Credits

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Federal Aviation Administration
Gulfstream
John Rodriguez
Jon Ross
Laurie Zaleski
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Michael Gross
National Aeronautics and Space Administration
National Archives and Records Administration
National Oceanic and Atmospheric Administration
Piper
Smithsonian Institution
Stella Mollman
The Boeing Company
Trey Brandt
United States Air Force
1930, Gladys O’Donnell wins the Women’s Air Derby
Appendices
1928, passengers board a Fokker Transport Aircraft, which also carries mail.

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*Federal Aviation Agency published its first National Airport Plan (now called National Plan of Integrated Airport Systems, or NPIAS) in 1959.*


Note: Since March 20, 1997, aircraft with 10 or more seats used in scheduled passenger service have been operated under 14 CFR 121.
1949, prototype Aerocar debuts in Washington
## Appendix B: Safety Record of U.S. Carriers, 1927-2007

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**NOTE:** The data below reflects the activity of passenger and cargo airlines operating under 14 CFR 121. Since March 20, 1997, aircraft with 10 or more seats in scheduled service (or their all-cargo equivalent) have operated under this part. Incidents resulting from illegal acts such as suicide or sabotage are included in accident and fatality totals but are excluded from accident rates, per National Transportation Safety Board.
Howard Hughes as a young aviator
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<td>2001</td>
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<td>10,633</td>
<td>41</td>
<td>6</td>
</tr>
<tr>
<td>2002</td>
<td>6,928</td>
<td>10,276</td>
<td>34</td>
<td>0</td>
</tr>
<tr>
<td>2003</td>
<td>7,016</td>
<td>10,228</td>
<td>51</td>
<td>2</td>
</tr>
<tr>
<td>2004</td>
<td>7,604</td>
<td>10,783</td>
<td>23</td>
<td>1</td>
</tr>
<tr>
<td>2005</td>
<td>7,844</td>
<td>10,910</td>
<td>33</td>
<td>3</td>
</tr>
<tr>
<td>2006</td>
<td>7,852</td>
<td>10,627</td>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td>2007</td>
<td>7,860</td>
<td>10,720</td>
<td>24</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes: All data reflects systemwide scheduled service performed by U.S. air carriers operating under 14 CFR 121. Data for 1927 passengers and fatalities were available for domestic flights only. Sabotage-caused accidents and fatalities are included in counts but not rates. Onboard fatalities include passengers and crewmembers.

1929, passengers undergo U.S. Customs at Alhambra Airport, California.
Appendix C: List of FAA Administrators

Elwood R. Quesada, November 1, 1958 - January 20, 1961
Deputy Administrator James T. Pyle became acting administrator

Najeeb E. Halaby, March 3, 1961 - July 1, 1965

William F. McKee, July 1, 1965 - July 31, 1968
Deputy Administrator David D. Thomas became acting administrator

John H. Shaffer, March 24, 1969 - March 14, 1973

Deputy Administrator James E. Dow became acting administrator

John L. Mclucas, November 24, 1975 - April 1, 1977
Quentin S. Taylor, nominated for Deputy Administrator, became acting
administrator

Associate Administrator for Administration Charles E. Weithoner became
acting administrator

J. Lynn Helms, April 22, 1981 - January 31, 1984
Deputy Administrator Michael J. Fenello became acting administrator

Donald D. Engen, April 10, 1984 - July 2, 1987
Director of the New England Region, Robert Whittington became acting
administrator

T. Allan McArtor, July 22, 1987 - February 17, 1989
Executive Director for Policy, Plans, and Resource Management Robert
Whittington became acting administrator

Deputy Administrator Barry L. Harris became acting administrator

Thomas C. Richards, June 27, 1992 - January 20, 1993
Acting Deputy Administrator Joseph M. Del Balzo became acting
administrator

David R. Hinson, August 10, 1993 - November 9, 1996
Deputy Administrator Linda Daschle became acting administrator until
her resignation from the agency on January 31, 1997; on February 1, 1997,
Barry Valentine became acting administrator

Jane F. Garvey, August 4, 1997 - August 2, 2002
Acting Deputy Administrator Monte Belger became acting administrator

Marion C. Blakey September 13, 2002 - September 13, 2007
Deputy Administrator Robert Sturgell became acting administrator
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAS</td>
<td>Advanced Automation System</td>
</tr>
<tr>
<td>ACCC</td>
<td>Area Control Computer Complex</td>
</tr>
<tr>
<td>AD</td>
<td>airworthiness directive</td>
</tr>
<tr>
<td>ADAP</td>
<td>Airport Development Aid Program</td>
</tr>
<tr>
<td>ADS-B</td>
<td>Automatic Dependent Surveillance-Broadcast</td>
</tr>
<tr>
<td>AEDT</td>
<td>Aviation Environmental Design Tool</td>
</tr>
<tr>
<td>AMK</td>
<td>anti-misting kerosene</td>
</tr>
<tr>
<td>APMT</td>
<td>Aviation environmental Portfolio Management Tool</td>
</tr>
<tr>
<td>ARAC</td>
<td>Aviation Rulemaking Advisory Committee</td>
</tr>
<tr>
<td>ARTCC</td>
<td>air route traffic control center</td>
</tr>
<tr>
<td>ARTS</td>
<td>Automated Radar Terminal System</td>
</tr>
<tr>
<td>ASIAS</td>
<td>Aviation Safety Information Analysis and Sharing</td>
</tr>
<tr>
<td>ASDE</td>
<td>airport surface detection equipment</td>
</tr>
<tr>
<td>ASDE-X</td>
<td>Airport Surface Detection Equipment-Version X</td>
</tr>
<tr>
<td>ATC</td>
<td>air traffic control</td>
</tr>
<tr>
<td>ATCRBS</td>
<td>Air Traffic Control Radar Beacon System</td>
</tr>
<tr>
<td>ATO</td>
<td>Air Traffic Organization [FAA]</td>
</tr>
<tr>
<td>BCAS</td>
<td>beacon avoidance system</td>
</tr>
<tr>
<td>CAA</td>
<td>Civil Aeronautics Authority</td>
</tr>
<tr>
<td>CAAAFI</td>
<td>Commercial Aviation Alternative Fuels Initiative</td>
</tr>
<tr>
<td>CAB</td>
<td>Civil Aeronautics Board</td>
</tr>
<tr>
<td>CAEP</td>
<td>Committee on Aviation Environment Protection [ICAO]</td>
</tr>
<tr>
<td>CARD</td>
<td>civil aviation research and development [DOT/NASA study]</td>
</tr>
<tr>
<td>CAST</td>
<td>Commercial Aviation Safety Team</td>
</tr>
<tr>
<td>CDA</td>
<td>continuous descent approach</td>
</tr>
<tr>
<td>CDM</td>
<td>Collaborative Decision Making [Free Flight Program tool]</td>
</tr>
<tr>
<td>CID</td>
<td>controlled impact demonstration</td>
</tr>
<tr>
<td>CIP</td>
<td>Capital Investment Plan</td>
</tr>
<tr>
<td>CIPRAF</td>
<td>Civil Reserve Air Fleet</td>
</tr>
<tr>
<td>DoD</td>
<td>U.S. Department of Defense</td>
</tr>
<tr>
<td>DOT</td>
<td>U.S. Department of Transportation</td>
</tr>
<tr>
<td>DSR</td>
<td>Display System Replacement</td>
</tr>
<tr>
<td>ECG</td>
<td>En route Communications Gateway</td>
</tr>
<tr>
<td>EDS</td>
<td>Environmental Design Space</td>
</tr>
<tr>
<td>EDMS</td>
<td>Emissions and Dispersion Modeling System</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>EPNdB</td>
<td>effective perceived noise level in decibel scale</td>
</tr>
<tr>
<td>ERAM</td>
<td>En Route Automation Modernization</td>
</tr>
<tr>
<td>FAA</td>
<td>Federal Aviation Administration</td>
</tr>
<tr>
<td>FAA</td>
<td>Federal Aviation Agency (prior to 1966)</td>
</tr>
<tr>
<td>FAR</td>
<td>federal aviation regulation</td>
</tr>
<tr>
<td>FAS</td>
<td>Federal Aviation Service</td>
</tr>
<tr>
<td>FASTA</td>
<td>Federal Aviation Science and Technological Association</td>
</tr>
<tr>
<td>FBI</td>
<td>Federal Bureau of Investigation</td>
</tr>
<tr>
<td>FCC</td>
<td>Federal Communications Commission</td>
</tr>
<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
</tr>
<tr>
<td>FLRA</td>
<td>Federal Labor Relations Authority</td>
</tr>
<tr>
<td>FMCS</td>
<td>Federal Mediation and Conciliation Service</td>
</tr>
<tr>
<td>FSM</td>
<td>Federal Security Manager</td>
</tr>
<tr>
<td>GAO</td>
<td>Government Accountability Office</td>
</tr>
<tr>
<td>GDPE</td>
<td>Ground Delay Program Enhancement</td>
</tr>
<tr>
<td>GPS</td>
<td>[U.S.] Global Positioning System</td>
</tr>
<tr>
<td>HFACS</td>
<td>Human Factors Analysis and Certification System</td>
</tr>
<tr>
<td>ICAO</td>
<td>International Civil Aviation Organization</td>
</tr>
<tr>
<td>IFF</td>
<td>identification, friend, or foe</td>
</tr>
<tr>
<td>IFR</td>
<td>instrument flight rules</td>
</tr>
</tbody>
</table>
1912, Ruth Law set many aviation records in her Curtiss Pusher
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ILS</td>
<td>instrument landing system</td>
</tr>
<tr>
<td>INM</td>
<td>Integrated Noise Model</td>
</tr>
<tr>
<td>IPT</td>
<td>integrated product team</td>
</tr>
<tr>
<td>ISSS</td>
<td>Initial Sector Suite System</td>
</tr>
<tr>
<td>JPDO</td>
<td>Joint Planning and Development Office</td>
</tr>
<tr>
<td>LAAS</td>
<td>Local Area Augmentation System</td>
</tr>
<tr>
<td>LLWAS</td>
<td>Low Level Wind Shear Alert System</td>
</tr>
<tr>
<td>MAGENTA</td>
<td>Model for Assessing Global Exposure to the Noise of Transport Aircraft</td>
</tr>
<tr>
<td>MLS</td>
<td>Microwave Landing System</td>
</tr>
<tr>
<td>MWAA</td>
<td>Metropolitan Washington Airport Authority</td>
</tr>
<tr>
<td>NAATS</td>
<td>National Association of Air Traffic Specialists</td>
</tr>
<tr>
<td>NAS</td>
<td>national airspace system</td>
</tr>
<tr>
<td>NASA</td>
<td>National Aeronautics and Space Administration</td>
</tr>
<tr>
<td>NOTAM</td>
<td>notice to airmen</td>
</tr>
<tr>
<td>NATCA</td>
<td>National Air Traffic Controllers Association</td>
</tr>
<tr>
<td>NATI</td>
<td>national air transportation inspection</td>
</tr>
<tr>
<td>NEXRAD</td>
<td>Next Generation Weather Radar</td>
</tr>
<tr>
<td>NextGen</td>
<td>Next Generation Air Transportation System</td>
</tr>
<tr>
<td>NORAD</td>
<td>North American Aerospace Defense Command</td>
</tr>
<tr>
<td>NPIAS</td>
<td>National Plan of Integrated Airport Systems</td>
</tr>
<tr>
<td>NTSB</td>
<td>National Transportation Safety Board</td>
</tr>
<tr>
<td>ODAPS</td>
<td>Oceanic Display and Planning System</td>
</tr>
<tr>
<td>OEP</td>
<td>Operational Evolution Partnership</td>
</tr>
<tr>
<td>PAMRI</td>
<td>Peripheral Adapter Module Replacement Item</td>
</tr>
<tr>
<td>PARTNER</td>
<td>Partnership for Air Transportation Noise and Emissions Reduction</td>
</tr>
<tr>
<td>PASS</td>
<td>Professional Airway Systems Specialists</td>
</tr>
<tr>
<td>PATCO</td>
<td>Professional Air Traffic Controllers Organization</td>
</tr>
<tr>
<td>pFAST</td>
<td>passive Final Approach Spacing Tool [Free Flight Program tool]</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>research and development</td>
</tr>
<tr>
<td>REDAC</td>
<td>Research and Engineering Development Advisory Committee</td>
</tr>
<tr>
<td>RLV</td>
<td>reusable launch vehicle</td>
</tr>
<tr>
<td>RNAV</td>
<td>area navigation</td>
</tr>
<tr>
<td>RNP</td>
<td>Required Navigation Performance</td>
</tr>
<tr>
<td>RVSM</td>
<td>Reduced Vertical Separation Minima</td>
</tr>
<tr>
<td>SAFER</td>
<td>Special Aviation Fire and Explosion Reduction</td>
</tr>
<tr>
<td>SAGE</td>
<td>semi-automatic ground environment</td>
</tr>
<tr>
<td>SFAR</td>
<td>special federal aviation regulation</td>
</tr>
<tr>
<td>SMA</td>
<td>Surface Movement Advisor [Free Flight Program tool]</td>
</tr>
<tr>
<td>STARS</td>
<td>Standard Terminal Automation Replacement System</td>
</tr>
<tr>
<td>SUP</td>
<td>suspected unapproved parts</td>
</tr>
<tr>
<td>SWIM</td>
<td>Systemwide Information Management</td>
</tr>
<tr>
<td>TACAN</td>
<td>tactical air navigation</td>
</tr>
<tr>
<td>TAMR</td>
<td>Terminal Automation Modernization-Replacement</td>
</tr>
<tr>
<td>TCA</td>
<td>Terminal Control Area</td>
</tr>
<tr>
<td>TCAS</td>
<td>traffic alert and collision avoidance system</td>
</tr>
<tr>
<td>TDWR</td>
<td>Terminal Doppler Weather Radar</td>
</tr>
<tr>
<td>TMA</td>
<td>Traffic Management Advisor [Free Flight Program tool]</td>
</tr>
<tr>
<td>TNA</td>
<td>thermal neutron activation</td>
</tr>
<tr>
<td>TRACON</td>
<td>terminal radar approach control [facility]</td>
</tr>
<tr>
<td>TSA</td>
<td>Transportation Security Administration</td>
</tr>
<tr>
<td>UAV</td>
<td>unmanned aerial vehicle</td>
</tr>
<tr>
<td>URET</td>
<td>User Request Evaluation Tool [Free Flight Program tool]</td>
</tr>
<tr>
<td>VFR</td>
<td>visual flight rules</td>
</tr>
<tr>
<td>VOR</td>
<td>very high frequency omnidirectional range</td>
</tr>
<tr>
<td>WAAS</td>
<td>Wide Area Augmentation System</td>
</tr>
</tbody>
</table>
Dr. Theresa L. Kraus joined the FAA in 1991 as a senior historian and recently served as an analyst in the ATO Operations Planning Research and Development Office. Prior to her 2008 appointment as the agency historian, she authored or co-authored a range of articles and publications on FAA and aviation history. Before coming to the FAA, she worked for the U.S. Army Center of Military History, where she served as one of the authors and co-editor the Army’s official history of Operations Desert Shield/Desert Storm. Dr. Kraus holds a Ph.D. in history from the University of Maryland. Her additional publications include complete books, chapters in anthologies, and a variety of articles appearing in military and aviation magazines and journals.