



One of the first airmail pilots, Jack Knight

Chapter 1: Prologue

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.



1908, Wilbur Wright in France

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.



1926, Charles Lindbergh flying in a DH-4 U.S. mail plane

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.



1926, Colonial Air Transport begins first airmail flight between Boston and New York. Juan Trippe, far right, receives an airmail package

July 1, 1927: Boeing Air Transport started commercial air service between Chicago and San Francisco. On October 30, 1928, Boeing Airplane - Transport Corporation incorporated and acquired Boeing Air Transport, Pacific Air Transport, and the Boeing Airplane Company. On February 1, 1929, Boeing Airplane - Transport Corporation changed its name to United Aircraft and Transport Corporation and acquired several new subsidiaries. On March 28, 1931, United Air Lines, Incorporated, became a management corporation formed to coordinate operations of United Aircraft and Transport Corporation's airline subsidiaries.

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



1928, first pitcairn mail flight

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



1929, Archie League, the first air traffic controller, St. Louis, Missouri

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.



1917, Willam MacCracken Jr., flying

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.



1930, first radio-equipped control tower, Cleveland Municipal Airport

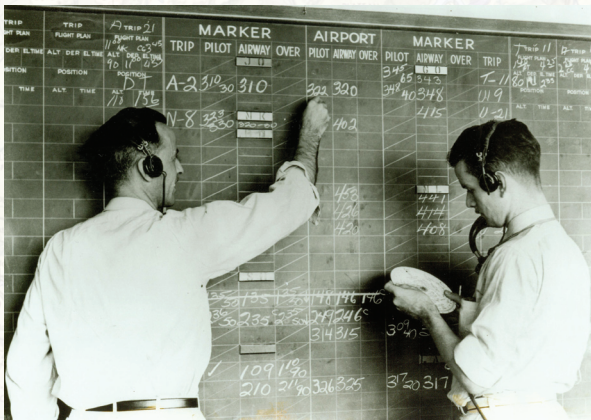
In 1934 the Department of Commerce renamed the Aeronautics Branch the Bureau of Air Commerce to reflect the growing importance of aviation to the nation. In one of its first acts, the bureau encouraged a group of airlines to establish the first air traffic control centers (Newark, New Jersey; Cleveland, 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.

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,



1936, Chicago airway traffic center

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.



1936, early air traffic controllers track aircraft with "shrimp boats"

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



1946, Atlanta Municipal Airport

Early Aviation Technological Advances

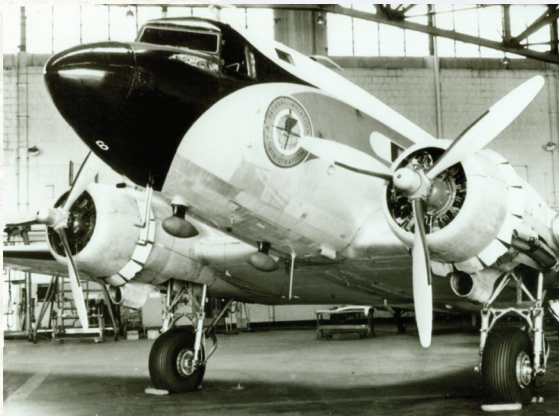
- 1920 Radial Air-Cooled Engine*
- 1921 Retractable Landing Gear*
- 1928 NACA Cowling*
- 1928 Two-Way Radio Communications*
- 1930 Stressed-Skin Metal Airplanes*
- 1931 Aluminum Alloys*
- 1932 Controllable Pitch Propellers*
- 1933 Autopilot*
- 1936 High Octane Fuels*
- 1937 Cabin Pressurization*
- 1941 Instrument Landing System*
- 1945 Swept Wing*
- 1945 Delta Wing*
- 1946 Thrust Reverser*
- 1946 Onboard Power Generation*
- 1947 Supersonic Flight*
- 1948 Ground-Based Weather Radar*
- 1949 Doppler Navigation Radar*
- 1953 Inertial Navigation*
- 1956 Turbofan Engine*
- 1957 Airborne Digital Computer*
- 1958 Communications Satellite*

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.



1958, early jet operations at the Los Angeles airport

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.



Pieces of the TWA Super Constellation strewn over the Grand Canyon



1952, a National Airlines flight bound for Miami, Florida, crashed near Elizabeth, New Jersey, which helped increase calls for stronger aviation safety regulations