

Key functions of airlines assignment

[Environment](#), [Air](#)



AIR CARRIER PLANNING & OPERATION MANAGEMENT Objective Airlines are no more used by the rich. Now they have become Essential for the modern day of transportation system the objective of this topic is to make the student aware of its operation and also its management. . From outside to a passenger it seems a very simple means of transport but its operation and management it an absolute professional and it requires highly professional approach.

This module has been planned to learn the air carriers' planning and its operational needs Over view The overview of this course is to give the future managers an inside view of Airlines management which is spread to various, functions, department and sub department. It is also deal with the various key functions and also the support functions of the air carriers. This Module has been divided into the following chapters 1Airlines functional activities This chapter covers the function of the airlines and its product.

It also studies the main operating department their function and also the other associated departments which are essential for the smooth operation It also covers the airport functions pertaining to commercial and technical activities. 2. The structure of the airlines industry This chapter deals with the growth and regulation of this Industry. Major and national carriers, regional carriers their growth and roles 3Planning optimization This chapter explains the networking of the airlines and its components of. How it is useful in the schedule planning 4

Flight Scheduling This chapter explains the schedule which is the result of planning department effort in preparing the flight 5Aircraft routing This

chapter explain how the aircraft are routed after the flight schedule has been made

6Principles of Airlines scheduling This chapter covers the Mission of scheduling, equipment maintenance, planning and coordination and hub and spoke system of the scheduling.

7Fleet assignment This chapter deals with the deployment of right fleet-type on a particular sector depending upon the demands

8Crew Scheduling

Chapter covers the deployment of crew for the completion of schedule keeping the various legal requirements of the safety and regulatory bodies

9Manpower planning This chapter covers the deployment of manpower as per the requirement of operations

10Revenue Management Chapter covers the various method and areas of revenue management for the airlines industry

11 Flight Dispatch This chapter covers the procedure and requirements for dispatching the flight by Operation Department

12Gate assignment Gate assignment topic describes the system of assigning gates to minimize the walking for connecting passengers

3 Project Management Describes the scope of any project, its design, financing contacting and implementing the project It also ensure the monitoring through a well defined system

14Airlines Irregular Operation It describes how to handle the flight in case of disruptions of the schedule which can be due technical or weather reason when the availability of the aircraft become less on a particular day

Chapter 1 History & Formation of Airlines. Man always had a desire to conquer the air and fly like a bird. Various attempted were made by the man until WRIGHT BROTHERS succeeded in building the aircraft and there was no looking back.

Various models were made and finally these were used in First World War extensively. Let us understand the history of aviation 400BC-1900 Early Experiments • Early Experiments • First Attempts • Second Attempts • Glider Flight • Powered Flight Early Experiments As early as 400 B. C. Archytas, a Greek scholar, built a wooden pigeon that moved through the air. It is unknown exactly how this was done, but most believe that the Greek coected it to a steam powered arm that made it go in circles. About 300 B. C, the Chinese developed kites, which are a form of gliders, which much later in history allowed humans to fly in them.

During Greek times a great mathematician, Archimedes discovered the principle of buoyancy in about 200 BC. He discovered how and why some objects float in liquids. This fact helped in the progress of true flight. When the great libraries in Alexandria, Egypt were destroyed in 500 A. D. the discoveries of Archimedes and many others were lost for a thousand years. 2000 years later men used Archimedes' principle to help them with the hot-air-balloon. Later in 1290 A. D Roger Bacon theorized that air, like water, has something solid around it, and something built correctly could be supported by the air.

First Attempts Early attempts to defy gravity involved the invention of ingenious machines, such as ornithopters. These were based upon designs written in 1500 by Leonardo da Vinci. This type of flying machine utilizes the flapping of the wings in order to achieve flight. Needless, is to say that all attempts to fly using this type of machine failed. n 1680, Giovanni Borelli stated that people's muscles are too weak to flap the large surfaces needed

to obtain flight. Later, additional reasons were found. Since the remarkable physiological capabilities of birds can never be matched by human beings.

In other words our heart beat rate must have to go up to 800 heart beats per minute in order to be able to achieve flight. 2nd Attempts at Flight The first free flight in a artificial device was done by two Frenchmen, Jean F. Pilatre de Rozier, and Marquis d'Arlandes. They achieved this with large linen balloon, and floated for more than five miles over Paris, France. The idea of filling a closed container with a substance that normally rises through the atmosphere was as early as the thirteen century. Over a five hundred year span, different substances came to be known as being lighter-than-air.

Between 1650 and 1900 this approach was used to flight. The most common gases proposed were water vapor, helium and hydrogen. The first successful attempts at achieving flight using his type of crafts were made by the Montgolfier brothers in France. Their most successful attempt was in 1783 when in a public demonstration; they achieved 6000 ft in a balloon with a diameter of more than 100 ft. As time went by, it was soon recognized that balloons although able to achieve flight, were basically handicapped by a total lack of directional control. This problem was solved with the introduction of power plants or engines in elongated-like balloons.

This elongated shape helped reduce drag in order to decrease the power size. The most successful builder of this type of lighter-than-air craft was Count Ferdinand von Zeppelin, whose name is synonymous with large rigid dirigibles. The term “ dirigible” really means controllable. In the early 1930's the German Graf Zeppelin machine was able to make a Trans-Atlantic flight

to the United States. They flew 18 mph and had a rigid metal frame that kept it in flight even if gas or power was lost. The Zeppelin design was copied and improved by others throughout the world.

One such airship was 3 times larger than a Boeing 747 and cruised at 68 mph. It made regular flights from Europe to South America in which 24 people had their own suites and dined from menus prepared by famous chefs. The large Hindenburg was equally successful until it was destroyed by fire while attempting a landing in 1937 in Lakehurst, New Jersey. The Hindenburg marked the end of large scale Zeppelin travel. Nowadays, the blimp has become ubiquitous, appearing over the skies of ballgames and large outdoor events. Glider Flight In 1804, a British inventor, George Cayley, built the first successful glider.

His original craft was a small model. A later full-sized glider carried his coachman, going unwillingly, across a valley. He founded the study of aerodynamics, and was the first to suggest a fixed wing aircraft with a propeller. Otto Lilienthal, a German, developed the first gliders in which the glider could be piloted. His work (1891-1896) inspired other inventors to take up the work of gliders. They included: Percy Pilcher of Great Britain, and Octave Chanute of the United States. These early gliders were hard to control, but could carry the pilot hundreds of feet into the air. Powered Flight In 1843, William S.

Henderson, patented plans for the first plane with a engine, fixed wings, and propellers. After one unsuccessful try the inventor gave up. Then in 1848, John Stringfellow built a small model which worked, but could only stay up a

short period of time. In 1890, a French engineer by the name of Clement Ader attempted flight in his steam powered plane. His plane failed, he could not control, or keep the plane in the air. Another steam powered plane, built by Sir Hiram Maxim, lifted off briefly, but did not fly. It was a gigantic steam powered machine with two wings, two engines, and two propellers.

In the 1890's a American by the name of Samuel P. Langley, a scientist, attempted piloted flight. His early experiments involved a small steam powered plane called the aerodrome. In 1896 it flew half a mile in ninety seconds. Later he created a full-sized aerodrome with a gas engine which was designed for piloted flight. Two attempts were made, on October 7, 1903, and December 8, 1903, and both failed. 1900-1920 – Piloted Flight & Early Growth • Wright Brothers • Piloted Heavier-than-Air Powered Flights • Early Aircraft Companies • First Scheduled Air Service • World War I

Piloted Heavier-than-Air Powered Flights The Wrights first became interested in flight after they began reading of Lilienthal's gliding flights in Germany. Upon his death they vowed to continue his progress. The Wright Brothers began flying gliders near Kitty Hawk, North Carolina. For 4 years they made 1000 successful gliding flights on those dunes. Unable to find an engine manufacturer to meet their specifications of 8 horsepower and engine weight of less than 200 pounds, they decided to design and build their own engine. Aided by their bicycle mechanic Charlie Taylor, they were able to build an engine that produced 12 horsepower. With the engine built, they then faced the problem of how to build a propeller since very little was known on the subject. Surprisingly, with their previously collected wing data, they were

able to build accurately the engine propellers. Using the basic airframe of their 1902 Glider, the Kitty Hawk Flyer was born. After numerous improvements, and studying how birds fly they were ready to test the Flyer out. They flipped a coin, and Wilbur won. They tested the Flyer, but the plane crashed after a wing dipped down.

On December 17, 1903 it was Orville's turn which resulted in a 120-foot, 12-second flight at Kitty Hawk, North Carolina. The aircraft represented the first powered flight in a heavier-than-air machine. After their success the Wright Brothers tried to sell their design to other governments. Since the brothers never made an official and public flight the governments were not about to spend on something they didn't even know that worked. The first person to fly as a passenger was Leon Delagrange, who rode with French pilot Henri Farman from a meadow outside of Paris in 1908.

Charles Furnas became the first American airplane passenger when he flew with Orville Wright at Kitty Hawk later that year. Early Aircraft Companies In 1905 Charles and Gabriel Voisin started the world's first aircraft company. They two French fliers set up a factory outside of Paris to build the custom planes. This was the first of many European companies to start. The first US airplane company was founded by Glenn Curtiss in Hammondsport, New York. The first commercial airplane sale was made by this company to the Aeronautic Society of New York for 5,000 dollars.

In 1909, two other American airplane companies were formed. The Wright brothers' established one, and Glenn Martin formed another. The Wright brothers had their first official public flight in 1908. The US government,

amazed by the capability of the plane, ordered a specialized plane for 30,000 dollars. The world's first military plane was for use in the Army Signal Corps. In November of 1909, a group of wealthy Americans loaned the Wright brothers money to start their own plant. They started the Wright Company which quickly became the leading supplier of military planes.

Later Wilbur died of typhoid in 1912, and Orville sold his portion out in 1915 to Eastern investors. First scheduled air service The first scheduled air service began in Florida on Jan. 1, 1914. Glenn Curtiss had designed a plane that could take off and land on water and thus could be built larger than any plane to date because it did not need the heavy undercarriage required for landing on hard ground. Thomas Benoist, an auto parts maker, decided to build such a flying boat, or seaplane, built for a service across Tampa Bay called the St.

Petersburg-Tampa Air Boat Line. His first passenger was ex-St. Petersburg Mayor A. C. Pheil, who made the 18-mile trip in 23 minutes, a considerable improvement over the two-hour trip by boat or 12-hour trip by rail between the two cities. The single-plane service accommodated one passenger at a time, and the company charged a one-way fare of \$5. After operating two flights a day for four months and carrying a total of 1,205 passengers, the company folded with the end of the winter tourist season. World War I (1914 - 1918)

These and other early flights were headline events, but commercial aviation was very slow to catch on with the general public, most of which was afraid to ride in the new flying machines. Improvements in aircraft design also were

slow. However, with World War I, the military value of aircraft was quickly recognized and production increased significantly to meet the rising demand for planes from governments. Most significant was the development of more powerful motors, enabling aircraft to reach speeds of up to 130 mph, more than twice the speed of pre-war aircraft.

Increased power also made bigger aircraft possible. On the other hand, the war was bad for commercial aviation in several ways. It focused all design and production efforts on building military aircraft. In the public's mind, flying became almost totally associated with bombing runs, surveillance, and aerial dog fights. In addition, there was such a large surplus of planes at the end of the war that the demand for new production was almost non-existent for several years. As a result, many aircraft builders went bankrupt.

Some European countries such as Great Britain and France helped commercial aviation by starting air service over the English Channel.

However, nothing similar occurred in the United States where there were no such natural obstacles isolating major cities and where railroads could transport people almost as fast as an airplane, and in considerably more comfort. The salvation of U. S. commercial aviation industry following World

War I was a government program, but one that had nothing to do with the transportation of people. 1920-1935 – Growth of Aviation Industry • Airline Growth • Airmail • Beacons Contract Air Mail Act of 1925 • Morrow Board • 1926 Air Commerce Act • Ford's Tin Goose • Other New Aircraft Companies • Charles Lindbergh • Walters Act • Air Mail Act of 1934 • Aircraft Innovations
Airline Growth With the surplus of planes left after World War I, thousands of

military planes were converted to civilian use. In 1919, bombers were being converted in Europe to form over twenty small new airlines. The first regular international airline service was started by one of those. The company setup by Henry and Maurice Farman used old Farman bombers to make weekly flights between Paris and Brussels.

By 1917, there were seventeen regularly operating airlines in Europe, Africa, Australia, and South America. Some airlines from that era that are still operating include: Royal Dutch Airlines (KLM), SABENA World Airlines, Lufthansa, and Qantas. In the '20s American aviation was quite slow. There were a few small airlines, but they often failed after only a few months of service. Americans viewed air travel as a dangerous sport, not a safe means of transportation. By the 1920's governments started to form national airlines through combining a few private airlines.

One such case is the British government who formed Imperial Airways. Airmail By 1917, the U. S. government felt it had seen enough progress in the development of planes to warrant something totally new, air mail. That year, Congress appropriated \$100, 000 for an experimental airmail service that was to be conducted jointly by the Army and the Post Office between Washington and New York, with an intermediate stop in Philadelphia. The first flight left Belmont Park, Long Island, for Philadelphia on May 14, 1918, and the next day continued on to Washington where it was met by President Woodrow Wilson.

With a large number of war-surplus aircraft in hand, the Post Office almost immediately set its sights on a far more ambitious goal, which was

transcontinental air service. It opened the first segment, between Chicago and Cleveland, on May 15, 1919, and completed the service on Sept. 8, 1920, when the most difficult part of the route, the Rocky Mountains, was spanned. Airplanes still could not fly at night when the service first began, so the mail was handed off to trains at the end of each day.

Nonetheless, by using airplanes the Post Office was able to shave 22 hours off coast-to-coast mail deliveries. Beacons In 1921, the Army deployed rotating beacons in a line between Columbus and Dayton, Ohio, a distance of about 80 miles. The beacons, visible to pilots at 10-second intervals, made it possible to fly the route at night. The Post Office took over the operation of the guidance system the following year, and by the end of 1923 constructed similar beacons between Chicago and Cheyenne, WY, a line later extended coast-to-coast at a cost of \$550, 000.

Mail then could be delivered across the continent in as little as 29 hours eastbound and 34 hours westbound (prevailing winds from west to east accounted for the difference), which was two to three days less than it took by train. The Contract Air Mail Act of 1925 – Kelly Air Mail Act By the mid 1920s, the Post Office mail fleet was flying 2. 5 million miles and delivering 14 million letters annually. However, the government had no intention of continuing airmail service on its own. Traditionally, the Post Office had used private companies for the transportation of mail.

So once the feasibility of airmail was firmly established, and airline facilities were in place, the government moved to transfer airmail service to the private sector by way of competitive bids. The legislative vehicle for the

move was the 1925 Contract Air Mail Act, commonly referred to as the Kelly Act after its chief sponsor, Rep. Clyde Kelly of Pennsylvania. It was the first major legislative step toward the creation of a private U. S. airline industry. Winners of the initial five contracts were National Air Transport (owned by the Curtiss Aeroplane Co. , Varney Air Lines, Western Air Express, Colonial Air Transport, and Robertson Aircraft Corporation. National and Varney would later become important parts of United Airlines (originally a joint venture of the Boeing Airplane Company and Pratt & Whitney). Western would merge with Transcontinental Air Transport (TAT), another Curtiss subsidiary, to form Transcontinental and Western Air (TWA). Robertson would become part of the Universal Aviation Corporation, which in turn would merge with Colonial, Southern Air Transport and others to form American Airways, predecessor of American Airlines.

Juan Trippe, one of the original partners in Colonial, would later pioneer international air travel with Pan Am — a carrier he founded in 1927 to transport mail between Key West, FL, and Havana, Cuba; and Pitcairn Aviation, yet another Curtiss subsidiary that got its start transporting mail, would become Eastern Air Transport, predecessor of Eastern Airlines. Because of this act, Henry Ford's airline was the first airline to transport US mail. Many of these companies who flew the mail started carrying passengers on flights. In 1926, airlines in the US carried 6, 000 passengers.

By 1930, passengers flying on US airlines had soared to 400, 000. The Morrow Board The same year Congress passed the Contract Mail Act, President Calvin Coolidge appointed a board to recommend a national

aviation policy (a much-sought-after goal of Herbert Hoover, who was Secretary of Commerce at the time). Dwight Morrow, a senior partner in J. P. Morgan's bank, and later the father-in-law of Charles Lindbergh, was named chairman. The board heard testimony from 99 people, and on Nov. 30, 1925 submitted its report to President Coolidge.

It was wide-ranging, but its key recommendation was that the government should set standards for civil aviation and that the standards should be set outside of the military. The 1926 Air Commerce Act Congress adopted the recommendations of the Morrow Board almost to the letter in the Air Commerce Act of 1926. The legislation authorized the Secretary of Commerce to designate air routes, to develop air navigation systems, to license pilots and aircraft, and to investigate accidents. In effect, the act brought the government back into commercial aviation, this time as regulator of the private airlines spawned by the Kelly Act of the previous year. The Bureau of Air Commerce was set up to enforce these regulations. Congress also adopted the board's recommendation for airmail contracts by amending the Kelly Act to change the method of compensation for airmail services. Instead of paying carriers a percentage of the postage paid, the government would pay them according to the weight of the mail. This simplified payments, and it proved highly advantageous to the carriers, which collected \$48 million from the government for the carriage of mail between 1926 and 1931.

Ford's Tin Goose Henry Ford, the automobile manufacturer, was among the first successful bidders for airmail contracts, winning the right in 1925 to

carry mail from Chicago to Detroit and Cleveland aboard planes his company already was using to transport spare parts for his automobile assembly plants. More importantly, he jumped into aircraft manufacturing and in 1927 produced the Ford Trimotor, commonly referred to as the “ Tin Goose. ” It was one of the first all-metal planes, made of a new material called duralumin that was almost as light as aluminum and twice as strong.

It also was the first plane designed primarily to carry passengers rather than mail. The Ford Trimotor had 12 passenger seats, a cabin high enough for a passenger to walk down the aisle without stooping, and room for a “ stewardess,” or flight attendant, the first of which were nurses hired by United in 1930 to serve meals and assist airsick passengers. Its three engines made it possible to fly higher and faster (up to 130 miles per hour), and its sturdy appearance, combined with the Ford name, had a reassuring effect on the public’s perception of flying.

However, it was another event in 1927 that brought unprecedented public attention to aviation and helped secure the industry’s future as a major mode of transportation. Other New Aircraft Companies. In Santa Monica, California, Donald Douglas started a new company called the Douglas Company. In 1923 another company was formed, the Consolidated Aircraft Corporation. This company was based in East Greenwich, Rhode Island. Pratt & Whitney started making aircraft engines in 1925 in their Hartford, Connecticut plant.

In 1929 the two companies, Wright and Curtiss, merged into the Curtiss-Wright Corporation. Also, in 1929 the Grumman Aircraft Company started

business on Long Island, New York. Charles Lindbergh Slightly before 8 a. m. on May 21, 1927, a young pilot named Charles Lindbergh set out on an historic flight across the Atlantic Ocean, from New York to Paris. It was the first continent-to- continent non-stop flight in an airplane, and its effect on both Lindbergh and aviation was enormous. Lindbergh became an instant American hero.

Aviation became a more established industry, attracting millions of private investment dollars almost overnight as well as the imagination and support of millions of Americans. The pilot that sparked all of this attention had dropped out of engineering school at the University of Wisconsin to learn how to fly. He became a barnstormer, doing aerial shows across the country, and eventually joined the Robertson Aircraft Corporation to transport mail between St. Louis and Chicago. In planning his transatlantic voyage, Lindbergh daringly decided to fly by himself, without a navigator, so he could carry more fuel.

His plane, the Spirit of St. Louis, was slightly less than 28 feet in length, with a wingspan of 46 feet, and it carried 450 gallons of gasoline that comprised half its takeoff weight. There was too little room in the cramped cockpit for navigating by the stars, so Lindbergh flew by dead reckoning. He divided maps from his local library into 33 100-mile segments, noting the heading he would follow as he flew each segment. When he first sighted the coast of Ireland, he was almost exactly on the route he had plotted, and he landed several hours later with 80 gallons of fuel to spare.

Lindbergh's greatest enemy on his journey was fatigue. The trip took an exhausting 33 1/2 hours, but he managed to keep awake by sticking his head out the window to inhale cold air, by holding his eyelids open, and by constantly reminding himself that if he fell asleep he would perish. In addition, he had a slight instability built into his airplane that helped keep him focused and awake. Lindbergh landed at Le Bourget outside of Paris at 10: 24 p. m. Paris time on May 22. Word of his flight had preceded him and a large crowd of Parisians rushed out to the airfield to see him and his little plane.

There was no question about the magnitude of what he had accomplished. The air age had arrived. The Walters Act and the Spoils Conference In 1930, Postmaster General Walter Brown pushed for legislation that would have another major impact on the development of commercial aviation. Known as the Walter Act (after one of its chief sponsors, Rep. Laurence H. Walters of Pennsylvania), it authorized the Post Office to enter into longer term contracts for airmail, with rates based on space, or volume, rather than weight. In addition, the act authorized the Post Office to consolidate airmail routes where it was in the national interest to do so.

Brown believed the changes would promote larger, stronger airlines as well as more coast-to-coast and nighttime service. Immediately after Congress approved the act, Brown held a series of meetings in Washington to discuss the new contracts. The meetings were later dubbed the "spoils conference" because Brown gave them little publicity and directly invited only a handful of people from the larger airlines. He designated three transcontinental mail

routes and made it clear that he wanted only one company operating each service rather than a number of small airlines handing the mail off to one another across the United States.

Brown got what he wanted — three large airlines (American, TWA and United) to transport the mail coast-to-coast — but his actions also brought political trouble that resulted in major changes to the system two years later. Scandal and the Air Mail Act of 1934 Following the Democratic landslide of 1932, some of the smaller airlines began telling news reporters and politicians alike that they had been unfairly denied airmail contracts by Brown. One reporter discovered that a major contract had been awarded to an airline whose bid was three times higher than a rival bid from a smaller airline. Congressional hearings followed, chaired by Sen.

Hugo Black of Alabama, and by 1934 the scandal had reached such proportions as to prompt President Franklin Roosevelt to cancel all mail contracts and turn mail deliveries over to the Army. The decision was a mistake. The Army pilots were unfamiliar with the mail routes, and the weather at the time they took over the deliveries (February, 1934) was terrible. There were a number of accidents as the pilots flew practice runs and began carrying the mail, leading to newspaper headlines that forced President Roosevelt to retreat from his plan only a month after he had turned the mail over to the Army.

By means of the Air Mail Act of 1934, the government once again tendered the mail to the private sector, but it did so under a new set of rules that would have a significant impact on the industry. Bidding was structured to be

more competitive, and former contract holders were not allowed to bid at all, so companies changed their names and appointed new executives. The result was a more even distribution of the government's mail business, and lower mail rates that forced airlines, and aircraft manufacturers, to pay more attention to the development of the passenger side of the business.

In another major change, the government forced the dismantling of the vertical holding companies common up to that time in the industry, sending aircraft manufacturers and airline operators (most notably Boeing, Pratt & Whitney, and United Airlines) their separate ways. The industry was reorganized and refocused. Aircraft Innovations For the airlines to attract more passengers away from the railroads, they needed both larger and faster airplanes. They also needed safer airplanes. Accidents such as the one in 1931 that killed Notre Dame Football coach Knute Rockne and six other men kept people away from flying in droves.

Aircraft manufacturers responded to the challenge. There were so many improvements to aircraft in the 1930s that many believe it were the most innovative period in aviation history. Air-cooled engines replaced water-cooled engines, reducing weight and making bigger and faster planes possible. Cockpit instruments also improved, with better turn indicators, altimeters, airspeed indicators, rate of climb indicators, compasses, and the “artificial horizon,” which showed pilots the attitude of the aircraft relative to the ground — important for flying in reduced visibility. 1935-1950 - The New Industry The New Industry • Radio • Modern Airliners • DC-3 • Pressurized Cabins • 1938 Civil Aeronautics Act • World War II • Jet Engine •

Radar The New Industry By 1935, the US had four major airlines: American, Eastern, Transcontinental, Western Air (now TWA), and United. Other notable, but smaller airlines, were: Delta, Northwest, and Braniff. Pan American World Airways served as the United States primary international airline with flights to Latin America. European governments on the other hand were still forming government airlines, such as Air France and Ala Littoria (Italy).

Top of Page | History Menu Radio Another development of enormous importance to aviation was radio. Aviation and radio developed almost in lock step. Marconi sent his first message across the Atlantic on the airways just two years before the Wright Brothers' first flight at Kitty Hawk. By World War I, some pilots were taking radios up in the air with them so they could communicate with people on the ground. The airlines followed suit after the war, using radio to transmit weather information from the ground to their pilots so they could avoid storms.

Perhaps an even bigger development, however, was the realization that radio could be used as an aid to navigation when visibility was poor and visual navigation aids such as beacons were useless. Once technical bugs were worked out, the Department of Commerce constructed 83 radio beacons across the country. They became fully operational in 1932, automatically transmitting directional beams, or tracks, that pilots could follow to their destination. Marker beacons came next, allowing pilots to locate airports in poor visibility. The first air traffic control tower was established in 1935 at Newark International Airport in New Jersey.

Modern Airliners Boeing built what generally is considered the first modern passenger airliner, the Boeing 247. It was unveiled in 1933, and United Air Lines promptly bought sixty of them, tying up Boeing production lines for two years. Based on a low-wing, twin-engine bomber with retractable landing gear, the 247 accommodated 10 passengers and cruised at 155 miles per hour. Its cabin was insulated to reduce engine noise levels inside the plane, and it featured such things as upholstered seats and a hot water heater to make flying more comfortable to passengers.

Eventually, Boeing also gave the 247 variable pitch propellers that reduced takeoff distances, increased the rate of climb, and boosted cruising speeds. Not to be out done by United, TWA went searching for an alternative to the 247 and eventually found what it wanted from the Douglas Aircraft Company. Its DC-1 copied Boeing's innovations and improved upon many of them. The DC-1 had a more powerful engine and accommodations for two more passengers than did the 247. More importantly, the airframe was designed so that the skin of the aircraft bore most of the stress on the plane during flight.

There was no interior skeleton of metal spars, thus giving passengers more room than they had in the 247. The DC-1 also was easier to fly. It was equipped with the first automatic pilot and the first efficient wing flaps for added lift during takeoff. However, for all its advancements, only one DC-1 was ever built. Douglas decided almost immediately to alter its design, adding 18 inches to its length so it could accommodate two more

passengers. The new, longer version was called the DC-2, and it was a big success, but the best was still to come.

The DC-3 Called the plane that changed the world, the DC-3 was the first aircraft to enable airlines to make money carrying passengers. As a result, it quickly became the dominant aircraft in the United States following its debut in 1936 with American Airlines (which played a key role in its design). The DC-3 had 50% greater passenger capacity than the DC-2 (21 seats versus 14), yet cost only 10% more to operate. It also was considered a safer plane, built of an aluminum alloy 25% stronger than materials previously used in aircraft construction.

It has more powerful engines (1, 000 horsepower versus 710 horsepower for the DC-2), and it could travel coast to coast in 16 hours — a fast trip for that time. Another important improvement was the use of a hydraulic pump to lower and raise the landing gear. This freed pilots from having to crank the gear up and down during takeoffs and landings. For greater passenger comfort, the DC-3 had a noise-deadening plastic insulation, and seats set in rubber to minimize vibrations. It was a fantastically popular airplane, and it helped attract many new travelers to flying.

Pressurized Cabins Although planes such as the Boeing 247 and the DC-3 represented significant advances in aircraft design, they had a major drawback. They could fly no higher than 10, 000 feet because people became dizzy and even fainted due to the reduced levels of oxygen at higher altitudes. The airlines wanted to fly higher to get above the air turbulence

and storms common at lower altitudes. Motion sickness was a problem for many airline passengers, and an inhibiting factor to the industry's growth.

The breakthrough came at Boeing with the Stratoliner, a derivation of the B-17 bomber introduced in 1940 and first flown by TWA. It was the first pressurized aircraft, meaning that air was pumped into the aircraft as it gained altitude to maintain an atmosphere inside the cabin similar to the atmosphere that occurs naturally at lower altitudes. With its regulated air compressor, the 33-seat Stratoliner could fly as high as 20,000 feet and reach speeds of 200 miles per hour. The 1938 Civil Aeronautics Act By 1938, over 3.5 million passengers were flying on airlines, over a million of them Americans.

This extreme growth prompted new government policies. Government decisions continued to prove as important to aviation's future as technological breakthroughs, and one of the most important aviation bills ever enacted by Congress was the 1938 Civil Aeronautics Act. Until that time, numerous government agencies and departments had a hand in aviation policy. Airlines sometimes were pushed and pulled in several directions, and there was no central agency working for the long term interests and stability of the industry. All the airlines had been losing money since the postal reforms in 1934 significantly reduced the amount they were paid for carrying the mail, and all were at risk of losing postal routes (still key to staying in business) to a low competing bid at the next Post Office auction. The airlines desperately wanted greater government regulation through an independent agency they could call their own, and the Civil Aeronautics Act

gave them what they wanted. It created the Civil Aeronautics Authority (CAA), and gave the new agency power to regulate airline tariffs, airmail rates, and interline agreements, mergers, and airline routes.

Its mission was to preserve order in the industry, holding rates to reasonable levels while at the same time nurturing the still financially-shaky airline industry by protecting carriers from unbridled competition. Congress created a separate agency — the Air Safety Board — to regulate the carriers on matters of safety. In 1940, however, President Roosevelt convinced Congress to transfer the safety regulatory function to the CAA, which was then renamed the Civil Aeronautics Board (CAB). These moves, coupled with the tremendous progress made on the technological side, put the industry firmly on the road to success.

World War II Aviation had an enormous impact on the course of World War II and the war had just as big of an impact on aviation. There were fewer than 300 air transports in the United States when Hitler marched into Poland in 1938. By the end of the war, over 40 U. S. aircraft manufacturers were producing 50, 000 planes a year. By the end of the war the US had built more than 300, 000 aircraft. During the war aircraft production had become the world's leading manufacturing industry. Most of the planes, of course, were fighters and bombers, but the importance of air transports to the war effort quickly became apparent as well.

Throughout the war, the airlines provided much needed airlift to keep people and supplies moving to the front and throughout the production chain back home. For the first time in their history, the airlines had far more business —

for passengers as well as freight — than they could handle. Many of them also had opportunities to pioneer new routes, gaining an exposure that would give them a decidedly broader outlook at war's end. While there were numerous advances in U. S. aircraft design during the war that enabled planes to go faster, higher, and further than ever before, mass production was the chief goal of the United States.

The major innovations of the wartime period — radar and jet engines — occurred in Europe. The Jet Engine Isaac Newton was the first to theorize (in the 18th century) that a rearward-channeled explosion could propel a machine forward at a great rate of speed (Newton's 3rd Law). However, no one found a practical application for the theory until Frank Whittle, a British pilot, designed the first jet engine in 1930. Even then, widespread skepticism about the commercial viability of a jet prevented Whittle's design from being tested for several years. The Germans were the first to actually build and test a jet aircraft.

Based on a design by Hans von Ohain, a student working independent of Whittle, it flew in 1939, although not as well as the Germans had hoped. It would take another five years for German scientists to perfect the design, by which time it was too late to affect the outcome of the war. Whittle also improved his jet engine during the war, and in 1942 he shipped an engine prototype to General Electric in the United States. America's first jet plane was built the following year. Radar A technological development with a much greater impact on the war's outcome (and later on commercial aviation) was radar.

British scientists had been working on a device that could give them early warning of approaching enemy aircraft even before the war began, and by 1940 Britain had a line of radar transceivers along its east coast that could detect German aircraft the moment they took off from the Continent. British scientists also perfected the cathode ray oscilloscope, which produced map-type outlines of surrounding countryside and showed aircraft as a pulsing light. Americans, meanwhile, found a way to distinguish between enemy aircraft and Allied aircraft by installing transponders aboard the later that signaled their identity to radar operators.

Dawn of the Jet Age Aviation was poised to advance rapidly following the war, in large part because of the development of jets, but there still were significant problems to overcome. In 1952, the British Overseas Airways Corporation (now British Airways) was formed. It used the new jet engine technology in its de Havilland Comets. The Comet was a 36-seat British-made jet which flew from London to Johannesburg, South Africa, at speeds as high as 500 miles per hour.

Two years later, the Comet's career ended abruptly following two back-to-back accidents in which the fuselage burst apart during flight — the result of metal fatigue caused by repeated pressurization cycles. The Comet was later redesigned to be safer. The cold war between the Soviet Union and the United States following World War II helped secure the funding needed to solve such problems and advance the jet's development. Most of the breakthroughs related to military aircraft that later were applied to the commercial sector.

For example, Boeing employed a swept-back wing design for its B-47 and B-52 bombers to reduce drag and increase speed. Later, the design was incorporated into commercial jets, making them faster and thus more attractive to passengers. The best example of military-civilian technology transfer was the jet tanker Boeing designed for the Air Force to refuel bombers in flight, thus extending their range. The tanker, called the KC-135, was a huge success as a military plane but even more successful when revamped and introduced in 1958 as the first U. S. passenger jet, the Boeing 707. With a length of 125 feet and four engines with 17,000 pounds of thrust, the 707 could carry up to 181 passengers and travel at speeds as high as 550 miles per hour. Its engines proved more reliable than piston driven engines, and they produced less vibration, putting less stress on the plane's airframe and reducing maintenance expenses. They also burned kerosene, which cost half as much as the high octane gasoline used in more traditional planes. With the 707, first ordered and operated by Pan Am, all questions about the commercial feasibility of jets were answered. The jet age had arrived, and other airlines soon were lining up to buy the new aircraft.

Present – • Dawn of the Jet Age • Federal Aviation Act of 1958 – • Wide-bodied and Supersonics Dawn of the Jet Age Aviation was poised to advance rapidly following the war, in large part because of the development of jets, but there still were significant problems to overcome. In 1952, the British Overseas Airways Corporation (now British Airways) was formed. It used the new jet engine technology in its de Havilland Comets. The Comet was a 36-seat British-made jet which flew from London to Johannesburg, South Africa, at speeds as high as 500 miles per hour.

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The jet age had arrived, and other airlines soon were lining up to buy the new aircraft. The Federal Aviation Act of 1958 Following World War II, air travel soared, but with the industry's growth came new problems. In 1956 two aircraft collided over the Grand Canyon and 128 people were killed. The skies were getting too crowded for existing systems of aircraft separation, and Congress responded by passing the Federal Aviation Act in 1958. The legislation created a new safety regulatory agency, the Federal Aviation Agency, later called the Federal Aviation Administration when Congress created the Department of Transportation in 1967.

The agency was charged with establishing and running a broad air traffic control system to maintain safe separation of all commercial aircraft through all phases of flight. In addition, it assumed jurisdiction over all other aviation safety matters, such as the certification of aircraft designs, and airline training and maintenance programs. The Civil Aeronautics Board retained jurisdiction solely over economic matters, such as airline routes and rates. Wide bodies and Supersonics 1969 marked the debut of another revolutionary aircraft, the Boeing 747, which Pan Am was the first to purchase and fly in commercial service.

It was the first wide body jet, with two aisles, a distinctive upper deck over the front section of the fuselage, and four engines under its wings. With seating for as many as 450 passengers, it was twice as big as any other Boeing jet and 80% bigger than the largest jet up until that time, the DC-8.

Recognizing the economies of scale to be gained from larger jets, other aircraft manufacturers quickly followed suit. Douglas built its first widebody, the DC-10, in 1970, and only a month later, Lockheed flew its contender in the widebody market, the L- 1011.

Both of these jets had three engines (one under each wing and one on the tail) and were smaller than the 747, seating about 250 passengers. During the same period of time, efforts were underway in both the United States and Europe to build a supersonic commercial aircraft. The Soviet Union was the first to succeed, testing the Tupolev 144 in December of 1968. A consortium of West European aircraft manufacturers first flew the Concorde two months later and eventually produced a number of those fast, but small, jets for commercial service. U. S. efforts to produce a supersonic passenger jet, on the other hand, foundered in 1971 due to public concern about the sonic boom produced by such aircraft. U. S. airlines have never operated a supersonic aircraft. (Web ref: URL: [http://www. geocities. com/capecanaveral/4294/history/1920_1935. html](http://www.geocities.com/capecanaveral/4294/history/1920_1935.html)) The 747 also found itself the solution to a rather large problem, that is, of the transportation of the space shuttle. There really is no other way to transport the large orbiter than strapping it on the top of a 747. NASA bought an ex American Airlines 747 in 1977 and has been using it ever since (Gilchrist, 61).

By the late seventies, the 727 and 737 were showing their age. Boeing was unable to sell newly modified version of the two aircraft and they soon realized that the whole new aircraft was needed. The new aircraft did not come in the form of a single plane but in two completely different airplanes

that would pick up the slack in the short to medium range jet planes. These planes would be the 757 and 767. They would prove to be very qualified successors to the 727 and the 737, proving themselves in both the commercial and the military world. In fact, the 767 came up with better performance than what was originally planned. Getting it into service, getting it under our original cost estimates and one day early – I do not know you can improve on that. And that is due to the great team at Boeings” (Bauer, 320). The short to medium range jet had been modernized with increases in its performance of its capacity, speed and fuel consumptions. The military had their eye on the 767. It was wide-bodied aircraft similar in dimensions to the 737 and the wider body is what the military saw as most appealing. One of the primary functions of the 767 serves is in AWACS (Airborne Warning and Control System) programme.

It is a 767, modified with a large circular disc on the top. The disc is composed of radars and antennas and its purpose is to target and track targets from a long range. This information is then communicated to the fighter on stand-by. The body of the plane has a crew and a large amount of computer equipment used in the process of determining targets. Boeing has some more plans for the 767, seeing in it a very capable candidate for a tanker/transport variant that would provide in flight refueling and transportation duties. (www. Boeing. com). The last in the family is the 777, which was introduced, in the early nineties.

It is a completely, new generation aircraft with complete integration of computers. The 777 has two main variants presently they are the 777-200

and 777-300. The main difference is length and the capacity. The 300 is about 33 feet longer and can hold about 70 more passenger than the 200. Both will work to satisfy the different needs of airlines. A newer version is in the works. It is the 777-400, which is planned to have even great capacity that what is now present. The 777 should gradually replace the 747 as the large capacity long-range jet. (www. Boeing. com).

The 777 is the plane of the future and will have many service roles in the commercial world. The line of Boeing 700 aircraft is undeniably a very versatile line of aircraft from the beginning they have dominated commercial jet sales... and for good reason. Boeing has always made their aircraft with the utmost quality and attention to detail. Boeing will test and test again until they get it right and it shows in the products. The 700's can accommodate any commercial and military need placed on them. They have made long distance air travel and a comfort and pleasure to many.

It is hard to imagine what life would be without Boeing. It is very safe to say that the commercial airlines travel would simply not be the same caliber we find it today. Since most of the aircraft manufactures were in US, and not very significant were in European countries, the five countries of the Europe joined their resources and formed Air Bus Industries such as Boeing and Mc Donnell Douglas. In 1960, European aircraft manufactures competed with each other as much as American giants. In MID-1960S, tentative negotiations commenced regarding a European collaboration approach.

In 1967, the British, French, German government signed a MOU to start development of a 300 seat Air bus A300. This was the second major unit

joint aircraft programme in Europe, following the Concorde for which no ongoing consortiums devised. An early announcement had been made in July 1967 but this had been complicated by BRITISH Aircraft Corporation (BAC). The British government refused to back its proposed competitor, a BAC 111 and instead supported the Airbus aircraft. In December 1968, the French and British Partner companies Sud Aviation and Hawker Siddeley proposed a revised configuration, the 250 seat, Airbus A-250.

Renamed the A300B, that aircraft would not require new engines, reducing development costs. In 1969 the British Government shocked its partner by withdrawing from the project. Given the participation by Hawker Siddeley up to the point, France and Germany were reluctant to take over their wings design. Thus the British Company was allowed to continue as a major contractor. Finally the Airbus Industry was set up in 1970 following an agreement between Aerospatiale (France) and Deutsche Aerospace (German) CASA (joined by CASA of Spain in 1971) each company would deliver its section fully equipped ready to fly items.

The Name “AIRBUS” was taken from a non-proprietary term used by airlines industry in the 1960s to refer to a commercial aircraft of certain size and range, for this the term was acceptable to French linguistically. This industry is now competing with Boeing Co and has produced series of A300 aircraft such as A-3210, 319, 321 (all single aisles), A310, A330 and A340 and now the latest A380 which has landed into controversy due wiring problem which has delayed its delivery.

A 380 is the largest commercial aircraft with two decks for the passenger and carry 555 passengers upto the range of more than 15500 nautical Kilometers. From the brief history described in the earlier pages we know that after the end of world war, there were plenty of Aircraft and now the desire of the people to fly to another country in the aircraft, become very high which gave a rise to the airlines operations . The first airline was formed in Germany; the Deutsche Luftreederie began service from Berlin to Leipzig and Weimar on Feb. , 1919. After three days, a Paris based airlines French Farman Company started its flight on the trans-channel crossing from Paris to London using a converted Goliath bomber. And in August 1919, the first daily service was established on this route from Le Bourget to Hounslow. The oldest surviving airline, KLM, was organized in The Netherlands in 1919 and jointly with a British company began flying the Amsterdam-London route the following year. Outside Europe, the Queensland and Northern Territories Aerial Services, Ltd. (Qantas) was founded in 1920; it eventually became the Australian national airline and now known as Qantas Airways Limited Most of the airlines founded in the 1920s and '30s were created at least in part to encourage the purchase of aircraft of domestic manufacture in the Europe only But the privately owned Swissair was the first European airline to purchase American aircraft .

The intertwining of domestic aircraft manufacture and national airline operation was widely advocated as critical to national defense. In the United States airline pioneers were private operators, as were the aircraft builders, and there was no national policy concerning either operation. Throughout the 1920s there were no adequately financed airlines, and most lasted for

only short periods before failing or merging. Given the large area of the United States, an airline with routes of national or even regional coverage was the exception.

And it was only in the late 1920s that any thought was given to the question of encouraging a domestic aircraft industry or the promotion of domestic airline companies. A second factor, especially in Europe, was the colonial airline. Britain, France, The Netherlands, and Germany all developed colonial airlines, with Belgium, Italy, and the United States joining the operation less extensively. Routes for national airlines were limited to destinations within a country or its possessions, except by agreement.

The extensive colonial empires still in existence in the 1920s and '30s became natural sites for extended airlines. Britain, for example, created Imperial Airways by first using bilateral agreements with other European countries to reach the Mediterranean and, once there, to project a continuation based on British colonies and protectorates in Malta, Cyprus, Palestine, Trans-Jordan, and the Iraq and Persian Gulf protectorates. India, Burma, the Malay Protectorate, Australia, and New Zealand.

China, Central Africa, and South Africa could be reached by other routes. Only the North Atlantic and the northern Pacific resisted a “British” national airline. France shaped a colonial airline from Province across the Mediterranean to Algeria, the French Sahara, French Equatorial Africa, and Madagascar. Working out landing rights between Belgium and France provided a route to the Belgian Congo. The Netherlands, again through trades with Britain, shaped a colonial route for KLM to the Dutch East Indies.

In the 1930s these colonial routes were the main long-distance air routes available not only because a far-flung empire simplified the problem of securing landing rights but also because the operating “stage”—that is, the maximum distance that might be flown without stopping to refuel—was then only about 500 miles. The Pacific and the Atlantic were the major “water jumps” that remained unconquered by civil aircraft in 1930. The American air routes showed the way to the solution.

Pan American Airlines was first organized to fly from Miami to Key West in Florida and to Havana and by the 1930s from Brownsville, Texas, to Mexico City and Panama. Pan American founder Juan Trippe advocated the concept of the “chosen instrument”—international connections for the United States should be provided by a single American company flying only outside the country. The American “empire” in this sense was Latin America, where American investment was extensive but political control was only indirect.

Germany, after World War I lost its empire, but turned to South America, particularly Colombia, to shape an extensive system of air routes. In the American case, Pan American’s ultimately extensive route structure in the Caribbean, on the east coast of South America, and in Central America provided experience in operating a long-distance international airline. By the early 1930s three airlines in particular were seeking to develop world-scale route patterns 1. Pan American 2, Imperial Airways, and 3 KLM.

Such a development called for a set of aircraft that were entirely new in concept from those that had been derived from the planes of World War I. Specifically, what was needed were seaplanes, which offered some of the

advantages that the Zeppelin company, DELAG, had obtained with their dirigibles. They could fly stages of considerably greater length than could be flown with standard land planes because the sea-based plane enjoyed an almost infinite takeoff runway, that of a long stretch of water in a sheltered embayment. Several miles might be used at a time when the norm for airport runways was 1, 000-feet.

Long runways, either on land or on water, meant that planes could be quite large, use multiple engines, have large enough fuel tanks to fly an extended stage, and require less strength in the undercarriage. The tradition of high-powered planes introduced between 1907 and 1909 by Glen Curtiss continued. In addition to the Curtiss Company, Martin and Sikorsky each produced large four-engine seaplanes with the potential for stages of more than 500 miles. Because of its size, the United States showed a concern for lengthening the stage even of land-based planes.

When Pan American adopted the seaplane in the early 1930s, the Sikorsky S-42 flying boat had four engines that permitted it to fly to Buenos Aires, Argentina, by making a series of water crossings between Puerto Rico and the Rio de la Plata. After World War I, another factor contributed to airline development: the desire for an air service to speed up the mails. Unlike Europe, where the nationalized airlines carried the mail, in the United States the Army Air Corps was assigned the job, with generally dreary results.

The problems of flying in a country the size of the United States were considerable. Particularly in the East, with the broad band of the Appalachians lying athwart the main routes, bad flying conditions were

endemic and crashes were frequent. The introduction of aircraft beacons helped, but the low altitudes at which most contemporary planes could operate continued to plague service. Commercial flying began in earnest in 1925 when, under the Kelly Act, the United States Post Office Department established contracts for carrying mail over assigned routes.

Payments were made in return for the weight of mail carried. This practice often gave earnings that made the difference between marginal operation and flying at outright losses. Later, the method of airmail payments was revised; instead of paying for the weight of mail carried, the Post Office paid instead for the space reserved for airmail were it to be offered to the airline company to transport. The result was an incentive to the companies to increase the size of the planes they normally flew. The end of Great War aviation developed rapidly not always for commercial reasons.

Though initially the airlines was doing the work of carrying mail and overseeing the national goals, this trend continued in the colonial period also of the 1950 -70, as many African, Asian and Caribbean national created their own airlines companies while reserving for specific markets and for specific routes. In advanced economies, the national policies went in the same direction with national markets reserved to national carrier offering stable services, but at high prices. Air Transport was then seen as a public service that should be regulated.

Thus, the regulatory agencies of government (e. g. Civil Aeronautic Board for United States) decided which routes were to be serviced, as well as pricing. In the 1970s, the outlook changed and air transport came to be increasingly

sees as just another transport service. Market forces played a major role in fixing air transport prices, and the roles of governments was limited to operational and safety regulations. In the United States, the Air Deregulation Act of 1978 put an end to fixed markets and opened the industry to competition.

Thus liberalization process has spread to many other countries, although with important local distinctions. Many of the former private firms in the US and many former state owned airlines that were greatly protected and subsidized went bankrupt or were absorbed by larger ones. Many new carriers have emerged, with several low-cost carriers such as Ryan Air and North-West Air in USA and now, Air Deccan in India having achieved industry leadership in this low-cost segment. A key outcome of airlines deregulation has been the emergence of Hub & Spoke Networks dominated by a single carrier.

Internationally, air transport is still dominated by bilateral agreements between nations (Graham 1995). The post-war II period saw a momentous growth of air transportation, as it became the leading mode of international movements of passengers. Air Transportation has greatly contributed to cutting distances as it is perfectly tailored to carrying freight and passengers rapidly across continents and oceans. However for safety reasons the organization of air transport at the international level is strictly regulated. As such, for long haul passenger travel, no other modes compete with air transportation.

In many cases such as in North America, air transportation became a significant mode for domestic movements of the passengers. As a result, airspace became progressively more used . They include two major components, one being land-based (takeoff & landing) and the other air based, mainly composed of air corridors. These corridors can superimpose themselves to altitudes up to 22, 500 feet. The geography of air transport is limited to the use of predetermined corridors. Air Transport makes use of air space that theoretically gives it great freedom of route choice.

Strat