

The Airline as we know it

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1. INTRODUCTION

The commercial airline industry as we know it today began on April 22, 1952. That was the day the Board of Directors of The Boeing Company authorized \$15 million to develop a commercial airplane powered by a jet engine and called project 367-80. Old timers at Boeing still refer to it as the dash 80 but we know it as the 707. It was the first successful commercial jet transport and with this tool airlines were finally able to replace ships and trains as the primary mode of long distance passenger transportation in the world.

At the time Douglas Aircraft was the leading producer of commercial aircraft with a highly successful line of piston powered airplanes that started with the DC-2 in 1934, continued with the famous DC-3 (the C-47 of World War II) and climaxed in the 1950s with the DC-6 and DC-7. Along with Lockheed Aircraft, Douglas dominated the production of commercial airplanes while Boeing was a bit player. The 707 changed all that. Douglas, as is so often the case with a market leader, was slow to appreciate the potential of this new technology and so their DC-8 came to market after the 707. Lockheed went in a different direction and developed a turbo-prop (a hybrid consisting of a propeller mounted in front of a turbo jet engine) called the Electra.

The pure jet proved to be much superior to the turbo-prop, and by having the first one in service Boeing soon came to dominate the world commercial aircraft market. Lockheed left the commercial business, and after a brief return in the 1970s left it again for good, while Douglas was merged into McDonnell Aircraft in 1967 as a way to escape bankruptcy. Thirty years later the circle was completed when, in 1997, the now McDonnell Douglas Company was acquired by Boeing.

1.1 Boeing the Leader; Airbus the Challenger

Boeing aircraft defined the future of the airline business as the 707 was followed by the two largest selling models in industry history, the 727 and 737 for short haul markets, and then in 1969 by the 747 which introduced the widebody cabin design of two aisles rather than one. The 747, with three times the seating size of a 707, is still the largest commercial passenger airplane in the world.

The 747 went on to become the most profitable product in the company's line although Boeing "bet the company" with the cost of its development. The early years were so difficult due to economic recessions that in the early 1970s there was a billboard in Boeing's hometown reading: "Will the last person to leave Seattle please turn out the lights". They didn't have to, and over the last forty years Boeing has delivered about 54% of all commercial jet airplanes with Douglas, today part of Boeing, accounting for another 20%. But now that leading position is being challenged by a new force in the field: the European consortium known as Airbus Industrie.

Europe had a long history of leadership in aviation and in commercial aircraft, but the various jet airplanes they designed proved to be inferior, in economic terms, to those of Boeing and Douglas so by the late 1960s the two US producers held 90% of the business. In reaction a multinational company, Airbus Industrie, was established by Britain, Germany and France in 1970 to reduce dependence on "foreign" equipment, facilitate survival of a struggling European aircraft industry and address a market opportunity not being met by the Americans.

The market opportunity existed because, following the launch of the Boeing 747, American Airlines asked for a twin engine, widebody airplane that could operate on domestic routes particularly out of LaGuardia Airport in New York. Both Douglas and Lockheed answered the request, but both proposals evolved during the design stage into three engine airplanes, the DC-10 and L-1011 respectively, which were too large to meet the American mission requirements. Airbus stayed with the original idea and entered the business with a two engine, widebody airplane called the A-300. As it turned out, many years would pass before American bought the A-300, and then not specifically for use at LaGuardia, but there was a market for the airplane and with it the Airbus story began.

Airbus had a slow start. Between 1974, when the first A-300 entered service, and 1979 only 81 airplanes were delivered. However, with their government backing they were able to stay the course, and during the 1980s Airbus developed the smaller A-310 widebody and then the first of its line of narrowbody airplanes, the A-320. These were followed in the 1990s by several more wide and narrow body models, and today Airbus delivers over 25% of all commercial jets and is the only company other than Boeing to have developed a product line that covers almost all of the size and range requirements of the world's airlines. Their market share is expected to grow to between 35% and 40% in the years to come, making them a formidable competitor for Boeing in an industry that has consolidated into just two large companies.

1.2 The Physics of Flight

We have used terms such as jet and turbo-prop that need to be explained. These, of course, are the engines that are mounted on the airplane, but to explain them we need to explain an airplane, as strange as that may sound. For any airplane to operate it must deal with four forces: thrust, drag, lift and weight (gravity), with thrust being the key. Thrust is the power driving the aircraft forward, and it not only must overcome the reverse force of drag caused by the density of air (your hand held out a car window is pushed backward by this force) but must also, in conjunction with the shape of the wing, provide the aircraft with enough lift to allow it to overcome its weight and become airborne.

In flight all four forces are active all the time since an airplane operates in three dimensions and not just the two, represented by thrust and drag, we encounter in daily life on earth. (A scuba diver knows that functioning in three dimensions is very different from two - neutral buoyancy is all about balancing lift and weight, something we never have to think about on land.) In airplanes thrust is a function of the engines, and the guiding principles of engine and airplane development have been summed up by aeronautical engineers in three words: higher, farther, faster. For the rest of us the more conventional words are altitude, range, and speed.

One of the more famous airline accidents in history came on March 31, 1931 when a TWA wood and fabric Fokker tri-motor went down in Kansas killing all aboard including the legendary Notre Dame football coach Knute Rockne. Up to that time there had been a fierce debate over whether wood or metal was the better material for building airplanes. When wood rot was found in the wing of the Rockne airplane the debate was over and all subsequent airplanes were made of metal.

From the beginning a propeller, an idea perhaps derived from a windmill, mounted in front of a piston engine that turned it was the source of thrust, and this worked very well for everything from the Wright flyer to trans-Atlantic airliners. There were, however, limits

to the efficiency of a piston driven propeller which restricted the speed of commercial aircraft to about 350 miles per hour, and the piston engine required oxygen rich air which limited the altitude at which the airplanes could fly. Finally, these engines used a considerable amount of fuel which placed limits on range, so trans-Atlantic trips stopped at Gander, Newfoundland, and Shannon, Ireland, to refuel.

The principles of a jet turbine engine had long been known, they were used in power generation and gas pipelines, but were not applied to aircraft until World War II when Germany built the ME-262 jet fighter late in the war. Following the war the British, who had also developed such an engine, built the first commercial jet named the Comet and it entered service in 1952. Unfortunately, structural weaknesses led to two accidents and the aircraft was withdrawn from operation in 1954 (later improved versions operated until 1997 when the last one was retired) casting a cloud of uncertainty over the future of commercial jet power. Boeing, of course, was already developing the 707 and its first flight came just six months after the Comet was grounded.

1.3 How a Jet Engine Works

A jet engine operates by compressing the air that enters the inlet, speeding it up much more than a propeller can, and this compressed air is ignited in the turbine where the fuel adds to the mass, pressure, and speed of the gas leaving the exit nozzle. Newton's third law says that any force produces an equal but opposite reaction, so the forward thrust comes from the speed of the exiting gas. With this greater thrusting power the three objectives of altitude, range, and speed all increased to the point that today we have aircraft capable of non-stop flight from New York to Asia at altitudes of 40,000 feet (air up there has much less oxygen to burn fuel, but this is OK since much less thrust is needed to cruise in that thinner air) at speeds of 600 miles per hour.

Going faster and higher involves supersonic flight which brings a whole new set of problems, some environmental, that almost certainly will be solved in the future. The British/French built Concorde is the only supersonic commercial airplane today but it is too small, probably too slow and clearly too inefficient to serve as a prototype for a commercially successful supersonic aircraft.

The first generation of jet engines are now not only obsolete in economic terms but illegal from a noise standpoint as environmental forces have demanded ever quieter operating standards, with the latest requirements, called Stage III, becoming effective in the US at the end of 1999 and in the rest of the world three years later. These demands, along with better economics, have been met by mounting a large fan in front of the turbine inlet to move, and compress, more air than the amount that needs to be burned in the turbine. This extra air passes directly out the exhaust and the ratio of it to the air that is burned is called the bypass ratio.

The higher the bypass ratio the more efficient, and quieter, the engines. These large fans are much like a propeller except they are enclosed in a housing, so the latest idea is to place a very advanced propeller without a housing in front of the turbine inlet to produce a new version of the old turbo-prop idea. Early turbo-prop models such as the Lockheed Electra were inferior to jets although many small commuter aircraft have employed this technology for years. The new turbo-props, if built, may be better than jets in terms of fuel efficiency and noise, and their equal in speed and range.

1.4 The Airplane as a Factory

Why start a discussion of the airline industry by talking about airplanes? Because for an airline the commercial airplane is their factory and it manufactures seats which become inventory for the airline. Moreover, the technology that makes that factory more productive is controlled by the airplane manufacturers so airlines must look to them to provide the kind of equipment that will allow airlines to compete successfully against other forms of transportation. This tight symbiotic relationship goes back to the very beginnings of aviation and neither party able to survive without the other. With the jet airplane airlines finally had a factory that enabled them to sweep the field and become the dominant form of passenger transportation in the world.

The seats produced by this airplane factory are a very peculiar kind of inventory. They do not appear on the current asset section of the balance sheet, as inventory does for most companies, because it is not the physical seat that is sold but just the use of that seat on a particular flight. Each seat is used over and over, on average more than 1,000 times a year in the US, so it is never consumed in the normal sense. However, on every flight any seat that is not occupied represents inventory that is lost forever. Therefore, we have the apparent paradox of an airline seat perishing many times a day but never dying. As we shall see, that paradox dominates all airline economic and business strategy decisions.

2. BEGINNINGS AND DEVELOPMENT OF THE AIRLINE INDUSTRY

The first recorded flight with a revenue passenger took place in Germany in March 1912, while the first such flight in the US was between St. Petersburg and Tampa, Florida, on New Year's Day 1914. The providers of these irregular services do not warrant the name "airline" so the first scheduled daily passenger service, and thus the first airline, was established in Germany in 1919. Only sixteen years had passed since the Wright brothers showed how flight was possible but there had been rapid advancements in aeronautics since then, much of it coming as a result of the military demands of World War I. Aircraft really played a small role in that war, although they produced some of its most notable heroes, but the value of this weapon was recognized for reconnaissance as well as combat missions so considerable resources were devoted to airplane improvements.

In the US the needs of a wartime economy and the availability of better airplanes led the Post Office to establish an air mail service in 1918. This was operated as an arm of the Post Office Department until 1926 when legislation converted the service to one operated by private companies under contract with the Post Office, and the first contract flight was performed by an air transport company owned by the Ford Motor Company. Many of the airlines operating today trace their beginnings to air mail contracts they were first awarded in the late 1920s but their dependence on these government awards was also the initial basis for government control of the fledgling airline industry.

The trans-Atlantic solo flight from New York to Paris by Charles Lindbergh on May 20-21, 1927, still ranks as the most memorable event in aviation history. No one foresaw the impact this would have on the public as seventy-eight people had already made the non-stop trip across the Atlantic (none solo), and he was just competing for a \$25,000 prize offered by a New York hotel man for the first non-stop trip to Paris, solo or otherwise. Lindbergh had already made a record trans-continental flight in his airplane, the Spirit of St. Louis, but at the time he was not the favorite to win the prize money. When he did, and did it solo, the public acclaim for his historic achievement translated directly into a greater appreciation of the merits of air travel. This, along with the award of mail contracts, gave the US airline industry its start.

Lindbergh's first direct involvement in the airline industry (he did fly mail for one of the early carriers) was as chairman of the technical committee of Transcontinental Air Transport (TAT) formed in May 1928 and quickly known as the "Lindbergh Line". In this role he had a major influence on TAT's routes and aircraft, and pioneered most of the routes that are still part of that airline, which is now TWA. Early in 1929 he became the technical advisor to Pan American, a company formed just six months earlier that had won all the foreign air mail contracts let by the Post Office up to that time. All of these contracts were in Latin America where Lindbergh was well known and liked following a goodwill tour of the region after his Atlantic crossing. Primitive facilities demanded that the routes be flown with aircraft capable of landing on water as well as land, but despite these limitations, by the end of 1930 Pan Am had over 20,000 miles of routes compared to only 250 when Lindbergh joined them.

In 1933 his work was to explore the possibilities of a route to Europe over the North Atlantic following, as nearly as possible, the "great circle" path he had used on his trip to Paris. Given that the earth is round, despite protestations from the Flat Earth Society, then

the shortest distance between continents, or from one end of a continent to the other for that matter, is not a straight line but a half moon arc going well to the north even, if the trip is long enough, into the Arctic. In the southern hemisphere, of course, it's the reverse and you go south. The Pan Am Atlantic routes followed the lines Lindbergh had explored but his similar great circle path in the Pacific, flown by he and his wife in 1931, could not be used as Russia refused to allow US aircraft to refuel on its territory (sound familiar?). As a result Pan Am had to use the longer central Pacific route using Honolulu, Midway, Wake, Guam and Manila as refueling stops - all of them points made famous in World War II. Lindbergh remained a technical advisor and a Director of Pan Am until 1974, retiring just a few months before he passed away at his home in Hawaii.

From the beginning airlines were considered a form of public utility subject to government regulation and/or ownership. Moreover, in many parts of the world they are seen as an extension of national identity. These attitudes caused the business aspect of airlines to become secondary to national and public service objectives, and therefore, profit, the normal goal of any business, was not seen as a measure of how well the airline was operated. You would think that public service motives would demand the lowest possible fares, but this was seldom how it worked. Government owned airlines in particular often emphasized employment as a primary goal even if that led to artificially high fares, while for most private airlines, such as those in the US, regulatory decisions were often determined more by political than economic factors.

2.1 The Nature and Form of Airline Regulation

For privately owned airlines the normal regulatory process was to accept the costs as reported by the airline and then apply a uniform rate of return to obtain an approved fare level. By insulating the business from market forces inter-company competition, which still existed and could be very aggressive, took such forms as larger seats and grander food. The fact that these amenities raised the cost of doing business was not considered because the regulatory body accepted those costs and allowed the airline to increase its fares enough to cover them and, in theory, earn a modest profit. Of course, those profits often were not achieved because political forces, not market factors, limited the size of the fare increase. This type of economic regulation came rather late in the US. During the 1920s and early 1930s the key involvement of the government was, as we have seen, awarding contracts to carry mail, while operational standards and the control of airways were in the hands of the Commerce Department. Those mail contracts were vital to the airlines in the early years, and amounted to de facto economic regulation, because airlines could not support a business with the small number of passengers they could carry on the aircraft of the day. Therefore, losing a contract could doom an airline while mail contract rates set by the Post Office largely determined their profitability. Few people flew, or were willing to fly, given the pioneering nature of the industry and the considerable risks involved which were due more to the primitive state of air navigation and weather forecasting than to the quality of the airplanes themselves. It took a tragedy to move the US Congress to address these problems, and it happened on May 6, 1935, when a TWA Douglas DC-2 trying to reach Kansas City went down because of unexpected poor weather, a malfunctioning radio and an inadequate fuel reserve. One of the four passengers killed was Senator Bronson Cutting of New Mexico. He was one of the more respected members of the Senate at the time and his death triggered an investigation that led to the Civil Aeronautics Act of 1938. Under it a Civil Aeronautics Authority (CAA) was established to operate air traffic control and

navigation facilities, including airports, while a Civil Aeronautics Board (CAB) became responsible for economic regulation over air fares and routes.

The CAA and CAB remained part of the Commerce Department until 1958 when another accident led to another change. By the mid 1950s air travel had begun to mature into a major mode of travel, but the traffic control system had a limited amount of radar and airplanes none at all. One result was that on September 15, 1954, 300 airliners were circling New York trying to land in pea-soup weather while on June 21, 1956, delays in the same place continued for fourteen hours. No accidents happened on those occasions but on June 30, 1956, a TWA Superconstellation and United DC-7 collided over the Grand Canyon and the 128 deaths made it the worst aviation accident in US history at the time. The direct result was the Federal Aviation Act which placed administration of airways and air safety in the hands of an independent Federal Aviation Administration (FAA), where it remains today, while the CAB was also made an independent agency. In 1972 the FAA was made part of the new Department of Transportation (DoT), but the CAB remained independent.

2.1.a Route Regulation

Along with air fares, the key form of economic regulation was deciding what routes an airline could fly. (A major portion of the route system of the larger carriers was in place before 1938 when this regulation began, with many of them resulting from the award of mail contracts, and those routes were not changed.) Route cases could be started for a variety of reasons such as requests from a city for more service or a determination by the Civil Aeronautics Board that more service was needed. Once begun, all airlines wishing to serve the route or routes could apply for them and, in a quasi-legal proceeding, all the arguments were heard and eventually, always after a year or more, the CAB would render its decision. For the winner it was often a mixed blessing. Winning was the only way to expand the system, but many times the route won did not fit well with the rest of the network. Airlines could only hope that in future cases they would win additional routes that complemented and supported the ones just received. Clearly this is not a textbook way to build a business.

Two stories illustrate the inherent weakness of the route award process of a regulated air transport system. One involves the Trans-Pacific Case of 1969 where the objective was to authorize new service across the Pacific. This was done, but it was also the event that started Pan American World Airways down the road to eventual liquidation. Pan Am was the de facto US flag carrier and as such it took passengers from gateway cities like New York and San Francisco to international destinations. By design it had almost no domestic routes so domestic airlines were willing to turn their international passengers over to Pan Am at these gateways. In the Trans-Pacific decision the CAB changed the rules. They awarded other airlines Pacific routes from inland cities such as Dallas and Chicago permitting them to avoid the gateways and avoid giving passengers to Pan Am.

Over the next several years the same thing was done in European markets. In response Pan Am, quite logically, requested domestic routes so it could compete for these inland international passengers, but all such requests were denied. Before 1969 Pan Am was a consistently profitable, often the most profitable, US airline, but over the next 23 years of its life it reported profits only five times. For Pan Am deregulation came ten years too late.

The second example is more recent and it involves a route between Honolulu and Nagoya, Japan, given to America West Airlines in February 1991. America West was (and is) a very

small airline that had little service to Hawaii from the mainland while Nagoya was (and is) a secondary traffic point in Japan. What Nagoya needed to enable that city to develop this international route in competition with Japan Airlines was an airline with a powerful traffic base in the United States and substantial service to Honolulu. That is not what Nagoya got. Instead of American Airlines, United Air Lines or Northwest Airlines they got America West because the US regulators ignored Nagoya's needs in order to implement their theory of spreading competition. The result was predictable. America West could not attract any traffic because it was not strong on either end of the route and there is a story that on one 747 flight there were just two passengers.

For this and other reasons America West entered bankruptcy in June 1991 (later it emerged and is now a successful domestic carrier) and gave up the route as part of its reorganization. Nagoya / Honolulu is now operated by Northwest. By following a vague policy of increasing competition at the expense of economic and market realities regulators have made many decisions like these and the losers have been airlines, the cities seeking to build air service and, in the end, even the regulatory objective of creating more competition.

2.1.b Deregulation in the United States

As a result of the shortcomings of this regulatory system, primarily its tendency to make air fares too high, the US Congress in 1978 passed the Deregulation Act. This legislation has proved to be one of the most important events in the history of the airline industry. At a stroke it cut all ties of government control over fares and domestic routes and for the first time gave airlines the opportunity to operate as a true business. As could be expected, a period of substantial turmoil followed as entrepreneurs quickly moved in to start dozens of new airlines while managers of the established carriers struggled to adapt to the new environment. In the end all but one (America West) of the airlines launched in the first decade of deregulation failed. Many of them, along with most of the smaller carriers operating before deregulation, were absorbed into the larger airlines as consolidation and acquiring a larger market share became the dominant feature of these years.

Management of all large airlines except United were strongly opposed to deregulation because it represented change to a world none of them could imagine, or were equipped by experience to deal with. Their testimony to Congress filled volumes and sometimes bordered on the hysterical as this author observed when he spent several days sitting in the Washington hearing room. The theoretical basis for deregulation was described in a 1974 book "Economic Regulation of Domestic Air Transport: Theory and Policy" by George Douglas and James Miller III and published by the Brookings Institution. The four years from that book until the passage of the Act in 1978 were easily the most contentious for the industry since the 1930s but, in the end, it was the promise of low fares for the consumer that carried the day with Congress. All economic regulation, along with the CAB, was abolished which, ironically, calmed the worst fears of airline managers. The initial proposals retained some degree of economic control over the airlines so were seen by the industry as just a rearranging of the deck chairs, while full freedom was something they never expected to obtain.

For the traveling public the rewards were indeed the significantly lower fares that were promised by the Act, most noticeable in the number of very low discount fares available to leisure travelers. For the airlines, however, the 1980s were actually less profitable than the

years before deregulation because carriers were still learning how to operate in the new environment. Some learned better than others.

One airline badly misread the political climate, and process, that produced deregulation and it cost them their life. Braniff International was a successful, medium-sized airline operating in the Midwest and Latin America from its base in Texas. The chief executive, Harding Lawrence, became convinced that deregulation would not last and that Congress would reverse itself before long and reinstate economic control over the industry. As a result, after the bill was passed in 1978, he set out to expand into as many new markets as possible before this happened, and the next two years witnessed an orgy of new additions to the system in all parts of the country. The fact that he was wrong about the intentions of Congress is really irrelevant because, whether he was right or wrong, the consequences for Braniff would have been the same. That much expansion that fast overwhelmed the resources of the company, led to massive losses by 1980 and caused the removal of Lawrence from the management. However, this and another change in management in 1981 could not save the day, and Braniff ceased operations and filed for bankruptcy in May 1982.

At the time conventional wisdom said that the public would not fly on an airline that was in bankruptcy so Braniff and the court saw no alternative except to liquidate the company. Of course, we soon found out that this conventional wisdom was wrong when Continental Airlines filed bankruptcy papers in September 1983, closed down for two days, and restarted as a low cost/low fare airline that was immediately accepted by the traveling public. There were some attempts to restart Braniff but in the end just the name was sold and used twice in the coming years by two entirely new startup airlines, both of which subsequently failed as well. Thus the Braniff name (in 1928 Paul and Tom Braniff were the founders) passed into history as the first major casualty of deregulation and the first of three famous names, Eastern and Pan Am being the others, that failed to make the transition from a regulated to a deregulated world.

With the United States adopting an unregulated domestic airline market, our national policy became one of pressing for similar freedom for international travel between the US and other countries. This pressure was not always well received, but a number of countries did sign what became known as "open skies" agreements with the US, and the European Union, representing the second largest air travel region in the world, made full deregulation a part of its economic policy. Only the Asia/Pacific region remains largely restricted, although cracks are appearing in several places. These three regions account for 86% of world airline traffic, and among the others Canada is following the US position as are parts of Latin America. The remaining regions are the Middle East and Africa.

It is important to understand that, except among the countries of the European Union, "open skies" deals with international travel between countries not domestic service within a country. Even in the United States domestic deregulation does not allow a foreign airline such as British Airways to operate a route such as Chicago / Memphis. Such service is called "cabotage" and it is forbidden: domestic markets are still reserved for domestic airlines although pure free market advocates would do away with this limitation.

2.2 The Gulf War: Disaster Spawns a new Strategy

The most recent seminal event shaping today's airline industry was the Gulf War of 1991. Its importance is not related to the fact that it was a war but to where it happened. The Middle East is the key source of oil and terrorism. Airlines use a lot of oil so fuel is a major cost item for them and airlines had become a prime target for terrorist attacks with most such attacks mounted by Middle Eastern groups. It was, therefore, the fear that there could be a rash of such attacks as a result of the war that led passengers throughout the world to avoid flying during and after the Gulf War and produced the first ever year-over-year decline in world airline traffic in 1991. That fear, along with the sharp rise in the cost of jet fuel in 1990 after the invasion of Kuwait, began a four year period when the world airlines recorded losses of \$20 billion with the US carriers accounting for almost \$11 billion of that. The financial trauma of these years is hard to overstate. Five of the twelve largest US carriers went into bankruptcy, two others came close and two of the bankrupt companies, Eastern and Pan American, were liquidated.

Management across the industry reacted to this trauma by changing its business strategy in very fundamental ways, the most significant being to abandon the continuous reach for more market share and instead emphasize cost control and strengthened service in markets where they already held a strong position. They also learned to use the power of their computer reservation systems to put more passengers on existing flights so that they could accommodate traffic growth with a smaller increase in capacity.

Although it is perhaps too early to say this with complete confidence, it does appear that the US airlines are, finally, being operated as a real business where profit and shareholder values take precedence over market share and empire building. Similar trends are being seen in other parts of the world, particularly Europe, and one result of the Asian economic crisis should be that more airlines in that region will also operate on sounder business principles. All of this may not change the basic nature of the airline business, described below, but would make for a healthier industry during all phases of the business cycle moderating, if not breaking, the extreme boom and bust pattern of the past.

3. THE ECONOMIC BASIS OF AIR TRANSPORTATION

3.1 *The Driver behind Travel*

Without travel there would be no need for airlines, so why do people travel and why do they go where they go? At the most basic level we are a restless race. Our early ancestor, Homo Erectus, traveled from Africa to Asia and several hundred thousand years later Marco Polo did the same thing from Europe. Asians crossed the Bering Strait to North America and later the Spanish conquered that new world. Americans made westward expansion the hallmark of their identity as a nation. Human beings, it seems, have an irrepressible urge to be on the go, but underneath it all is an economic driver.

Virtually all travels in human history are about gaining land, or food or wealth - in short, economics. It's no different for air travel. But if air travel is driven by economics it is a very special kind of economics. Air travel is the alpha form of transport. It is the fastest and most expensive mode on a scale where walking is the cheapest, and slowest, way to go from point-to-point. This fact means that air travel is for the wealthy (using the world, not the western, standard for defining wealth) and this is why most air travel today is found in developed countries of the world. It also means that, above the subsistence level, the rate of growth in a country's economy is the key factor in determining how much air travel there will be within that country and between it and other countries.

Given this connection between air travel and wealth it should be no surprise that the airline industry in the US is a relatively mature business. This country probably has the highest level of personal wealth in the world, has held that position for many years, and has had the longest time to exploit the opportunities opened up by deregulation. Total US passenger revenue compared to Personal Consumption Expenditures was growing rapidly until 1980, but has declined since then. At the 1980 peak airline revenue was 1.67% of the Personal Consumption component of GDP while in 1997 it was only 1.47%. It does seem odd that this was a growth industry when it was regulated but became mature at almost the same time it was deregulated, but that is what the data says. After deregulation traffic expanded almost three fold, but because air fares, on average, declined over 38% in real terms revenue failed to keep pace with growth in the overall economy.

Europe, where deregulation has just begun, appears to be in about the same position the US was in 1978 and it will be interesting to see if, over the next decade, their growth matures as it did here. Asia / Pacific was in a rapid growth stage before the recent economic troubles and most observers expect that growth to resume within a few years. Indeed, it is still expected that the region will pass the US by about 2015 to become the largest in the world in terms of total airline traffic, and one reason is that China will more and more dominate its economic trends. This suggests that Asia / Pacific is about where the US was in 1960 when twenty years of strong growth was still ahead. Among the other geographical sectors Latin America may be on the steepest growth curve of all, although from a very small base, while Africa lags the furthest behind. Canada is somewhere between the US and Europe as is the Middle East whose growth is closely tied to the fortunes of the oil industry.

3.2 Travel is an Intermediate, not End, Product

Unlike most consumer services air transportation is not an end product but an intermediate one, used only when it is necessary for someone to satisfy another personal or business need. No one gets up in the morning and says that today I am going to take an airplane ride unless they are part of that small minority that have their own airplane. In the early days of aviation many people did do that because the experience was so new and unique that flying was a thrill in itself; you didn't have to go anywhere, just fly, and barnstormers traveled throughout the country offering people that chance. Now the airplane is just another mode of transportation and that means the airplane ride is not the key activity. The desire to reach a vacation resort or a place where business can be conducted is the key and the airplane trip just a necessary intermediate step to achieve that end.

This intermediate nature of air transportation is one reason it is, in economic terms, a commodity. An analogy can be made to a bushel of wheat which is a commodity for two reasons. First, nobody wants a bushel of wheat, what they want is a loaf of bread or a cake, so, like air transportation, wheat is an intermediate material needed to achieve the desired end product. Second, every bushel of wheat is just like every other bushel, so no producer can make his different from any other. In the same manner every airplane seat is just like every other seat. There are, of course, different grades of wheat and there are first class and coach seats, but for the most part wheat is wheat and a seat is a seat.

Since neither the bushel nor the seat has any value as an end in itself, economic theory says that its price will tend to seek the lowest possible level under the supply / demand conditions that prevail. Moreover, assuming the supply is adequate, the unit profit margin to any supplier will be very small. It is possible for a gourmet food shop to charge an upscale price for its cakes and cookies but there is no such thing as an upscale price for a bushel of wheat. So too with the airline seat. Viewing air travel this way helps us understand why we have frequent price wars in the US and on some international routes, particularly when new suppliers are trying to enter the market.

3.3 Producers Seek to Control Supply of a Commodity

This commodity characteristic is the force driving the intense effort of airline management's to gain a greater degree of control over, and even domination of, the cities and routes they serve. The only way any producer of a commodity can hope to manage its price in a way that improves profit is to control the supply. The rash of US airline mergers in the 1980s and recent moves by airlines throughout the world to enter into code sharing alliances across national boundaries are driven by this desire to control the supply of a commodity product. By doing these things they expect to realize a better price, or gain more traffic at the same price, than would otherwise be possible. The establishment by US carriers such as United, Delta and USAirways of no-frills, "shuttle" or "express" alternatives to their full service product in order to compete more effectively against new, low fare airlines is another example of this drive to obtain better control of markets.

It must be said, however, that while an airplane seat is a commodity it is not as perfect a commodity as is wheat. Airlines do have brand names, and those names do influence consumer choice as we found out after the ValuJet accident in Florida when passengers in large numbers stopped using all newly-formed airlines and booked their trips on the established names. This brand preference is a factor in the marketplace and some airlines

refer to its benefits as the "revenue premium" they are able to obtain because of their well-known brand name. Nevertheless, any such benefits are marginal and it remains true that price, particularly for leisure travel, is the top priority with most consumers.

Of course, in many respects any effort to control markets is a zero sum game because, with most competitors likely to follow the same path, none can be expected to achieve the measure of control over markets, or the amount of profitability, they seek. There is an old adage that says in the history of civilization no one has ever made money transporting people for hire. We cannot verify this for Roman chariots but it is certainly true for stagecoaches and railroads and, despite all the improvements in business strategy, in the end it may prove to be true for airlines as well.

4. PRODUCING AND DISTRIBUTING THE SERVICE - HOW THE INDUSTRY FUNCTIONS

4.1 Air Service from a Passenger's Perspective

You have two trips to make. One is for business four days from now and the other is a long awaited ten day vacation to Europe in two months. You live in a medium-sized city working in a branch office of a large company and the need for the business trip just came up this morning. If your company has a corporate travel department you call them to arrange the flight, hotel and car since this is what company policy dictates. Many large companies have been able to work out arrangements with some airlines whereby they obtain discounts even for last minute travel arrangements and you must use those airlines unless they simply cannot meet your needs - but proving they don't to the travel department may be only slightly easier than proving to the IRS that you don't owe more taxes.

You don't care what the price of the ticket is, you just know you have to leave by 7:00AM Monday morning to arrive in time for lunch, and you know you must return by 2:00 PM on Wednesday to get home in time for your daughter's basketball game. You also know that both legs of the trip will involve changing planes at one of the four hubs which different airlines serve from your town because that's what you do on every trip. There are rumors that one of those airlines plans to fly directly from your city to the place you're going with a new 50 seat jet but it's not available yet - you wish it were. You would give anything to avoid going through that hub again and face the risk of delay or missed connections - last time it was a quarter mile sprint to the gate to make one.

As it turns out the airline the travel department favors is fully booked so they tell you to make your own arrangements. Now you must check all the other ways of getting to your destination, which you can do on your office computer over the internet or with a local travel agent, and you soon realize that having several hubs to choose from opens up a lot of options. With them you have no trouble finding seats on flights that exactly meet your needs - maybe there is an upside to sprinting between gates other than an unplanned aerobic activity.

Although you are only going 600 miles the round trip price is \$700 but, of course, you don't care about that. It's just that when you get on the plane the person next to you, going the same place you are, brags about paying only \$175 for the same seat, same cup of coffee, same peanuts and same sprint. Funny system, you think. There is just one thing that annoys you. That seat mate came on board before you did with two shopping bags and two suitcases full of stuff for the grandkids and these now completely fill the overhead bin so your briefcase and small overnight duffel bag must both go under your feet. You remember that one of the other airlines serving your town recently limited carry on to one bag plus a briefcase and you now wish this airline had the same rule - you hear they are planning to but apparently not yet, at least not on this flight. Still everything works and you make the connection with just a brisk walk which gets you on the next leg before your seat mate so this time you can use the overhead. More important, the return trip is on time so you make the basketball game with room to spare.

Now you can think about Europe. No need for the travel department here - it's your money and they don't book personal trips anyway. But it is your money and now price is of great

importance. You would use some of those frequent flyer miles you have accumulated but you are going during one of the blackout periods that apply to them so you call your sister-in-law the travel agent. She comes up with several options: if you would like business class (who wouldn't) the round trip price is over \$4,000 - you say thanks. A coach seat on the days you prefer is a more reasonable \$800 but she says that if you can leave a day later than planned, and come back a day later as well, there is a special going on for \$300. It's a test to see how quickly you can say yes. Shifting the trip a day is no problem and you can't believe that a 3,000 mile trip will cost less than half as much as that earlier one of 600 miles. Again you think, funny system.

There is one catch. This flight leaves from New York so that means changing planes at your friendly hub and then again in New York. There are international flights out of the hub - lots of them, but not at \$300. Moreover, since you have to be in New York several hours before the international flight departs getting there from home will pretty much kill a full day. You don't like this but for the price it is worth it, and besides you are on your own time so its like making \$500 for the day which is more than the company pays you for working.

Oh, and by the way, the international flight is to Brussels and you wanted to go to Amsterdam so there will be a two hour train trip at about \$50 on the other end. Again you say OK and reduce that daily pay to \$450 - still enough to pay for some extra things you wanted to buy in Europe but felt you couldn't afford. In the end you changed the days of travel, used a less than a direct route and took considerable extra time in transit, all to save \$450. The funny thing is you are happy, particularly so when you brag to your seat mate about your price and find that he paid \$1,200.

All these peculiarities in planning and paying for airline trips arise from the imperatives of the airline business and the route systems and pricing practices that have evolved to meet them.

4.2 Hub-and-Spoke systems replace Point-to-Point

When the industry was regulated building a route system could be done only by participating in all of the numerous route award proceedings that were held by the CAB. These were, as noted, quasi-legal proceedings, the results of which were almost never based on economics but on vague government policy objectives such as balancing competition. By the nature of the process all of these routes were point-to-point, meaning they connected one city to another, so a passenger with a complex itinerary involving several cities often had to transfer to another airline to do it. He could buy the entire ticket from the original airline and then "interline" with another airline at the connecting city. Following the 1978 Deregulation Act airlines quickly began to change their route systems to build up those regions where they were strong and eliminate routes where they were weak. The adopted strategy is called hub-and-spoke, and it became the basis for building a system because it enabled an airline to compete more effectively in a particular city or region of the country.

The hub strategy is based on having a large number of flights into and out of an airport, the hub, within about a two hour period, a process that is then repeated several times a day. Each of these periods is called a "bank", although at the largest hubs there are now so many banks that it has become difficult to identify specific ones and this has led to the concept, and term, "continuous hubbing". The hub process enables passengers in any city, the spokes of the system, to have one stop or two stop service several times a day to just about

anywhere in the country on the same airline. The system evolved because most cities do not have enough traffic to support point-to-point service to any but the largest metropolitan areas, and then often with just one flight a day. By using a hub an airline can provide those cities with several daily flights to and from the hub, so passengers can connect, at the hub, with one of several daily flights going to their final destination. The passenger thus gets a much greater choice of frequencies while the airline obtains a higher load factor by consolidating passengers going to or from many cities onto one flight.

A not incidental benefit for the airline is that they gain greater control over their markets and do not have to share the revenue with others as they did when interlining was common. Much has been written about the economics of hub operations, a great deal of it negative because of the expense of operating one, but a hub has powerful attractions. One is control over most of the traffic in the region which directly serves the objective of controlling the supply of a commodity product. Hubs are also the only feasible way to move the huge volumes of traffic going to dozens of different places. This exactly describes domestic air travel in the US, but in many parts of the world air travel takes place largely between a few major population / business centers where point-to-point operations work well, making hubs unnecessary. The advantages of a hub must be measured against the fact that hubs are more expensive than point-to-point service for both the airline and, in terms of travel time and/or cost, for many passengers as well. This fact has limited the number of true hubs and has caused a rebirth of point-to-point flying in a number of markets.

4.3 Point-to-Point Stages a Comeback

By their nature hubs tend to become very congested airports, and the decade of the 1980s was the high water mark of US hub development. Since then the number of hub airports has declined, although the very largest ones such as Dallas, Atlanta, Chicago and Denver continue to be expanded. Overcrowded hubs, the growth of traffic in many secondary cities as corporations moved activities to these areas to lower their costs, and the development of new airplane types have made point-to-point service feasible in more markets. Moreover, there isn't a passenger anywhere that wouldn't prefer a non-stop flight to one requiring one or more stops, so it has never been a question of the demand for this type of service.

An early example of this shift is found on North Atlantic routes to Europe. Through all of the 1970s and into the 1980s the Boeing 747 was the airplane of choice in all international markets, and it is still the flagship of many fleets. Its very large size, however, meant it was suited only to those heavily traveled routes where a profitable load factor could be obtained, and so it tended to move traffic between such international hubs as New York and London or Paris where passengers connected to another flight to reach a different destination. Beginning in 1982 with the Boeing 767 long range airplanes, much smaller in size but offering the comfort standards of the wide body cabin made popular by the 747, became available.

These aircraft enabled airlines to fly directly from many US points to European cities that could not support 747 service and/or offer greater frequency to those cities that could. Today trans-Atlantic service is largely operated by 767s and other similar types. Now the same trend is developing in the Pacific, because long range Boeing 777 and Airbus A-340 aircraft are specifically designed to allow non-stop flights from all parts of the US and Europe to almost anywhere in Asia without going through hubs such as Tokyo.

In domestic markets, largely US and European, new smaller airplanes from the 50 seat regional jets to the Boeing 717 and 737-600/700 and Airbus A-319 are opening up the same options. Airlines in all operating environments (short haul, long haul, domestic or international) have shown that they will always opt for smaller airplanes with which they can offer greater frequency in preference to larger equipment. In economic terms they are saying that the revenue and earnings benefits of smaller aircraft and higher frequency outweigh the lower unit cost advantage they could obtain by using large airplanes.

The proof comes in the fact that in the ten years since 1988 the average size of the world fleet has remained unchanged at about 175 seats, while the US fleet has shrunk to 160 seats from 168, despite all forecasts that expected it to grow. With these new airplane types we should see much more point-to-point flying in the future. Airlines will not only find it easier to obtain a profitable load factor and yield on the smaller number of seats they contain but the competitive force of passenger preference will demand it. In terms of pure volume most traffic in the US will continue to flow through hubs, but much of the growth is expected to be in point-to-point service.

4.4 Southwest: the Prototype Point-to-Point Airline

The leading exponent of point-to-point flying is Southwest Airlines. What may be the most famous napkin of all time is the one that Rollin King used to draw a triangle with the cities of San Antonio, Dallas and Houston at the points. He said to his lunch companion, Herb Kelleher, "Herb, let's start an airline". Herb's response was "Rollin, you're crazy - let's do it". Thus was born, in 1966, the idea that became Southwest Airlines, and today it is easily the most successful airline in the US and perhaps in the world. When it began operations in 1971 the industry was still regulated but as Southwest served only cities in the state of Texas it was not under the economic control of the CAB. Its example was another intra-state airline, Pacific Southwest Airlines (now merged into USAirways), that had been operating in California since 1949.

Southwest does not run a hub-and-spoke system but rather offers point-to-point service with a high number of frequencies in mostly short-haul markets at very low prices. The original concept, still the hallmark of the company today, was to win passengers that would otherwise drive between cities that were 300 or so miles apart. It worked, in spades. Today, thanks to deregulation, Southwest covers a large portion of the US, and in the process they have developed several key cities that function much like hubs. Southwest, however, does not operate them with banks of flights like a conventional hub, but because there are so many flights coming and going through each one it is possible for a passenger to reach most cities in the country on Southwest, making between one and three stops to change planes.

With their low prices this also works, but perhaps the real key to their consistent profitability (they have not lost money since 1972, the second year in business) is disciplined growth. They have never added too many airplanes to the fleet too fast or tried to enter too many new markets too quickly - by contrast, the inability to control temptation in one or the other, if not both, of these areas is the chief reason almost all new, startup airlines have failed. For Southwest the result of this discipline has been substantial and steady growth, with revenue up 400% in the last ten years, and a high level of net profits which averaged 6.6% of revenue over that time.

Southwest may be the textbook case of how an airline should be run, but its greatest compliment might have come in 1994 when United Air Lines converted a portion of their system into a new low fare, no frills airline called "Shuttle by United", specifically to be able to compete against Southwest in US west coast markets. Since then both Delta and USAirways have established similar operations on the east coast, again largely to meet the challenge of Southwest. For all three the routes operated are point-to-point, bypassing even the major hubs of those airlines.

4.5 Cargo

For a passenger airline cargo is a byproduct. All airlines were originally cargo companies as the only economic activity that could support regular air service was air mail contracts obtained from the government. That was then. Now an airline's schedule is determined by passenger traffic flows, but the airplanes making most of those flights have more room in the belly than is required to carry passenger luggage, and this is available for cargo.

All of the economic characteristics described for passenger service apply to cargo: an intermediate service of a commodity nature with marginal cost pricing. However, as a byproduct cargo pricing can be even more marginal than that for passengers, and this makes it particularly difficult for those airlines that are entirely cargo carriers. That is a key reason why such cargo airlines use mostly old airplanes which are no longer economic for passenger service and are, therefore, cheap enough to be profitable in an all cargo fleet. Some products can, to some extent, escape this pricing trap because they are perishable (flowers are an example), have a time urgency (such as designer clothes), or lend themselves to serving "just in time" inventory management which many companies have adopted.

The ultimate example of the ability of a cargo airline to charge a premium price for just in time delivery is the now ubiquitous FedEx. Started in 1971 it, along with a number of competitors, has become an indispensable part of business life throughout the world and, as is the case with the last minute business traveler, the price of the service is usually not a relevant consideration in deciding whether to use it.

5. PRICING AND MARKETING

5.1 Management by Engineers with Safety First

In the early days of the industry senior management was dominated by engineering types. These founders of the industry were aviators, and their main interest was the airplane with the commercial aspects of carrying mail and passengers largely an excuse for being in aviation and a reason to be able to buy more airplanes. Nevertheless, that pioneering group led the industry from the beginning all the way to the jet age. Along the way they developed an acute sense of passenger service as well, but service to them largely involved such things as better seats and food because, under regulation, pricing and marketing (new routes) were essentially in the hands of lawyers who argued cases before the CAB, leaving little need for them to develop skills in these areas.

Perhaps the foremost engineering concern was safety because from the earliest days the founders knew that unless air transportation was safe few would use it. Airline safety is somewhat like motherhood and the flag, no one can be against it but most of the things said about it are platitudes at best and political stump posturing at worst. Why does airline safety make such good press (it has always been a good fallback subject for a reporter looking for a story to get him on page one) and why, despite the superb safety record of the airline industry, does the public still have a real fear about safety when they fly? The answer is in our genes.

We evolved as a terrestrial animal that only feels secure when its feet are on the ground. At one time our early ancestors were arboreal and our closest genetic cousins, the chimps, are still comfortable climbing and sleeping in trees. We climb trees, mostly before the age of twelve, but few of us can claim to have no fear of the heights involved even if we are only a few feet off the ground. On the ground we feel we are in control of our destiny but off it we are not. Flying is the ultimate loss of control for the human primate species. Every fiber of our genetic makeup screams at us that this is wrong, that we cannot survive in this environment and that we must get back to land as quickly as possible.

It is testimony to the reasoning power of our brain that it is able to overcome this genetic message and allow most of us to feel reasonably safe in an airplane. However, for some like John Madden the genes take over and flying is an impossible, or at best a terrifying, experience. Yet many of these same people, as well as a lot of others, have no concerns about driving a car at high speed in heavy freeway traffic, an activity that is acknowledged to be much more dangerous than flying on a commercial airplane. However, that is on land and on land our genes tell us we are in control. This fact of human nature was well understood by the airlines from the beginning so safety has always been a primary, if not the primary, concern of management.

5.2 From Financial Managers to Airline Managers

While engineering, and in particular safety, remain critical concerns for airline managers, the immediate need shifted toward financial types in the 1980s as takeovers and mergers swept the industry, and a number of financial people became Chief Executive Officers. This went along with a rearrangement of the competitive order following deregulation, and in the process market share became a, if not the, key strategic objective for management.

Several significant pricing and marketing tools were developed to serve that market share objective, notably frequent flyer programs and yield management systems, but consolidation and market share were the chief focus.

The financial problems that followed the 1991 Gulf War were, to no small extent, exacerbated by that obsession with market share. Partly as a consequence, some chief executives have now come into the industry from other fields and they bring a broader view of business priorities, with the emphasis shifting to profit and shareholder values rather than being centered on the type of airplane or size of market share. This brings with it a more balanced view of the role of each activity so that costs, fleet strategy, revenue management, and market share are all integrated to serve the end of producing a successful, profitable business. In the process pricing and marketing, as discrete activities, have gained a stature they generally lacked in the past.

5.3 Airline Marketing: To Whom?

What is airline marketing? Remember, we are dealing with a near commodity service where brand name is much less significant than it is for other consumer products or services. The starting point is to determine to whom you will market your product and where it will be sold - that is on what routes. United Air Lines has a study showing that 6% of its customers generated 37% of its revenue. United labels these customers the "Road Warriors" and the meaning is clear - people that travel every week, spending almost all of their work time on the road. At the other end of the scale 32% of the passengers produced just 9% of revenue; these are the occasional leisure travelers for whom price is paramount. In between these two groups there are six other categories of which three business and one personal travel segment, more interested in service than price, represent 35% of passengers and 40% of revenue. The remaining two are a price conscious business segment and a moderately price sensitive personal travel group that represented 27% of passengers but only 14% of revenue.

This breakdown is probably typical for most large US airlines, and it says that 59% of the passengers account for just 23% of revenue. Clearly, intensive marketing to these groups would be very unrewarding. Indeed, the real question might be: why even operate the airplanes whose seats would be filled by them? Of course, the issue is not that simple as most if not all of the flights in a scheduled system must be operated to properly serve the remaining 41% that provide 77% of the revenue. So the pricing and marketing issues become how to attract more of the favored groups and just enough of the others to make sure each flight departs with the highest possible load factor.

Before getting into that there is a related question, and it has to do with the size of the airplane. The imbalance between the number of passengers and the amount of revenue is a key element in holding down the average seat size because, to expand on the phenomenon described earlier, greater frequency is very valuable to the road warrior as is point-to-point service that bypasses hubs. Moreover, with a smaller airplane a greater percentage of the seats can be allocated to the favored groups, so it becomes both a tool to attract more passengers of this type and to increase average yield.

5.4 Frequent Flyers: Get Them and Hold Them

The first tool developed to attract, and hold, the road warrior and other premium groups was the now ubiquitous frequent flier program. Launched by American Airlines in 1981 these programs are now so widespread, with mileage awards given for everything from hotels to automobile purchases, that they have lost much of the marketing power of the early years. Still, no airline can afford to be without one, and it remains true that programs at the largest carriers are more valuable than others because more destinations, particularly overseas, can be offered, although this can be somewhat overcome by having joint programs with leading international airlines. The travel liability represented by the outstanding mileage awards is a contentious accounting issue and finally led to the placement of expiration dates on miles earned.

5.5 The Route Structure as a Marketing Tool

It is probably fair to say that the starting point for any airline in its marketing program is the route structure, and this usually means its hub or hubs. In the beginning there was a proliferation of hubs as carriers believed this was the way to gain a foothold in, and eventually dominate, new areas of the country. Soon, however, they learned that many of these were a hub too far, and those established in smaller cities could not develop enough traffic to be profitable. There followed a move to cut the number of hubs and consolidate service into "fortress" hubs such as Atlanta for Delta or Dallas for American.

Adding another flight at one of these fortress points has a multiplier effect on all of the other flights and increases the "hub premium" that accrues to the dominant airline. This means, for example, that an airline offering 60% of the flights into and out of a given hub can expect to gain 70% of the traffic (these percentages are illustrative, not actual), and this ratio rises as the percentage of flights increases. This is a powerful marketing tool because the gathering power of the hub sweeps up all traffic, premium and other, most of which has a limited number of options to fly on other carriers to meet its travel needs. Once the airline has gained control of the passengers the remaining job is to price the product to its best advantage.

5.6 Yield Management - Keystone of the Marketing Program

Without doubt the most important marketing and pricing tool in the industry is yield management. This was developed initially in the early 1980s, and at its most elemental level it is not a system for selling seats but rather is a "don't sell" system. That is, the essential concept of yield management is founded on the fact that usually the earlier a passenger books and pays for a trip the lower the price he/she will be able to obtain. Moreover, it is likely that most of these long lead time buyers will be traveling for personal reasons, such as vacations or family holiday visits, and thus are very interested in getting the lowest price and are willing to meet the restrictions that apply to those prices such as staying over a Saturday night before the return trip. These passengers are part of the 59% that produce less than one quarter of the revenue. The airline wants to serve them but not at the expense of the later booking business traveler who is willing to pay a higher price and doesn't want to, or can't, meet the restrictions that apply to lower ones.

The yield management program must limit the number of seats sold to the early birds, this is the "don't sell" aspect, so that inventory is available closer to the flight's departure date to serve the premium price buyer. Of course, on the day of departure any seats that are not sold are about to become worthless so in the last hour before the flight the price again drops as those seats are offered to "stand by" passengers willing to take the risk and uncertainty that such seats will be available. On the other hand, if more seats have been sold than there are seats on the airplane, you will hear the familiar announcement by gate agents offering free tickets or a cash bonus to anyone willing to give up their seat. Yield management programs allow overbooking based on past history of the number of passengers that are likely not to show up for a flight, but in these days of record high load factors it is becoming more difficult to rely on that history. Both empty seats and overbooking are expensive for an airline, although overbooking is the only one with a direct cost, and yield management walks a fine line in trying to keep both to a minimum.

It all sounds simple, but consider that each airline has several hundred flights every day, and every one of them has a different profile of the type, and number, of passenger that normally uses them. Then multiply that daily total by up to 365 days, since some people book a year in advance, and the magnitude of a job which can only be done with massive computer power becomes apparent. Flights at 5:00PM on Friday have a very different volume and mix of passengers from those at 1:00PM on Tuesday, both are different if the flight is departing from a major hub or a small spoke city, and all of them are different in February than they are in August. (There is a story told by the comic Myron Cohen where the punch line is "everybody got to be somewhere". Well, every airplane got to be somewhere all day, every day, and some of those somewheres produce much more traffic than others).

The yield managers use elaborate mathematical models to assist in the determination of how many seats on each flight should be allocated to various price "buckets", and these quantities are continuously updated as seats are sold through travel agents, company reservation systems, and electronic systems over the internet. In the end, however, yield management is as much an art as a science, and the manager is often faced with anomalies that cause bookings on a particular flight to depart from the established profile. This requires changing the program for that flight and in making such changes the manager has to use judgment based on experience.

Over the years the cumulative effect of these judgments, and of experience with the underlying math, has refined the yield management system to the point where the airline has become much more adept at predicting traffic flows for all types of passengers. The rewards of this knowledge are that an airline is now better able to match airplane size with market needs and obtain higher load factors on all flights. In 1991 the domestic operations of the Major US airlines had a load factor of 61.3%, but just six years later, in 1997, the domestic load factor was 69.6%. This more than eight point increase had never happened before. From the beginning of the jet age until the mid 1980s the annual domestic load factor wandered between 55% and 60% with only occasional years above or below that range, while in the late 1980s it held level at just over 60%.

The ability of the industry to achieve load factors once thought to be impossible without incurring severe traffic spill is a direct result of improved yield management. They were achieved despite a relatively modest 4.2% annual rate of domestic traffic growth during those years, so the average ASM capacity growth could be limited to just 2% a year. Therefore, revenue per flight and RASM (revenue per available seat mile) grew without a significant rise in yield, which was up just 0.8% a year over that time, and airlines were

able to avoid a considerable amount of capital spending for additional aircraft which would have been required had loads remained in the 60% area. It is not much of an overstatement to say that the industry earnings recovery from the huge losses of the early 1990s to the record level of 1997 is due primarily to better yield management.

6. COMPETITION - CHALLENGE, RESPONSE AND THE ROLE OF GOVERNMENT

6.1 Reprise - The Airline Trip from a Passenger's Perspective

When visiting your company's home office you work out at the health spa and find next to you the recently retired chief executive officer of the airline on which you recently made your trip to Europe. You chat, and you tell him about the things you found peculiar about your recent two trips. He explains them in much the same way as what you have just read, but you say there are other things that bother you. He has free time so suggests lunch.

The first thing you bring up is the fact that the trip from New York to Brussels was on Sabena, the national airline of Belgium, although it was listed, even on the airport announcement board in Brussels, as being a flight on his airline. You also mention a newspaper article that said the government was requiring his company to give up landing and takeoff slots at one of the crowded airports - you say you thought the government was out of the airline regulatory business. Then, when you were in his New York terminal, you noticed there was a separate area for a service called a shuttle and wondered what that was and how it fits with the rest of the airline. He sighs, sits back, and begins a dialogue that consumes the afternoon. Actually he expects to enjoy the experience, since he started in the industry in the 1940s as a baggage handler just out of the Army and he already misses the day-to-day excitement of the business.

6.2 A Global Industry Learns to Compete Globally

During the 1980s consolidation in the US involved mergers and this, along with the financial problems that came in the wake of the Gulf War, thinned out the industry leaving three giant air transport systems (American, Delta, and United), three other large systems (Continental, Northwest, and USAirways) and three smaller ones (Alaska, American West, and TWA) along with, of course, the ever expanding Southwest. In the breakup of Pan Am and Eastern in the early 1990s American acquired the Latin America operation of the latter, making them the largest US carrier in the region. Delta acquired the European routes of Pan Am while United obtained most of the Pan Am Latin America division. Well before this, in 1986, United had purchased the Pan Am Pacific operation. As a result the three giant systems, which accounted for 55% of the Major's domestic traffic in 1997, now held 66% of the international business and that made them major players in the global air transport market. In recent years most of the growth for all three has been in these international systems.

All of the economic forces and characteristics that pertain to in the domestic air travel market apply to these international routes as well, but it quickly became apparent that mergers were not a feasible way to gain a stronger international market position. For one thing US law prohibits a foreign airline from owning a controlling interest in a US airline, and other countries are no more eager to see a US airline own one of theirs even should their law permit it. Another method had to evolve, and that was code sharing alliances.

Alliances can range from a loose agreement to cooperate in some markets and share frequent flyer programs to an almost complete integration of schedules between the two airlines involved - somewhat like a merger without the financial aspects. Most of the recent

alliances are closer to the latter than the former with the most significant proposal being that between American and British Airways. This agreement encountered severe regulatory problems at the European Commission because the two airlines will have about 60% of the total US/England market, and 70% of the New York/London portion, but it has been approved subject to the surrender of over 250 weekly takeoff and landing slots at the two chief London airports. This condition will not, however, prevent the companies from achieving the economic objective of market domination and hub premium that have proven to be so valuable at large domestic hubs.

The other large US/European alliances are the Star group of United, Lufthansa and Scandinavian (SAS), and Delta in two groups, one with Air France and one with Sabena and Swissair - that trip to Brussels was within this group which is why you saw the Delta flight number on the Brussels announcement board. With these alliances the US/European market is now largely in the hands of three giant systems, and all of the other airlines on both sides of the Atlantic are likely to be in a permanent minority position. All of those other airlines, as well as the participants in the three giant systems, have alliances in other parts of the world such as Latin America and Asia, but none of those relationships are as fully developed as the big three between this country and Europe.

6.3 Alliances go Domestic

For some time analysts have speculated about the possibility of more mergers in the domestic industry, but they have not happened. One reason is that any merger involving one of the big three would very probably encounter antitrust objections, but the major barrier is labor. Any combination would envision a reduction in the combined number of employees in order to realize the necessary financial benefits of the takeover, and labor knows this very well. In 1996, when USAirways was in financial difficulty, they offered themselves to both United and American and both declined, primarily because of the great difficulty they would have integrating the seniority lists of pilots and other labor groups even if there were no significant layoffs. Then, early in 1998, Continental and Northwest announced an alliance that would essentially bind their two systems into one without having to deal with the problems raised by a merger. This was quickly followed by a similar move between Delta and United and between American and USAirways, meaning that the six largest US carriers are evolving into three systems and two of those systems include the participants in all three of the largest European groups as well. Truly, the age of the mega-global air transport system is upon us.

That is if all goes well. While the three domestic alliances are not mergers, they raise the same questions, particularly the one involving Delta and United, and it is not clear what action, if any, the government and/or labor will take to limit or even prohibit these combinations. What is clear is that those alliances would make life much more difficult for most other airlines, so strong opposition can be expected from that quarter.

6.4 Government Still a Key Player

Mergers or alliances between or among airlines in this country or in Europe are subject to the same governmental review and approval that apply to similar proposals in any industry under laws that govern antitrust or anti-competitive behavior. Until a few years ago this oversight for airlines was entirely in the hands of the Department of Transportation but

now the Department of Justice has the greater voice. In Europe this oversight is new as it came only with the full development of the European Union, and its powers in this area are lodged with the Economic Commission (EC). The merger of Boeing and McDonnell Douglas in 1997 encountered much stiffer resistance at the EC than it did with the US Justice Department.

Although economic regulation over routes and air fares was abolished in 1978, the government remains a major factor in the industry apart from antitrust, and all of it is administered by the FAA and DoT. All airlines must be certified as "fit", meaning that the officers must have the experience to operate an airline and company operating systems must be adequate to maintain and operate the aircraft safely. All pilots, commercial and other, are licensed by the government, have to pass regular physical exams, and must retire from commercial flying at age 60. Maintenance personnel are also licensed, as are the maintenance facilities and every airplane part that is replaced during maintenance work. Every aircraft and its parts must have a complete paper trail that government inspectors examine more or less regularly, and most of the fines imposed on airlines are for shortcomings in the maintenance of this documentation.

Then there is the airport and airways air traffic control system - the interstate highway network of the air. Air traffic controllers are government employees which is why, when they went on strike in 1981, President Reagan terminated two-thirds of the work force for violating the prohibition against strikes by government employees. Airlines file flight plans before departure and can modify them only upon approval of the traffic controller. There is a new concept called "free flight" being discussed that would allow aircraft the discretion to use more direct routes without staying in the rigid corridors now prescribed, and reduce in-route traffic control to one of maintaining airplane to airplane separation, but for now that remains a proposal.

The most intense traffic control work comes in the terminal, or airport, area and that is where most weather or other delays occur. Delays are most frequent at major hub and large metropolitan airports and several of these, such as LaGuardia and Kennedy in New York, O'Hare in Chicago and National in Washington, have become so crowded that "slot" controls have been imposed. These controls place a limit on the number of landings and takeoffs (each one being a slot) that are permitted within a given time period and that leads to a shortage of slots relative to demand. This makes all slots at controlled airports very valuable to the airline that has them, but whether having them means owning them is a controversial issue. Some such slots have been sold, and those sales have been allowed to stand, but in a few cases the DoT has required airlines to give up such slots without compensation to make room for new airlines that otherwise could not serve the city in question in the prime traffic hours of the day. This is what happened at London's Heathrow and Gatwick airports as the price for EC approval of the American/British Airways alliance.

Probably the most important government involvement, at least so far as the passenger is concerned, is the area of airline safety. The investigation of accidents, fatal or otherwise, is in the hands of the independent National Transportation Safety Board (NTSB). If they determine that some changes in airplane design or systems are needed to prevent a repeat accident their conclusions are not binding, but must be implemented by the FAA in the form of an Airworthiness Directive (AD). There are several levels of urgency in these ADs from some that can be accomplished at the next regular C or D check to those that must be done immediately, with all airplanes of the type involved grounded until the work is completed. As might be expected, the NTSB and FAA are not always on the same page over

these issues with the former being much more conservative than the latter. The FAA considers the economic effect of any recommendations on the airlines and/or passengers in addition to the pure safety factor. An example of one of the more prominent of these differences is that of requiring child seats as is the case in automobiles. No one questions the greater security provided by these seats, but the economic dilemma becomes clear when you realize that this means parents must buy a seat for the infant who now flies free and sits on their lap unless the adjacent seat happens to be vacant. Safety is often not an absolute black or white thing.

Then there is airplane noise. Once upon a time airports were out in the country, but urban development, and the economic pull of the airport itself, have caused most of them to become surrounded by homes and businesses. People don't like noise, particularly near their homes, and people vote. Airplanes make lots of noise, and they don't vote. The result is predictable. Political pressure led to legislation requiring airlines worldwide to reduce the noise level of their aircraft in the 1970s and again in the 1980s. This latest standard, which must be met in the US by the end of 1999, is called Stage III and a similar noise reduction must be achieved in most of the rest of the world by the end of 2002. The effect of these regulations is to require that substantial amounts be spent by airlines to modify existing aircraft engines with hushkits, or to dispose of those aircraft and buy new equipment. Moreover, no one believes that Stage III is the end of it. Standards for a proposed Stage IV already exist and some airports in the US and Europe require airplanes operating there to approach, if not reach, that Stage IV level. All these noise levels are denominated in decibels and are measured three ways: takeoff noise a certain distance from the end of the runway, landing noise at a certain distance from the beginning of the runway, and sideline noise measured a certain distance to the right and left of the runway. Each airplane type has a decibel level established for each measurement which it must be meet to conform with the requirements.

Finally, there is a regular stream of complaints in Congress, and from some consumer groups, questioning whether government shouldn't consider some economic re-regulation of the airlines. Usually this arises because some city feels shortchanged in its air service, an airline feels it is being unfairly squeezed by one of the giants, or a consumer group feels that air fares are too high in certain markets. It isn't that any of these groups are necessarily wrong, it's just that no market is perfect much as we may wish it so. A vast majority of interest groups, and all of the airlines, believe that any really necessary changes can be accomplished within the current system rather than turning back the clock to a world that clearly didn't serve the best interests of either the airlines or the traveling public. Economic re-regulation is not a realistic risk at this time, but all parties in the equation must be on constant guard to be sure it doesn't become one.

6.5 Shuttles - An Airline within an Airline

On April 30, 1961 Eastern Air Lines began a shuttle service between New York/Boston and New York/Washington. There had been some earlier experiments with the idea, but only Eastern had the unique concept of a guaranteed seat for anyone who arrived at the gate before the scheduled departure time, with or without a reservation, even if that meant rolling out another airplane. The stories of these second sections flying with just one passenger were legion, and probably mostly apocryphal, but Eastern did honor the promise and often they went out with very few passengers, if rarely just one. Eastern, of course, could not predict demand and so had to deal with such things as the entire Boston

Symphony orchestra showing up late one night to fly home after a concert in New York. Needless to say, the service was very expensive to operate as extra airplanes and crews always had to be on hand even if they were used infrequently. But that was all right because, for the passenger, the service was much more valuable than the standard reserved seat system and it took the "on demand" concept to its ultimate extreme. However, Eastern initially thought the shuttle was a downgrade as the amenities were few, and they priced it at a discount to regular flights causing it to lose money in the early years. As time passed the true value of the shuttle became apparent, and today it is priced at a significant premium over regular flights of similar distance.

The Eastern shuttle dominated the northeast corridor by itself until Pan American launched its version in 1986. With Eastern operating every hour on the hour Pan Am scheduled its to leave on the half hour to both Boston and Washington using New York's original LaGuardia marine terminal (it was called marine because it was the base for transatlantic flights by Pan Am starting in 1939 with Boeing 314 flying boats from Long Island Sound). It is somewhat ironic that both shuttles were started by airlines that failed in the early 1990s. The old Eastern shuttle is now part of USAirways, while the Pan Am operation is now part of Delta. Both continue to function like a separate company within a company, and the USAirways shuttle is indeed a separate airline with its own certificate, using aircraft and personnel that are dedicated to the shuttle alone. There are no other true shuttle operations with the guaranteed seat feature in this country but British Airways has a near likeness between London and several English and Scottish cities.

6.6 Express Airlines - A New Type of Airline within an Airline

Lately, a new type of airline within an airline has emerged - United's Shuttle by United on the Pacific coast, Delta's Delta Express in Florida/Northeast/Midwest markets, and USAirway's Metrojet also between Florida and Northeast points. The motive for all three can be summed up in one word - Southwest. As that airline expanded out of its Texas base following deregulation, it first went to California and other west coast points with its short haul, high frequency, low fare formula and soon dominated those markets. Next it moved north through St. Louis to Chicago, making Nashville a key junction point for the system, and then moved east where Baltimore became the eastern junction. With the great appeal of its type of service to the leisure traveler it was only a matter of time before they invaded Florida, tying those cities to Nashville, Baltimore, and other points on the system, and this was done in 1996. Finally, Southwest entered New England with service to Providence, Rhode Island, and so covered most of the country with the notable exception of New York City. They have so far avoided New York because air traffic congestion and delays would seriously impact one of Southwest's key operating strategies - taking only fifteen minutes between the time an airplane arrives at the gate until it departs.

This relentless expansion of the Southwest system placed great competitive pressure on airlines already serving the areas, and their answer, first by United, was these new express services. (It may be a stretch, but if giant airlines are like 600 pound Gorillas that can go and sit wherever they want then Southwest is like a 100 pound Velociraptor that eats Gorillas) In all three cases it was necessary to negotiate special wage rates with the unions so that the costs could be close to those of Southwest and that, along with the dedication of some airplanes to the express system, made them the company within a company. It is important to note, however, that they are not separate airlines, even though they may be subsidiaries from a corporate structure standpoint, as they do not have a separate

operating certificate from the DoT. The oldest one, Express by United, appears to have stemmed the market share erosion on the Pacific Coast, but it has not recaptured any meaningful amount of that which was lost. For the others it is too soon to tell what the competitive results will be.

7. FINANCIAL CHARACTERISTICS OF THE AIRLINES

As often as not the motive to buy an airline, or start a new one, is not profit but ego. It is very similar to the ego that drives men (not women) to buy professional football or baseball teams - it brings a high degree of public visibility to someone who made their fortune in much more mundane activities. There is a story that when Carl Icahn, the successful corporate raider, bought TWA in 1985 he danced around his office with a TWA baseball cap on proclaiming, "We bought ourselves an airline, We bought ourselves an airline"! The fact that he spent the better part of the next ten years trying to extract himself from the tar pit he had gotten into has not deterred others, and there have been plenty of investors willing to put capital into new, startup airlines with almost all of that capital sinking like the Titanic, never to be seen again. Airlines, whether they are new ones or old ones, eat capital.

7.1 The Need for Capital

Air transportation is a service and thus it is very labor intensive. Labor costs amount to some 36% of total expenses, and with fuel at about 13% and commissions to travel agents at around 8%, these three categories account for 57% of total costs for a typical company. However, unlike most service industries, airlines are also very capital intensive. Depreciation and equipment rentals account for over 14% of expenses making facilities the second largest expense item. Moreover, the need for substantial amounts of capital has a profound impact on the balance sheet and on cash flow because, over time, the industry has been able to generate only about half of its capital needs from internal cash flow. Thus, the debt to equity ratio for a healthy airline is usually in the neighborhood of one to one and runs much higher at those which are financially weak.

The ceaseless quest for capital by almost all airlines is complicated by their generally poor earnings record. Over the last 35 years, which covers almost all of the jet aircraft age, the net profit margin for the world's airlines was 0.3%. Even if we exclude the four terrible years of 1990 to 1993 the average margin is only 1.3%, and this gives substance to our earlier comment about not making money carrying people for hire. The US industry cannot take any comfort from the fact that their numbers are a little better at 0.5% and 1.6%, respectively, for those years with and without 1990 to 1993. Considering that 5% is often considered a minimum profit margin for most industries, this is a truly dismal record. The wonder is that the airlines have been able to attract any capital at all much less the substantial amounts needed to finance the equipment that was purchased. Over the last ten years capital expenditures for the world's airlines were about \$340 billion of which a little less than half came from internal cash flow, leaving \$174 billion to be raised from the capital markets.

Let's quickly dispose of a myth. There is no such thing as a capital shortage although this term is often used in discussions of airline capital requirements. A shortage cannot exist in this kind of narrow, single industry situation. There is a supply of capital, at a price, and a demand for capital, also at a price. The amount of capital that is actually provided to the airlines is determined by the point where the two price objectives intersect. Demand for capital at lower prices does not get satisfied, but it is not real demand either. It is a want or a desire, but in economic terms it is not real demand. Similarly, capital offered at higher

prices is not employed here and must seek other investment opportunities that may be prepared to pay the asking price. If airline cash flow cannot support the amount of desired spending then either those spending plans must be reduced, as they were in the early 1990s when the industry was losing money, or new sources of financing must be found, and for the airlines that was leasing.

7.2 Leasing to the Rescue

The \$174 billion was raised, and the airplanes were acquired, but only because a new financing tool emerged that was based not on the credit of the airline but on the asset and market value of the airplane. The aircraft leasing industry did not really exist until the mid 1980s, but since then it has grown until in 1997 about 46% of the entire world airline fleet of 12,000 airplanes are leased.

Leasing became popular because the commercial airplane is a very unique type of capital equipment. All airlines in the world use the same types of aircraft, and there are a relatively small number of types. Also, the airplane is the only form of capital equipment that can be delivered to a buyer or operator anywhere in the world within a day and get there under its own power. These characteristics mean that investors not only have a world market at their disposal but one that is relatively liquid since there are a large number of transactions in most types every year. Finally, the value of each type can be readily determined since the revenue potential and operating costs, and thus earning power, of the airplane can be calculated with considerable accuracy. Discounting this earning power over the expected life of the asset gives a base value; the actual market price will range above or below this value depending on supply/demand conditions in the market generally and for that specific type.

The operating lease business was essentially founded by International Lease Finance in the early 1970s and today many companies are in the field. An operating lease means that the lessor retains ownership of the asset and rents it to the airline for a short or long period of time; by contrast in a finance lease, which has an older history, the airline has an option to buy the airplane at the end of the lease term which is usually fifteen years or more, so it is, in effect, just another way of financing the purchase of the equipment. Many variations on this theme have evolved, but for the airlines the key point is that much of the job of creating and finding capital has been taken over by parties other than the airlines or the manufacturers.

7.3 Outsourcing: How Much and What?

There is a school of thought that says an airline should outsource many of its activities not just a large part of its capital formation. Some airlines do this now with their aircraft and engine maintenance, food service, and more recently, the computer based reservation system (not yield management, just the booking system). The logic is that specialists can do these jobs much more efficiently than all but the largest airlines, and the carriers have enough to do just operating the aircraft and servicing the passengers. With cost control now one of the highest priorities for all airline management's decisions about what functions can or should be outsourced will be a key question for the companies and their advisors in coming years. In many cases pride and the "we've always done it this way" syndrome will be the barrier to overcome if change is deemed necessary.

7.4 Organized Labor's Effect on Airline Management Decisions

The other barrier is labor. Recently, when several airlines purchased 50 seat regional jets for use by their commuter carriers, the pilots at the parent airlines forced the companies to limit the markets in which those jets could operate and/or the number of such jets the commuter could have. This action means that management cannot realize the full economic benefits that could be obtained through the use of this equipment. Similar barriers exist in connection with most outsourcing decisions management may desire to make.

Airline labor unions are very strong. This dates from the days of regulation when airlines had little incentive to resist labor demands for higher pay or inefficient work rule standards since any higher costs that resulted could be passed on to the consumer through the fare setting system which accepted those costs and allowed the airline a rate of return on them. (The situation is further complicated by the fact that airlines operate under the Railway Labor Act which is very different from, and allows management less flexibility than, the law that governs labor relations in all other industries - except railroads, of course). Labor's strength also comes because airlines are very vulnerable to strikes, particularly by the pilots, which invariably shut down the company, causing a significant loss of revenue. As often as not labor/management conflicts are not about pay but are about work rules and employment levels, and this goes directly to the heart of the "do it here or outsource" debate. Labor's opposition makes it likely that some outsource moves which would be justified on economic grounds will not be possible.

8. SECURITY ANALYSIS AND AIRLINE STOCK VALUATION

8.1 The Financial Statements

In addition to quarterly and annual reports all airlines file financial and operating data with the Department of Transportation in a report called Form 41. This consists of a series of monthly and quarterly schedules that are much more detailed than the material in any company reports.

The Form 41 originated in the early days of the CAB when this information was an essential ingredient of economic regulation. While the CAB was eliminated after deregulation the Form 41 was not as the government still considered it necessary to gather this data to fulfill its ongoing responsibility over such things as safety, adequate service to small communities and negotiation of bilateral agreements with other countries. There is an enormous amount of data in the Form 41 and all analysts access it through one of several computer time share service companies that buy the tapes from the government. The financial portion of Form 41 is based on an accounting system established by the government and therefore is somewhat different from that used by companies, whose reports follow generally accepted accounting principles (GAAP) standards. Airlines always say that they do not use the Form 41 system in their management of the business, but for outsiders the expense detail it contains is far superior to company reports, and is the only source for much of the operating data such as miles and hours flown, etc.

8.2 The Profit Equation - A Tool for Airline Analysis

It is helpful for analysts to have a matrix that allows them to array key economic variables for a company in a format that illuminates trends and highlights areas where problems may exist. Airline analysts generally begin by examining four elements that, individually or together, describe what factors were responsible for earnings growth or decline in a particular period. A suggested matrix for these elements will be called the "Profit Equation"; that term, and this methodology, is not standard among analysts but the concepts are used by all of them in one form or another.

The revenue stream is essentially made up of two elements, traffic (RPMs) and yield (for this purpose cargo and other revenue are ignored), and expenses also consist of two elements, capacity (ASMs) and unit cost per ASM. After calculating the year over year percentage change for each of the four factors on a quarterly or annual basis, the results are arrayed as follows: subtract the percentage for ASMs from that for RPMs and subtract the percentage for unit cost from yield. Then add together the remainders of both pairs. The result will be either a positive or negative number of percentage points for each pair of factors, and for the two pairs combined. These sums can be called the "spread". They are no longer the percentage of anything as, of course, percentages cannot be added together, but they do become a useful tool

The point of the exercise is to see whether changes in operating income were caused by physical (traffic and capacity) or financial factors. For example, from the first quarter of 1996 through the third quarter of 1997 almost all of the earnings improvement was due to a positive relationship between RPMs and ASMs, in other words, to a higher load factor, and this overcame a generally negative yield to unit cost relationship. As we proceed with this

discussion we will explore the nature and importance of each of these four elements in the profit equation.

8.3 Airlines Not Considered part of a Core Investment Program

The first thing to understand about airline stocks is that they are viewed by most portfolio managers as opportunistic, usually short term, holdings that are not part of a basic investment strategy. The reason is the extreme volatility of these stocks (high beta) and the fact that most of the time the poor earnings record has made conventional analysis based on such things as price/earnings ratios relatively meaningless. That said, the airline group has outperformed the S&P 500 index in fourteen of the last twenty-five years and in just seven of those years has the performance been substantially worse than that average. Moreover, over that entire time the compound annual rate of gain for the Major passenger airlines was 8.7% compared with 8.3% for the S&P, so their reputation might seem to be somewhat undeserved. However, this is a perfect example of the old saying about liars and statistics, since just a year earlier, at the end of 1996, this measurement shows airlines underperforming the S&P, and three years ago the then 22 year record was an average annual return of 3.6% for airlines vs. 5.8% for the S&P. From 1994 through 1997 portfolio managers had to own airline stocks as they were up 271% while the S&P rose 111%, but that doesn't mean they do, or should, see the group differently. Seven stock crashes in twenty-five years is often enough to keep portfolio managers wary, and then consider that since 1978 airlines have not outperformed the S&P for more than two consecutive years until they did so for the third year in 1997. It is unlikely that the recent performance will make many investors shift their historic view from seeing airline stocks as opportunistic holdings to one of considering them part of a core investment program.

Airline stocks are also viewed as early cycle stocks in that their best performance is expected in the early years of an economic recovery. To a significant degree this is due to the fact that five of those seven years when the stocks crashed (relative to the S&P) were just before or during an economic recession. Sometimes the group was very cheap, even as low as four to five times earnings, in the year before they underperformed by a large amount, while in four of the seven years when the airlines outperformed the S&P by more than fifteen percentage points the industry actually posted a net loss. All of this makes it clear that the conventional approach to stock valuation doesn't work well for the airlines. So if that doesn't, what does?

8.4 The Big Picture - Traffic First

Airline analysts, like analysts in all other industries, love to gather the most minute facts about the companies they cover, but here, perhaps more than for most groups, the basic adage of security analysis applies: any research that helps one reach a decision about whether to buy or sell a stock is invaluable but any research that goes beyond that point is a waste of time. Of course, it is very difficult to tell just where that marginal amount of research begins, but airline stock behavior tells us that getting the big industry issues right are much more likely to lead to successful investment decisions than will knowledge of small company details.

The biggest of those big issues is the state of the general economy, particularly the prospect of a recession. No event will rob airlines of market value more quickly than the concern that a recession may be near at hand, and airline analysts have a powerful insight into this

eventuality through watching traffic trends. Airline traffic is not an official leading economic indicator, but it could be since it is a mirror of both business activity and consumer confidence. For this reason the analyst must closely watch monthly traffic trends in terms of the year over year percentage growth and the seasonally adjusted pattern to detect signs of weakness as early as possible. Or, if the economy is in a recession, signs of recovery. These will be the first signals that a significant sell or buy opportunity is developing. In many respects the major turns are easier to read than the years in between when the economy is growing nicely and the pattern of traffic is showing more or less steady if moderate growth. This is when other factors become much more relevant.

8.5 Jet Fuel - the Wild Card

In terms of the impact on stock prices, if not so much on earnings, few factors are more significant than the price of jet fuel. Even rumors of a major price rise or decline will move stocks in the opposite direction, so airline analysts would do well to take their oil analyst to lunch occasionally. Fuel, as noted earlier, is one of the larger expense items for airlines and it has ranged from 11% to 17% of total costs in the last decade - thus if fuel prices quickly rise 50% or more, as they have on three occasions since the early 1970s, this produces at least a 6% to 9% rise in expenses. These large changes are infrequent but smaller moves, in both directions, come more often and the market is extremely sensitive to them. The final dilemma for airline managements is that fuel prices, along with traffic growth for that matter, are driven by forces largely beyond their control. At least for fuel they are able to use a hedging strategy to soften the effects, but that doesn't change the impact on stock prices.

8.6 Yield and the Revenue Stream

To return to the main story line, perhaps the most important of these other factors is yield which reflects the average level of, and direction of change in, passenger air fares. Here again, since fares are driven by market conditions and demand, managements lack a meaningful degree of control over them, although the use of yield management techniques gives them somewhat more than is the case with fuel or traffic. Still, no one airline can successfully raise its fares unless all its competitors follow suit. But if any airline, even a small one, cuts its fares all competitors must immediately follow, so the basic price of the product becomes the one set by the airline offering the lowest fare. Since the Second World War yields in real, or constant dollar, terms have declined at an average annual rate of 2.4% and this rate of decline has continued during the 1990s. Only a steady improvement in the economic efficiency and productivity of airplanes has allowed airlines to be even moderately profitable in the face of that trend. As positive as this steady decline in real air fares has been in stimulating traffic, it is graphic evidence of the commodity and marginal pricing nature of the product since it means that almost all of those productivity gains are, in the end, passed through to the passenger in the form of lower fares.

In terms of the profit equation we find that both elements of the revenue side of the income statement, traffic and yield, are to a greater or lesser degree driven by forces beyond the direct control of the management of an individual airline. Thus analysts must first satisfy themselves of the overall current and prospective trends of both before exploring with management the actions it plans to take to maximize its revenue potential. Then the

analyst can judge the probable success of those plans against the background of those broad trends. In recent years the interplay between market forces and management actions is most evident in the effort to increase RASM much more than yield by increasing the load factor. Management's success in doing this is, as much as anything, responsible for the very positive earnings results of the last three years because they were able to obtain that RASM improvement in the face of modest rates of traffic growth and even less growth in yield.

8.7 Expenses and Capacity - where Management is in Control

If the revenue side of the equation is somewhat hostage to broad economic trends, expenses, other than fuel, and capacity are almost entirely under the direct control of airline management. A detailed analysis of, and probing questions about, expenses and capacity are needed for the analyst to be satisfied that company results are the best they can be, given the revenue environment that prevails. To a major extent the failure of the industry to record more than modest profits during most of the 1980s and its exposure to, and losses from, the exogenous event of the Gulf War and its aftermath in the early 1990s can be traced to weak expense control and excessive capacity additions.

8.8 Forecasts - the Reason for Stock Analysis

With the profit equation a forecast can be built by concentrating the analytical effort on determining the probable percentage changes in each of the four elements and applying those percentages to the latest quarterly or annual results. Those inputs will come partly from management plans and partly from the analysts' judgment about economic, traffic and yield trends. The advantage of using the profit equation is that it keeps a balance between the attention given to the macro factors and the micro elements that will emerge from discussions with management - it is often all too easy to let the latter dominate the analysis at the expense of the former, and it is generally necessary to have some way of tempering management's innate optimism.

All of this can perhaps be summed up best by saying that the airlines now believe that they can remain profitable under all but the most negative of economic conditions. If true, this would bring a much better climate for airline stocks and with it a greater ability to use security valuation methods such as the price/earnings ratio in a meaningful way. But the thesis has to be proven during a period of economic decline before the market will accept it as fact and behave accordingly. Until then, major moves in airline equities are likely to be determined more by the overall economic and traffic outlook than by actions of individual companies, so the fortunes of airline analysts will continue to rise or fall to the extent they correctly perceive these trends.

TERMINOLOGY OF THE AIRLINE BUSINESS

All industries have unique terms and airlines are no different. The following definitions cover the terms used by airline managements and analysts, and include a description of a number of the basic concepts that underpin many industry activities.

Revenue Passenger Mile (RPM):

The way traffic is measured, and it is one passenger carried one mile. Traffic and RPMs are synonymous and the terms are used interchangeably. The presumption is that the passenger paid for the trip, thus the use of the word "Revenue". Some passengers don't pay, such as those using frequent flier miles, but they are counted the same way. Everywhere other than in the United States distance is measured in kilometers, so the term is Revenue Passenger Kilometers and the acronym is "RPK". The "K" can be substituted everywhere that "M" is used in the list that follows. To convert kilometers to miles, divide kilometers by 1.6093 and to go the other way multiply miles by the same factor. In a similar respect, when airplane manufacturers speak of the range of an airplane they denominate it in nautical rather than statute miles. Airlines, on the other hand, use statute miles, or kilometers, when measuring the distance of a route between two cities and when measuring RPMs and ASMs. If it is necessary to convert nautical miles to statute miles, or vice versa, multiply nautical by 1.1515 to get statute, and divide statute miles by that factor to convert them to nautical miles. There is no term "nautical kilometer" so data in kilometers must first be converted to statute miles and then converted to nautical miles.

Available Seat Mile (ASM):

This is the definition of capacity, and it is one seat carried one mile whether or not it is occupied by a passenger. In the case of both RPM and ASM the acronym is what you will hear.

Load Factor:

The percentage of RPMs to ASMs and a key measurement of how efficiently the airline is utilizing its capacity. In general higher is better but there is a limit beyond which the airline will turn away, or "spill" passengers to its competitors and not have seats available for last minute business travelers who are prepared to pay the highest fares for that seat. Since the real objective is to maximize revenue not seat occupancy, the optimum load factor becomes the highest that can be obtained while spilling as few passengers as possible. Once an airplane leaves the airport gate, of course, empty seats represent inventory lost forever so the art of inventory management is one of balancing the perishable nature of the seat against the desire to have last minute product available for the premium buyer.

Yield:

The amount of passenger revenue received for each RPM. It is a weighted average price and is expressed in cents. In 1997, for example, the US airlines had a yield of 12.99 cents per RPM. Yield does not represent the price paid by anyone, just the average amount paid by all passengers and while it only measures passenger revenue, that accounts for 91% of

the total for US passenger airlines. Cargo airlines use a different group of measures that are described below.

Unit Cost or Cost per ASM (CASM):

The cost of producing one ASM, also expressed in cents. For 1997 the unit cost for all US airlines was 8.80 cents per ASM and it is derived by dividing total operating expenses by total ASMs.

Total Revenue per ASM (RASM):

Airlines, particularly in the US, have begun using this alternative to yield as the revenue component to compare against unit cost. It is, of course, more comprehensive than yield as it takes into account all revenue not just passenger, but that is not the reason airlines have adopted it. Their reason relates to the fact that when the load factor is rising, RASM grows faster than yield because it is a function of both load factor and yield. Thus, during these times, RASM presents a more favorable picture of company operations than would a yield to unit cost comparison. (A declining load factor produces the opposite effect and when that happens we may see less use of this term.) As this suggests, RASM is not an independent variable in airline economics, so using it without looking at trends in the two underlying components can lead to erroneous conclusions, particularly about the trend of passenger air fares.

Breakeven Load Factor:

Another way of expressing the relationship between revenue and expenses. It is determined by dividing total operating costs by total revenue and multiplying the load factor by the quotient. For example, if revenue is \$100 and costs are \$90 the quotient is 0.9. Assuming the load factor is 60% the breakeven is 54% (60 times 0.9). A short form of this is to multiply the load factor by the operating ratio (see below).

Operating Ratio:

Most industries describe earning power before such non-operating factors as interest on currency gains or losses and income taxes, as the operating profit margin. Airlines use the reciprocal and call it the operating ratio; thus a 10% operating profit margin becomes, in airline terms, a 90% operating ratio. Don't ask why, it's just the way it is.

Available Ton Mile and Revenue Ton Mile (ATM and RTM):

Cargo airlines use these in place of ASM and RPM for the obvious reason that they don't carry passengers. All of the measurements described above can be applied with essentially the same meaning. Passenger airlines also denominate their traffic and capacity in terms of ton miles by arbitrarily attributing 200 pounds to each passenger and his/her baggage, and to each empty seat. This number was established many years ago when the US industry was regulated and remains unchanged despite some evidence that the average US passenger may have become larger. Outside the US the term is "tonne kilometer" and to convert them to ton miles divide by 1.46.

Scheduled Service:

Most airlines in the world operate a scheduled system which means that a schedule of flights is established and passengers can select the one that best meets their needs. This is often called an "on demand" system because the flight will depart when scheduled so that from the passenger's standpoint that, or any other flight, is available upon his or her demand. By contrast, non-scheduled service, which is more generally called Charter service, means that the flight operates only if the seats are sold. This type of service is particularly strong in Europe where it is known as the Inclusive Tour business and it mostly involves vacation travel from northern Europe to Mediterranean coastal resorts. All scheduled airlines will have a small amount of Charter business for professional sports teams, corporate groups, and the military.

Revenue Hours and Block Hours:

Aircraft maintenance is based on hours of operation rather than miles flown. Revenue Hours are measured from takeoff (wheels up) to landing (wheels down). Block Hours are measured gate to gate and so count the time spent taxiing at both ends of the flight. "Block" refers to the placement and removal of a block under the wheel at the gate. All analysis of the direct cost of operating an airplane, including flight crew, fuel, maintenance, depreciation and/or rent and insurance is done in terms of costs per Block Hour and such calculations are also used to compare the relative economic performance of one type of airplane to another. A related measurement is "cycles" with a cycle consisting of one takeoff and landing. The Federal Aviation Administration requires special inspections to be made on many old aircraft that have been operated for a specified number of cycles.

Utilization:

The word refers to the number of hours per day, usually Block, that an airplane operates. Its importance lies in the fact that the only ways an airline can carry more passengers without adding new airplanes to the fleet are to increase the Load Factor or the daily Utilization. Both are, therefore, key measures of the productivity of the fleet.

"Major", "National" and "Regional" airlines:

The Department of Transportation classifies all US airlines as belonging to one of these groups, with the Regional group subdivided into Large and Medium. Each has different requirements for reporting traffic and financial data to the DoT and the classification is made on the basis of annual revenue. Majors are those airlines having revenue over \$1 billion, Nationals between \$100 million and \$1 billion, Large Regionals from \$20 million to \$100 million and Medium Regionals under \$20 million.

"A", "B", "C" and "D" Checks:

These letters refer to the various levels of maintenance work that must be done on every commercial airplane. Both the "A" and "B" checks are done overnight at the airport or at an established maintenance base and are carried out every few days or weeks. A "C" check is more extensive, is performed about every fifteen months, and takes the airplane out of service for several days. The "D" check is the most comprehensive of all, is done about every six to eight years, and takes a month or more to complete. The timing of the C and D work is largely determined by the number of hours of operation or the number of cycles,

although some airlines do them on a strict calendar basis. The terms "zero time" or "half life", refer to the number of hours the airplane or engine has operated since its last D check.

Code Sharing:

Almost every airline in the world has a unique two letter code (some are one letter and one number) assigned by the International Air Transport Association (IATA) to identify its flights, tickets and other commercial documents. Many airlines have now entered into agreements whereby they share these codes, and usually coordinate their schedules as well. The result is that each airline can offer its passengers more destinations, and a more convenient routing to those destinations, than would be possible for either one of them alone. The motive, of course, is to control that traffic by keeping it within the joint system and avoid losing passengers that are going to points outside the route network of one or the other of the partners.

Freedoms of the Air:

Air transportation is unique. Not only is it a worldwide business (and was before globalization became the hot business concept) but it is the key way in which all countries are physically connected to one another. This fact is behind the need for a worldwide agreement on the rules of the road, and these were established at the Chicago Convention in 1944. They are called the "freedoms of the air", and they are fundamental to the international route network we have today. There are five basic freedoms recognized by almost all countries, two others less widely accepted, and one hardly accepted at all. Each is subject to specific conditions, such as establishing the frequency of flights, that are determined through bilateral agreements between any two of the countries that are parties to the Convention:

First Freedom - The right to fly and carry traffic over the territory of another partner to the agreement without landing.

Second Freedom - The right to land in those countries for technical reasons such as refueling without boarding or deplaning passengers.

Third Freedom - The right to land in those countries and deplane passengers coming from the airline's own country.

Fourth Freedom - The right to land in those countries and board passengers going to the airline's own country.

Fifth Freedom - The right to land in those countries and deplane or board passengers going to or coming from a third country. An example would be a flight from the US to England that is going on to France. Traffic could be picked up in England and taken to France.

Sixth Freedom - The right to carry traffic from one state through the home country to a third state. Example: traffic from England coming to the US on a US airline and then going on to Canada on the same airline.

Seventh Freedom - The right to carry traffic from one state to a third state without going through the home country. Example would be traffic from England going to Canada on a US airline flight that does not stop in the US on the way.

Eighth Freedom - This would be an airline like British Airways operating domestic flights in the US between Chicago and Memphis. It is called cabotage and almost no country permits it.