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SYNERGY, INC.

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LETX/Synergy, Inc.
DEVELOP A NORMATIVE OR DESCRIPTIVE
MODEL OF THE INTERNATIONAL/DOMESTIC
CIVIL AVIATION INDUSTRY

Volume 1

Final Report

Executive Summary

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Final Report

Executive Summary

September 30, 1982

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Develop a Normative or Descriptive
Model of the International/Domestic
Civil Aviation Industry

Volume 1

Final Report

Executive Summary

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I. INTRODUCTION

Volume 1 of this report provides an overview of the U.S. civil aviation industry, focusing on the immediate term and the future. Its purpose is to provide a summary for identifying the implications of the projected future aircraft fleet mix on the civil/military airlift system into the 1990 time period. The project is a direct result of the current turbulence in the airline industry and the uncertainty of the future airlift system. The results of the study provide a foundation to support the development of an analytical/modeling system for the Air Staff to project alternative future configurations of the civil air fleet given alternative scenarios of future conditions in the industry. The end result of the effort will serve planning purposes for the CRAF and CRAF enhancement program.

This particular phase of the effort focuses on four areas, including:

- The regulatory framework existing in the industry and that projected to exist in the future;
- The association network that has developed for the civil aviation industry and its importance to the development of future air industry structure;
- The components of the industry itself, including the number and types of airframes, engines, support functions within the industry such as travel agents, air freight forwarders, etc., and;
- The industry demographics, including operating behavior, route competition, fares, etc.

An evaluation of these factors is summarized in this volume, so that the reader can have an overview of the interrelationships that exist between these different aspects of the airline industry. Volume 2 of this report will provide a much more detailed description of the interrelationships which exist in the airline industry. Volume 3 of the study contains detailed supporting appendices. It is not the purpose of this report to judge the effectiveness

of these interrelationships. Instead, this report only describes the industry, to provide the foundation for future modeling exercises. In addition, emphasis will be placed on the most important descriptive factors.

The major purpose of the CRAF program is to supplement military airlift by supporting the Military Airlift Command (MAC) in times of national emergency. Presently, there is sufficient capacity to meet most demands for moving personnel. However, the total cargo capability, especially for outsized cargo (i.e., too large for a C-141), may not be adequate to meet certain future contingencies.

There are certain requirements about aircraft size and range of flight that must be met. This study will focus on wide-body aircraft with a range of 3,000-3,500 nautical miles, including long-range wide-body aircraft and some medium-range wide-body aircraft. The study will concentrate on prospects for their continued development and expansion (or contraction) within the overall civil air fleet.

All studies have certain limitations, and this report is no exception. Data are reasonably current and thus provide a good operating and financial description of the industry in a historical context. However, other factors such as the nature of the deregulated environment, general economic trends, fluctuations in fuel prices, and the development of alternative patterns of route structure raise considerable uncertainty about the future evolution of the civil airline industry. The concern is primarily over the size and shape of the industry that will emerge from the interaction of these factors. This report does not present arguments pro and con on the merits of deregulation, nor does it attempt to project future fuel prices or foretell future competition, etc. These topics are current and are constantly being evaluated

by experts within and outside the industry, and little could be added to those debates here. Instead, this report is intended to be descriptive of what has gone on in the past, what is current, and what is likely to occur in the future, based on the judgments of industry experts, government officials, and independent observers and analysts. However, current, swift changes occurring in the airline industry cloud our understanding of the airlines' immediate future and cause the analysis here to be suggestive rather than indicative of the future of the industry.

This volume is an executive summary which provides an overview of the findings of the entire study. The executive summary will be of most interest to readers not interested in the detail behind the findings of the study. Readers least familiar with the airline industry can understand the major conclusions of the study by focusing on the executive summary.

II. EXECUTIVE SUMMARY

The current operating and financial condition of the U.S. airline industry is the worst in its history. From an operational point of view, the airlines are still adjusting to the deregulatory environment with extensive entry and exit from specific markets and the development of alternative patterns of route competition. Fuel prices have increased several-fold in recent years, and shortages have been experienced, leading to the development of more fuel efficient engines and aircraft types for the newly restructuring markets.

The recent U.S. and worldwide recession has reduced the demand for air travel, and that condition together with deregulation of prices, routes, and guaranteed rates of return, has caused the industry to reduce capacity, rationalize product lines, and engage in intense fare competition. The resulting operating performance of these companies has been quite poor, and in one case, that of Braniff, has resulted in bankruptcy.

The outlook for the future of the airline industry is uncertain. Much depends upon general economic conditions and whether increased demand for air service in the future can pull the industry out of its current slump. Individual airlines, in response to increasing fuel prices, had ordered new fuel-efficient aircraft but declining profits have caused cancellations as they now find that they cannot afford new equipment. The possibility that airlines will focus on ways to improve yield other than the purchase of new, fuel-efficient aircraft in the future is quite high.

In terms of operating competition, route structure, and the continued development of the hub and spoke network, airlines continue to jockey for position in individual markets. The future may witness continued fare

competition below operating costs in an effort to "win" markets, resulting in net losses for individual airlines. The future will likely bring different airlines into the major markets than currently exist. The increased activity of former regional airlines such as Piedmont, Frontier, USAir, and Air Florida into direct competition with the major or trunk airlines such as American, Delta, Eastern, United, etc. will continue the weeding-out process of the least efficient operators. Current patterns indicate the development of a larger number of major hubs, with more airlines serving those major hubs, and the emergence of new commuter airlines to service smaller markets abandoned by regional carriers.

The outlook for financial operations within the airline industry is also uncertain. New methods of financing capital equipment must be developed if airlines are to improve efficiency and productivity with the use of new equipment. Profitability must be improved through better control of costs and a clearer understanding of revenues.

A. Regulatory Environment

The airline industry is currently experiencing a radical departure from historical trends in regulatory activity -- the periodic phasing out of certain aspects of the airline regulation specifically affecting the airlines' operating behavior and structure. The "dust" has not settled from this process and is causing a rapidly changing, evolving new industry structure. However, it is clear that the airline industry of the future will look different from that of the last ten to fifteen years. The deregulated environment applies to both passenger travel domestically and cargo service and the philosophy of deregulation has penetrated bilateral negotiations for international travel. Cargo deregulation occurred in 1977, followed by

passenger deregulation in the Airline Deregulation Act of 1978. The latter act set specific time periods for eliminating regulation of both fare structure and entry and exit, allowing individual airlines to set their own fares and to enter and exit freely from markets. Deregulation was gradual, to minimize the burden on travelers and shippers.

Several federal agencies previously held regulatory responsibility over the airline industry and three of these agencies will continue to control aspects of air traffic after current deregulation is completed. This is detailed in Table 1, which shows the major functional responsibilities for each agency for the pre- and post-deregulation period. The table shows the decrease in regulatory responsibilities for the CAB and the elimination of freight regulation activities by the ICC. The FAA's control over safety-related issues will continue, as will the Department of Transportation's responsibility for international policy, some data collection, and national transportation policy in general. The Department of State will continue its role in international policy.

Early sunset legislation has been proposed by the CAB for various aspects of its regulatory functions. Much is currently being considered by Congress to speed the process of deregulation. However, with the recent poor performance of the airline industry, some slowing in deregulation is expected.

B. Association Framework

A large number of associations deal in some way with the airline industry. However, only a few have any significant impact on industry activity. Four associations are of primary importance and are discussed here. They include the Air Transport Association (ATA), the Aerospace Industries Association (AIA), the International Air Transport Association (the IATA), and

TABLE 1
Major Functional Responsibilities

Pre-Deregulation

FAA	CAB	DOT	DOS	ICC
1. Safety	1. Safety	1. National Transportation Policy	1. International Policy - Bilateral Agreements	1. Freight
2. Efficient Use of Air Space	2. Entry/Exit	2. International Policy - Bilateral Agreement		
3. Certification	3. Routes	3. Data Collection		
4. Airport Management	4. Pricing			
	5. Operating Behavior			
	6. Data Collection			
	7. Regulate Freight Conglomeration (FTC, DOT)			

Post-Deregulation

FAA	CAB	DOT	DOS	ICC
1. Safety	No Role	1. National Transportation Policy	1. International Policy - Bilateral Agreements	No Role
2. Efficient Use of Air Space		2. International Policy - Bilateral Agreements		
3. Certification		3. Data Collection		

Legend: FAA - Federal Aviation Agency
 CAB - Civil Aeronautics Board
 DOT - Department of Transportation

DOS - Department of State
 ICC - Interstate Commerce Commission

the International Civil Aviation Organization (ICAO). These associations in particular are most influential on the "supply side" of the airline industry. Other associations deal with demand or users of airline services -- the passengers or shippers.

Associations provide centralized information collection and transfer functions for the airline industry. They are a relatively inexpensive means of collecting industry-wide information and provide a collective or joint forum for expressing (individual) airline ideas on certain issues. Associations are the natural outgrowth of an efficient, market-pricing mechanism for services needed by individual firms. They do not have independent, autonomous governing bodies from which decisions are made, nor do they have their own particular interests. Rather, they represent industry positions.

For example, the cost for each individual airline to employ lawyers to evaluate issues and present their cases to a representative public agency, Congress, or the Administration is more expensive than having a team of lawyers centrally located in an association that responds to the needs and desires of each individual airline on a collective basis, formulating industry positions, and presenting that position to appropriate public bodies.

The Air Transport Association, founded in 1936, is the trade and service organization for scheduled airlines operating within the United States. It represents about 98 percent of all U.S. scheduled airline passenger service. Safety is its top priority, followed by the improvement of passenger and cargo traffic procedures, economic and technical research, and action on legislation that affects the airline industry.

The Aerospace Industries Association of America is a national trade association of aviation-manufacturing companies and is engaged in research,

development, and manufacture of aerospace systems, including manned and unmanned aircraft, missiles, space-launch vehicles, spacecraft, propulsion, guidance and control units as well as a variety of airborne and ground-based equipment essential to the operation of flight vehicles. Begun in 1917, the AIA membership includes 49 companies that manufacture aerospace products, as well as some affiliate firms.

The International Air Transport Association is made up of 96 active members and 18 associate member airlines from all over the world. Its primary aims are to promote safe, regular, and economical air transport for the benefit of peoples of the world, to foster commerce and to study problems connected therewith, to provide means for collaboration among the air transport enterprises engaged directly or indirectly in international air transport service, and to cooperate with the International Civil Aviation Organization and other international organizations. The IATA also serves as a world parliament for the airlines and their representatives in international organizations.

The International Civil Aviation Organization is the outgrowth of a conference held in Chicago in November, 1944, called the Convention on International Civil Aviation. Articles were established that describe international standards and recommended practices regarding air navigation. By 1980, 95 nations had accepted the transit agreement which made provisions for aircraft of any signatory power to fly over or to land for technical reasons in the territory of any other signatory.

It is unclear that the changing regulatory environment will cause any structural change to the association framework. In addition to current functions, associations in a deregulated environment may have to expand their

interests. Studies that focus on capital availability, fuel costs, load factors, and other behavioral items that are so important in a competitive environment may receive additional attention by associations. Guaranteeing adequate rates of return on investments by airlines and the relationships that were fostered with manufacturers in the regulated climate no longer exist, and airlines may need to be more careful about the consequences of their operating and financial behavior. Associations will likely play a larger role in those research areas.

However, in certain areas associations may relinquish power. Since fares and routes will no longer be regulated, and the industry will be more competitive, associations may be more restricted to the kinds of information that it collects, evaluates, and disseminates to its membership, primarily for antitrust purposes.

C. Industry Components and Demographics

The airline industry is currently experiencing changes in the structure of its firms and the nature of competition in all markets. These changes will, no doubt, influence the mix of aircraft in the future and the availability of wide body aircraft. The industry components and demographics description can be divided into two parts, the first focusing on structural and behavioral characteristics of the airlines, and the second on financial performance.

1. Activity

World transport operations in the year 1980 showed a decrease of 1.7 percent from 1979. While demand fell, capacity (measured in available seat-kilometers) increased 7.3 percent and passenger load factors declined 5.6 percent. The domestic industry is comprised of 85 airlines with only a few

firms in cargo transport.¹ Domestic activity was less robust than international activities, especially in passenger service. Over the past twenty years, air traffic growth has been rapid. Passenger service has grown at 9.3 percent annually while cargo growth has averaged 12.2 percent annually. In freight, non-U.S. airline scheduled freight transportation continued to grow at a rate faster than growth in U.S. airlines' scheduled freight.

2. Employment and Productivity

Since 1970 total industry employment for the airlines has fluctuated around 300,000 employees per year, except for the years 1979 and 1980 where that figure rose to approximately 340,000. Between 1980 and 1981 there were dramatic decreases in employment in the industry. Full-time employment decreased about 13 percent with the number of part-time employees decreasing approximately 20 percent. The most significant decreases in employment occurred for carrier groupings of national and regional carriers (some of those decreases are due to switching of airlines into and out of carrier groupings). In labor productivity, there has been a continuing but often slow improvement in available seat-miles per employee for the industry as a whole. Larger fluctuations have occurred within each of the individual carrier classes. While the industry showed a dramatic increase in productivity from 1980 to 1981, cargo traffic productivity was almost constant over that period.

¹ For statistical and financial data analysis, the CAB has grouped airlines according to annual revenues into Majors, Nationals, Large Regionals, and Medium Regionals. The twelve airlines included in the category of major airlines are roughly equivalent to the former carrier grouping called trunk airlines. This includes carriers whose annual revenue exceeds \$1 billion.

3. Travel Agencies

An integral part of the competitive airline environment is accounted for by the nearly 20,000 U.S. travel agencies. Their sales exceeded \$18 billion in 1980, and grew by 12 percent in 1981. There has been a rapid increase in the volume and number of corporate accounts handled by travel agencies, especially in group sales. Travel agencies now account for about 60 percent of total sales, and sales and commissions are growing rapidly.

There has been a rise in commission payments (over 20 percent from 1980 to 1981), clearly a result of the Airline Deregulation Act, allowing individual airlines more freedom to offer unpublished discounts and to negotiate prices with favored clients. Travel agents with their large share of total sales, can heavily influence the operations of an airline by writing tickets for that particular airline.

4. Cargo Traffic

In 1979, the estimated world air cargo market amounted to more than 24 billion revenue-ton miles. Less than half of the traffic was transported in all-cargo aircraft with the remainder in combination-service aircraft. U.S. carriers had accounted for 60 percent of cargo transport in 1960; their share fell to approximately 33 percent by 1979. While U.S. carriers had an annual growth rate in air freight of about 21 percent during the first half of the 1960s and 11 percent during the next five years, the growth rate has dropped to 5 percent since 1970.

The world scheduled air freight growth during the last two decades has been influenced by a number of factors, including:

- The introduction of standard body aircraft during the 1960s;
- Slowed down world economies during the late 1960s and early 1970s;

- Stimulus provided by wide body aircraft during the early 1970s;
- Increased fuel prices starting in 1973-74;
- The 1974 recession and subsequent recovery; and
- Deregulation.

Due to the various effects of regulation and increased fuel prices, the air cargo industry became an unprofitable operation during the 1970s. In fact, Continental, Delta, and Eastern eliminated their scheduled freighter service in the mid 1970s, and American and United reduced their nighttime freighter service to reduce financial losses.

In November of 1977 the air cargo deregulation bill was signed into law, opening competition in domestic markets by eliminating the CAB's control over entry and exit and sharply curtailing its jurisdiction over tariffs. By July, 1980, the CAB had certificated 97 all-cargo 418 carriers, including supplemental carriers, air taxi operators, and air freight forwarders. Since deregulation, the structure of the industry has changed dramatically. Some former supplemental carriers, freight forwarders, and air taxi operators have inaugurated scheduled air-freight service. There has also been a large increase in the number of air freight forwarders, rising from 366 in 1976 to almost 1,300 by July, 1980.

Operating revenues for the top twenty air freight forwarders in 1980 was slightly more than \$1.9 billion, an increase over 1978 in excess of 26 percent.

5. Fare Determination Policies

Prior to the conclusion of the Domestic Passenger Fare Investigation (DPFI) in 1974, the CAB did not have comprehensive standards for evaluating

industry proposed tariffs. From that study inflexible normal fare structures based on average trip length and given standard load factors were developed. In 1977, passenger fares began to deviate from the DFFI when the CAB approved "peanut" fares for Texas International and "super saver" fares for American Airlines. These discount proposals and others that have been filed with the CAB led to the adoption of a fare flexibility rule (PS-80) which allowed market-by-market price competition beginning in September, 1978. These criteria were replaced by the Airline Deregulation Act of 1978, with the Standard Industry Fare Level (SIFL) which could be adjusted twice a year to reflect changes in actual industry costs and gave the airlines some flexibility in determining individual rates in individual markets. The use of the SIFL protected the consumer from potential monopoly power abuses. However, it was biased in favor of long-haul markets and served as a practical disincentive to other types of integrated pricing. Over time, interim CAB policy statements have been issued to broaden the fare structure and to provide more flexibility in individual markets.

6. Operating Costs

Operating costs have increased dramatically in the last few years, contributing to the serious financial difficulties of several major airlines. The Air Transport Association's composite cost index shows an increase from 88.0 in 1970 to 262.0 in 1980 and nearly 300.0 by the third quarter of 1981, a rate three times faster than growth in the consumer price index since 1970. The composite cost index closely follows the GNP deflator until 1974 and then begins to increase at a much higher rate up to the present time. Individual components of the composite cost index show somewhat dissimilar patterns. For example, in comparison to the GNP deflator, labor, commissions, and landing

fees show increases similar to the composite index. Fuel shows a dramatic deviation, from the GNP deflator, in an upward direction. Maintenance material expenditures seem to track the GNP deflator quite well over the entire period while interest payments fluctuate above the GNP deflator in the early 1970s but are consistently below the GNP deflator in the mid and late 1970s. Advertising expense and food costs run far below the GNP deflator.

Operating expense comparisons can also be made on an aircraft-type basis. Wide-body aircraft, including the B-747, DC-10, the L-1011, and the A-300, show lower flying operating expense per available seat miles than do narrow body jets. Expense per revenue passenger mile over the period 1973-1981 also shows lower costs for the wide body jets than for standard body jets.

7. Load Factors

The increase in average system load factor (Revenue Passenger Miles/Available Seat Miles) over the last decade signaled an improvement in productivity of airline operations resulting from reduced per-passenger costs and for some time kept fares from increasing even higher than they would have in lieu of higher load factors. The average load factor for U.S. domestic operations for trunk and local-service carriers increased from 45.9 percent in early 1971 to a high of 69 percent during the second quarter of 1979 and then declined to 59.7 percent during the second quarter of 1981. However, the higher the load factor, the lower the quality of service in terms of convenience. Recently, carriers have attempted to deal with the high load factor/service/convenience problem through the introduction of capacity-controlled fares -- fares that are offered for an overall percentage of the total capacity on a given route. These capacity-controlled fares are deep discount fares that are offered on a percentage of the total seats on a

flight. This type of pricing is a refinement of the off-peak pricing concept that has been used by the airlines for many years. It permits load factors to be increased without increasing demand on heavily traveled days by allowing the airline to fill seats with passengers willing to travel on less popular days in exchange for some fare reduction. While average load factors during the last decade have increased, and reduced the cost per passenger, declining fares and increased costs in total have raised the break-even load factor, i.e., the load factor from which 100 percent of the fixed costs are recouped. Over time, actual and break-even load factors have risen. During the first quarter of 1979 and the fourth quarter of 1979 as well as the first two quarters of 1980, the spread between actual and break-even load factors was negative, resulting in industry-wide losses.

One measure of differential activity between wide body and narrow body jets is the passenger load factor. Wide body jets as a group (and excluding the A-300 which showed wide fluctuations in load factors) all showed a general upward trend in passenger load factors with declines from 1979-1980 and an increase in 1981 (except for the L-1011 which showed a decline from 1980-1981). For narrow-body jets, the 727 showed an increase over the period up to 1979 but a decline from 1979-1981. The DC-9 and the 737 showed patterns similar to the 727.

8. Route Structure

The process of deregulation has intensified the local-service carriers' interest in longer-haul, high-density routes. In fact, the average passenger trip length increased between the first quarter of 1979 and the first quarter of 1980 by 1.8 percent for the trunk carriers, and 12.3 percent for the local-service carriers. In addition, the industry has increased its focus on

developing the hub and spoke-type network of route structure. Of the 60,000 city pairs with scheduled air service, the top 1,000 city pairs now account for about 70 percent of passenger traffic.

9. Financial Condition of the Industry

During the late 1960s, the U.S. airlines acquired billions of dollars worth of new wide-body aircraft. These purchases stemmed from commitments made earlier in the 1960s when profits were sufficient to provide a means of internal financing and also attracted any needed external funds. During the late 1960s, however, the financial position of the industry began to deteriorate. High operating ratios were experienced, earnings fluctuated, and returns on assets began to decline, and the capital required to finance new investment programs was available only at much higher cost. By the end of 1970, operating costs were nearly equal to operating revenues (operating ratio of 99.7 percent), liabilities were three times the size of equity capital, the rate of return on assets was negative, and new equipment financing required nearly \$2.50 of outside funding for every dollar of internal funds. In addition, income before interest and taxes amounted to a mere 10 percent of interest cost.

This deteriorating financial condition for the industry prompted the individual airlines to embark on cost-cutting measures and actions to improve yield. Between 1971 and 1974, operating ratios did improve. However, the increases in fuel prices, which began in 1973 and continued through 1980 helped force up operating ratios. These reached significant levels in 1975, decreased somewhat during 1976 to 1978, but then increased from 1979 to the present.

Earnings fluctuated over the period 1968 to 1976, as seen in the return on

assets and times interest-earned ratios. Actual losses were experienced in 1970 and 1975 with only a slight improvement over the period 1971-1974. During this period, long-term debt declined, with increased funding of new investment from operations. The financial structure of the industry remained relatively constant over this period.

From 1976 to 1979, the industry financial situation improved. Operating ratios declined from 1976 through 1978, and return on assets increased steadily through 1978, reaching 5.8 percent in that year (from a low of -0.4 in 1975). During this period, much new equipment was funded from operations.

In response to the Airline Deregulation Act of 1978 and the entrance of new airlines into multiple markets, the high inflation experienced throughout the economy, strikes, and the grounding of the DC-10s, the financial condition of the industry was severely impacted. The ratio of operating costs to operating revenues rose from 94.1 percent in 1978 to 99.3 percent in 1979, and surpassed 100 percent in the years 1980 and the first three quarters of 1981. From a high of 5.8 percent in 1978, return on assets decreased to 1.5 percent in 1979, and 0.1 percent in 1980. The purchase of new equipment, which had been financed largely internally in 1978, has in the last few years been financed largely from external sources. Although operating costs exceeded revenues in 1980 and 1981, the airlines avoided net losses only through non-airline net income and extraordinary gains from the sale of assets. By the end of the third quarter of 1981, the return on assets approached zero. The ratio of total debt to total equity increased significantly over these last few years, with the funds used to finance investment and current operations. The purchase of new equipment during 1981 slowed significantly.

The poor financial condition of the industry and resulting lack of

internal funds and high cost of external funds resulted in the development of new, creative forms of financing. The changes included in the 1981 Economic Recovery Tax Act brought some hope to the airlines through the introduction of the phantom lease. However, an early 1982 move to repeal the leasing section led carriers to cancel or consider canceling aircraft orders.

The present financial condition of the industry creates a picture of high risk and great uncertainty. At no other time in the last two decades has the airline industry been confronted with the combination of overwhelming financial and operating problems that it faces today. The successful development of the CRAF program requires that some analytical system be developed to forecast the operating and financial condition of the airlines in the future.

D. Conclusions

1. Analysis of Interrelationships Between Operating and Financial Characteristics

Developments in three general classes of interrelationships between operating and financial conditions of the U.S. civil airline industry largely determine the industry's current and future position. These areas are:

- a) General U.S. economic conditions;
- b) The deregulatory environment and its effect on competition; and
- c) Fuel prices.

The industry's current turbulence has caused the airlines to shorten their planning horizons to coincide with external influences, internal operations, and the speed of change of various factors affecting the overall industry. The interrelationships between the industry's various structural, behavioral and performance characteristics are complex and subject to change over time.

However, focusing on existing conditions, current trends, and near-term expectations, it is possible to describe the major components and their interrelationships.

2. General Economic Conditions

One major influence on the operating and financial condition of the U.S. airline industry at any point in time is the prevailing condition of the general economy. Airlines are more sensitive than many other firms to general economic trends, growing fast during upswings while suffering in a declining economy. This is due to the non-essential nature of much air traffic. For example, during a recession businesses cut back on travel, vacationers fly less, and freight shipments decline.

General financial conditions also impact the airlines. When interest rates are high, capital to finance expansion is more difficult to obtain and is more costly than during periods of more sustained growth and lower interest rates. Financial institutions are less willing to arrange capital expansion for airlines during periods of declining economic activity. Thus, one factor which is very important to the renewed operating and financial strength of the U.S. airline industry is the general condition of the economy.

3. Deregulation

A second factor affecting the U.S. airline industry is the major change resulting from deregulation. During the long period of airline regulation, the industry structure had been relatively stable and there was a clear understanding of these "rules of the game." However, since deregulation, apparent structural changes include the movement to larger markets by the major and national airlines, the movement of large regional airlines into

longer-haul markets, and the development of the hub and spoke network. The hub and spoke network of route competition allows the airlines to move larger numbers of people at less cost per person. Although it brings some inconvenience, the potential for reducing costs, increasing load factors, and reducing the number of unprofitable routes should improve airlines' conditions. It seems likely that the hub and spoke network will continue to grow and become a major logistics feature of the future U.S. airline industry.

The deregulated environment, combined with a depressed economy, has resulted in intense fare competition between airlines, even to the point where average fares do not cover operating costs and individual airlines incur losses, as most did in 1981. This type of "frictional" adjustment, that is, changes in the structure of the market adapting to a new deregulated environment, has certainly had impacts on individual airlines but in general should not affect the total level of air travel (capacity) in the airline industry.

The overall volume of service provided by the airline industry will closely follow general trends in the economy, although as individual airlines jockey for position in different markets, there may be a change in the participants within the industry. Inefficient airlines will be less able to compete in the new deregulated market; they will have to radically change their operating structure or exit the industry, while more efficient carriers will thrive. After the adjustments to deregulation have been made, the airline industry should emerge as a stronger and more viable component of the transportation sector. The structure, in terms of number and size distribution of airlines in different carrier classes, may be different and is difficult to predict, but the result should be more efficient passenger and

cargo service.

One major ingredient in the new competitive environment is the relationship between travel agents and the airlines. They write approximately 60 percent of all air travel tickets. With so large a share of total tickets, travel agents acting collectively could influence the health of a specific airline (for example, a joint decision to avoid or embargo an airline could push that airline toward bankruptcy).

Travel agents' effectiveness in dealing with a specific airline is determined largely by the relative speed of diffusion of information and how individual agents act on that information. The structure of the travel agent industry is sufficient to cause that the likelihood of agencies acting collectively is small. However, the fact that travel agents are not cohesive does not in itself preclude influence -- agents have relatively few information sources, and are particularly dependent upon the large data bases provided by a few individual airlines. Given the current structure of information processing, it is possible that agents could, either coincidentally or by design, affect an individual airline's position in the industry. Currently, airlines are recognizing the increasing importance of travel agents and are examining their relationships with travel agents, in a deregulated, competitive environment.

4. Fuel Prices

The third major factor affecting the airline industry is the dramatic increase in fuel prices begun in late 1973, and the impact of higher prices on technological development within the industry. Fuel costs now represent over 30 percent of total operating expense, a 2-1/2 fold increase from the approximately 12 percent level which prevailed in the 1960s and early

1970s. This has spurred the development of new, more fuel-efficient aircraft such as the Boeing 757 and 767. Airlines have attempted to purchase new, fuel-efficient aircraft and have structured their routes to better utilize their aircraft and reduce total fuel cost.

5. Impact on Expansion in the Industry

The current financial condition of the industry in general and most of the airlines is at best tenuous. Braniff has gone bankrupt, and several others are experiencing deteriorating financial positions. The changes in the airline industry's financial structure seriously affect their ability to acquire (finance) new equipment. Leasing has recently become a more important if not necessary means by which many airlines acquire new capital equipment. Various leasing arrangements have been used, some of which are relatively straightforward. However, as the complexity of financing new equipment has increased, so has the intricacy of lease arrangements, many now spanning international borders and involving various governments. Domestic actions such as support of the Export-Import Bank policies and safe-harbor leasing have recently had a large impact on airlines' ability to finance new equipment. However, in spite of these conditions, the poor operating performance of the industry and the subsequent poor financial performance has caused many airlines to postpone new equipment on order (as well as options) and to keep older, less efficient aircraft in service for a longer period of time than they would have under an environment where some guarantee about yields could be expected. This has had an impact also on the market for used aircraft and has initiated refurbishing of existing fleets.

6. Outlook for the Future

The changes that the U.S. airlines are undergoing are new in the history of the airline industry. These changes in the structure, operating behavior and financial positions of airlines, while severe in some cases, are likely to be temporary and greatly dependent upon general economic conditions. It was widely accepted that deregulation would intensify competition, both in terms of route structure and fares. However, it could not be forecast that the transition to deregulation would occur during generally weak economic times and consequently poor demand for air service. These events, along with increasing fuel prices, have weakened the airlines.

From an operational perspective, the airline industry is changing dramatically, from one that stressed passenger convenience (in a regulated environment) to operating efficiency and cost reductions reflected in development of the hub and spoke network of air travel.

It seems clear that the conditions currently being felt throughout the airline industry are not what many experts consider to be normal. The industry has not fully adjusted to its new operating environment. While current conditions in the airline industry are more severe than they have been in decades, there have been other instances in the past when sectors within the industry have had to deal with great uncertainty. For example, the introduction of new aircraft types has always caused great uncertainty, not only on the part of manufacturers, but for those airlines that chose to purchase that aircraft (the introduction of wide body aircraft in the late 1960s is a prime example of the enormous impacts and swings that can occur within the industry). If there is anything to learn from historical consequences in the airline industry, it is that the industry is resilient to

negative influences, and has the ability to adjust, reevaluate its position, and change. That flexibility may be the saving grace for individual airlines. It seems likely that the industry will prosper in the future. Individual firms in the industry will adjust, both in their operating and financial behavior, in order to survive, and the total level of air service provided to the public will not significantly change, meeting the demands of travelers. However, in the long run, a stronger industry will emerge, one that is more efficient, and better able to deal with future operating and financial challenges.

7. Variables of Interest

In order to better understand the implications of the factors discussed above on the future design of the industry, further study of particular key variables within the industry is required. These variables, measures of specific operational and financial activity, require evaluation for their potential in forecasting the future fleet mix. Since many of the variables discussed above are more detailed in the main body of this report and accompanying appendices, it is sufficient here to list those that might be good candidates for inclusion in an analytical system that forecasts the future fleet mix. These variables include the following:

a) General economic variables such as:

1. GNP
2. Disposable personal income
3. Prime interest rate
4. Consumer Price Index
5. Wholesale price index for transportation
6. Unemployment rate

b) Operating characteristic variables, including:

1. Revenue passenger miles
2. Available seat miles

3. Revenue ton miles
4. Available ton miles
5. Employment
6. Aircraft age
7. Price of fuel
8. City-pair characteristics, such as number and range
9. Changes in fares
10. Operating cost components
11. Operating expense changes
12. Load factors, break-even load factors
13. Revenue passenger enplanements
14. Passenger trip length
15. Output labor ratios

c) Financial characteristic measures including the following:

1. Operating ratio (operating expense/operating revenue)
2. Times interest earned (income before interest and taxes - total interest expense)
3. Debt/equity
4. New equipment operating funds
5. Return on assets, return on equity
6. Asset turnover (operating revenues - total assts)
7. New investment as percent of total assets
8. New investment as percent of funds operations
9. Funds from operations as percent of total sources
10. Total debt/total invested capital
11. Long-term debt/total invested capital
12. Current ratio (current assets - current liabilities)
13. Net income
14. Benefit from sale of tax benefits
15. Capital expenditures/total assets
16. Total liabilities/total assets
17. Total noncurrent liabilities/total assets