U.S. Department of Transportation
Federal Aviation Administration

The Economic Impact of Civil Aviation on the U.S. Economy

August 2011

Contents

Foreword

Look around. In today's ever-changing and innovative world, aviation provides a vital link to economic opportunities at home and abroad. In the wake of global economic and financial uncertainties, runways have become the new main streets for cities and towns to get down to business and soar once more.

In 2009, civil aviation supported over 10 million jobs, contributed $1.3 trillion in total economic activity and accounted for 5.2 percent of total U.S. Gross Domestic Product (GDP). Civilian aircraft engines, equipment and parts also contribute $75 billion toward the U.S. trade balance. Civilian aircraft engines, equipment and parts have been the top net export for the past decade.

Our economic success clearly depends on the success of aviation. So the Federal Aviation Administration (FAA) is committed to providing the safest, most efficient aerospace system in the world. As we move forward, the FAA will continue to invest in airports, and build the Next Generation Air Transportation System (NextGen). NextGen is a transformation of the National Airspace System. It will add a suite of 21st century technologies and procedures to make air travel more efficient and green. FAA's Destination 2025 will provide the strategic bridge to accomplish the NextGen vision.

This concise report, ideal for policymakers and industry officials, offers the latest data on the economic impact of civil aviation. This version contains several new points of analysis including the economic impact of federal spending on aviation and hard-to-quantify economic enablers such as speed, cost, flexibility, reliability and safety.

Over the decades, civil aviation has been a catalyst for commerce. Where it takes us from here, only our imagination knows.

David Grizzle
Chief Operating Officer
Air Traffic Organization
Federal Aviation Administration

Overview

Enabling American Commerce in the Global Marketplace…

The civil air transport industry has a crucial role in fostering trade and making any place on the globe easily and quickly accessible. U.S. industry and consumers depend on the vital services of air transportation, which continue to maintain and vitalize the U.S. economy.

- In 2009, air carriers operating in U.S. airspace transported 793 million passengers over 1,039.3 billion revenue passenger miles (RPM).
- More than 53 billion revenue ton-miles (RTM) of scheduled freight passed through U.S. airports in 2009.[1]
- The U.S. civil aviation manufacturing industry continues to be the top U.S. net exporter. According to 2009 data from the U.S. International Trade Commission (USITC), the U.S. civil aviation manufacturing industry supported a positive trade balance of over $75 billion.
- New research using data from 2008 shows that air transportation enables economic activity in other sectors of the economy through:
  - Air-traveler spending of $249.2 billion on goods and services
  - Freight valued at $562.1 billion transported domestically or to other countries
- The Federal Aviation Administration (FAA) spent more than $14 billion on air traffic operations, facilities and equipment, and grants in 2008 to support the National Airspace System (NAS). These expenditures supported additional spending in the economy totaling $26.2 billion and nearly 218,000 jobs with earnings of $8.3 billion.

[1] U.S. Department of Transportation, Bureau of Transportation Statistics (BTS), T-100 Segment. System revenue ton-miles.

Economic Survival During Uncertainty…

Even during tough times, the efficiency of our air transport network serves commerce and supports jobs that maintain and revitalize the strength of the U.S. economy. Today, despite the lingering effects of the recent recession, there is cautious optimism in the air transport sector of the U.S. economy.[2] The industry continues to be flexible, developing new, innovative ways to lower costs and increase revenues.

- For example, as the price of jet fuel climbs, air carriers are finding innovative ways to conserve fuel and lower costs by: replacing old, heavy drink carts with new lighter versions, removing seat back telephones, installing lighter seats and TV monitors, applying new coating on airframes to improve airflow, and purchasing more tugs to reduce engine fuel use.[3]

- Investment in air transportation infrastructure leads to smart growth and job creation. The American Recovery and Reinvestment Act of 2009 provided funding to invest $200 million in FAA facilities and equipment and $1.1 billion in grants-in-aid for airports.

- The 2011 FAA Aerospace Forecast expects a 4.9 percent increase in RPM between fiscal years 2010 and 2011, and projects average annual growth rates of 3.8 percent per year through 2031 for U.S. airlines.

Sustaining Economic Development and Growth…

From live traffic reports sent from helicopters to just-in-time delivery of life saving organs for transplant, civil aviation has become an integral part of the U.S. lifestyle and commerce. In challenging economic times, the services that air transportation provides are essential among the building blocks for recovery and economic growth. The financial crisis and ensuing recent recession affected the whole world. Global real GDP growth slowed from 3.9 percent to 1.6 percent between 2007 and 2008,[4] while real GDP growth in the U.S. dropped from 1.9 to zero percent during the same period.[5]

Although June 2009 marked the end of the recent recession in the United States, real GDP growth fell by 2.6 percent by the end of 2009 and unemployment rates reached double digits. However, despite the dramatic slowdown of the economy and impact on the aviation industry, the U.S. economy produced $14.1 trillion in value-added economic activity and sustained 140 million jobs.[6] At the same time, civil aviation economic activity:

- Supported 10.2 million jobs
- Contributed $1.3 trillion in total economic activity
- Accounted for 5.2 percent of total U.S. GDP

[2] International Air Transport Association. *State of the Industry*, June 2010.
[3] NBC News. "American Airlines Gets Creative to Save Fuel." http://www.nbcdfw.com/news/business/American-Airlines-Gets-Creative-to-Save-Fuel-117978259.html
[4] International Monetary Fund, World Economic Outlook Database, October 2010. http://www.imf.org/external/pubs/ft/weo/2010/02/weodata/index.aspx
[5] U.S. Department of Commerce, Bureau of Economic Analysis. National Income and Product Account Tables. January 2011. http://www.bea.gov/national/nipaweb/Index.asp
[6] U.S. Department of Labor. Bureau of Labor Statistics (BLS), Labor Force Statistics from the Current Population Survey. February 2011. http://www.bls.gov/

Introduction

Economic Impact of Civil Aviation Highlights

What Is New?

To keep abreast of all of the changes with greater accuracy, the FAA has incorporated new government data, methodologies and an updated version of the Regional Input-Output Modeling System (RIMS II). Along with the 2009 economic-impact estimate, the FAA has taken the opportunity to revise its impact estimates for the years 2000 through 2008, providing users with a consistent time series, using the new methodologies and data. The most current official economic data available is for calendar year 2008.

Federal spending to maintain and upgrade the NAS has long been ignored in understanding the full economic impact of the aviation industry. Accordingly, this year's report contains an extensive study of the impact of FAA spending (e.g., payroll, nonpayroll, grants) on national and state economies. The impact of this spending is reported by total output, earnings and jobs at the national and state levels.

Also included in this report is an analysis of the enabling impact of aviation, a concept developed by Massachusetts Institute of Technology (MIT) researchers. The concept envisions transportation services in terms of the following characteristics: speed, cost, flexibility, reliability and safety. These characteristics are not easily quantifiable, but the FAA has taken a first step at quantifying some measures of enabling flows for 2008.


900
800
700
600
500
400
300
200
100
0
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
0
1978
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
Real GDP
(Billions of Dollars)

Current Outlook

There is growing optimism for aviation industry growth. The overall health of the aviation industry is tied to the U.S. business cycle, and the airline industry remains very responsive to overall changes in the economy (**Figures 1 and 2**).

As commonly stated in 1950s and 1960s economic literature, *every time America sneezes, the rest of the world catches pneumonia*. This old adage can also be applied to today's aviation industry's relationship with the overall U.S. economy. As shown in **Figure 2**, after deregulation and throughout the 1980s, the demand for air travel consistently increased or decreased faster than the economy. In the 1990s, the economy and demand for air travel became more linked than in the previous decade and grew at more consistent rates. However, after September 11, 2001, the link between the economy and the airline industry decoupled and the impact on the demand for air travel is again exhibiting an increase in sensitivity to economic and global events.

The economy grew 1.1 percent in 2001, but after the events of September 11, the demand for air travel fell 6.2 percent. The subsequent years continue to exhibit a similar pattern. Air travel demand increased 11.6 percent in 2004, just over three times the growth rate of the economy (3.6 percent), whereas in 2009, air travel demand dropped by 5.3 percent, twice that of the economy (-2.6 percent). However, preliminary data coming out of the recent recession show that the economy and demand for air travel growing at similar rates in 2010, 2.9 percent and 3.7 percent respectively.

The aviation industry has shown flexibility and ingenuity, adopting innovative resource-saving and revenue-enhancing techniques during these challenging economic times. U.S. flagship air carriers had roughly 809 billion RPM in 2010, a 2.9 percent increase over 2009. The seat mile capacity of U.S. flagship air carriers grew by 1.7 percent from 975.3 billion available seat miles (ASM) in 2009 to 991.9 billion ASM in 2010. According to the Bureau of Transportation Statistics (BTS), the average round-trip air fare (including taxes) increased 5.2 percent from $320 in the fourth quarter of 2009 to $337 in the fourth quarter of 2010.[7] The change in average fares was beneficial for airlines as they removed seat mile capacity from their networks and were able to post the highest profit margins since 2002.[8]

Prior to the recent recession, air cargo experienced considerable growth. In 2009, as the impact of the recent recession took hold, U.S. air carriers saw a precipitous drop in the demand for air cargo services. However, 2010 shows a different story. U.S. air carriers moved 35.2 billion revenue ton-miles (RTM) of freight in 2010, an increase of just over 16 percent from the 30.3 billion RTM carried in 2009.[9]

[7] Fares based on domestic itinerary fares, round-trip or one-way for which no return is purchased. Fares are based on the total ticket value, which consists of the price charged by the airlines plus any additional taxes and fees levied by an outside entity at the time of purchase. Fares include only the price paid at the time of the ticket purchase and do not include other fees paid at the airport or onboard the aircraft. Averages do not include frequent-flyer or "zero fares" or a few abnormally high reported fares.

[8] Bureau of Transportation Statistics. Airline Financial Data. www.bts.gov/press_releases/2010/bts060_10/html/bts060_10.html.

[9] U.S. Department of Transportation. BTS.

Figure 1 The Economy and Demand for Air Travel

Source: Bureau of Economic Analysis and Bureau of Transportation Statistics

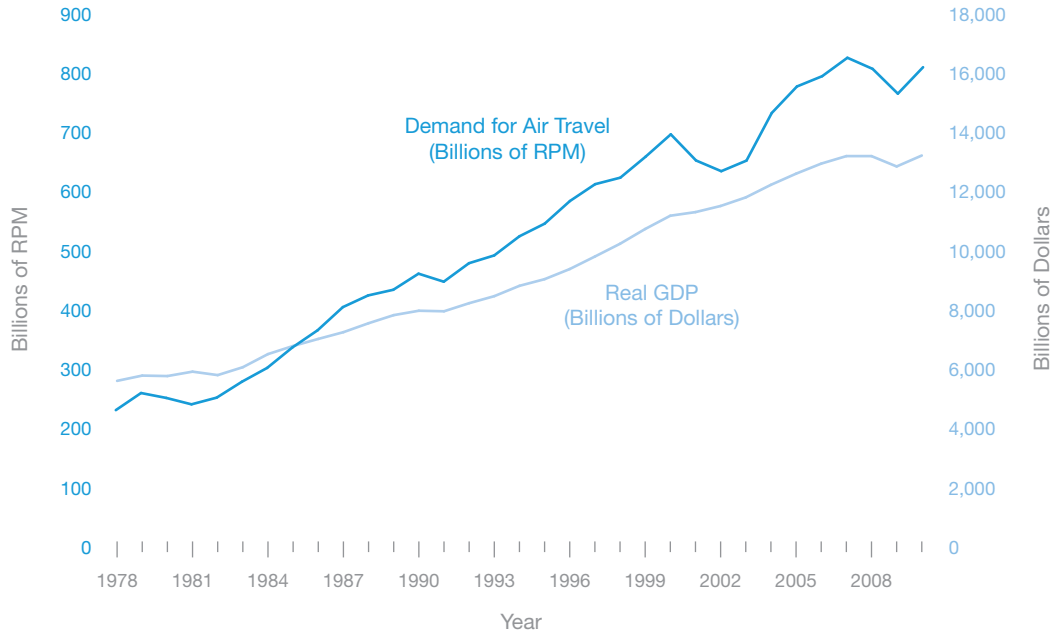
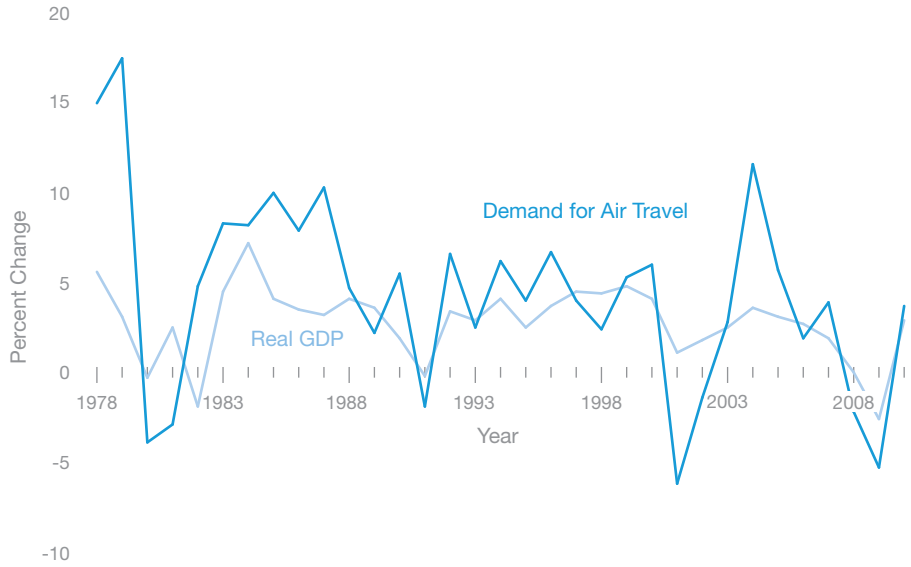


Figure 2 Growth of the U.S. Economy and the Demand for Air Transportation

Source: Bureau of Economic Analysis and Bureau of Transportation Statistics



For decades, American-made aircraft have been in high demand both domestically and internationally, and sales of airframes, aircraft engines and parts boosted the economy. Due to the high quality of U.S. aerospace products, global demand continues to add to overall economic growth and job creation within U.S. borders. One way to measure how the U.S. aircraft manufacturing industry is faring in today's global economy is to estimate the net value of goods exchanged between the United States and the rest of the world.[10] The net value of goods exchanged between the countries is characterized as the balance of trade and is defined as the difference between the value of exports and imports.

According to the USITC, the value of the U.S. trade balance in goods was -$500.9 billion in 2009. The total U.S. trade balance has been negative since 1971,[11] driven significantly by net imports of petroleum and motor vehicles, undermining U.S. competitiveness in the world market (**Figure 3**). However, for the past decade, the trade balance of the U.S. civil aviation industry has remained positive. Even as the global economic downturn continued into 2009, the civil aviation industry remained a net exporter of U.S. goods to the world, contributing to a lower overall U.S. trade balance.[12]

The highly volatile price of fuel continues to be a major concern for the airline industry and overall economy. In the summer of 2008, jet-fuel prices spiked to record highs, followed quickly by a precipitous drop in the autumn (**Figure 4**). Oil market speculators drove the increase as did flat U.S. crude petroleum field production, cuts in U.S. refining capacity, declines in Strategic Petroleum Reserve stocks, decreases in Organization of Petroleum Exporting Countries (OPEC) production targets, and political uncertainty in the Persian Gulf, Venezuela, Algeria and Nigeria.[13] Prices subsequently fell during the remaining months of 2008 to $53 per barrel in February 2009—a 68 percent decline. This decrease was mainly due to the delayed impact of falling overall demand for oil as a result of the recession.[14] With the upturn in the economy, the price of jet fuel has slowly risen. In January 2011, the price of jet fuel averaged $110 per barrel. Recent political turmoil in North Africa and the Middle East has led to further price increases.

While many analysts believe that the oil market will return to more familiar patterns, it should be noted that the increased demand from China, India, Brazil and other emerging economies will likely place upward pressure on the price of energy faced by airlines and by their customers. Moreover, as in all forecasts, some events cannot be foreseen. Recent unrest in the Middle East and Africa has created more uncertainty for all transportation-related services and dampened economic expectations. From December 31, 2010, through March 4, 2011, the spot price of U.S. Gulf Coast jet fuel, according to the U.S. Energy Information Administration, rose 63 cents per gallon to $3.13, versus an increase of 42 cents per gallon for all of 2010.

[10] United States International Trade Commission. www.usitc.gov
[11] U.S. Department of Commerce, Bureau of Economic Analysis (BEA). Balance of Payments.
[12] USITC now measures Civil Aviation Aircraft, Engines, Engines, Equipment and Parts separately from Aerospace Products.
[13] Joseph Kowal, Antonio Lombardozzi, Scott Sager and William Snyders. 2008. "Producer Inflation Accelerates in 2007 Due to Rising Prices for Energy and Foods." *Monthly Labor Review*. Volume 131, Number 7 (July 2008). http://www.bls.gov/opub/mlr/2008/07/art1full.pdf; U.S. Department of Energy. Energy Information Administration. 2007. "Short-Term Energy Outlook Supplement: Why Are Oil Prices So High?" http://www.eia.gov/emeu/steo/pub/special/2007-oil-prices.pdf
[14] Joseph Kowal, William Snyders, Antonio Lombardozzi and Lana Borgi. 2009. "Producer Prices Reverse Course in 2008." *Monthly Labor Review*. Volume 132, Number 7 (July 2009). http://www.bls.gov/opub/mlr/2009/07/art2full.pdf

Figure 3 U.S. Trade Balance by Industry, 2009 (Best Five and Worst Five)

Source: U.S. International Trade Commission

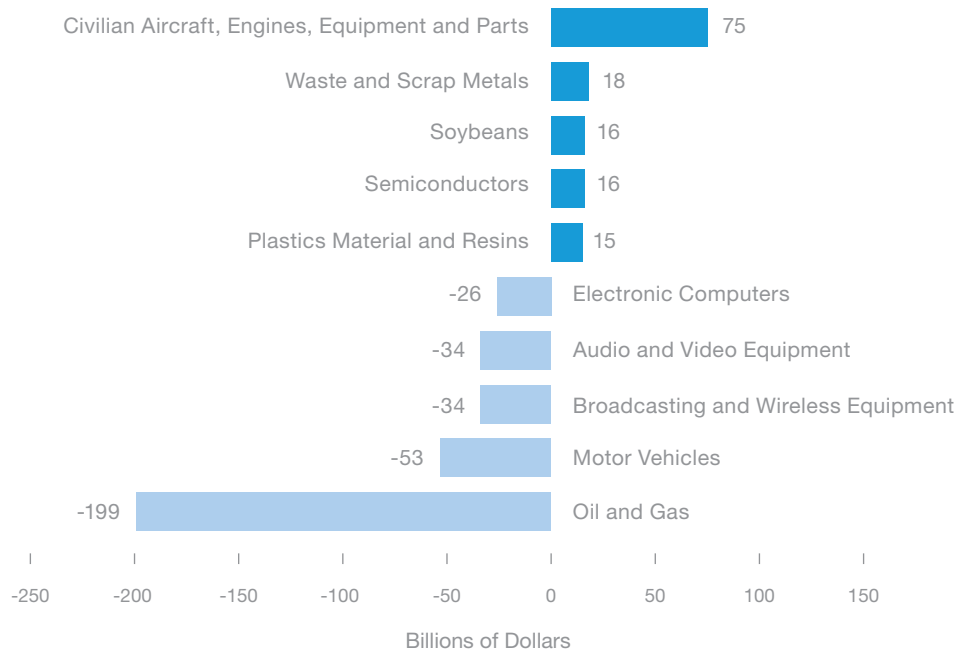
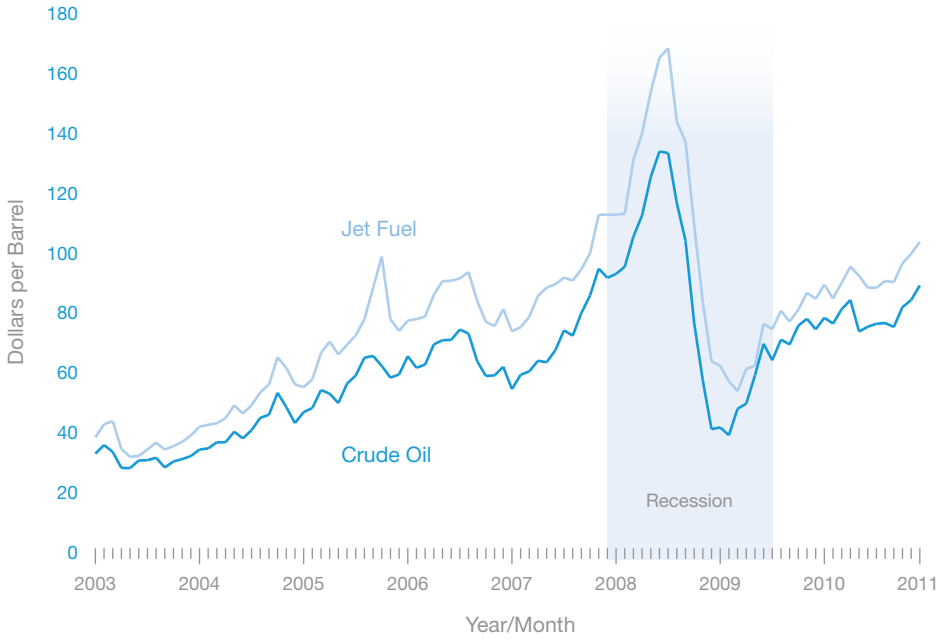


Figure 4 Monthly Fuel Prices

Source: U.S. Department of Energy, Energy Information Administration



Impact of the Recession on U.S. Airlines, Coping Strategies and Future Outlook

The financial crisis that began in the United States due to problems in the financial and housing sectors quickly spread to the rest of the world, resulting in the recent recession. The National Bureau of Economic Research (NBER), the watchdog of business-cycle contractions (recessions) and expansions (recoveries), determined that the recent recession[15] officially began in December 2007 and, despite continued high unemployment in the U.S., ended in June 2009 with the resumption of positive economic growth in the overall economy.[16] Although unemployment remained high throughout 2010, NBER stated that based on analysis of previous business cycles, the slow return of employment is a lagging characteristic of deep recessions.

The fallout of the financial- and housing-sector crises crimped the aggregate demand of businesses and individual consumers for goods and services, as well as the availability of new money for investment. As the crisis continued to unfold, the economy abruptly slowed, causing the recession. The lower wealth levels resulting from the fall in home prices and loss of income among the newly unemployed led to even lower expenditures, including spending on air transportation.

The Overall Economy

Recent movements in real GDP, retail sales and industrial production suggest that the economy is in recovery. Year-over-year growth rates[17] in real GDP, retail sales and industrial production have turned positive and, although employment and the housing market remain challenged, signs of improvement are surfacing.

The first part of the recession, from December 2007 through the first quarter of 2008, was characterized by positive but declining economic growth. Real GDP, retail and food service sales, industrial production and employment continued to grow during this period, but at lower rates (**Figures 5 and 6**).[18] Subsequently, from the second quarter of 2008 to mid-2009, growth rates turned increasingly negative. Industrial production shrank in April 2008, followed by a drop in employment in May 2008. Although growth in retail sales slowed in the first period, it did not turn negative until September 2008. The economy seemed to turn the corner by the end of the second period, with annual growth in real GDP reaching a low of -4.1 percent in the second quarter of 2009. June 2009 was the low point of the economic trough, signifying the end of the recession.

As the economy started to recover, real GDP growth remained negative but was slowly improving. Growth turned positive in the fourth quarter of 2009, as did growth in retail sales in November 2009. Industrial production exhibited strong positive growth in January 2010 and continued to grow thereafter. Employment reached a low of 138 million persons in December 2009[19] but is currently growing slowly on a month-to-month basis. In February 2011, employment stood at 139.5 million.[20] Employment is recovering slowly because employers do not wish to add new workers until recovery is more certain.

[15] This recession was labeled the "Great Recession" by the news media in the U.S., not by NBER. An official definition for the term does not exist.
[16] National Bureau of Economic Research. www.nber.org
[17] Year-over-year growth rates are percent changes from the previous year or period.
[18] All monthly and quarterly data are seasonally adjusted, at annual rates. Real GDP, published by the BEA, is constructed from seasonally adjusted data. Seasonally adjusted retail sales, industrial production and employment are published by the Census Bureau, the Federal Reserve and the Bureau of Labor Statistics, respectively. Along with quarterly real GDP, BEA also publishes annualized quarterly percent changes in real GDP. These quarterly percent changes are different from the year-over-year percent changes presented here.
[19] At the business-cycle peak, December 2007, employment stood at 146.2 million. Therefore, employment fell by 8.3 million from December 2007 to December 2009.
[20] U.S. Department of Labor, Bureau of Labor Statistics, Labor Force Statistics from the Current Population Survey. February 2011.

Figure 5 Real GDP Year-over-Year Growth by Quarter during the Recent Recession and Recovery, Seasonally Adjusted at Annual Rates

Source: U.S. Department of Commerce, Bureau of Economic Analysis

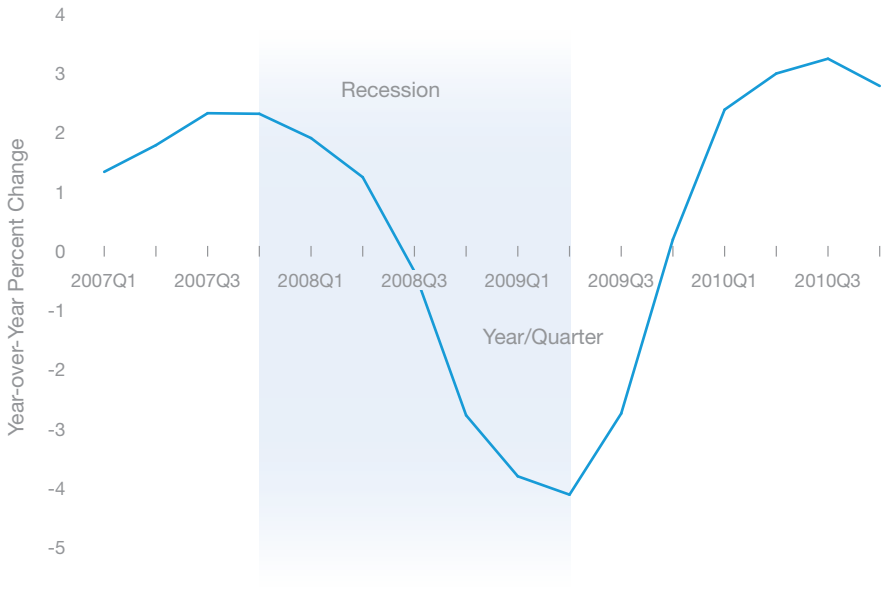
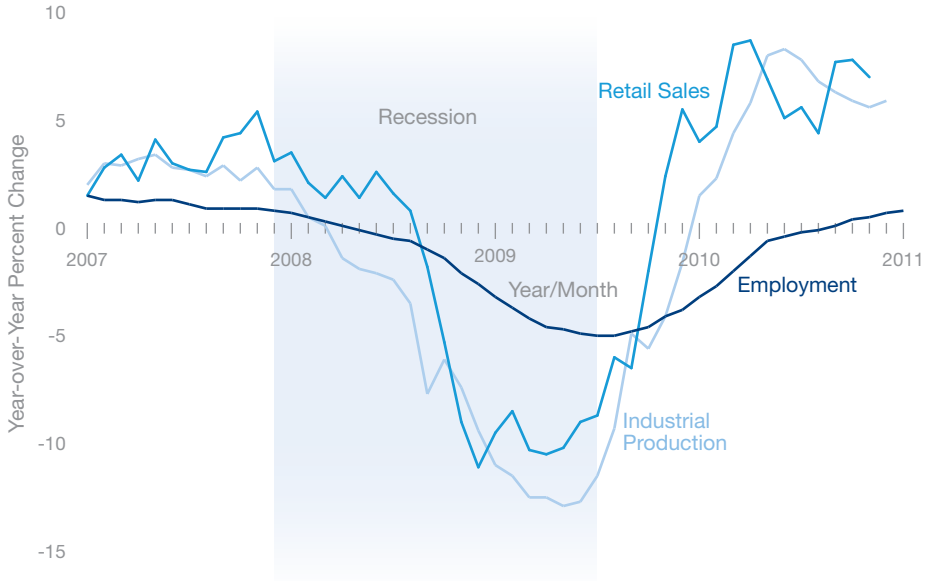


Figure 6 Key Monthly Economic Indicators during the Recent Recession and Recovery, Seasonally Adjusted at Annual Rates

Sources: Bureau of Labor Statistics, Federal Reserve Board and Census Bureau



The Air Transportation Industry

Economic recovery in the air transportation industry depends heavily on the economic recovery of the rest of the economy, the willingness and financial ability of individuals and businesses to undertake travel, and the need for air-freight services. As the overall economy improves and as more individuals and businesses are willing and able to travel, more arrangements are made for trips to be completed at a future date. Therefore, economic movements in the air transportation industry generally lag movements in the rest of the economy. The recent growth in the economy is leading to increases in airline operating revenues and RPM,[21] but not industry employment. Airline industry employment is in decline and could continue to fall even as the industry recovers. Airline employment has fallen since reaching a peak in 2000, before the onset of the U.S. recession in 2001 and the ensuing terrorist attacks on September 11.

The decrease in airline employment may reflect long-run changes within the industry, as the structure of the industry changes and airlines seek to increase productivity. In recent years industry output and employment began to move independently of one another. Airline industry employment peaked in the fourth quarter of 2000 at over 557,000 employees and fell sharply to about 376,000 employees by the third quarter of 2010 (**Figure 7**), a decrease of 32.5 percent over 10 years, or approximately 3.9 percent per year.[22] Over the same period, RPM rose 1.4 percent per year, from 710.6 billion to 811.4 billion.[23]

Why is employment declining so drastically while output is rising? There are three reasons for this apparent contradiction. The first reason is that many airlines are replacing directly employed workers with workers supplied through contracts with outside firms. According to annual data from BTS, maintenance employment fell 33 percent from 64,248 in 2000 to 42,774 in 2009 (**Table 1**). The drop in employment stemmed mainly from changes in employment at the network carriers. Among seven network airlines, employment decreased from 55,715 to 31,448.[24] At these carriers, the average number of maintenance workers per aircraft fell from 16.6 in 2000 to 12.4 in 2009, and the percentage of maintenance expenses outsourced to other firms rose from 24.3 to 38.9.[25]

Second, low-cost carriers (LCC), which employ far fewer maintenance employees per aircraft and outsource a higher percentage of maintenance expenses, grew as a share of the industry during this period. In 2009, the number of LCC workers was 3,300 while the number of maintenance employees per aircraft and the percent of maintenance expenses outsourced stood at 3.2 employees and 55.6 percent, respectively (**Table 1**). LCC's maintenance activity is lower because these carriers utilize newer aircraft. According to calculations using the Aircraft Inventory data from BTS, the average age of LCC's aircraft was 9.4 years versus 14.8 years for network carriers in 2009. Also noteworthy is the increase in LCC industry share of domestic flight operations. According to BTS, the annual number of domestically scheduled flights by network airlines fell from 4.2 to 2.5 million between 2000 and 2009, while the number of flights among LCCs increased from 1.3 to 1.8 million. Furthermore, in response to the recent recession, airlines employed fewer maintenance workers and reduced outsourced maintenance expenses. Comparison of the 2008 and 2009 data shows a 7.2 percent decline in the employment of maintenance workers, all attributable to a decrease in employment at network airlines (**Table 1**). The data also show a 1.8 percentage-point decrease in the share of maintenance expenses that were outsourced.

The third reason for the fall in industry employment is the substitution of technology for tasks previously handled by employees. For example, more travelers are using the Internet instead of contacting airline ticket agents to book, price-compare or check in for flights. Digital technology also has brought about greater efficiencies in handling airline tickets and luggage at airports.[26]

[21] One RPM is equal to one paying passenger transported one mile.
[22] The number of employees is defined as full-time equivalents (FTE), seasonally adjusted.
[23] RPM are at seasonally adjusted, annual rates.
[24] The seven network carriers are: Alaska, American, Continental, Delta, Northwest, United and US Airways.
[25] U.S. Department of Transportation, Bureau of Transportation Statistics, 2010. Form 41 Financial Report, B-1.
[26] Samantha Bomkamp. 2010. "Airline Staffs Hits Record Lows, With Room to Fall." *Washington Post*. April 11, 2010.

Figure 7 Airline Employment Trend, 2000–2010

Source: Air Transport Association of America (ATA)

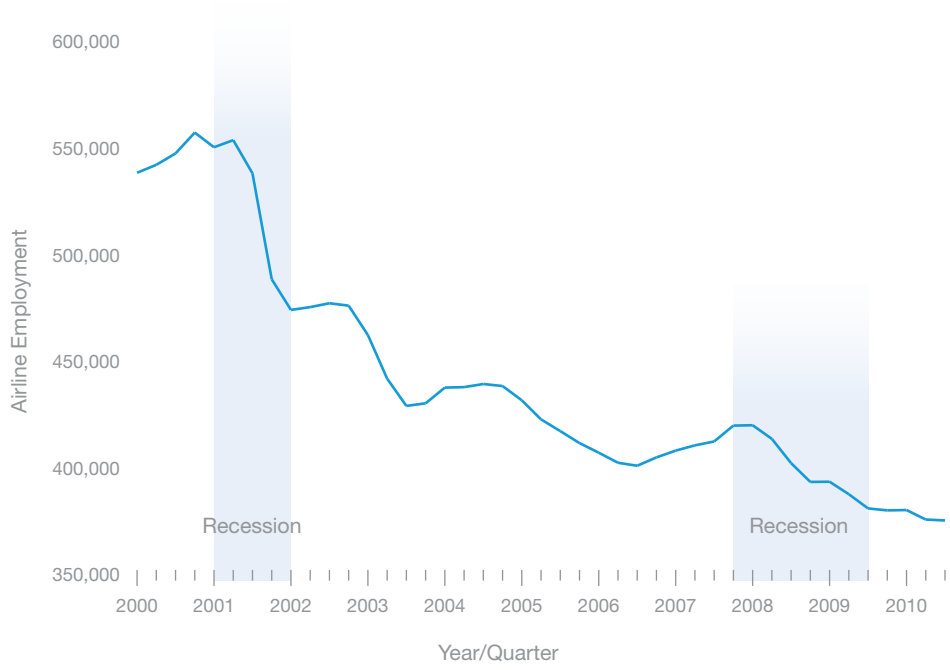


Table 1 Airline Maintenance Employees and Outsourcing

	2000	2008	2009
Passenger Airlines*			
Maintenance employees	64,248	46,075	42,774
Maintenance employees per aircraft	13.0	8.9	7.9
Percent maintenance expenses outsourced	29.6	45.2	43.1
Network (7 Airlines)			
Maintenance employees	55,715	34,698	31,448
Maintenance employees per aircraft	16.6	12.9	12.4
Percent maintenance expenses outsourced	24.3	42.8	38.9
Low-Cost Airlines**			
Maintenance employees	3,630	3,015	3,300
Maintenance employees per aircraft	5.7	3.2	3.2
Percent maintenance expenses outsourced	52.0	54.6	55.6

Source: U.S. Department of Transportation, Bureau of Transportation Statistics
* All scheduled passenger airlines reporting annual employment numbers to BTS: 30 in 2000 and 37 in 2009.
** Nine airlines in 2000 and seven in 2009.

Like the overall economy, the history of the air transportation industry during the recent recession can be divided into two distinct periods. The early period was characterized by positive, but declining, growth; however, unlike the overall economy, this process began in the first quarter of 2008, not in late 2007. At the beginning of the second period (the third and fourth quarters of 2008) growth in airline operating revenues, RPM and employment turned negative and continued to fall (**Figure 8**), reaching a low point during the first and second quarters of 2009. In the first quarter of 2009, RPM growth bottomed out at -11.4 percent; in the second quarter, growth in airline operating revenues fell to a low of -22.1 percent. After the recession, negative growth persisted but began to moderate. Airline industry revenues began to grow in the first quarter of 2010. The entire economy began to grow in the fourth quarter of 2009, suggesting that the industry lags the overall economy by one quarter. Thus far, except for employment, the first part of 2010 was characterized by gains in industry operating revenues.

Airlines ended 2007 with a fourth quarter operating profit of $7.8 billion, which quickly turned to a loss of $9.5 billion in the second quarter of 2008 (**Figure 9**). These losses resulted from a substantial increase in jet-fuel prices from late 2007 to mid-2008, and slowing demand for air transportation. Jet-fuel prices[27] rose about 50 percent, from $2.66 per gallon in December 2007 to $3.97 per gallon in July 2008.[28] In response to this run-up in fuel prices, many airlines adopted hedging strategies to limit their exposure to future price increases. Instead, when the global economy collapsed, fuel prices plummeted rapidly and the costs of these strategies significantly compounded airlines losses during this period.[29]

Airlines also adopted various strategies to deal with the recession-induced decline in air travel, including capacity reductions through the retirement of old and less efficient aircraft, deferral of outstanding aircraft orders, reduction of unprofitable routes, renegotiation of leases, and workforce reductions.[30] Regional carriers began operating aircraft with more than 50 seats, flying more routes between hubs rather than the typical regional carrier routes between hubs and smaller cities, and reducing workforce.[31]

Other strategies included ancillary-revenue enhancements such as à la carte services and bundled-service packages. À la carte services are separately priced services such as snacks, check-in luggage, select seating, early boarding, extra leg room and lounge access. Bundled-service packages represent bundles of several different services.[32]

The response of the civil aviation sector to the recent recession was innovative. The Boeing Company reported in July 2010 that it was cautiously optimistic:

> The world market is doing much better than last year, but there are still challenges. Looking at 2010, we see a world economy that continues to recover. We expect the world economy to grow above the long-term trend this year. As a result, both passenger and cargo travel will grow this year. Airline revenue and yields are up, but fuel prices remain volatile. The inclusion of the high traffic-growth levels in 2010, following the recession, is driving our cargo forecast upward ... Today, about one-third of all airline traffic touches the Asia-Pacific region, and as a result of the growth in this market, by 2029 almost 43 percent of all traffic will be to, from, or within the region ... However, the strength of the industry and its growth will continue to be driven by sound fundamentals—speed and reliability, consumer product innovation and global industrial interdependence.
>
> — Randy Tinseth,
> Vice President of Marketing, Boeing[33]

The next section presents the results of the sector's hard work in 2009, and reviews the methodology to estimate the impact of civil aviation on the U.S. economy.

[27] New York Harbor kerosene-type jet fuel, as published by the Energy Information Administration.
[28] U.S. Department of Energy. Energy Information Administration. 2010. *Petroleum and Other Liquids: Spot Prices.*
[29] Aaron Karp. 2009. "Losing Bet on Hedging." *Air Transport World*. Page 61.
[30] Adrian Schofield. 2010. "U.S. Airlines Remain Optimistic Despite Ominous Signs." *Aviation Week & Space Technology*. February 1, 2010.
[31] Andrew Compart. 2009. "U.S. Regionals Seek Course Corrections." *Aviation Week & Space Technology*. May 18, 2009.
[32] "Tapping the Ancillary Revenue Wall." *ATW Online*. March 3, 2009; Michele McDonald. 2010. "Bags, Boarding and Booking Fees: Ancillary Revenues Grew 43% in 2009." *ATW Online*. August 3, 2010.
[33] Source: The Boeing Company, July 15, 2010.

Figure 8 Key Airline Economic Indicators during the Recent Recession and Recovery, Seasonally Adjusted at Annual Rates

Source: U.S. Department of Transportation, Bureau of Transportation Statistics

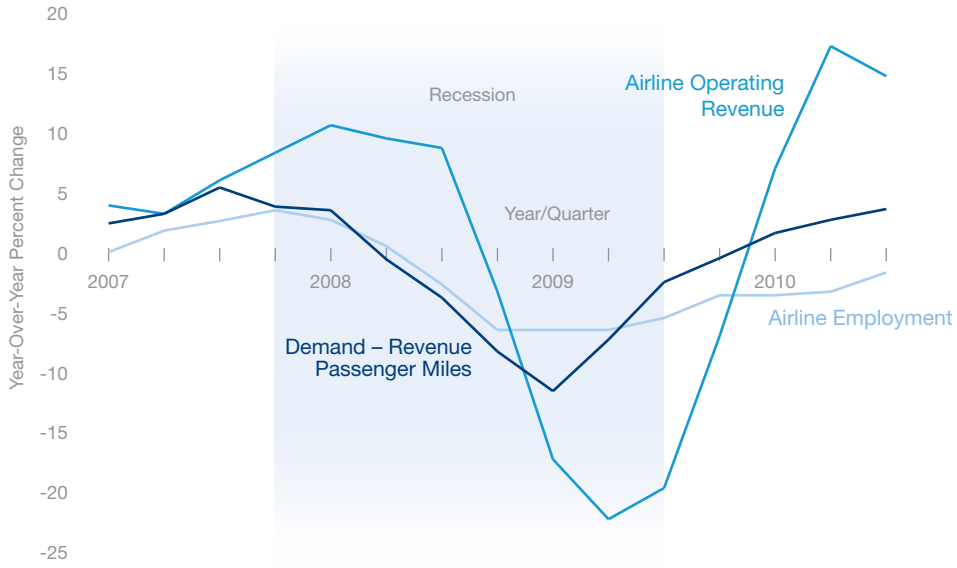


Figure 9 Airline Profits during the Recent Recession and Recovery, Seasonally Adjusted at Annual Rates

Source: U.S. Department of Transportation, Bureau of Transportation Statistics

National Impact of U.S. Civil Aviation

Civil aviation has far-reaching economic impacts.

Although some of civil aviation's impacts cannot be measured quantitatively, this report attempts to capture all the economic activity generated by direct and indirect air transport of passengers and cargo using the best data available from government and private sources. A special effort was made to include the contributions of General Aviation (GA) to the economy. While GA operates in a large and remarkable range of communities across the United States, exact data on the vital economic activity generated by this sector of aviation is sparse. Numerous survey studies were used and special attention was paid to GA operations to estimate its economic contribution.

Methodology

The total economic impact of an industry is the summation of primary impacts (direct and indirect) and induced impacts of spending on that particular industry. This definition is standard for economic-impact studies and is used to estimate aviation's unique economic contribution to the national economy. The data used to measure the primary economic impacts of civil aviation were collected from reliable government and private sources. This study estimated those impacts by looking at industry output, earnings and jobs. These data were entered into RIMS II to derive the secondary impacts. Primary and secondary impacts were then summed to produce a measure of civil aviation's total impact on the U.S. economy.

Types of Economic Impacts

Primary Impacts: The primary impacts of aviation are a summation of direct and indirect impacts of civil aviation on the U.S. economy and include:

- Air transportation and supporting services
- Aircraft, aircraft engines and parts manufacturing
- Travel and other trip-related expenditures by travelers using air transportation

Direct: Direct impacts of civil aviation are created through manufacturing and air-transportation activities as measured by the employment, payroll and sales/output associated with the following industries/entities:

- Scheduled and nonscheduled airlines (passenger and cargo) and air couriers
- Airport and aircraft service providers (including FAA and other government services)
- Air cargo service providers
- GA (noncommercial) aircraft operators (including flight schools)
- Aircraft and components manufacturing

Indirect: Indirect impacts result from the expenditures of air passengers, other than airfares and associated charges paid directly to airlines or travel arrangers. Visitor expenditures translate into sales, payroll and employment for the following industries:

- Traveler accommodations (hotel, motel, etc.)
- Food and beverage providers (restaurants, bars, fast-food outlets and stores)
- Arts, entertainment and recreation (museums, theaters, amusement parks)
- Visitor travel services (sightseeing and other tourist services, travel agencies)
- Ground transportation (to and from airports)
- Other on- and off- airport purchases of goods and services (souvenirs)

Induced or Secondary Impacts: Induced impacts result from expenditures made by industries identified in the measurement of primary impacts to supporting businesses and entities, as well as the spending of direct and indirect employees. Induced impacts capture the secondary impacts to the economy as direct/indirect sales, and payroll impacts are circulated to supporting industries through multiplier effects.

Measures of Economic Impacts

Direct and indirect expenditure estimates are input into RIMS II to estimate the secondary effects of those expenditures on the U.S. economy. The output of RIMS II includes the secondary effects on economic output, earnings and jobs.

Output: The current dollar production of goods or services by a production unit and measured by total sales or receipts of that unit, plus other operating income, commodity taxes (sales and excise taxes) and changes in inventories.[34]

Earnings: Wages and salaries, other labor income, benefits and proprietors' income paid to all employed persons who deliver final demand output and services.

Jobs: The number of people employed in the industry that provide civil-aviation services, manufacture aircraft and aircraft engines, or work in other industries that are indirectly affected by activity in the civil air transportation sector.

[34] "Output" includes the sum of all of intermediate goods and services used in production, plus value added by the industry itself. This distinguishes output from GDP, which only counts value added.

Update

Every year, the most current available model and data are used to support the best possible estimates. The Bureau of Economic Analysis (BEA) recently updated RIMS II by incorporating the BEA 2002 U.S. Benchmark Input-Output (I-O) table and most current employment data. One significant enhancement to RIMS II is the addition of value-added coefficients from the 2002 I-O table. These coefficients are used to estimate the contribution of civil aviation to U.S. GDP. The new methodology for value-added estimates is a significant improvement from the previous methodology utilized in past editions of this report. Accordingly, the updated model was used to estimate new results for 2008 and 2009 and to revise estimates from previously published reports.

The U.S. Census Bureau just completed and published the results of the 2007 Economic Census. These Census results, as well as revisions of Census data prior to 2007, were incorporated into this report. Further, as the airline industry has sought new ways to increase revenues, ancillary fees have become an important revenue enhancer for airlines. To capture this trend, baggage fees reported to BTS were added to the airline estimate.

Along with new estimates for 2008 and 2009, estimates for the years 2000-2007 are included in this report. The same methodology is used for all years calculated, assuring the reader of a consistent and well scrutinized measure of civil aviation's contribution to the U.S. economy in the current century. The results are reported in the next section. (More detailed results are available in the Appendix – Supplemental Tables.)

Results

Table 2 summarizes the total impact of U.S. civil aviation on output, earnings and jobs. Economic activity attributed to civil aviation-related goods and services totaled $1.3 trillion in 2009, generating 10.2 million jobs with $394.4 billion in earnings. Aviation accounted for 5.2 percent of GDP, the value-added measure of economic activity.

The impact of the recent recession on civil aviation's contribution to GDP began in 2008 as the percent of GDP contribution started to drop from previous years. In 2009, the percent of GDP contribution for civil aviation was near 2004 levels, when civil aviation was still recovering from the twin effects of September 11 and the 2001 recession. Overall, civil aviation's contribution to U.S. GDP ranged from 4.7 to 5.6 percent over the past decade.

Table 3 reports the revisions to previously published FAA economic-impact estimates for civil aviation. About one-half of the increase in 2005-2007 output is due to the new visitor-expenditures methodology. New 2007 Census Bureau data lowered manufacturing total output estimates; the BEA update of RIMS II air transportation and airport multipliers accounts for the remainder the increase.

The new RIMS II employment coefficients calculated for the manufacturing and service sectors showed lower job creation induced by spending in these sectors. With the ever-changing global economic climate, more goods and services are produced overseas and imported into the United States. Therefore, investment and expenditures do not create as many jobs as estimated in previous RIMS II models.

Table 2 Summary - Impact of Aviation on U.S. Economy 2000–2009

Year	Output ($Billions)	Earnings ($Billions)	Jobs (Thousands)	Percent of GDP
2009	1,311.2	394.4	10,186	5.2
2008	1,437.1	432.6	11,138	5.5
2007	1,409.7	423.7	10,901	5.6
2006	1,307.8	393.5	10,149	5.4
2005	1,206.3	363.4	9,413	5.3
2004	1,106.2	333.4	8,641	5.2
2003	1,012.9	305.1	7,876	5.0
2002	1,003.1	301.1	7,740	4.7
2001	1,077.8	323.6	9,383	4.8
2000	1,131.0	339.5	9,891	5.2

Table 3 Revisions to Previously Published Estimates

OUTPUT			
Year	Previous ($Billions)	Current ($Billions)	Percent Difference
2007	1,315.3	1,409.7	7.2
2006	1,223.3	1,307.8	6.9
2005	1,134.2	1,206.3	6.4

JOBS			
Year	Previous (Thousands)	Current (Thousands)	Percent Difference
2007	11,512	10,901	-5.3
2006	10,778	10,149	-5.8
2005	10,055	9,413	-6.4

EARNINGS			
Year	Previous ($Billions)	Current ($Billions)	Percent Difference
2007	396.3	423.7	6.9
2006	369.1	393.5	6.6
2005	342.7	363.4	6.0

PERCENTAGE OF GDP			
Year	Previous	Current	Percent Difference
2007	5.6	5.6	0.0
2006	5.6	5.4	-0.2
2005	5.5	5.3	-0.2

Table 4 reports real primary expenditures or output in 2005 dollars. Primary output is used to calculate the total economic impact of civil aviation. To isolate changes in civil aviation spending from inflationary effects, the nominal primary output measures are transformed into constant 2005 dollars.

Between 2008 and 2009, real primary output for civil aviation fell 9.4 percent. Commercial aviation output dropped 8.6 percent during the same period, and primary output in GA dropped 21.9 percent. During the height of the recent recession, commercial aircraft manufacturing and airport operations were the only industries registering positive growth in output between 2008 and 2009. Commercial aircraft manufacturing was buoyed by global demand, and airports operations were shored up by the American Recovery and Reinvestment Act of 2009 (ARRA).[35]

As stated above, primary output estimates are used to estimate the secondary effects of spending in the economy with the updated RIMS II. Results from RIMS II are reported in **Table 5** and show the following:

- Airline operations accounts for the bulk of civil aviation's economic contribution, with operations generating $296.6 billion in total output in 2009.

- Once airline passengers reach their final destinations, their expenditures on hotels, rental cars and entertainment contribute $597 billion in total output to the U.S. economy, approximately double the output supported by the airline operations.

- GA also made a remarkable impact. While smaller than the impact from commercial aviation, the GA contribution still reflects the industry's unique role in the nation's transportation system. GA operations contributed $38.8 billion to total output. Factoring in manufacturing and visitor expenditures, GA accounted for a significant contribution of $76.5 billion. In the U.S., GA has access to more than 5,178 public-use airports and a significant number of private airports, making it one of the largest airport users.[36]

[35] ARRA provided supplemental funding of $1.1 billion in grants-in-aid to airports. *FAA Budget Highlights, Fiscal Year 2010.*
[36] U.S. Department of Transportation, Federal Aviation Administration. *Administrator's Fact Book*. (September 2010). http://www.faa.gov/about/office_org/headquarters_offices/aba/admin_factbook/

Table 4 Real Primary Output 2008 versus 2009 (2005 Dollars)

Description	2008 ($Billions)	2009 ($Billions)	Percent Change
Airline Operations	111.3	90.7	-18.5
Airport Operations	22.3	23.3	4.1
Civilian Aircraft Manufacturing	22.2	27.1	22.2
Civilian Aircraft Engine and Engine Parts Manufacturing	9.0	6.6	-26.7
Civilian Other Aircraft Parts and Equipment	22.2	20.9	-5.8
Air Couriers	27.7	24.3	-12.0
Visitor Expenditures	229.5	213.3	-7.0
Travel Arrangements	4.8	4.2	-12.0
Subtotal–Commercial	**448.8**	**410.4**	**-8.6**
General Aviation Operations	14.4	11.9	-17.6
GA Aircraft Manufacturing	12.3	8.3	-32.6
GA Visitor Expenditures	4.6	4.2	-7.0
Subtotal – General Aviation	**31.2**	**24.4**	**-21.9**
Total Primary Output	**480.1**	**434.8**	**-9.4**

Table 5 Total Output, Earnings and Jobs Estimates, 2009

Description	Output ($Billions)	Earnings ($Billions)	Jobs (Thousands)
Airline Operations	296.6	91.9	2,007
Airport Operations	78.9	27.5	614
Civilian Aircraft Manufacturing	84.3	21.5	418
Civilian Aircraft Engine and Engine Parts Manufacturing	20.9	5.6	112
Civilian Other Aircraft Parts and Equipment	72.2	21.5	454
Air Couriers	72.0	21.5	637
Visitor Expenditures	597.0	178.8	5,329
Travel Arrangements	12.8	4.0	118
Subtotal – Commercial	**1,234.8**	**372.2**	**9,690**
General Aviation Operations	38.8	12.0	262
GA Aircraft Manufacturing	25.8	6.6	128
GA Visitor Expenditures	11.9	3.6	106
Subtotal – General Aviation	**76.5**	**22.1**	**496**
Total Impact	**1,311.2**	**394.4**	**10,186**

Table 6 Average Annual Earnings per Employee by Activity, 2009

Description	Average Earnings
Airline Operations	$45,791
Airport Operations	$44,727
Civilian Aircraft Manufacturing	$51,303
Civilian Aircraft Engine and Engine Parts Manufacturing	$49,595
Civilian Other Aircraft Parts and Equipment	$47,375
Air Couriers	$33,762
Visitor Expenditures	$33,550
Travel Arrangements	$34,188
Subtotal – Commercial	**$38,415**
General Aviation Operations	$45,791
GA Aircraft Manufacturing	$51,303
GA Visitor Expenditures	$33,550
Subtotal – General Aviation	**$44,599**
Total Impact	**$38,717**

Table 5 shows the total output, earnings and job estimates by civil aviation activity for 2009. The two largest activities contributing to output, earnings and jobs are airline operations and visitor expenditures. Civilian aircraft manufacturing, engine and parts manufacturing, and other aircraft parts and equipment contribute a total of $177.4 billion and nearly one million jobs to the U.S. economy. Increased global demand for U.S. aircraft and parts makes this an important part of the manufacturing sector. Visitor expenditures contributed the largest single portion of the total impact by far, with some $597 billion in output and over 5.3 million jobs. Air couriers, airport operations and travel arrangements round out the rest of commercial aviation, contributing $163.7 billion in total output and supporting just over 1.4 million jobs in the U.S economy.

Civil aviation supports job creation and the jobs are highly compensated. Civilian aircraft manufacturing's average salary of $51,303 was the highest among the industry followed by the engine and other aircraft parts manufacturers (**Table 6**). Average salaries for jobs supported by airport operations was nearly $45,000, while jobs supported by air courier and travel arrangements hovered around $34,000. At the lowest part of the spectrum, the average salary for jobs supported by visitor expenditures was $33,550. The jobs induced by visitor expenditures are concentrated in the retail and the service sectors.

Aviation's Contribution to Gross Domestic Product

U.S. nominal GDP was $14,119.4 billion in 2009.[37] GDP represents the sum of all value-added activities in an economy, so intermediate goods and services used in the production of goods and services are not included. In the previous section, total output included intermediate goods and services that were purchased as part of the production process. In order to compare aviation's contribution to GDP, these intermediate goods and services must be subtracted from total output. To estimate civil aviation's contribution to GDP, each impact type is calculated separately using the newly published BEA RIMS II value-added coefficients. The results are shown in **Table 7**. In 2009, aviation-related value-added economic activity totaled $728.2 billion, or 5.2 percent, of total U.S. GDP.

The largest contributor to the overall economic impact of civil aviation in 2009 was commercial aviation. Commercial aviation's total value added to the U.S. economy was $689.3 billion, or 4.9 percent of GDP. Within commercial aviation, the largest share of the total is commercial visitor expenditures, $359.3 billion, or approximately 2.5 percent of GDP. GA contributed nearly $39 billion to the U.S. economy in 2009, a large number by any measure.

(**Table 24** in the Appendix – Supplemental Tables reports civil aviation's contribution to GDP for the years 2000-2009.)

Table 7 Contribution to GDP, 2009

Impact Type	Value Added ($Billions)	Percent of GDP
Airline Operations	150.5	1.1
Airport Operations	44.6	0.3
Civilian Aircraft Manufacturing	39.6	0.3
Civilian Aircraft Engine and Engine Parts Manufacturing	10.2	0.1
Civilian Other Aircraft Parts and Equipment	36.9	0.3
Air Couriers	40.8	0.3
Visitor Expenditures	359.3	2.5
Travel Arrangements	7.5	0.1
Subtotal – Commercial	**689.3**	**4.9**
General Aviation Operations	19.7	0.1
GA Aircraft Manufacturing	12.1	0.1
GA Visitor Expenditures	7.1	0.1
Subtotal – General Aviation	**38.9**	**0.3**
Total Impact	**728.2**	**5.2**

[37] U.S. Department of Commerce, Bureau of Economic Analysis. January 2011.

Real Change from the Previous Year

Three measures highlight the economic contribution of the civil aviation sector: the value of total output, earnings paid to employees and the number of jobs maintained. These measures are shown in **Table 8**. The values for output and earnings are presented in 2005 dollars in order to report growth attributable strictly to changes in the civil aviation industry rather than to inflation. Civil aviation's real output dropped 9.6 percent between 2008 and 2009. According to the most recent release of U.S. economic data, real GDP declined 2.6 percent during the same time period.[38]

Overall, yearly real earnings in civil aviation decreased 9.7 percent between 2008 and 2009. The recent recession further exacerbated employment losses in the sector, which fell 8.5 percent. Airline operations output and earnings dropped 18.5 percent and the number of jobs fell 17.7 percent. While the GA contribution to the impact is not large enough to cause significant changes to the total output for civil aviation, it should be noted that the GA contribution was significantly affected by the recent recession. Overall, real GA output, including GA manufacturing, dropped 22.1 percent and the number of GA jobs fell by 19.5 percent.

Between 2008 and 2009, real airport expenditures increased 4.1 percent while jobs increased nearly 5.1 percent. Some of this increase was attributable to ARRA, which included $1.1 billion in grants-in-aid to airports. Air couriers, the important link for consumers and business to connect the United States with the rest of the world, experienced drops in real output and earnings of 12 percent between 2008 and 2009. Air courier output decreased as retail sales and businesses were among the first to feel the impacts of the recent recession.

[38] U.S. Department of Commerce, Bureau of Economic Analysis. January 2011.

Table 8 U.S. Civil Aviation, Growth of Total Output, Earnings and Jobs (2005 Dollars)

Description	2008 Output ($Billions)	2009 Output ($Billions)	Percent Change	2008 Earnings ($Billions)	2009 Earnings ($Billions)	Percent Change	2008 Jobs (Thousands)	2009 Jobs (Thousands)	Percent Change
Airline Operations	332.1	270.6	-18.5	102.9	83.8	-18.5	2,440	2,007	-17.7
Airport Operations	69.1	72.0	4.1	24.1	25.1	4.1	584	614	5.1
Civilian Aircraft Manufacturing	63.0	76.9	22.2	16.0	19.6	22.2	339	418	23.3
Civilian Aircraft Engine and Engine Parts Manufacturing	26.0	19.1	-26.7	6.9	5.1	-26.7	152	112	-26.0
Civilian Other Aircraft Parts and Equipment	69.9	65.9	-5.8	20.8	19.6	-5.8	477	454	-4.9
Air Couriers	74.7	65.7	-12.0	22.3	19.6	-12.0	717	637	-11.2
Visitor Expenditures	585.8	544.6	-7.0	175.4	163.1	-7.0	5,678	5,329	-6.2
Travel Arrangements	13.3	11.7	-12.0	4.2	3.7	-12.0	133	118	-11.1
Subtotal– Commercial	**1,233.8**	**1,126.5**	**-8.7**	**372.6**	**339.6**	**-8.9**	**10,521**	**9,690**	**-7.9**
General Aviation Operations	42.9	35.4	-17.6	13.3	11.0	-17.6	316	262	-16.8
GA Aircraft Manufacturing	34.9	23.5	-32.6	8.9	6.0	-32.6	188	128	-32.0
GA Visitor Expenditures	11.6	10.8	-7.0	3.5	3.2	-7.0	113	106	-6.2
Subtotal– General Aviation	**89.5**	**69.7**	**-22.1**	**25.7**	**20.2**	**-21.3**	**616**	**496**	**-19.5**
Total Impact	**1,323.3**	**1,196.2**	**-9.6**	**398.3**	**359.8**	**-9.7**	**11,138**	**10,186**	**-8.5**

Manufacturing

Over the past decade, the manufacturing of U.S. civil aircraft reflected changes within the airline industry and changes in consumer demand. At the beginning of the decade, demand for air transportation rose along with shipments of both commercial and GA aircraft. However, due to the 2001 recession, the September 11 terrorist attacks and the subsequent shutdown of the air traffic system and adoption of more stringent air-travel security measures, the demand for air travel fell sharply over the latter part of 2001 and 2002. Shipments of new aircraft fell from 2002 to 2004.

In 2001, both commercial and GA customers took delivery of about $34.2 billion in U.S.-manufactured aircraft. By 2004, only $20.2 billion in new aircraft were delivered—a decrease of 40 percent. During that time, the number of new commercial aircraft delivered by Boeing fell from 527 in 2001 to 281 in 2003 and the number of GA aircraft delivered fell from 2,634 to 2,137.[39]

Subsequently, global demand surged. In 2007, global customers took delivery of $29.2 billion in U.S.-manufactured aircraft—the peak before the recent recession. Between 2004 and 2007, shipments of new aircraft rose over 42 percent. However, in 2008 demand for orders of new aircraft started to decline. The value of new aircraft delivered declined 17.4 percent to $24.1 billion, and the number of new commercial and GA aircraft deliveries fell by 15 percent and 6.1 percent to 375 planes and 3,079 planes, respectively. By 2009, the value of deliveries of new aircraft rose by 23.3 percent to $29.7 billion, with the number of Boeing aircraft increasing by 28.3 percent to 481 units. However, the number of GA aircraft fell more than 48 percent to 1,587, reflecting the economic uncertainty during the recent recession.

Table 9 captures how these changes affected the total economic impact estimates. In real terms, the overall loss in output for civil aviation manufacturing in 2009 was 4.3 percent despite commercial aviation's real output rise of 22.2 percent. Between 2008 and 2009, GA manufacturing experienced a 32.6 percent drop in real output and job loss of 43.6 percent. Aircraft engines and engine parts manufacturing real output fell 26.7 percent and jobs fell 26 percent.

[39] The Boeing Company, *Orders and Deliveries*. http://active.boeing.com/commercial/orders/index.cfm; General Aviation Manufacturers Association, 2009, General Aviation Statistical Databook & Industry Outlook, Table 1.7, p. 22. http://www.gama.aero/files/GAMA_Databook_2009.pdf.

Table 9 Real Growth of Civil Aviation Manufacturing: Total Output, Earnings and Jobs

Description	2008 Output (2005 $Billions)	2008 Earnings (2005 $Billions)	2008 Jobs (Thousands)
Civilian Aircraft Manufacturing	63.0	16.0	339
GA Aircraft Manufacturing	34.9	8.9	188
Civilian Aircraft Engine and Engine Parts Manufacturing	26.0	6.9	152
Civilian Other Aircraft Parts and Equipment	69.9	20.8	477
Total Impact–2008	**193.8**	**52.7**	**1,156**

Description	2009 Output (2005 $Billions)	2009 Earnings (2005 $Billions)	2009 Jobs (Thousands)
Civilian Aircraft Manufacturing	76.9	19.6	418
GA Aircraft Manufacturing	23.5	6.0	106
Civilian Aircraft Engine and Engine Parts Manufacturing	19.1	5.1	112
Civilian Other Aircraft Parts and Equipment	65.9	19.6	454
Total Impact–2009	**185.4**	**50.3**	**1,090**

	2008-2009 Percent Change		
Description	**Output**	**Earnings**	**Jobs**
Civilian Aircraft Manufacturing	22.2	22.2	23.3
GA Aircraft Manufacturing	-32.6	-32.6	-43.6
Civilian Aircraft Engine and Engine Parts Manufacturing	-26.7	-26.7	-26.0
Civilian Other Aircraft Parts and Equipment	-5.8	-5.8	-4.9
Total Impact	**-4.3**	**-4.6**	**-5.7**

General Aviation

GA provides a vital service to all in times of need as well as leisure activities and agricultural services. From law enforcement, medical transportation, border control, and search and rescue missions to disaster relief and emergency evacuation, GA is there to provide a helping hand to those in need and the most vulnerable.

However, despite GA's substantial contribution to society, according to the GA and Part 135 Activity Survey, overall GA flight hours dropped nearly 25 percent between 2000 and 2009 (**Figure 10**). Most of the decrease in GA flight hours is due in part to the dramatic drop in flight hours by piston engine airplanes. Piston engine airplane flight hours dropped nearly 39 percent between 2000 and 2009, while turboprop, jet and rotorcraft GA airplanes increased by 9 percent, 14.7 percent and 30.1 percent, respectively, during the same period.

However during the recent recession, the average annual growth rate of total GA flight hours fell by just over 5.5 percent each year, for an overall drop of 15.7 percent between 2007 and 2009. During the same period, annual flight hours for piston engine airplanes dropped by 5.7 percent, while flight hours conducted by turboprop, jet and rotorcraft GA airplanes declined by 5.9 percent, 7.1 percent and 2.6 percent, respectively.

Compared to the level of GA operations, the economic contribution of GA to the economy has remained fairly stable over the past decade. Overall, GA visitor expenditures remained roughly the same, but the economic output of GA operations and manufacturing dramatically slowed between 2008 and 2009 during the recent recession (**Figure 11**; Appendix – **Table 21**). Rising fuel costs and aviation security changes are some of the reasons for the decline.

Figure 10 General Aviation Flight Hours by Type of Aircraft

Source: U.S. Department of Transportation, Federal Aviation Administration

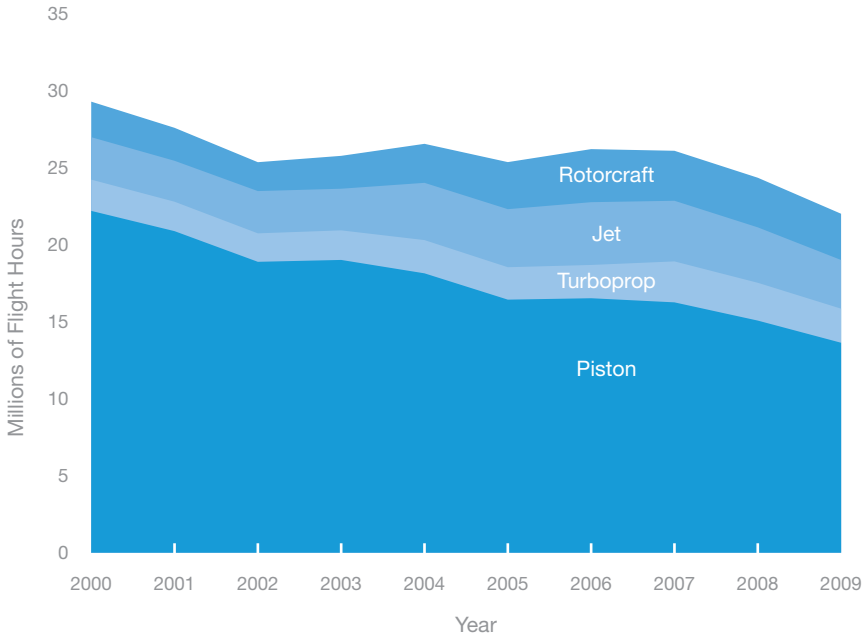
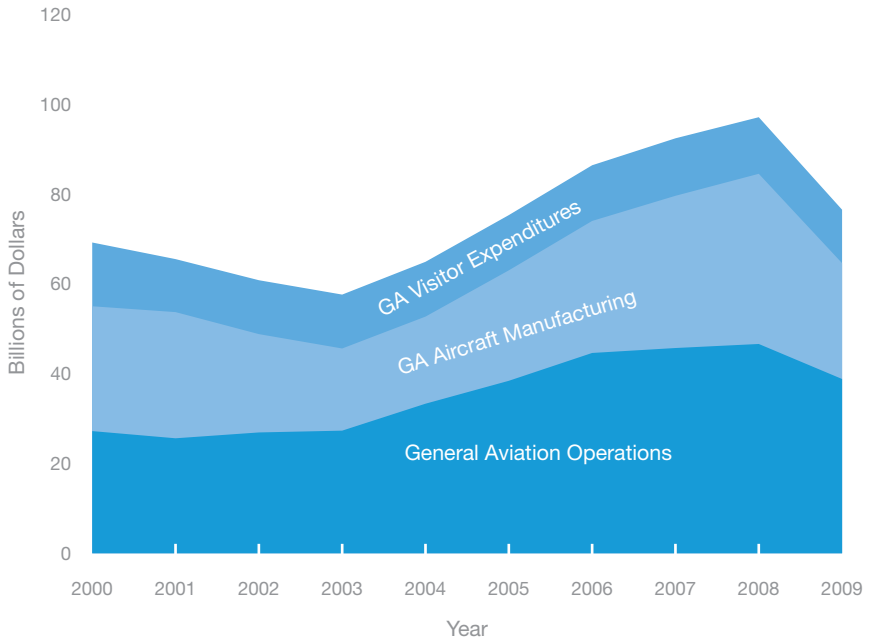


Figure 11 General Aviation Economic Contribution to the U.S. Economy between 2000 and 2009

Source: U.S. Department of Transportation, Federal Aviation Administration



FAA Spending Overview

Previous FAA economic impact analyses did not include federal spending on air traffic control and other related activities. Federal expenditures on the provision of safe airspace and infrastructure are often overlooked factors behind civil aviation's successful contribution to the U.S. economy. Whether by directly employing people to oversee our National Airspace System (NAS) or providing the funds necessary for the development of infrastructure, the FAA has an important and vital role in the U.S. economy. Even during times of economic contractions, the FAA's ability to maintain safe skies, finance projects and support job creation is even more apparent.

FAA expenditures impact the U.S. economy in four important ways by:

- Providing state and local job opportunities
- Facilitating opportunities for private entities
- Distributing aid for infrastructure to local airports through grants
- Keeping the industry operating efficiently and safely

In order to highlight the importance of the FAA's contribution to the U.S. economy, the economic impact of FAA spending to the national economy as a whole and to each of the 50 states and the District of Columbia is measured and reported for fiscal year 2008.[40] The most important factor driving the level of expenditures in a particular state is the presence of large FAA facilities and/or large or multiple airports. Expenditures analyzed include payroll, nonpayroll (e.g., facilities and equipment, operations, research) and grants issued through the Airport Improvement Program (AIP).

[40] Updates to this estimate will be released in subsequent reports focused only on the impact of civil aviation on state-level economies.

Table 10 shows the number of FAA employees by state. Overall, California and Texas have the highest number of FAA employees. Oklahoma, third in number of FAA employees, is the home of the Mike Monroney Aeronautical Center (MMAC). The MMAC, located in Oklahoma City, provides training, logistics, research and data services for the FAA and attracts a diverse and talented workforce. Note, although a large number of employees work at FAA headquarters in Washington, D.C., few of them call the District "home." Most headquarters employees reside in Maryland and Virginia and commute to work.

Table 11 reports FAA spending by state. Total FAA spending for the 50 states and District of Columbia for fiscal year 2008 was almost $14 billion, approximately 0.1 percent of U.S. GDP. California, Virginia and Texas received the most FAA spending. All three states are home to large airports and FAA facilities.

FAA spending not only contributes direct employment, earnings and jobs to states, but also spurs other economic activity. The total impact of FAA spending on state economies was estimated using BEA RIMS II. The total impact of FAA spending on state output, earnings and employment appears in **Table 12** and **Figure 12**. The total impact includes primary (FAA direct spending) plus secondary or induced effects.

The $14 billion in primary FAA spending induced secondary spending totaling $26.2 billion in total output and nearly 218,000 jobs with $8.3 billion in earnings. California, Texas, New Jersey, Virginia and Oklahoma make up the top five states in total output related to FAA spending. Although FAA spending is only one of many factors contributing to the U.S. economy, the value to maintaining a safe and reliable NAS cannot be measured solely with quantitative measures. The next section introduces a new methodology for capturing some of these qualitative impacts.

Table 10 FAA Employees by Place of Residence, FY 2008

State	FAA Employees	Percent Total FAA Employees
Alabama	249	0.5
Alaska	1,246	2.7
Arizona	492	1.1
Arkansas	169	0.4
California	3,849	8.3
Colorado	1,058	2.3
Connecticut	165	0.4
Delaware	56	0.1
District of Columbia	271	0.6
Florida	2,648	5.7
Georgia	2,381	5.2
Hawaii	373	0.8
Idaho	114	0.2
Illinois	1,843	4.0
Indiana	1,019	2.2
Iowa	187	0.4
Kansas	857	1.9
Kentucky	301	0.7
Louisiana	271	0.6
Maine	147	0.3
Maryland	2,080	4.5
Massachusetts	569	1.2
Michigan	695	1.5
Minnesota	981	2.1
Mississippi	320	0.7
Missouri	790	1.7
Montana	138	0.3
Nebraska	125	0.3
Nevada	321	0.7
New Hampshire	747	1.6
New Jersey	1,645	3.6
New Mexico	610	1.3
New York	2,045	4.4
North Carolina	471	1.0
North Dakota	109	0.2
Ohio	1,240	2.7
Oklahoma	3,413	7.4
Oregon	209	0.5
Pennsylvania	785	1.7
Rhode Island	71	0.2
South Carolina	287	0.6
South Dakota	68	0.1
Tennessee	804	1.7
Texas	3,825	8.3
Utah	696	1.5
Vermont	48	0.1
Virginia	2,972	6.4
Washington	1,896	4.1
West Virginia	221	0.5
Wisconsin	300	0.6
Wyoming	49	0.1
Total	**46,226**	**100.0**

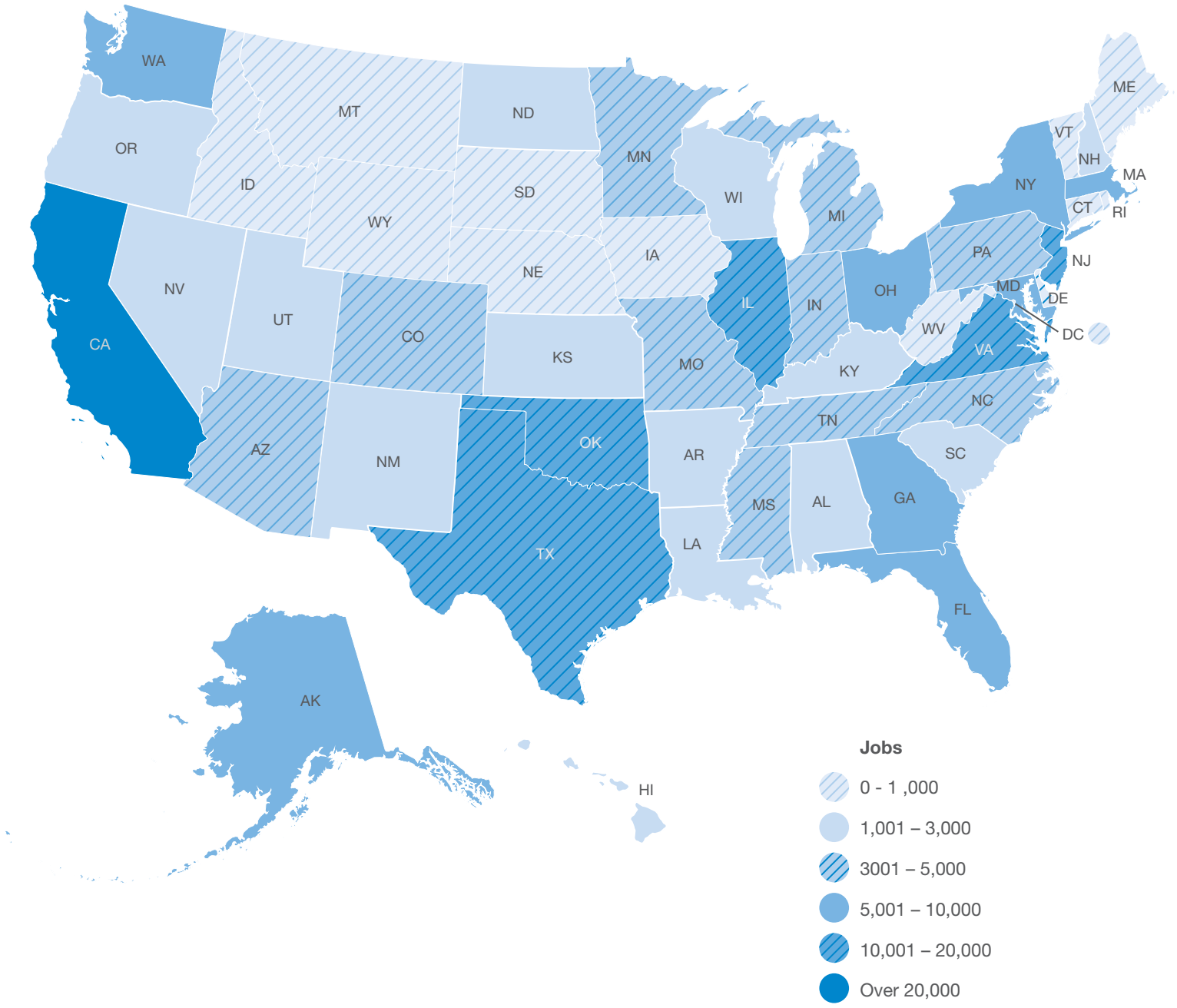
Table 11 FAA Direct Spending by State, FY 2008

State	Total Spending ($Millions)	Percent of Total FAA Spending
Alabama	93.5	0.7
Alaska	457.6	3.3
Arizona	201.0	1.4
Arkansas	62.4	0.4
California	1,332.3	9.5
Colorado	261.1	1.9
Connecticut	47.9	0.3
Delaware	17.9	0.1
District of Columbia	395.4	2.8
Florida	599.5	4.3
Georgia	483.6	3.5
Hawaii	103.5	0.7
Idaho	38.0	0.3
Illinois	767.0	5.5
Indiana	212.8	1.5
Iowa	59.3	0.4
Kansas	130.2	0.9
Kentucky	75.6	0.5
Louisiana	95.9	0.7
Maine	51.7	0.4
Maryland	467.5	3.3
Massachusetts	413.4	3.0
Michigan	219.8	1.6
Minnesota	225.2	1.6
Mississippi	110.0	0.8
Missouri	234.2	1.7
Montana	48.3	0.3
Nebraska	35.7	0.3
Nevada	105.6	0.8
New Hampshire	127.5	0.9
New Jersey	777.6	5.6
New Mexico	114.5	0.8
New York	478.0	3.4
North Carolina	237.9	1.7
North Dakota	153.6	1.1
Ohio	404.6	2.9
Oklahoma	857.6	6.1
Oregon	80.7	0.6
Pennsylvania	336.2	2.4
Rhode Island	22.3	0.2
South Carolina	69.0	0.5
South Dakota	37.5	0.3
Tennessee	229.3	1.6
Texas	975.6	7.0
Utah	154.1	1.1
Vermont	12.0	0.1
Virginia	1,018.6	7.3
Washington	364.0	2.6
West Virginia	55.5	0.4
Wisconsin	100.4	0.7
Wyoming	26.7	0.2
State Total	**13,979.2**	**100.0**

Table 12 Total Impact of FAA Spending by State, FY 2008

	TOTAL: PRIMARY + SECONDARY		
State	Output ($Millions)	Earnings ($Millions)	Jobs
Alabama	186.4	59.7	1,814
Alaska	730.6	241.4	6,292
Arizona	388.6	132.5	3,486
Arkansas	111.9	34.7	1,112
California	2,781.0	923.0	21,237
Colorado	507.6	167.2	4,278
Connecticut	82.3	26.1	582
Delaware	29.1	7.8	210
District of Columbia	488.0	29.1	646
Florida	1,063.8	354.4	9,820
Georgia	935.3	294.8	8,331
Hawaii	173.0	57.8	1,579
Idaho	61.2	20.3	662
Illinois	1,684.1	554.5	12,732
Indiana	372.6	112.1	3,354
Iowa	98.4	30.7	947
Kansas	168.3	46.7	1,461
Kentucky	139.1	40.5	1,281
Louisiana	175.0	57.2	1,675
Maine	94.4	31.7	989
Maryland	817.4	262.3	6,555
Massachusetts	838.6	282.2	6,264
Michigan	433.4	141.5	3,876
Minnesota	401.6	126.2	3,351
Mississippi	196.5	60.4	2,007
Missouri	466.9	137.4	3,939
Montana	82.3	27.6	918
Nebraska	53.3	17.1	501
Nevada	174.1	57.5	1,504
New Hampshire	185.1	53.7	1,494
New Jersey	1,684.1	536.8	11,670
New Mexico	164.2	53.3	1,695
New York	751.8	226.4	5,195
North Carolina	496.9	165.1	4,863
North Dakota	260.3	86.6	2,291
Ohio	836.1	265.1	7,442
Oklahoma	1,609.4	560.2	16,251
Oregon	156.7	49.0	1,334
Pennsylvania	358.1	107.1	3,004
Rhode Island	37.6	11.1	307
South Carolina	133.0	41.4	1,333
South Dakota	61.1	19.9	649
Tennessee	464.8	140.7	3,856
Texas	2,077.1	662.4	17,228
Utah	299.8	95.6	2,929
Vermont	19.4	6.2	193
Virginia	1,937.7	618.4	16,342
Washington	638.9	202.1	5,150
West Virginia	86.4	25.6	827
Wisconsin	189.6	61.5	1,750
Wyoming	40.5	13.2	376
State Total	**26,223.5**	**8,335.8**	**217,581**

Figure 12 Total Employment Impact of FAA Spending by State, FY 2008



Enabling Impact

Throughout the history of aviation, technological improvements have lowered the cost and increased the availability of air transportation to an ever wider market. These improvements include more efficient, safer and environmentally friendly aircraft, constructed with stronger and lighter materials. Modern engine and aircraft designs mean more efficient travel and shipping over longer distances. In more recent decades, improvements in computer technology led to enhancements in the cockpit, on the ground and throughout the air traffic system. Web access led to revolutionary changes in how customers purchase tickets, and digital technology brought about greater efficiencies in handling airline tickets and luggage. Furthermore, digital technology transformed the way freight is delivered among cities. In essence, all of these technological changes are "embodied" in the assets used within the air transportation industry, reducing capital input costs. In turn, these cost reductions lead to expanded flight availability, increasing business and personal air travel and enabling other industries to transport goods less expensively by air.[41]

Air transportation is a key enabler for other industries such as tourism or industries that transport goods by air. Low fares and increased flight availability increase passenger travel, benefiting the tourism industry and other companies that require business travel, and also help industries that rely on air freight to transport high-value goods. As technology improves, relative fares and costs fall as flight availability rises, facilitating productivity and output gains in these industries.

Transportation services provided by air carriers stimulate activity in other parts of the economy. For example, when air passengers reach their destinations, they spend money on hotel accommodations and food services, entertainment, sightseeing tours and so on. In addition, businesses that produce relatively high-value or perishable goods may prefer to ship their products to customers by air.[42] In 2008, the value of commodities shipped by air was $72,516 per ton, far higher than any other mode of transportation

[41] Lower capital input costs relative to labor implies that we can produce more air transportation services using the same amount of labor.
[42] In terms of value per unit of weight transported, Table 13 shows commodities shipped by air in 2008 had a much higher value compared with commodities conveyed by other modes of transportation.

(**Table 13**). Typically these are manufactured or technology-oriented goods or agricultural commodities. Values of the top 10 commodities transported by air appear in **Table 14**. Electronics and machinery are the top two commodities transported by air. Without air transportation, many of these commodities could not be delivered and, therefore, could not be produced; also, without air transportation, many travelers may choose to forgo trips altogether due to the relative time-intensiveness of the alternative modes of transportation. These are called enabled effects – the economic activity generated by air-passenger destination spending and the value of goods transported by air.

MIT researchers Mariya A. Ishutkina and R. John Hansman view transportation services in terms of the following characteristics: speed, cost, flexibility, reliability and safety.[43] Speed, flexibility and reliability are important characteristics for passengers with limited available time, while speed and reliability are important for perishable freight. Since air freight is costly compared to other transportation modes, higher-value goods tend to be transported by air.

The value of passenger destination services and transported goods makes up part of what the MIT researchers call enabled impacts or enabled flows, "the total economic impact on employment and income generated by economic activities that are dependent on the availability of air transportation services."[44] This increase induces a feedback effect whereby the increase in "economic activity in turn provides capital and generates the need for passenger travel and freight, which drives the demand for air transportation services."[45]

Table 13 Value of Commodities Transported by Mode of Transportation, 2008

Mode of Transportation	Value ($/Ton)
Air	72,516
Other Intermodal	8,424
Truck	1,049
Pipeline and Unknown	708
Sea	509
Rail	397
Water	76
All Modes	**981**

Source: U.S. Department of Transportation, Federal Highway Administration, *Freight Analysis Framework*

Table 14 Value of Commodities Transported by Air, Top 10 Commodities, 2008

Commodity	Domestic and Export Flows ($Billions)
Electronics	201.9
Machinery	101.8
Precision Instruments	83.0
Misc. Manufacturing Products	40.7
Transport Equipment	37.2
Pharmaceuticals	30.1
Basic Chemicals	10.7
Chemical Products	10.7
Articles-Base Metal	10.7
Plastics/Rubber	6.3
All Commodities	**562.1**

Source: U.S. Department of Transportation, Federal Highway Administration, *Freight Analysis Framework*

[43] Mariya A. Ishutkina and R. John Hansman. 2009. "Analysis of the Interaction Between Air Transportation and Economic Activity: A Worldwide Perspective," MIT International Center for Air Transportation, p. 29.
[44] Ishutkina and Hansman, *loc. cit.*
[45] Ishutkina and Hansman, *loc. cit.*

The driving factors behind the air transportation system and the economy described by this research are shown in a diagram developed by Ishutkina and Hansman (**Figure 13**). They wrote:

> The air transportation system is defined by its infrastructure capability, regulatory framework, vehicle and airline capabilities. Internal to the air transportation system is the supply and demand relationship where airlines provide supply through pricing and scheduling of flights based on the revenues and profitability of a particular route. Air transportation impacts an economy by providing employment in the aviation sector and creating wider socioeconomic benefits through its potential to enable certain types of activities in a local economy because of its distinctive characteristics: speed, cost, flexibility, reliability and safety. The region's economic activity in turn provides capital and generates the need for passenger travel and freight which drives the demand for air transportation services.[46]

Two measures were identified to illustrate enabling impacts for passengers and cargo: the impact of passenger spending on local communities once they reach their destinations and the movement of goods within the U.S. and internationally.

Passenger Expenditures

Results for 2008 show U.S. destination spending by international and domestic air travelers (the indirect or enabled flows) amounted to $249.2 billion (**Table 16**). Using RIMS II, these expenditures induced additional secondary spending for a total of $636.1 billion. Spending by travelers alone generated about 2.2 million jobs and $74.6 billion in worker earnings. In all, indirect and induced spending was responsible for $190.5 billion in earnings and 5.7 million jobs.[47]

During 2008, the U.S. welcomed 33.4 million international air travel visitors.[48] Destination spending by foreign visitors alone equaled approximately $93 billion in 2008 (**Table 16**). Foreign visitor spending induced additional spending, so together the indirect and induced flows totaled $237.3 billion and generated about 2.1 million jobs and $71.1 billion in earnings.

Foreign visitors tend to travel to only a small number of states. In 2008, about one-half of all visitors to the United States traveled to New York, California or Florida and almost two-thirds visited one of the top-five destination states (**Table 15**).[49]

The economic impact of destination spending by domestic U.S. air-travelers was $156.2 billion in 2008 (**Table 16**). This translated into $386.9 billion in total and induced spending. Destination spending by domestic U.S. air-travelers generated about 3.6 million jobs and $119.4 billion in indirect and induced earnings.

Freight Flows

In order to measure the magnitude of air freight flows, data from the Freight Analysis Framework (FAF), a database constructed by the Federal Highway Administration (FHWA), are used to construct national and state totals by weight and value.[50] The FAF database contains both domestic and foreign flows by value and by weight for each transportation mode and identifies the origins and destinations of these flows.

Table 15 Foreign Travelers to States (top five states), by Percent of Total, 2008

State	Percent of Total
New York	20.2
California	17.7
Florida	13.2
Texas	6.3
Nevada	5.8

Source: U.S. Department of Commerce, International Trade Administration, FAA calculations

[46] *Ibid.*, pp. 28–29.
[47] In 2007, destination spending amounted to $221.7 billion, supporting 2.3 million jobs and $68.3 billion in earnings.
[48] U.S. Department of Commerce, International Trade Administration. 2009. "Canadian Visitors to the U.S. by Mode of Transportation One or More Nights—2008"; U.S. Department of Commerce. International Trade Administration. 2009. "2008 Market Profile: Mexico (Air Only)"; U.S. Department of Commerce. International Trade Administration. 2009. "Summary of International Travel to the U.S."
[49] These figures exclude visitors from Canada. The data that appear on this table are constructed from U.S. Department of Commerce. International Trade Administration. 2009. "Summary of International Travel to the United States"; U.S. Department of Commerce. International Trade Administration. 2009. "Overseas Visitation Estimates for U.S., States, Cities and Census Regions: 2008."
[50] U.S. Department of Transportation, Federal Highway Administration, Freight Analysis Framework, version 2.

Figure 13 The Air Transportation System and the Economy

Source: Mariya A. Ishutkina and R. John Hansman. 2009. "Analysis of the Interaction between Air Transportation and Economic Activity: A Worldwide Perspective," MIT International Center for Air Transportation, p. 29

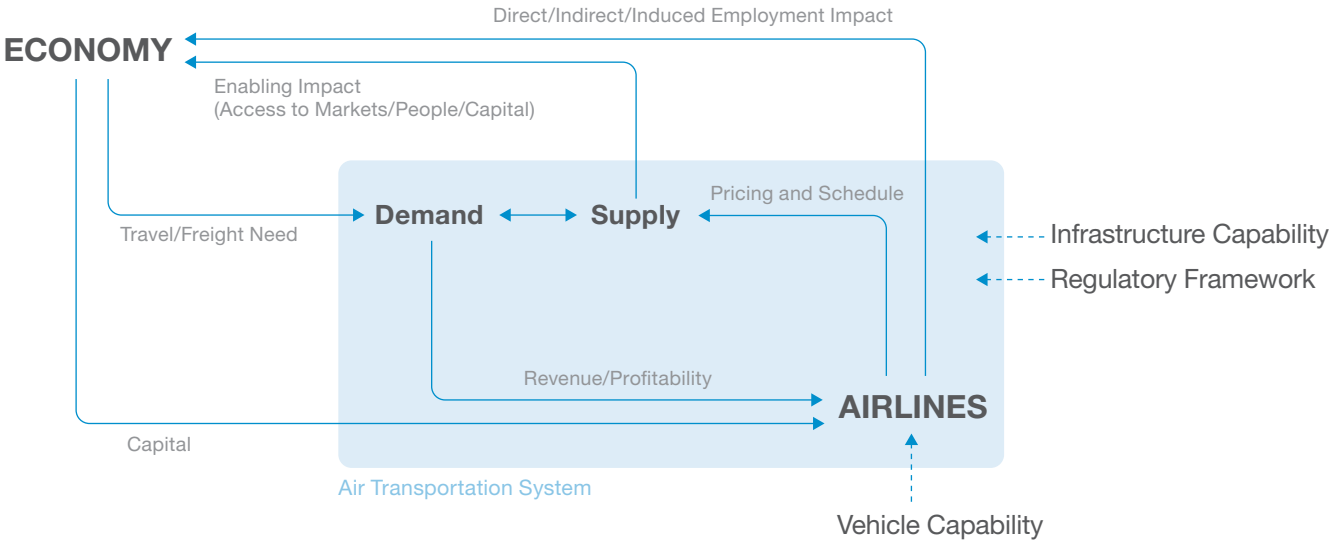


Table 16 Economic Impact of Destination Spending by Air Travelers, 2008

	Foreign Travelers to U.S.	U.S. Domestic Travelers	Foreign and Domestic
Output			
Spending by Air Travelers ($Billions)	93.0	156.2	249.2
Total Output ($Billions)	237.3	386.9	636.1
Earnings			
Indirect Earnings ($Billions)	27.8	46.8	74.6
Total Earnings ($Billions)	71.1	119.4	190.5
Employment			
Indirect Employment (Millions)	0.8	1.4	2.2
Total Employment (Millions)	2.1	3.6	5.7

Source: U.S. Department of Commerce, International Trade Administration and Federal Aviation Administration

Air freight flow data are available at the state and national levels and include intrastate flows, interstate flows and flows to and from other countries.

Results show the 2008 value of air freight transported to other countries and within the United States (freight-enabled flows), amounted to $562.1 billion (**Table 17**). Based on RIMS II, these expenditures induced additional spending and together totaled $1,648.6 billion. Further, production of these goods generated about 3.2 million jobs and $148.7 billion in worker earnings. Indirect spending also led to induced earnings in other businesses and about 6.4 million in additional employment. In all, indirect and induced spending was responsible for $436.4 billion in earnings and 9.3 million jobs.

Among the individual states, the value of goods transported by air is the sum of (1) value of goods transported to other countries (exports), (2) value of goods transported to other states and (3) value of goods transported within the state. Across all states, a total value of $562.1 billion in goods was transported by air. California ranked highest with $101.4 billion. Florida was second at $71.6 billion. Out of the top five states, four (California, Florida, New York and Texas) ranked high due to their size (by state GDP and by population). The fifth state, Tennessee, ranked high because it is home to the main hub for FedEx Corporation and a supply chain base for many wholesale and retail operations (**Table 18**).

Freight Exports

The value of freight exports equaled approximately $387.3 billion in 2008. This induced additional spending and together, these indirect and induced flows totaled $1,137.6 billion, and generated about 6.4 million jobs and $300.8 billion in earnings.

At the state level, the level of exports are related to state GDP and population; four of the top five export states (Florida, California, New York and Illinois) are among the leading states with respect to GDP and population (**Table 19**).

Domestic Air Freight

The value of domestic air freight was $174.8 billion in 2008. The indirect spending from the production of goods transported by air within the United States, plus induced flows, totaled $511 billion, generating about 2.9 million jobs and $135.6 billion in indirect and induced earnings. The value of domestic air freight from California accounts for about one-fifth of the value all domestic shipments, or $39 billion (**Table 20**). Flows originating from Arizona are second highest at $14.9 billion. Air freight from Arizona consists mainly of electronics ($12.6 billion), namely microprocessors, which are relatively high-value lightweight goods. Intel has two of its largest microprocessor production plants in Arizona.[51] A majority of the finished products from these facilities are shipped out of state by air. Tennessee is third at $13 billion, consisting mainly of precision instruments ($5.3 billion) and pharmaceuticals ($5.1 billion). Memphis, Tennessee, is the main transport hub for FedEx. Texas is fourth at $9.8 billion (electronics, $6.7 billion); the companies Dell Computer and Texas Instruments are located in this state. Massachusetts is fifth (electronics, $4.1 billion; precision instruments, $3.3 billion). Massachusetts is home to many high-tech firms.[52] Together, the top five states account for almost one-half of the total value of domestic air freight.

The enabling flows concept offers a new framework to analyze the dynamic relationship between air transportation and the rest of the economy. Only two dimensions of this economic interaction are studied in this report: indirect visitor expenditures by foreign and domestic travelers and the value of freight flows. Visitor expenditures by air travelers accounted for $636.1 billion of total output to the U.S. economy in 2008; this measure was included in previous versions of this report. The value of freight transported by air contributed more than $1.6 trillion to the U.S. economy in 2008, a huge contribution overlooked in previous analyses.

[51] Intel Corporation. n.d. Intel in your Community: Arizona. http://www.intel.com/community/arizona/index.htm.
[52] Ross C. DeVol, Kevin Klowden, Armen Bedroussian and Benjamin Yeo. 2009. *North America's High-Tech Economy: The Geography of Knowledge-Based Industries*. The Milken Institute. http://www.milkeninstitute.org/pdf/NamericaHiTechExecSmmry_Final.pdf; "Route 128: Birthplace of The Digital Age." Boston Tech Info. July 6, 2010. http://bostontechinfo.bizcloudnetwork.com/2010/07/06/route-128-birthplace-of-the-digital-age/

Table 17 Economic Impact of Freight Transported by Air, 2008

	Freight Exports	Domestic Freight	Foreign and Domestic
Output			
Value of Air Freight ($Billions)	387.3	174.8	562.1
Total Output ($Billions)	1,137.6	511.0	1,648.6
Earnings			
Indirect Earnings ($Billions)	102.4	46.4	148.7
Total Earnings ($Billions)	300.8	135.6	436.4
Employment			
Indirect Employment (Millions)	2.2	1.0	3.2
Total Employment (Millions)	6.4	2.9	9.3

Source: U.S. Department of Transportation, Federal Highway Administration, *Freight Analysis Framework*

Table 18 Value of Goods Transported by Air (top five states), 2008

State	Value ($Billions)
California	101.4
Florida	71.6
New York	66.4
Tennessee	41.7
Texas	33.7

Table 19 Value of Goods Transported by Air to Other Countries (top five states), 2008

State	Value ($Billions)
Florida	65.0
California	62.4
New York	61.4
Tennessee	28.7
Illinois	27.4

Table 20 Value of Goods Transported by Air within the U.S. (top five states), 2008

State	Value ($Billions)
California	39.0
Arizona	14.9
Tennessee	13.0
Texas	9.8
Massachusetts	8.6

Source: U.S. Department of Transportation, Federal Highway Administration, *Freight Analysis Framework*

Conclusion

The civil air transport industry provides economic benefits for the United States and the world.

In a world of decreasing barriers to trade, the U.S. civil aviation industry remains a unique engine for innovation and technological progress, one that provides infrastructure that keeps the nation competitive. This report found that, once all impacts are identified, civil aviation accounted for 5.2 percent of the U.S. economy in 2009. Aviation contributes to economic growth and to stronger ties to local and global markets for every region in the nation.

The total output of civil aviation-related goods and services amounted to $1.3 trillion in 2009 and generated more than 10 million jobs, with earnings of almost $394.4 billion. Specific areas of civil aviation such as air cargo have contributed to more effective networking and collaboration between companies far and wide.

Recovery in the wake of the recent recession presents many challenges and opportunities for aviation and the U.S. economy as a whole. There is evidence that the capacity reductions made by airlines and airports as the result of high fuel prices allowed the industry to better weather the storm, yet the prevailing economic winds will lead the industry to continue to innovate and become leaner and more responsive to volatile market conditions. The cost of fuel will likely remain a continuing concern for airlines and those affected by air transportation. Many analysts believe that the price of oil will continue to transform the airline industry for years to come, just as it will influence the prospects of other sectors of the economy.

As it did in the past century, the role of air transportation will continue to grow for the U.S. and global economies. The economic impacts of civil aviation quantified in this report summarize the benefits made possible by a vital and innovative industry. The industry contributes positively to the U.S. trade balance, creates high-paying jobs, helps keep just-in-time business models viable and connects us to friends, family and commercial opportunities. As the role of air transportation evolves and becomes even more integral to our way of life, a safe and efficient air transportation system will continue to be a vital, even essential, component of a strong and healthy American economy in the 21st century.


Los Angeles
San Francisco
Kahului, Maui
Honolulu
20
15
10
5
0
-5
-10
-15
-20
-25
2008
2009
2010
Airline Operating
Baggage Claim A

Appendix–Supplemental Tables

Table 21 U.S. Civil Aviation Economic Impact Total Output: Primary plus Secondary Impacts

	OUTPUT ($BILLIONS)									
Description	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Airline Operations	274.5	236.8	232.3	251.5	272.2	300.3	326.7	345.0	360.6	296.6
Airport Operations	44.9	52.2	60.5	58.3	59.9	61.9	65.6	74.2	75.1	78.9
Civilian Aircraft Manufacturing	98.7	111.1	78.3	59.7	58.2	62.3	73.5	82.8	68.4	84.3
Civilian Aircraft Engine and Engine Parts Manufacturing	18.4	18.6	17.0	16.9	16.7	18.4	19.8	28.4	28.2	20.9
Civilian Other Aircraft Parts and Equipment	55.1	57.7	48.4	48.4	52.2	53.5	63.9	70.8	75.9	72.2
Air Couriers	57.4	56.4	54.0	58.3	63.5	65.2	73.6	79.8	81.1	72.0
Visitor Expenditures	494.2	461.7	435.5	446.4	503.1	554.1	583.3	621.6	636.1	597.0
Travel Arrangements	18.7	17.8	16.1	15.9	15.6	15.3	15.0	14.5	14.4	12.8
Subtotal–Commercial	**1,061.8**	**1,012.3**	**942.3**	**955.3**	**1,041.3**	**1,131.1**	**1,221.3**	**1,317.2**	**1,339.9**	**1,234.8**
General Aviation Operations	27.2	25.6	26.9	27.3	33.3	38.4	44.6	45.7	46.6	38.8
GA Aircraft Manufacturing	27.8	28.1	21.9	18.3	19.4	24.6	29.4	33.9	37.9	25.8
GA Visitor Expenditures	14.2	11.8	12.0	12.0	12.2	12.3	12.4	12.8	12.6	11.9
Subtotal–General Aviation	**69.2**	**65.5**	**60.8**	**57.6**	**64.9**	**75.2**	**86.5**	**92.4**	**97.2**	**76.5**
Total Impact	**1,131.0**	**1,077.8**	**1,003.1**	**1,012.9**	**1,106.2**	**1,206.3**	**1,307.8**	**1,409.7**	**1,437.1**	**1,311.2**

Table 22 U.S. Civil Aviation Economic Impact, Total Earnings: Primary plus Secondary Impacts

	EARNINGS ($BILLIONS)									
Description	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Airline Operations	78.9	68.1	72.0	77.9	84.4	93.0	101.2	106.9	111.7	91.9
Airport Operations	16.9	19.6	21.1	20.3	20.8	21.5	22.8	25.8	26.1	27.5
Civilian Aircraft Manufacturing	25.5	28.7	19.9	15.2	14.8	15.9	18.7	21.1	17.4	21.5
Civilian Aircraft Engine and Engine Parts Manufacturing	4.6	4.7	4.5	4.5	4.5	4.9	5.3	7.6	7.5	5.6
Civilian Other Aircraft Parts and Equipment	16.0	16.7	14.4	14.4	15.5	15.9	19.0	21.1	22.6	21.5
Air Couriers	18.0	17.7	16.1	17.4	19.0	19.5	22.0	23.8	24.2	21.5
Visitor Expenditures	154.3	144.2	130.4	133.7	150.7	165.9	174.7	186.2	190.5	178.8
Travel Arrangements	6.0	5.7	5.1	5.0	4.9	4.8	4.7	4.6	4.6	4.0
Subtotal– Commercial	**320.1**	**305.3**	**283.6**	**288.4**	**314.5**	**341.5**	**368.5**	**397.1**	**404.7**	**372.2**
General Aviation Operations	7.8	7.4	8.3	8.5	10.3	11.9	13.8	14.2	14.4	12.0
GA Aircraft Manufacturing	7.2	7.3	5.6	4.6	4.9	6.3	7.5	8.6	9.6	6.6
GA Visitor Expenditures	4.4	3.7	3.6	3.6	3.7	3.7	3.7	3.8	3.8	3.6
Subtotal– General Aviation	**19.4**	**18.3**	**17.5**	**16.7**	**18.9**	**21.8**	**25.0**	**26.6**	**27.9**	**22.1**
Total Impact	**339.5**	**323.6**	**301.1**	**305.1**	**333.4**	**363.4**	**393.5**	**423.7**	**432.6**	**394.4**

Table 23 U.S. Civil Aviation Economic Impact, Total Jobs: Primary plus Secondary Impacts

	JOBS (THOUSANDS)									
Description	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Airline Operations	1,965	1,695	1,572	1,702	1,842	2,032	2,210	2,334	2,440	2,007
Airport Operations	437	508	471	453	466	482	511	578	584	614
Civilian Aircraft Manufacturing	548	617	388	296	289	309	364	411	339	418
Civilian Aircraft Engine and Engine Parts Manufacturing	100	101	92	91	90	99	107	153	152	112
Civilian Other Aircraft Parts and Equipment	359	376	304	304	328	336	401	445	477	454
Air Couriers	566	557	478	515	562	577	651	706	717	637
Visitor Expenditures	5,241	4,897	3,888	3,985	4,491	4,946	5,207	5,549	5,678	5,329
Travel Arrangements	176	168	149	147	144	142	139	133	133	118
Subtotal–Commercial	**9,392**	**8,918**	**7,342**	**7,493**	**8,210**	**8,922**	**9,590**	**10,309**	**10,521**	**9,690**
General Aviation Operations	195	183	182	185	225	260	302	310	316	262
GA Aircraft Manufacturing	155	156	109	91	96	122	146	168	188	128
GA Visitor Expenditures	150	125	107	107	109	109	111	114	113	106
Subtotal–General Aviation	**499**	**464**	**398**	**382**	**431**	**491**	**559**	**592**	**616**	**496**
Total Impact	**9,891**	**9,383**	**7,740**	**7,876**	**8,641**	**9,413**	**10,149**	**10,901**	**11,138**	**10,186**

Table 24 U.S. Civil Aviation Economic Impact, Percent Contribution to GDP

	VALUE ADDED – PERCENT OF GDP									
Description	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Airline Operations	1.0	0.8	1.0	1.1	1.2	1.2	1.2	1.2	1.3	1.1
Airport Operations	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Civilian Aircraft Manufacturing	0.3	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.2	0.3
Civilian Aircraft Engine and Engine Parts Manufacturing	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Civilian Other Aircraft Parts and Equipment	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
Air Couriers	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Visitor Expenditures	2.6	2.3	2.3	2.4	2.6	2.6	2.6	2.7	2.7	2.5
Travel Arrangements	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Subtotal– Commercial	**4.9**	**4.5**	**4.4**	**4.8**	**4.9**	**5.0**	**5.1**	**5.2**	**5.2**	**4.9**
General Aviation Operations	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1
GA Aircraft Manufacturing	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
GA Visitor Expenditures	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Subtotal– General Aviation	**0.3**	**0.2**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**
Total Impact	**5.2**	**4.8**	**4.7**	**5.0**	**5.2**	**5.3**	**5.4**	**5.6**	**5.5**	**5.2**

Glossary of Economic Terms

Annual Rates
Published time series data often represent flows which take place over a month, quarter, or year. One example is revenue passenger miles, which is often reported at rates of RPM per month, per quarter, or per year. Therefore, these data are at different rates, meaning RPM per year are far higher than RPM per month and RPM per quarter, making it difficult to compare the data. To annualize or present the monthly or quarterly data at annual rates, multiply the data by 12 and 4, respectively.

Earnings
Earnings are wages and salaries and other labor income, such as overtime, benefits and proprietors' income, paid to all employed persons by employers for a given unit of work or time. The Bureau of Labor Statistics (BLS) publishes earnings data.

Employment (Jobs)
Employment is the implicit or explicit contractual relationship which exists between an employer and employee, whereby the employee voluntarily agrees to provide work effort to the employer in exchange for cash or in-kind remuneration.[1] The BLS is responsible for collecting and publishing data on the number employed within the U.S. According to BLS:

> Employment data refer to persons on establishment payrolls who received pay for any part of the pay period that includes the 12th day of the month. Data exclude proprietors, the unincorporated self-employed, unpaid volunteer or family workers, farm workers, and domestic workers. Salaried officers of corporations are included. Government employment covers only civilian employees; military personnel are excluded. Employees of the Central Intelligence Agency, the National Security Agency, the National Imagery and Mapping Agency and the Defense Intelligence Agency also are excluded.[2]

Enabling Impact
Enabling impact is the economic impact on employment and income generated by economic activities that are dependent on the availability of air transportation services.[3]

FAA Spending
FAA spending includes FAA expenditures on payroll, nonpayroll (including facilities and equipment, operations, research) and grants issued through the Airport Improvement Program (AIP).

Gross Domestic Product
Gross Domestic Product (GDP) is the dollar measure of overall economic production during a period of time. It is the current dollar value of all final goods and services produced within a country during a specified time period, such as a year or quarter. These goods and services include consumption, investment, government expenditures and net exports. GDP also can be viewed in value added terms as the sum or aggregate of value added over each stage of production over the entire economy. The Bureau of Economic Analysis (BEA) publishes annual and quarterly measures of GDP.

Gross Output
For an industry, gross output is the dollar value of goods or services produced by the industry and made available for use outside that industry during a specified time period.[4] It is measured as total sales or receipts, plus other operating income, commodity taxes (sales and excise taxes) and changes in inventories; or, equivalently, as value added, plus goods and services purchased for use in production. For an entire nation, total gross output is equal to total intermediate inputs plus GDP. Therefore, total gross output exceeds GDP. The BEA publishes annual national- and industry-level estimates of gross output.

Induced Impact
Induced impacts result from expenditures identified in the measurement of primary impacts, as well as spending by employees.

Input
Input is the total monetary value of goods and services consumed or used to produce a final good or service. These inputs include capital, labor, energy, materials and services.

[1] United Nations. 2008. *System of National Accounts*, 2008, p. 136.
[2] U.S. Department of Labor, Bureau of Labor Statistics. 2011. *Handbook of Labor Statistics*. March 2011.
[3] Mariya A. Ishutkina and R. John Hansman. 2009. "Analysis of the Interaction Between Air Transportation and Economic Activity: A Worldwide Perspective," MIT International Center for Air Transportation.
[4] Organisation for Economic Co-operation and Development. 2002. "Glossary of Statistical Terms."

Multipliers
Multipliers measure the impact of particular spending on the rest of the economy. In particular, these coefficients gauge the effects of spending on output, earnings and employment. The BEA publishes industry-level multiplier estimates.

Output
Output is the current dollar production of goods or services by a production unit and is measured by total sales or receipts of that unit, plus other operating income, commodity taxes (sales and excise taxes) and changes in inventories.

Primary Direct Impact
Primary direct impact refers to expenditures on air transportation, air transportation support services and civil aviation-related manufacturing.

Primary Impact
Primary impact refers to expenditures on air transportation and support services; aircraft, aircraft engines and parts manufacturing; and travel and other trip-related expenditures by travelers using air transportation.

Primary Indirect Impact
Primary indirect impact refers to expenditures of air passengers on travel-related goods and services, other than airfares and associated charges paid directly to airlines or travel arrangers.

Recession
A recession is the period between an economic peak and an economic trough and is characterized by a significant decline in economic activity across the economy, lasting from a few months to more than a year. The timing of economic peaks and troughs are based on measures of economic activity such as real GDP, employment, retail sales and industrial production.[5] Recessions are declared by the Business Cycle Dating Committee of the National Bureau of Economic Research (NBER). The most recent U.S. business-cycle contraction or recession officially began in December 2007 and ended in June 2009. It was labeled the Great Recession by the press, due to the length and severity of the recession. An official definition for the term does not exist.[6]

Seasonally Adjusted, at Annual Rates
This term refers to time series data which have been both seasonally adjusted and annualized. See, Annual Rates and Seasonal Adjustment.

Seasonal Adjustment
Many aviation-related time series data display seasonal patterns or seasonality. For example, travel tends to pick up during the summer and the end-of-year holiday season and slow down in the spring. Seasonal adjustment is a statistical process which removes such patterns to reveal underlying trends. In other words, seasonal adjustment removes the effects of recurring seasonal influences from time series. This process "quantifies seasonal patterns and then factors them out of the series to permit analysis of non-seasonal"[7] trends in the data.

Secondary Impact
Secondary impact is used interchangeably with Induced Impact.

Total Economic Activity
Total economic activity is a term used interchangeably with Gross Output.

Total Impact
Total impact is the sum of primary and induced impacts.

Value Added
Value added refers to the current dollar contribution to production by an individual producer, industry or sector during a specified time period. It is measured as the difference between gross output and goods and services purchased for use in production. (These purchased goods and services are also called input purchases or intermediate inputs.) Equivalently, value added consists of employee compensation, production-related taxes, imports less subsidies and gross operating surplus. Value added can be summed or aggregated across individual producers over an entire sector, industry or nation; at the national level, total value added equals GDP. The BEA publishes national- and selected sector-level annual and quarterly measures of value added, as well as selected annual industry measures.

[5] National Bureau of Economic Research. "Statement of the NBER Business Cycle Dating Committee on the Determination of the Dates of Turning Points in the U.S. Economy."
[6] Catherine Rampell. 2009. "'Great Recession': A Brief Etymology." *New York Times*. March 11, 2009; Courtney Schlisserman. 2010. "'Great Recession' Gets Recognition as Entry in AP Stylebook." Bloomberg. February 23, 2010; Neil Irwin. 2010. "It's Official: The Great Recession Ended Last Summer." *Washington Post*. September 20, 2010.
[7] Bureau of Labor Statistics. 2010. "Fact Sheet on Seasonal Adjustment in the CPI." February 23, 2010.

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