

The Economic Impact of U.S. Civil Aviation

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**Federal Aviation
Administration**

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Foreword

Civil air transportation plays a major and growing role in economies around the world. In the United States, more than 5,000 public-use airports support over 7,000 air transport and 210,000 General Aviation aircraft performing more than 51 million airport operations. In 2018, the number of passengers at U.S. airports surpassed 1 billion for the first time in history. Since travel demand is derived from other pursuits, whether business or leisure, the extremely active aviation industry supports a range of economic impacts throughout the economy.

As this report shows, in 2018 the direct sectors amounted to 2.2 percent of gross domestic product (GDP), \$911.3 billion in economic activity, and over 4 million jobs. When looking at both direct and catalytic sectors, civil aviation contributed to more than 5 percent of our GDP, \$1.9 trillion in total economic activity, and supported over 11 million jobs. As a reminder, the data in this report reflect 2018, therefore this report does not describe in-depth the impact that COVID-19 public health emergency has had on civil aviation. However, the data demonstrate the importance of the civil aviation sector to the U.S. economy and underscore the reasons for providing the support contained in the CARES Act of 2020. In the *Emerging Topics in Aviation* section there is a short description highlighting some of COVID-19's impact on civil aviation.

The Federal Aviation Administration (FAA) continues its efforts to support this economic activity, in keeping with our mission to ensure the safest, most efficient aerospace system in the world. As part of our continual modernization effort, we are introducing new airspace innovations every day. These innovations include publishing more than 9,000 performance-based (or satellite-based) navigation routes. These routes enable more point-to-point flying reducing fuel usage and emissions. The FAA continues to put in place Data Communications which enable air traffic controllers and pilots to communicate using text, in addition to voice. Changes like these are making flying more efficient and environmentally friendly, while ensuring we meet all safety needs.

The FAA is working to integrate new users such as unmanned aircraft and commercial space operations into the national airspace system. These new vehicles are poised to change how we live, in a way not seen since the dawn of the jet age. All of these efforts are bringing positive commercial benefits to our citizens and helping to sustain America's leadership in civil aviation.

The FAA's Economic Impact Report is ideal for policymakers, industry officials, and universities. It offers data from 2018 on the economic importance of passenger and cargo transportation, from activities by commercial airlines, air couriers, airports, aircraft and avionics manufacturing, and of aviation research and development. The report also discusses the critical role that aviation plays in supporting tourism and other travel-related activities.

Like all of us at FAA, I am passionate about civil aviation and recognize that now, more than ever, it is a vital component of the nation's transportation network, and one that generates an outsized impact on the economy.

Laurence Wildgoose



Assistant Administrator
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Overview

Furthering Economic Growth and Development...

Civil aviation provides the means of transporting millions of passengers and tons of freight to all corners of the globe every day. Consumers rely on this physical connectivity to improve their quality of life and businesses depend on it to facilitate transactions, both of which are key to increasing a nation's economic productivity and prosperity.

As the U.S. economy strengthened in 2018 after a prolonged period of muted growth, other U.S. industries and consumers depended on civil aviation's ability to provide reliable services that support business and personal opportunities.

Some highlights of civil aviation in 2018 include:¹

- Air carriers operating in U.S. airspace transported 1,027.0 million passengers over 1,521.5 billion revenue passenger miles (RPM).
- More than 78.5 billion revenue ton-miles (RTM) of freight passed through U.S. airports.
- Civil aircraft manufacturing total output was \$143.2 billion, leading to its role as the top net export in the United States with a positive trade balance of \$88.1 billion.
- Commercial airline operations supported \$388.6 billion of visitor expenditures on goods and services.



A complex industry with many facets...

The U.S. air transportation network continues to support the U.S. economy by providing access to markets beyond the local community. Between 2016 and 2018, U.S. economic growth outpaced growth of the civil aviation industry as a whole. Although the U.S. economy averaged 2.7 percent growth per year while civil aviation saw average annual growth of 2.1 percent during this time, the real primary output of several aviation sectors was much higher².

This report's estimates reveal that sectors experiencing rapid growth of real primary output included Avionics Manufacturing, which expanded at an annual rate of 5.2 percent. Other sectors also grew over the 2016-2018 period, including the largest single category: Airline Visitor Expenditures. As the U.S. economy was growing at a real rate of 2.7 percent, Airline Visitor Expenditures grew at a real rate of 2.2 percent and added \$15.7 billion.

Real growth in Civilian Commercial Aircraft Manufacturing output between 2016 and 2018 declined, however, by an average of 1.0 percent per year, and General Aviation Aircraft Manufacturing declined at a rate of 0.7 percent per year. Nevertheless, Civilian Aircraft Manufacturing continued to fuel the U.S. economy as the largest U.S. net export in 2018.

Overall, during 2018 the total U.S. economy generated \$20.6 trillion in value-added economic activity³ and supported 148.9 million jobs⁴. At the same time, civil aviation directly or indirectly supported:

- \$1.9 trillion in total economic activity,
- 11.4 million jobs, and;
- contributed 5.1 percent of U.S. gross domestic product (GDP).



Introduction

What's New

This report incorporates data from the U.S. Department of Commerce, Department of Transportation, Department of Labor, and the National Science Foundation from the years 2016-2018.

For this report, the FAA used the most recent Regional Input-Output Modeling System (RIMS II) multipliers from the Bureau of Economic Analysis (BEA). These multipliers reflect the 2012 input-output benchmark table (I-O table) and the 2018 regional economic accounts. Compared to those used in the 2016 report⁵, over half of the new multipliers imply a slightly lower impact to output, earnings, and jobs growth across the various industries.

This report continues to group industry sectors by their primacy in relation to the function of providing air transport. The first category is Direct, which includes airline and airport operations, aircraft manufacturing and others. The second category is Catalytic, which comprises only travel arranging services and visitor spending. This change brings the report more closely into alignment with common usage of the terminology that appears in other economic impact studies. This affects only the presentation of the results; the methodology is unchanged from previous reports.

Note also that the definition for the sector Airport Operations has changed in this report, as it no longer includes non-operating revenues, and now subtracts out insurance claims and settlements from operating expenses. This new definition better reflects the consistent economic impact of Airport Operations. This resulted in a decrease in value for primary output, leading to decreases in estimated output, earnings, and jobs.

Emerging Topics in Aviation

Brief sections on the COVID-19 public health emergency (COVID-19), unmanned aircraft systems (UAS), and commercial space are included in this report. COVID-19 has greatly affected U.S. civil aviation. Below is a short highlight of the impact of COVID-19 on civil aviation so far in 2020. The next report (which will cover data from 2020) will provide a more in-depth discussion of the impact of COVID-19 nationally. The rise in popularity of UAS (also known as drones) is well known. Future editions of this report may include UAS estimates as this segment of the aviation industry matures and more economic data become available. Additionally, the commercial space estimates represent the economic impact of commercial launches of vehicles into orbital or suborbital space carrying payloads for private or government purposes. BEA published data on the Space Economy via a Satellite Account in December 2020. This data will help in possibly including commercial space estimates to future publications of this report.

COVID-19

The impact of COVID-19 on U.S. civil aviation has been devastating. Passenger traffic has decreased significantly globally as a result of limitations on travel and personal gatherings imposed by governments seeking to stop the spread of COVID-19. We do not currently have complete data to analyze these effects, as this report utilizes data from a variety of sources from 2018. The next National report, however, will utilize a full data set from 2020 and will further expand on the impact of COVID-19. It will show the impact each industry experienced from COVID-19, and the impact it has had on output, earnings, and jobs.



Unmanned Aircraft Systems

From a nascent industry only five years ago, UAS have experienced robust growth in the United States and around the world. A UAS is an aircraft without a human pilot onboard, a ground-based control station, and a communications link connecting all the components. While introduction of UAS in the national airspace system have opened numerous possibilities, it has also brought operational challenges. Integration of UAS into the National Airspace must be done in a manner that ensures the safety of people and property both in the air and on the ground. Despite these challenges, the UAS sector holds enormous promise. Uses range from recreational flyers and modelers experimenting with small UAS, to individuals performing aerial photography for personal use, to larger UAS capable of inspecting infrastructure, crops, and package delivery.

The FAA's online registration system – the primary source of data to understand the evolution of small UAS ownership in the United States – went into effect on December 21, 2015. On August 29, 2016, the rules on the small UAS (14 CFR part 107) were promulgated. The regulations require all UAS weighing more than 0.55 pounds (250 grams) and less than 55 pounds be registered using the online system (https://www.faa.gov/uas/getting_started/registration/). Since launching the online registration system, more than 1.7 million users have registered. By the end of September 2020, over 1,208,000 individuals registered as modelers (with multiple equipment ownership) and more than 494,000 registered equipment for use in commercial purposes. The FAA's 2020 Aerospace Forecast shows that both model and commercial registration, and thus ownership of small UAS, are well distributed with denser ownership consolidated in larger populations and economic centers across the country (https://www.faa.gov/data_research/aviation/aerospace_forecasts/). Given the trend observed in the number of registrations, expert opinions, review of available industry forecasts, and market/industry research, the forecast indicates that the model fleet will likely (i.e. base scenario) reach its peak over the next four years, from 1.32 million units to over 1.48 million units. The high scenario shows the fleet may reach 1.59 million units while the low scenario projects as low as 1.39 million units in four years. Alternatively, the non-model fleet is forecasted (i.e., base scenario) to be one and a half times larger (almost two and a half times under the high scenario) than the present size of approximately 494,000 in four years.

UAS provide a wide array of economic benefits to users and the overall economy but the FAA's definitive estimation of benefits of direct (i.e., to users), indirect (i.e., spill-overs) and induced (i.e., multiplier) effects of UAS is at an early stage. This is because these markets are just starting to emerge. At present, there are four broad areas for which direct benefits can be accounted with varying maturity and thus accuracy. First, the UAS manufacturing sector is well developed and its contribution, i.e. in value and employment, can be accounted. Second, the UAS parts manufacturing sector include components and systems such as frames, engines, propellers, batteries, transmitters and autopilots. This sub-sector is evolving with increasing research and development spending and new innovations, but the value and employment contributions are somewhat murky. Third is UAS services, such as providing data and analytics (i.e., mapping, 3D modeling, computer vision, etc.) to other sectors. These are constantly evolving with the changing sectoral demands and newer sectors using UAS-based data and analytics. Therefore, this sub-sector is in flux and expected to grow over time. Fourth and finally, at the end of September 2020, over 194,000 remote pilot certificates had been issued. By the end of 2024, the FAA forecasts there will be 350,000 remote pilots. This additional employment of about 156,000 new remote pilots over the next four years yields direct benefits from use of UAS in commercial activities.

As the industry evolves and economic gains of UAS integration become increasingly apparent, efficiency, safety, security, and the true economic impact will become transparent. At this point, studies that report the economic impact of UAS are somewhat lacking in comprehensive data and/or demonstrate shortfalls in methodology. As the FAA collects more information through the registration database and targeted surveys of UAS registrants this year, we expect to better quantify the economic impact of UAS in the future.



Commercial Space

Commercial space is becoming a greater presence in the national airspace system. The commercial space industry historically launched communications satellites into space, but today the industry is planning to send scientific payloads to the Moon, tourists into orbit, and possibly mine asteroids. Launching these varied payloads into space is becoming a big business, with numerous companies entering the commercial launch market. BEA's release of a Satellite Account on the Space Economy in December 2020 is evidence of the growth in commercial space. Currently, there are twenty-four active launch licenses⁶.

The FAA Office of Commercial Space Transportation (AST) is charged with regulating the safety of commercial space transportation in the United States⁷. Among other regulations, the FAA requires that: all commercial suborbital and orbital space launches operated by an American citizen or corporation must be licensed or permitted by AST; and all non-governmental launch and reentry sites in the United States must be licensed by AST. FAA's role is primarily a public safety regulator. AST ensures the uninvolved third-party public is protected from the risks of commercial spaceflight.

Currently, areas of direct economic impacts from commercial space remain somewhat narrow. In 2018, the majority of global space revenue was generated by companies providing services including television; mobile, fixed, and broadband communications; remote sensing; satellite systems; ground equipment manufacturing; and launch services. Other spending resulted from government space budgets and commercial human spaceflight. U.S. space industry revenues were approximately \$170 billion in 2018⁸. This figure includes almost \$120 billion in revenues generated by satellite services, satellite manufacturing, satellite ground equipment, and launch services, as well as over \$50 billion spent on space programs by the U.S. government⁹. U.S. launch service providers accounted for about \$2.3 billion in internationally competed contract revenues (37 percent of global revenues)¹⁰.

As of September 2020, there were 12 commercial launch sites in the United States, located in Alaska, California, Colorado, Florida, New Mexico, Oklahoma, Texas, and Virginia¹¹. With the projected future growth of launches, air traffic controllers will need to incorporate commercial space operations into the national airspace system. As new air management policies are developed for inclusion of commercial space traffic, more information regarding launches will be necessary to allow for safe and effective use of airspace.

In the years 2017, 2018, and 2019, the numbers of U.S. commercial launches were 22, 35, and 32 respectively¹². Worldwide there were 93 commercial launches, in 2018¹³. Annual revenues of U.S. private commercial launch providers were approximately \$1.8 billion in 2017¹⁴, \$2.3 billion in 2018¹⁵, and \$1.7 billion in 2019¹⁶.

In the future, the commercial space industry intends to send tourists into space as well. Several U.S. companies, including Blue Origin and Virgin Galactic, hope to take passengers to the fringe of earth's atmosphere on suborbital reusable vehicles (SRV)¹⁷.

The FAA will continue to research data for future editions of this report. This includes assessing the Space Economy Satellite Accounts produced in December 2020 by BEA.



NATIONAL IMPACT OF U.S. CIVIL AVIATION

This report estimates the economic contribution of the U.S. civil aviation industry. Civil aviation has numerous and far-reaching economic impacts. This report uses the best data available from government and private sources to capture economic activity generated by the air transport of passengers and cargo.

The FAA has produced numerous economic impact reports since 2003 at both the national and state levels. Recently, the FAA has chosen to follow an alternate-year schedule, with the national and state versions staggered and each produced every other year. Publication of this report puts the FAA on schedule where the report will contain a two-year lag in data since this report references 2018 data.

Methodology

The total economic impact of an industry is a summation of primary and secondary spending related to that particular industry. This definition is standard for economic-impact studies. It also helps to estimate aviation's unique economic contribution to the national economy. The data used to measure the primary economic impacts of civil aviation comes from reliable government and private sources. This study estimated those impacts by looking at industry output, earnings, and jobs. Application of the multipliers from the

RIMS II Input-Output Model, a model developed by the U.S. Department of Commerce's Bureau of Economic Analysis, help derive the amounts of secondary spending¹⁸. The summation of primary and secondary amounts 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 the revenue earned from the sale of goods and services by each of the sectors, whether categorized as direct or catalytic, relevant to the civil aviation industry. For example, these sources of revenue include:

- Air carrier ticket sales
- Value of aircraft manufacturer shipments
- General Aviation operating costs
- Visitor spending (excluding airfare) on trips taken by air

Secondary Impacts: Secondary impacts result from expenditures made by sectors identified in the measurement of primary impacts to supporting businesses and entities, as well as the spending of employees. In other words, secondary impacts capture, through multiplier effects, the spending down the supply chain, and payroll impacts that circulate. As noted above, the RIMS II model derives the secondary impacts from their corresponding primary impacts.



Measures of Economic Impacts

Primary expenditure estimates are inputs into the RIMS II model to estimate the secondary effects of those expenditures on the U.S. economy, in terms of economic output, earnings, and jobs.

Output: The total economic value of goods and services produced¹⁹.

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 full-time in industries that provide civil-aviation services, manufacture aircraft and aircraft engines, or work in other industries (such as hospitality) that are indirectly affected by activity in the civil aviation sector.

Results

Table 1 summarizes the total impact of U.S. civil aviation on output, earnings, and jobs, in addition to providing the breakdown between direct and catalytic sectors for each measure. The direct category includes airline and airport operations, aircraft manufacturing and others, while the catalytic category comprises only travel arranging services and visitor spending.

In 2018, economic activity attributed to civil aviation-related goods and services totaled \$1.9 trillion, generating 11.4 million jobs with \$543.9 billion in earnings. Aviation contributed 5.1 percent of GDP, the value-added measure of overall U.S. economic activity. Considering only the direct sectors, aviation contributed 2.2 percent of GDP, \$911.3 billion in economic activity, and 4.3 million jobs.

Table 2 reports primary output for 2018 and is the basis for calculating the total economic impact of civil aviation for the year. As described above, to get these secondary and total impacts, multiplication of the primary output with the BEA's RIMS II multipliers takes place.

Airline Operations is, by more than a factor of two, the largest single sector in the Direct category with primary output of \$147.6 billion. Among all sectors, however, Airline Visitor Expenditures is clearly in the lead with primary output of \$388.6 billion, reflecting the scope and importance of air travel as a means of transport both domestically and internationally. In 2018 total primary output for the industry as a whole is \$762.7 billion.

Table 1. Summary - Economic Impact of U.S. Civil Aviation 2016-2018 (Current Dollars)

Year	Sector Category	Output (\$Billions)	Earnings (\$Billions)	Jobs (Thousands)	Percent of GDP
2018	Direct	911.3	237.8	4,259	2.2
	Catalytic	1,031.2	306.1	7,092	2.9
	Total	1,942.6	543.9	11,351	5.1
2017	Direct	864.4	225.7	4,034	2.2
	Catalytic	983.7	292.0	6,766	2.9
	Total	1,848.1	517.7	10,801	5.1
2016	Direct	834.7	217.6	4,035	2.3
	Catalytic	916.4	265.9	6,720	2.9
	Total	1,751.1	483.5	10,755	5.1

Table 2. Primary Output (Current Dollars)

Description	2018 (\$Billions)
Airline Operations	147.6
Airport Operations	28.9
Civilian Aircraft Manufacturing	60.7
Civilian Aircraft Engine and Engine Parts Manufacturing	7.9
Civilian Other Aircraft Parts and Equipment Manufacturing	27.5
Civilian Avionics Manufacturing	12.1
Civilian Research and Development	11.4
GA Operations	24.8
GA Aircraft Manufacturing	11.6
Air Couriers	28.0
Subtotal - Direct	360.4
Airline Visitor Expenditures	388.6
GA Visitor Expenditures	4.9
Travel Arrangements	8.7
Subtotal - Catalytic	402.2
Total Primary Output	762.7

These primary output amounts, in conjunction with the RIMS II multipliers, calculate the secondary amounts. Total output, or the sum of primary and secondary impacts, reported in **Table 3**, shows the following:

- In 2018, Airline Operations generated \$367.4 billion in total output, representing the largest single sector of civil aviation's direct contribution.
- General Aviation Operations accounted for \$61.8 billion of total output in 2018. While the impact is less than Airline Operations, the GA contribution continues to reflect the sector's unique role in the nation's transportation system.
- As domestic and foreign airline passengers reach their destinations in the United States, their total expenditures on hotels, rental cars, and entertainment contributed \$994.6 billion in total output, more than double the output supported by Airlines' Operations.

Table 3. Total Output, Earnings and Jobs Estimates, 2018 (Current Dollars)

Description	Output (\$Billions)	Earnings (\$Billions)	Jobs (Thousands)
Airline Operations	367.4	90.3	1,543
Airport Operations	89.3	29.8	564
Civilian Aircraft Manufacturing	143.2	33.3	519
Civilian Aircraft Engine and Engine Parts Manufacturing	16.5	3.9	62
Civilian Other Aircraft Parts and Equipment Manufacturing	67.5	17.8	304
Civilian Avionics Manufacturing	29.6	7.8	133
Civilian Research and Development	32.5	10.7	170
GA Operations	61.8	15.2	260
GA Aircraft Manufacturing	27.4	6.4	99
Air Couriers	76.3	22.7	606
Subtotal - Direct	911.3	237.8	4,259
Airline Visitor Expenditures	994.6	295.4	6,869
GA Visitor Expenditures	12.5	3.7	86
Travel Arrangements	24.1	7.0	136
Subtotal - Catalytic	1,031.2	306.1	7,092
Total Impact	1,942.6	543.9	11,351

Aviation's Contribution to Gross Domestic Product

U.S. GDP was \$20,611.9 billion in 2018²⁰. GDP represents the sum of all value-added activities in an economy, so intermediate goods and services used in the production of other goods and services are not included. This contrasts with the previous section where the total output calculation included intermediate goods and services that were purchased as part of the production process. In order to assess aviation's contribution to GDP, these intermediate goods and services must be subtracted from total output.

In order to estimate civil aviation's contribution to GDP, each expenditure category is calculated separately using the RIMS II value added coefficients. **Table 4** shows the results. In 2018, value added economic activity from aviation and other related sectors totaled \$1.1 trillion, or 5.1 percent of U.S. GDP.

In 2018, the direct sectors contributed \$457.5 billion or 2.2 percent of GDP, while the catalytic sectors contributed \$592.7 billion or 2.9 percent of GDP. Among all sectors, the largest component is Airline Visitor Expenditures totaling \$572.4 billion, or 2.8 percent of GDP, followed by Airline Operations at \$179.6 billion, or 0.9 percent of GDP. General Aviation, including operations, manufacturing and visitor spending, while small in comparison to commercial aviation, still contributed 0.2 percent to GDP, or \$51.0 billion.

See the Appendix for civil aviation's contribution to GDP for the years 2016 through 2018.

Table 4. Civil Aviation's Contribution to GDP, 2018 (Current Dollars)

Description	Value Added (\$Billions)	Percent of GDP
Airline Operations	179.6	0.9
Airport Operations	46.8	0.2
Civilian Aircraft Manufacturing	71.0	0.3
Civilian Aircraft Engine and Engine Parts Manufacturing	8.4	0.0
Civilian Other Aircraft Parts and Equipment Manufacturing	34.3	0.2
Civilian Avionics Manufacturing	15.0	0.1
Civilian Research and Development	18.1	0.1
GA Operations	30.2	0.1
GA Aircraft Manufacturing	13.6	0.1
Air Couriers	40.6	0.2
Subtotal - Direct	457.5	2.2
Airline Visitor Expenditures	572.4	2.8
GA Visitor Expenditures	7.2	0.0
Travel Arrangements	13.1	0.1
Subtotal - Catalytic	592.7	2.9
Total Impact	1,050.2	5.1

Revision to Previous Years

Table 5 reports the change from previously published FAA economic impact estimates for civil aviation. For 2016, the total difference between the current and previously published estimates were about \$14.8 billion lower in total output, or, approximately 0.1 percentage point lower in contribution to GDP.

The downward revisions to output, earnings, jobs, and percent of GDP are primarily attributable to revisions of underlying data in one category: Airport Operations. Airport Operations decreased due to a change in scope. In this report, Airport Operations no longer includes non-operating revenues and now subtracts out insurance claims and settlements from operating expenses.

Table 5. Revisions to Previously Published Estimates (Current Dollars)

	Year	Output (\$Billions)	Earnings (\$Billions)	Jobs (Thousands)	Percent of GDP
Current Total:	2016	1,751.1	483.5	10,755	5.1
Previous Total:	2016	1,765.9	488.2	10,857	5.2
Difference (Revisions):		-14.80	-4.73	-102.36	-0.08
Revision by Sector		Output (\$Billions)	Earnings (\$Billions)	Jobs (Thousands)	Value Added (\$Billions)
Airline Operations		0.0	0.0	0	0.0
Airport Operations		-13.0	-4.2	-86	-7.0
Civilian Aircraft Manufacturing		3.4	0.9	14	1.7
Civilian Aircraft Engine and Engine Parts Manufacturing		0.0	0.0	0	0.0
Civilian Other Aircraft Parts and Equipment Manufacturing		0.0	0.0	0	0.0
Civilian Avionics Manufacturing		-0.1	0.0	-1	-0.1
Civilian Research and Development		-0.8	-0.3	-4	-0.4
GA Operations		-2.0	-0.5	-9	-1.0
GA Aircraft Manufacturing		0.0	0.0	0	0.0
Air Couriers		0.0	0.0	0	0.0
Subtotal - Direct		-12.6	-4.1	-86	-6.8
Airline Visitor Expenditures		-2.3	-0.7	-17	-1.4
GA Visitor Expenditures		-0.1	0.0	-1	-0.1
Travel Arrangements		0.2	0.1	1	0.1
Subtotal - Catalytic		-2.2	-0.6	-16	-1.3

Real Change from Previous Years

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 supported by civil aviation. **Table 6** shows these measures in 2016 dollars. This removes inflation lending to a better comparison to 2018 estimates.

Comparing the 2018 estimates to the 2016 revised values in **Table 5**, real total output of civil aviation increased 6.5 percent between 2016 and 2018, while real earnings increased 7.9 percent and total jobs increased 5.5 percent during the same time. Airport Operations, Airline Operations, and the catalytic sectors were primarily responsible for these increases in real total output, real earnings, and total jobs.

Table 6. U.S. Civil Aviation: Growth of Total Output, Earnings, and Jobs (2016 Dollars)

Description	Output (2016 \$Billions)			Earnings (2016 \$Billions)			Jobs (Thousands)		
	2016	2018	Percent Change	2016	2018	Percent Change	2016	2018	Percent Change
Airline Operations	315.6	352.1	11.6	77.0	86.6	12.4	1,362	1,543	13.3
Airport Operations	68.7	85.6	24.6	21.9	28.6	30.5	455	564	23.9
Civilian Aircraft Manufacturing	147.8	137.2	-7.1	37.0	31.9	-13.8	621	519	-16.5
Civilian Aircraft Engine and Engine Parts Manufacturing	18.6	15.8	-15.1	4.5	3.7	-16.9	78	62	-20.2
Civilian Other Aircraft Parts and Equipment Manufacturing	71.0	64.6	-9.0	17.8	17.0	-4.5	331	304	-8.3
Civilian Avionics Manufacturing	25.6	28.3	10.6	6.4	7.5	16.1	119	133	11.4
Civilian Research and Development	39.6	31.1	-21.4	12.6	10.3	-18.6	219	170	-22.3
GA Operations	50.3	60.7	20.7	12.3	14.9	21.6	217	260	19.6
GA Aircraft Manufacturing	28.8	26.9	-6.6	7.2	6.2	-13.3	121	99	-18.0
Air Couriers	68.7	73.1	6.4	20.8	21.7	4.4	512	606	18.3
Subtotal - Direct	834.7	875.6	4.9	217.6	228.4	5.0	4,035	4,259	5.5
Airline Visitor Expenditures	884.2	953.3	7.8	256.5	283.1	10.4	6,505	6,869	5.6
GA Visitor Expenditures	11.5	12.2	6.2	3.3	3.6	8.7	85	86	1.5
Travel Arrangements	20.7	23.1	11.8	6.0	6.7	10.8	130	136	4.6
Subtotal - Catalytic	916.4	988.6	7.9	265.9	293.4	10.4	6,720	7,092	5.5
Total Impact	1,751.1	1,864.2	6.5	483.5	521.9	7.9	10,755	11,351	5.5



CONCLUSION

Civil aviation connects the entire globe, providing much needed economic benefits both seen and unseen for U.S. consumers and businesses. Civil aviation has been a major force connecting America to the global economy and the U.S. civil aviation industry truly remains a unique engine for innovation and technological progress.

From 2016 to 2018, real GDP averaged 2.7 percent growth per year, and employment grew by 4.6 million persons, from 144.3 million to 148.9 million. Civil aviation direct sectors produced 2.2 percent of GDP, and generated 4.3 million jobs. Earnings for civil aviation direct sectors registered at \$237.8 billion. The catalytic sectors generated 2.9 percent of GDP and supported 7.1 million jobs. Overall, in 2018, civil aviation and the sectors it supports accounted for 5.1 percent of the U.S. economy. The total output of civil aviation-related (both direct and catalytic) goods and services amounted to \$1.9 trillion and generated 11.4 million jobs, with earnings of \$543.9 billion. Total output and earnings from civil aviation and related sectors has expanded notably since 2014, even as its contribution to employment and share of GDP have edged lower.

Unmanned aircraft systems and commercial space operations are both emerging sectors within civil aviation, though as yet, neither category has sufficiently reliable data to be included in the computational breakdown of impacts in this report. As with commercial aviation, the economic impact of UAS and commercial space operations extends beyond those sectors to other parts of the economy. The FAA will continue to monitor availability of data on UAS and commercial space as their impacts expand.

Appendix – Supplemental Tables

**Table 7. U.S. Civil Aviation Economic Impact,
Total Output: Primary plus Secondary Impacts (Current Dollars)**

Description	Total Output (\$Billions)		
	2016	2017	2018
Airline Operations	315.6	343.5	367.4
Airport Operations	68.7	81.2	89.3
Civilian Aircraft Manufacturing	147.8	136.8	143.2
Civilian Aircraft Engine and Engine Parts Manufacturing	18.6	16.6	16.5
Civilian Other Aircraft Parts and Equipment Manufacturing	71.0	69.3	67.5
Civilian Avionics Manufacturing	25.6	28.4	29.6
Civilian Research and Development	39.6	36.1	32.5
GA Operations	50.3	56.2	61.8
GA Aircraft Manufacturing	28.8	25.1	27.4
Air Couriers	68.7	71.2	76.3
Subtotal - Direct	834.7	864.4	911.3
Airline Visitor Expenditures	884.2	949.6	994.6
GA Visitor Expenditures	11.5	12.1	12.5
Travel Arrangements	20.7	22.1	24.1
Subtotal - Catalytic	916.4	983.7	1,031.2
Total Impact	1,751.1	1,848.1	1,942.6

**Table 8. U.S. Civil Aviation Economic Impact,
Total Earnings: Primary plus Secondary Impacts (Current Dollars)**

Description	Earnings (\$Billions)		
	2016	2017	2018
Airline Operations	77.0	84.5	90.3
Airport Operations	21.9	27.1	29.8
Civilian Aircraft Manufacturing	37.0	31.8	33.3
Civilian Aircraft Engine and Engine Parts Manufacturing	4.5	3.9	3.9
Civilian Other Aircraft Parts and Equipment Manufacturing	17.8	18.2	17.8
Civilian Avionics Manufacturing	6.4	7.5	7.8
Civilian Research and Development	12.6	11.9	10.7
GA Operations	12.3	13.8	15.2
GA Aircraft Manufacturing	7.2	5.8	6.4
Air Couriers	20.8	21.1	22.7
Subtotal - Direct	217.6	225.7	237.8
Airline Visitor Expenditures	256.5	282.0	295.4
GA Visitor Expenditures	3.3	3.6	3.7
Travel Arrangements	6.0	6.4	7.0
Subtotal - Catalytic	265.9	292.0	306.1
Total Impact	483.5	517.7	543.9

Table 9. U.S. Civil Aviation Economic Impact, Total Jobs: Primary plus Secondary Impacts

Description	Jobs (Thousands)		
	2016	2017	2018
Airline Operations	1,362	1,443	1,543
Airport Operations	455	513	564
Civilian Aircraft Manufacturing	621	496	519
Civilian Aircraft Engine and Engine Parts Manufacturing	78	63	62
Civilian Other Aircraft Parts and Equipment Manufacturing	331	312	304
Civilian Avionics Manufacturing	119	128	133
Civilian Research and Development	219	189	170
GA Operations	217	236	260
GA Aircraft Manufacturing	121	91	99
Air Couriers	512	565	606
Subtotal - Direct	4,035	4,034	4,259
Airline Visitor Expenditures	6,505	6,558	6,869
GA Visitor Expenditures	85	83	86
Travel Arrangements	130	125	136
Subtotal - Catalytic	6,720	6,766	7,092
Total Impact	10,755	10,801	11,351

Table 10. U.S. Civil Aviation Economic Impact, Value Added (Current Dollars)

Description	Value Added (\$Billions)		
	2016	2017	2018
Airline Operations	156.1	167.9	179.6
Airport Operations	36.9	42.5	46.8
Civilian Aircraft Manufacturing	74.6	67.9	71.0
Civilian Aircraft Engine and Engine Parts Manufacturing	9.1	8.4	8.4
Civilian Other Aircraft Parts and Equipment Manufacturing	37.8	35.2	34.3
Civilian Avionics Manufacturing	13.6	14.4	15.0
Civilian Research and Development	21.0	20.1	18.1
GA Operations	24.9	27.5	30.2
GA Aircraft Manufacturing	14.5	12.4	13.6
Air Couriers	36.8	37.9	40.6
Subtotal - Direct	425.2	434.3	457.5
Airline Visitor Expenditures	517.8	546.5	572.4
GA Visitor Expenditures	6.8	7.0	7.2
Travel Arrangements	11.1	12.0	13.1
Subtotal - Catalytic	535.6	565.4	592.7
Total Impact	960.8	999.7	1,050.2

Table 11. U.S. Civil Aviation Economic Impact, Percent Contribution to GDP

Description	Value Added - Percent of GDP		
	2016	2017	2018
Airline Operations	0.8	0.9	0.9
Airport Operations	0.2	0.2	0.2
Civilian Aircraft Manufacturing	0.4	0.3	0.3
Civilian Aircraft Engine and Engine Parts Manufacturing	0.0	0.0	0.0
Civilian Other Aircraft Parts and Equipment Manufacturing	0.2	0.2	0.2
Civilian Avionics Manufacturing	0.1	0.1	0.1
Civilian Research and Development	0.1	0.1	0.1
GA Operations	0.1	0.1	0.1
GA Aircraft Manufacturing	0.1	0.1	0.1
Air Couriers	0.2	0.2	0.2
Subtotal - Direct	2.3	2.2	2.2
Airline Visitor Expenditures	2.8	2.8	2.8
GA Visitor Expenditures	0.0	0.0	0.0
Travel Arrangements	0.1	0.1	0.1
Subtotal - Catalytic	2.9	2.9	2.9
Total Impact	5.1	5.1	5.1

Glossary of Economic Terms

Catalytic Sector

This is a term used to categorize the various sectors within the civil aviation industry. In this report, these sectors provide goods and services that are related to, and partially dependent upon, civil aviation, but their main function is not to support aviation. The sectors categorized as catalytic are visitor expenditures and travel arrangers²¹.

Direct Sector

This is a term used to categorize the various sectors within the civil aviation industry. In this report, these sectors provide goods and services that are fundamental to, and inseparable from, civil aviation. Airline operations, aircraft manufacturing, air couriers and others all are grouped in this category.

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)

The BLS is responsible for collecting and publishing data on the number of persons employed within the United States. 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 excluded²².

Gross Domestic Product

Gross domestic product (GDP) is a measure of overall economic production during a period of time. It represents 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 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 period²³. 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, and thus exceeds GDP. The BEA publishes annual national and industry-level estimates of gross output.

Multipliers

Multipliers measure the impact of a particular category of spending on the rest of the economy, specifically 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 Impact

This is a term used to categorize the dollar amounts that flow through the civil aviation industry. Primary impact refers to the first round of expenditures within each sector that are collected from government and private sources. These amounts are applied against the RIMS II multipliers to derive secondary impacts.

Seasonal Adjustment

Many aviation-related time series data display seasonal patterns. For example, travel tends to pick up during the summer and the end-of-year holiday season and slow down at other times of the year. Seasonal adjustment is a statistical process that 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”²⁴ trends in the data.

Secondary Impact

This is a term used to categorize the dollar amounts that flow through the civil aviation industry. Secondary impacts result from follow-on spending down the supply chain after the initial round or primary impact. This includes payments to suppliers, and suppliers of suppliers, as well as spending by employees of those businesses. Secondary impacts therefore capture both interindustry and household spending that derive from activity in the respective sectors.

Total Economic Activity

Total economic activity is a term used interchangeably with gross output.

Total Impact

Total impact is the sum of primary and secondary 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.) Measures of value added consist 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.

Notes

- 1 Data sources include: Bureau of Transportation Statistics T-100 Segment data for passengers and freight; FAA impact report estimates for visitor expenditures; U.S. Department of Commerce data for trade balance.
- 2 U.S. Bureau of Economic Analysis, "Table 1.1.6. Real Gross Domestic Product, Chained Dollars," (accessed September 30, 2020).
- 3 U.S. Bureau of Economic Analysis, "Table 1.1.5 Gross Domestic Product," (accessed September 27, 2020).
- 4 Bureau of Labor Statistics, U.S. Department of Labor, Current Employment Statistics, (accessed September 28, 2020) <https://www.bls.gov/ces/data/>
- 5 U.S. Department of Transportation, Federal Aviation Administration. 2020. The Economic Impact of Civil Aviation on the U.S. Economy. January 2020. https://www.faa.gov/about/plans_reports/media/2020_jan_economic_impact_report.pdf
- 6 U.S. Department of Transportation, Federal Aviation Administration, Active Licenses, (accessed October 1, 2020) https://www.faa.gov/data_research/commercial_space_data/licenses/
- 7 Commercial Space Launch Amendments Act of 2004, PL 108-492.
- 8 Bryce Space and Technology, Satellites Key to \$5T+ Across U.S. Economy, (accessed September 30, 2020) https://brycetechnology.com/reports/report-documents/Bryce_Satellites_Key_2019.pdf
- 9 Bryce Space and Technology, 2018 Global Space Economy, (accessed October 6, 2020) https://brycetechnology.com/reports/report-documents/2018_Global_Space_Economy.pdf
- 10 Bryce Space and Technology, 2019 State of the Satellite Industry Report, (accessed September 30, 2020) <https://brycetechnology.com/reports/report-documents/SSIR-2019-2-pager.pdf>
- 11 U.S. Department of Transportation, Federal Aviation Administration, Active Licenses, (accessed October 1, 2020) https://www.faa.gov/data_research/commercial_space_data/licenses/
- 12 Office of Aviation Policy and Plans, Federal Aviation Administration, FAA Aerospace Forecast Fiscal Years 2020-2040, March 2020, p. 38.
- 13 Bryce Space and Technology, 2019 State of the Satellite Industry Report, (accessed September 30, 2020) <https://brycetechnology.com/reports/report-documents/SSIR-2019-2-pager.pdf>
- 14 Bryce Space and Technology, 2018 State of the Satellite Industry Report, (accessed October 1, 2020) https://brycetechnology.com/reports/report-documents/SIA_SSIR_2018.pdf
- 15 Bryce Space and Technology, 2019 State of the Satellite Industry Report, (accessed September 30, 2020) <https://brycetechnology.com/reports/report-documents/SSIR-2019-2-pager.pdf>
- 16 Bryce Space and Technology, 2020 State of the Satellite Industry Report, (accessed September 30, 2020) https://brycetechnology.com/reports/report-documents/SIA_SSIR_2020.pdf
- 17 Office of Commercial Space Transportation, Federal Aviation Administration, The Annual compendium of Commercial Space Transportation: 2018, January 2018, p.19.
- 18 The multipliers typically change over time thereby affecting these secondary impacts as compared to earlier years. For example, 2018 jobs multipliers were generally lower than those for 2016, resulting in lower estimates for total jobs and from gross domestic product, which only counts value added.
- 19 "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 gross domestic product, which only counts value added.
- 20 U.S. Bureau of Economic Analysis, "Table 1.1.5 Gross Domestic Product," (accessed September 27, 2020).
- 21 ACI Europe, The Social and Economic Impact of Airports in Europe, 2004, p. 5.
- 22 Bureau of Labor Statistics, U.S. Department of Labor, Chapter 2. Employment, Hours, and Earnings from the Establishment Survey. In Handbook of Methods, (accessed October 1, 2020) <https://www.bls.gov/opub/hom/pdf/ces-20110307.pdf>
- 23 Organization for Economic Co-operation and Development, "Glossary of Statistical Terms," 2002
- 24 Bureau of Labor Statistics, U.S. Department of Labor, Fact Sheet on Seasonal Adjustment in the CPI, (accessed October 1, 2020) <https://www.bls.gov/cpi/seasonal-adjustment/questions-and-answers.htm>

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