



CENTER OF INNOVATION FOR AEROSPACE
Georgia Department of Economic Development

2013 Economic Impact of Georgia's Aerospace Industry

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Prepared by:

Enterprise Innovation Institute
Georgia Institute of Technology

**Georgia
Tech**  **Enterprise
Innovation
Institute**

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Executive Summary

The aerospace industry’s operations and its employees play an important role in the state of Georgia’s economy. The 2013 economic impact study is an update of the 2011 economic study and was commissioned by Georgia’s Center of Innovation for Aerospace (COIA) to assess the industry’s contribution to the state’s economy.

More specifically, this analysis quantifies the level of economic activity conducted by the components of the aerospace industry in 2013, estimates its fiscal impact, quantifies the industry’s contribution to the state’s Gross Domestic Product and estimates the economic impact of unmanned space systems companies located in the state of Georgia.

Definition of Aerospace Industry in Georgia

The Georgia Center of Innovation – Aerospace uses “Aerospace” as an inclusive term covering the life cycle activities for vehicles that fly in the air or in space. To measure the economic impact of the broad span of these activities in this analysis, the aerospace industry includes the six-digit North American Industrial Classification System (NAICS) industries shown in Table E-1. The sectors included in this analysis were carefully examined and tailored to exclude any non-aerospace related companies and organizations.

Table E-1: Aerospace Industry Definition Components by NAICS Code

Category	Sector
Support	Soil preparation, planting, and cultivating (aerial dusting or spraying)
Support	Wood Container & pallet manufacturing
Support	Tire manufacturing, except retreading
Support	Clay Building Material and Refractories Manufacturing
Support	Other Aluminum Rolling, Drawing, and Extruding
Support	Hardware manufacturing
Support	Fluid power valve and hose fitting mfg.
Support	Overhead cranes, hoists, and monorail systems
Support	Search, detection, and navigation instruments
Support	Other measuring and controlling device mfg.
Support	Motor vehicle seating and interior trim mfg.
Core	Aircraft manufacturing
Core	Aircraft engine and engine parts mfg.
Core	Other aircraft parts and equipment
Core	Guided missile and space vehicle mfg.
Core	Space vehicle propulsion units and parts mfg.
Core	Parts Wholesaler
Support	Other transport. Goods merchant wholesalers
Core	Petroleum and petroleum products merchant wholesalers (except bulk stations, terminals)
Core	Scheduled passenger air transportation
Core	Scheduled freight air transportation
Core	Nonscheduled air passenger chartering
Core	Nonscheduled air freight chartering
Core	Other nonscheduled air transportation
Core	Air traffic control
Core	Other airport operations
Core	Other support activities for air transport.
Support	Transportation equipment rental and leasing
Support	Custom Computer Programming Services–Aerospace
Support	Other physical and biological research
Support	Photographers specializing in aerial photography
Core	Flight training
Core	Other technical and trade schools
Core	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance
Support	Reupholstery and furniture repair
Core	Transportation program administration

Economic Impact

Georgia's aerospace industry generates considerable direct economic and fiscal benefits for the state. The aerospace industry as defined by the NAICS codes shown on page 2 and tailored to exclude non aerospace firms, employed **88,359 workers** in 2013. This includes civil service employment at Robins AFB, Dobbins AFRB and Moody AFB, which together comprise nearly 17 percent of the total direct employment in aerospace industry. Individuals in the aerospace industry were paid nearly **\$9.2 billion in wages and salaries and generated an economic output of \$32.5 billion in 2013.**

While a very large share of the impacts is attributed to direct employment, the total impact (direct, indirect, and induced) is important to the state's economy. The ongoing operations of aerospace generated ripple impacts throughout the state, **supporting an additional 130,819 indirect and induced jobs with earnings of \$6.4 billion and economic output of \$18.4**

Each job in the aerospace industry supports 1.48 additional jobs in Georgia in 2013

billion. This brings the total economic output to nearly \$50.9 billion (see Table E-2).

The wages of aerospace employees are higher than Georgia's overall average wages of all industries. In 2013, the **annual average wage rate of aerospace industry workers, excluding benefits, was \$72,572 or 55 percent higher than the state's overall average wage rate of \$46,748.** The average wage rate, including benefits, of aerospace workers in Georgia was \$103,674.

In 2013, the employment multiplier of the aerospace industry in Georgia was 2.48 and the income multiplier was 1.70. These multipliers are higher than average due to the industry's high level of output and high wages.

Table E-2 shows a summary of the economic impact of the aerospace industry in Georgia.

Table E-2: Georgia's Aerospace Industry Economic Activity: 2013

	Direct	Indirect	Induced	TOTAL
Employment	88,359	52,776	78,043	219,178
Wages & Salaries	\$9,160,517,373	\$2,968,953,314	\$3,438,645,646	\$15,568,116,333
Output	\$32,451,139,212	\$8,157,816,762	\$10,255,875,284	\$50,864,831,258

Fiscal Impact

The fiscal impact analysis was calculated by estimating the revenues associated with the

aerospace industry's total economic activity and subtracting the costs associated with

providing state services to Georgia's households and companies associated with that activity. Revenues included individual and corporate income taxes, sales and use taxes, highway taxes, fees, and miscellaneous revenues. Costs included education; public health, safety, and welfare; highways; administration; and miscellaneous. Table E-3 provides the fiscal impact estimates based on

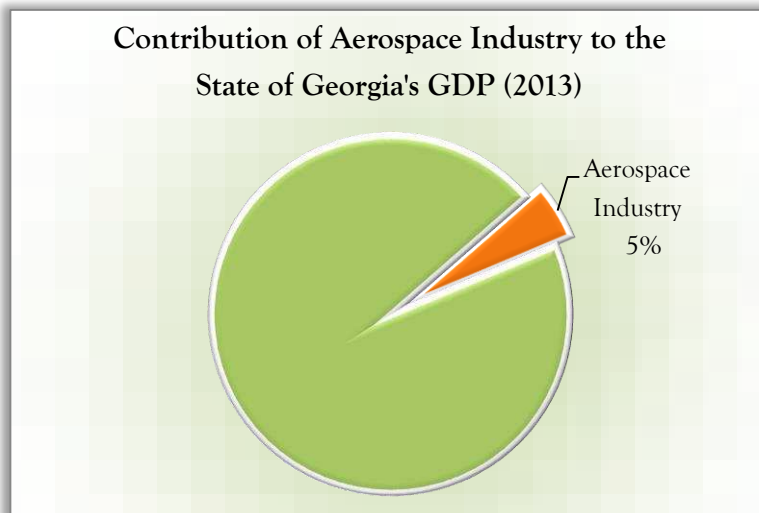
total impacts. **The aerospace industry generated an estimated \$1.6 billion in revenues for the state budget in calendar year 2013.** When the costs of providing services to all employees were deducted from these revenues, the **net contribution of aerospace industry to the state revenues in 2013 was nearly \$895 million.**

Table E-3: Aerospace Fiscal Impact Analysis: 2013

Annual State Government Revenues	\$1,584,451,111
Annual State Government Costs	\$689,886,956
Net Annual Revenues	\$894,564,155

Aerospace Industry and the State's GDP

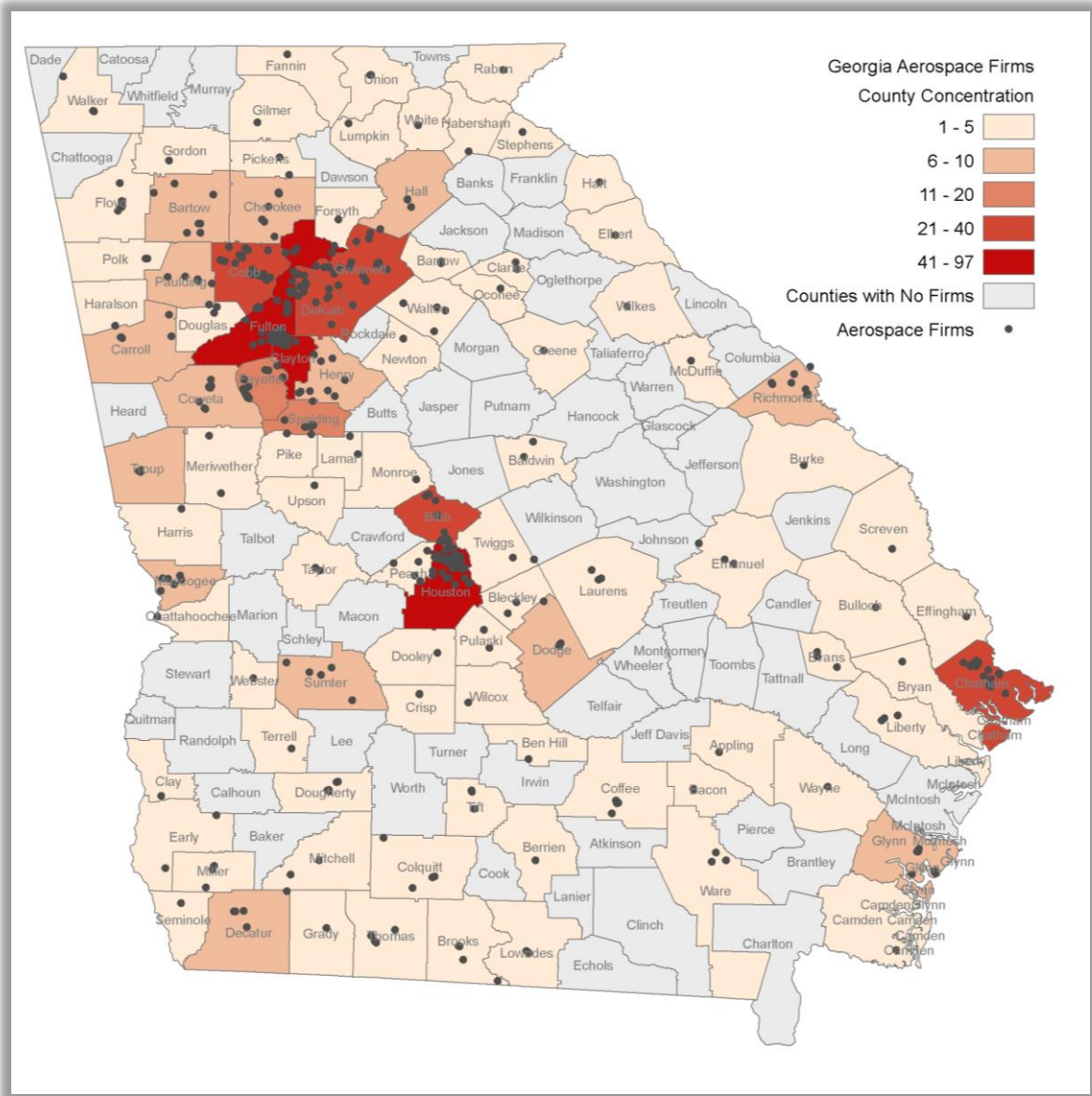
Aerospace contributes significantly to the state's economic activity, and more important, it creates and supports high-paying jobs for Georgia's citizens. **In calendar year 2013, aerospace supported 219,178 jobs or 4 percent of the state's employment, and it contributed \$22.7 billion to the state's GDP or 5.3 percent.**



Location of Aerospace Firms in Georgia

Georgia's diverse aerospace industry includes a range of firms that manufacture, operate, service, and repair aircraft, provide air transportation, and operate flight schools.

The map below shows the location of aerospace firms in Georgia. Firms were geocoded and mapped based on their physical address.



Unmanned Space Systems Companies

Unmanned aircraft systems (UAS) have been used by the military for decades and the technology has now evolved to be applicable commercially across many industries. Given the growing use of UAS in the commercial and civil market, this study quantified the economic impact of UAS companies operating in the state of Georgia.

Using data provided by the Georgia Department of Labor, it was determined that UAS companies employed 101 people in year 2013, who earned nearly \$8.8 million in wages and salaries and

generated \$30.4 million in economic activity. Spending by these companies and their employees generated additional activity in other sectors of the state's economy. Overall, UAS companies in 2013 created and supported 265 jobs with wages of \$16.6 million and generated nearly \$52 million of economic activity.

Table E-4: Economic Impact of Unmanned Space Systems Companies in Georgia: 2013

	Direct	Indirect	Induced	TOTAL
Employment	101	76	88	265
Wages & Salaries	\$8,783,355	\$4,134,195	\$3,666,967	\$16,584,517
Output	\$30,353,503	\$10,703,221	\$10,935,979	\$51,992,704

SECTION 1

Introduction

The economic impact study of Georgia’s aerospace industry measured the industry’s contribution to the state’s economy in 2013 by quantifying its activity in terms of economic output, employment, and employee compensation. An additional factor included how the industry affects state government costs and revenues. This report is an update of the economic study conducted in 2011.

Economic output is typically defined as business revenues, and employee compensation is defined as wages and salaries including benefits, paid by employers. Total activity is generally referred to as the “multiplier effect.” This effect occurs whenever dollars are brought into a state’s

economy and recirculated before exiting or “leaking out.” Section 2 explains the methodology used to estimate total economic activity, and provides perspective on how important these activities are in the overall Georgia economy. Section 3 quantifies the industry’s impact on state government costs and revenues. Sections 4 and 5 compare the economic activity of aerospace industry to the state’s GDP and show the location of aerospace firms in Georgia, respectively. Section 6 is an addition to the 2013 study and it quantifies the economic impact of unmanned space systems companies located and operating in the state of Georgia.

Definition of the Aerospace Industry in Georgia

The aerospace industry in Georgia has many diverse components including manufacturing, maintenance/repair and overhaul, operations, and aerospace education and training. Each subsector of these components is classified under the North American Industry Classification System (NAICS). The definition of aerospace industry varies by state due to its numerous and different components, which explains the lack of a standard industry definition. The sectors included in this study

were carefully examined by the Georgia Center of Innovation for Aerospace and tailored to exclude any non-aerospace related companies and organizations. NAICS codes used in this study are described in Table 1-1. The industry definition in the 2013 study differs from the definition in the 2011 study. The latest study includes a more extensive list of sectors. Also, as result of recent revisions, some sectors fall under new NAICS code classification.

Table 1-1: Aerospace Industry Definition Components by NAICS Code

Industry (NAICS) Code	Category	Industry Title
115112	Support	Soil preparation, planting, and cultivating (aerial dusting or spraying)
321920	Support	Wood Container & pallet manufacturing
326211	Support	Tire manufacturing, except retreading
327120	Support	Clay Building Material and Refractories Manufacturing
331318	Support	Other Aluminum Rolling, Drawing, and Extruding
332510	Support	Hardware manufacturing
332912	Support	Fluid power valve and hose fitting mfg.
333923	Support	Overhead cranes, hoists, and monorail systems
334511	Support	Search, detection, and navigation instruments
334519	Support	Other measuring and controlling device mfg.
336360	Support	Motor vehicle seating and interior trim mfg.
336411	Core	Aircraft manufacturing
336412	Core	Aircraft engine and engine parts mfg.
336413	Core	Other aircraft parts and equipment
336414	Core	Guided missile and space vehicle mfg.
336415	Core	Space vehicle propulsion units and parts mfg.
423110	Core	Parts Wholesaler
423860		Other transport. Goods merchant wholesalers
424720	Support	Petroleum and petroleum products merchant wholesalers (except bulk stations, terminals)
481111	Core	Scheduled passenger air transportation
481112	Core	Scheduled freight air transportation
481211	Core	Nonscheduled air passenger chartering
481212	Core	Nonscheduled air freight chartering
481219	Core	Other nonscheduled air transportation
488111	Core	Air traffic control
488119	Core	Other airport operations
488190	Core	Other support activities for air transport.
532411	Support	Transportation equipment rental and leasing
541511	Support	Custom Computer Programming Services-Aerospace
541712	Support	Other physical and biological research
541922	Support	Photographers specializing in aerial photography
611512	Core	Flight training
611519	Core	Other technical and trade schools
811310	Core	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance
811420	Support	Reupholstery and furniture repair
926120	Core	Transportation program administration

Source: North American Industrial Classification System (2012); Georgia Center of Innovation for Aerospace, Georgia Tech's Enterprise Innovation Institute

Top Aerospace Companies in Georgia

Georgia is home to companies in three major aerospace sectors. With the world's busiest commercial airport, Georgia is home to Delta Air Lines and several of the largest air carriers. Georgia is also the home base for two large aircraft manufacturers and a multitude of their lower tier suppliers. With the large number of aircraft and airports, Georgia is the natural

home for several large Maintenance, Repair and Overhaul (MRO) enterprises. Georgia is also home for companies and academic centers that do significant levels of research and development for aerospace. Table 1-2 displays a list of the top 20 aerospace employers in Georgia.

Table 1-2. Top 20 Aerospace Employers in Georgia*

No.	Company Name	Employees
1	Delta Air Lines	27,100
2	Warner Robins Air Logistics Center (civilian employees only)	12,832
3	Gulfstream Aerospace Corp.	10,000
4	Lockheed Martin Aeronautics	5,900
5	Express Jet Airlines, Inc.	3,168
6	FAA (Atlanta Metro Offices & Facilities)	2,290
7	Air Serv Security, Inc.	1,200
8	Meggitt	1,100
9	Triumph Aerostructures, LLC	778
10	Federal Aviation Administration	637
11	SITA	600
12	City of Atlanta-Aviation Department	600
13	Lockheed Martin Corporation	535
14	Dobbins Air Reserve Base	526
15	Moody Air Force Base	511
16	Air Serv Corp	400
17	Precision Components International, Inc.	400
18	Haeco (formerly Timco Aviation Services, Inc.)	350
19	The Boeing Company	280
20	Pratt & Whitney Engine Services, Inc.	280

*2014

Sources: Georgia Center of Innovation for Aerospace, GDEcD, Georgia Power Company

Aerospace Industry Employment and Wage Rate Trends in Georgia

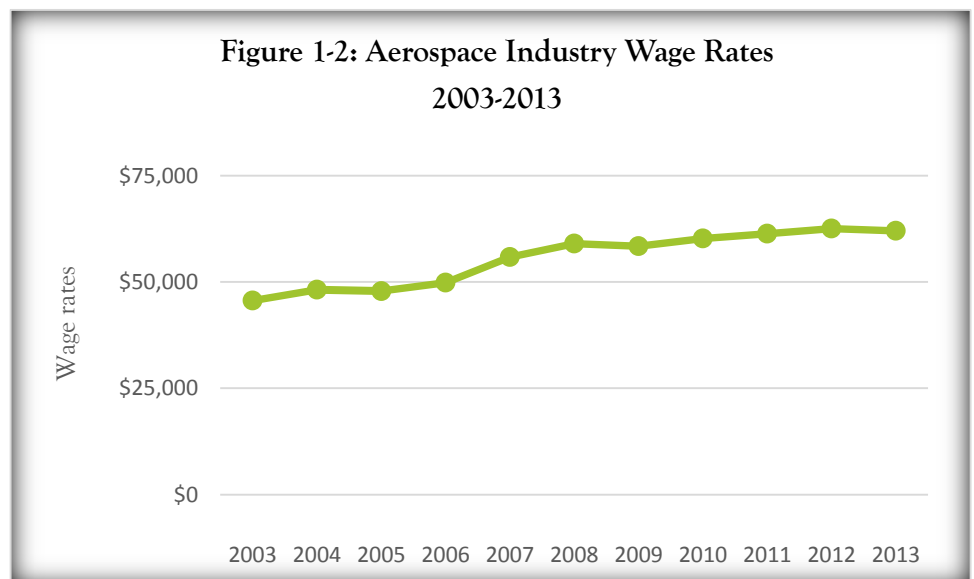
Figure 1-1 and 1-2 illustrate historical data of aerospace industry civilian employment and wage rates for the 2003-2013 time period. It should also be noted that the historical employment and wage rate numbers are not an exact match of direct employment shown in this study due to the industry classification changes introduced by the 2012 NAICS code system, as well as the nondisclosure limitations of the data from the Bureau of Labor Statistics. Furthermore, data presented in Figures 1-1 and 1-2 were derived from the BLS Quarterly Census of Employment and Wages. BLS figures usually include companies that may be classified under aerospace-related NAICS codes but provide services to other sectors.

As shown in Figure 1-1, civilian aerospace employment fluctuated greatly during the 2003-2013 period. This trend reflects the economic challenges of the past few years. As the chart shows, employment dropped very slightly in 2013. The drop is very small and reflects the trend of the overall economy in 2013 where employment was growing very slowly.



Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Aerospace wage rates were also in an upward trend during the 2003-2013 period. On a year to year basis, wage rates in 2013 were higher than 2011 rates (when the previous study was completed) and slightly lower than 2012 rates. Once again, this trend reflects the overall U.S. economy where wage rates have been very slow to grow since the great recession.



Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages

SECTION 2

Economic Impact Analysis

The conceptual basis for estimating economic benefits of an industry is that resources brought into a state's economy by that industry raise the level of economic activity.

The aerospace industry provides a wide range of direct economic benefits in Georgia. These benefits are measured by analyzing jobs, wages, and output. From these direct impacts, multiplier effects are also evaluated, as wages and other spending are re-spent in the local economy thereby supporting increased employment, income, and business revenues. These increases are estimated from an input-output (I/O) economic model.

In this study, the analytical process of estimating the economic impacts (direct, indirect, and induced) of aerospace involved the following steps:

- ✓ Direct employment for each sector (by NAICS code) was quantified. This study counted the number of employees working for companies whose primary business supports the aerospace industry in Georgia. The best source for employment and wages is the employment security data collected and maintained by the Georgia Department of Labor. Commonly called ES202 data, it has the advantage of being current, allowing an estimate of the economic benefits occurring in 2013. It has the drawback, however, of not including single proprietorships (because they have no employees).
- ✓ Review of employment data was a critical part of this analysis due to the broad definition of NAICS codes for aerospace sectors. Employment was verified by calling individual firms (calls were conducted by Georgia's Center of Innovation for Aerospace), and changes were made where necessary. During the vetting process, it became apparent that many companies were classified under the wrong code. Every attempt was made to capture all aerospace-related employment as defined by the NAICS codes listed on page 8. We recognize that there are many supporting companies that are not included in this study.
- ✓ The third step was to use the I/O model to estimate total impacts, which were divided into three components. The first was the *direct* impacts (the value of resources brought into the state); the second was *indirect* impacts (impacts from recirculation of resources resulting from aerospace industry purchases from other industries); and the third was *induced* impacts, resulting from activities in the household sector. The total impact was the sum of direct, indirect, and induced impacts.

Table 2-1 provides estimates of the impacts of aerospace industry sectors contained in the industry's definition. Georgia's

aerospace industry employed **88,359 workers** in 2013, who earned nearly **\$9.2 billion in wages and salaries** and generated an **economic output of \$32.5 billion**. The direct employment included civilian employment at Robins AFB, Moody AFB and Dobbins ARB, which in 2013 accounted for nearly 17 percent of Georgia’s direct employment in aerospace industry. While a very large share of the impacts is

attributed to direct employment, the total impact (direct, indirect and induced) is important to the state’s economy. The ongoing operations of aerospace generated ripple impacts throughout the state **supporting an additional 130,819 indirect and induced jobs with earnings of \$6.4 billion and economic output of \$18.4 billion**.

Table 2-1: Georgia’s Aerospace Industry Economic Activity: 2013

	Direct	Indirect	Induced	TOTAL
Employment	88,359	52,776	78,043	219,178
Wages & Salaries	\$9,160,517,373	\$2,968,953,314	\$3,438,645,646	\$15,568,116,333
Output	\$32,451,139,212	\$8,157,816,762	\$10,255,875,284	\$50,864,831,258

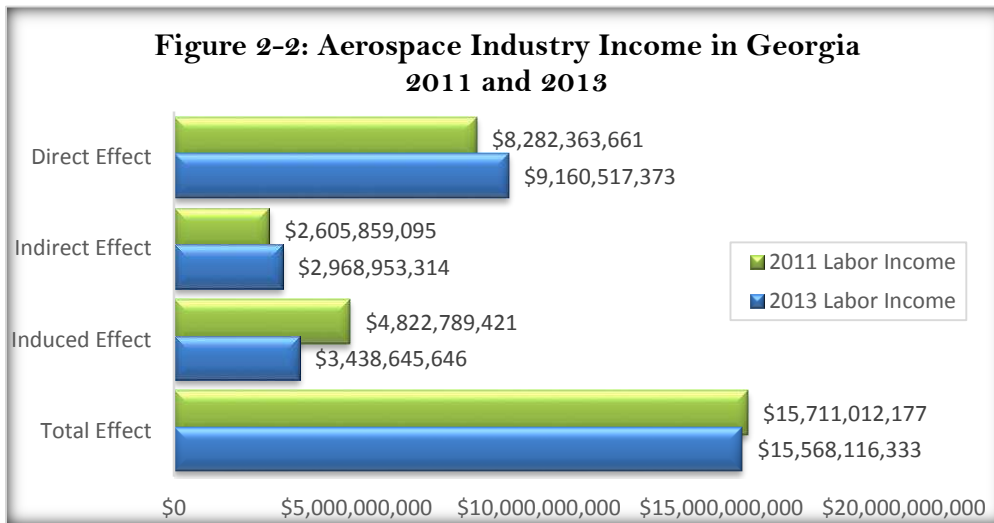
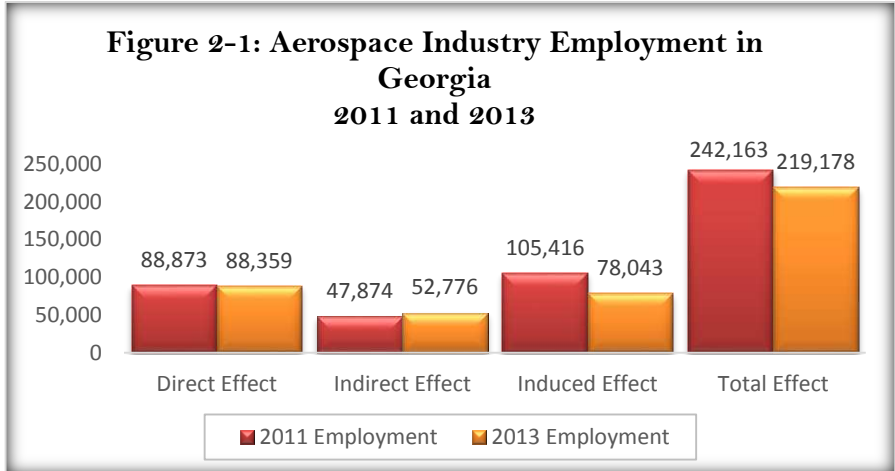
Overall, wage rates of aerospace employees were higher than Georgia’s average wage rates of all industries. In 2013, **the annual average wage of aerospace industry workers, excluding benefits, was \$72,572 or 55 percent higher than the state’s overall average wage rate of \$46,748**. The average wage rate, including benefits, of aerospace workers in Georgia was \$103,674.

The employment multiplier of the aerospace industry in Georgia was 2.48 and the income multiplier was 1.70. These multipliers were higher than average due to the industry’s high level of output and high wages.

Findings of 2011 and 2013 Studies

The Georgia Center of Innovation – Aerospace engaged Georgia Tech to conduct the economic impact of Aerospace industry in Georgia in 2011 and revise it in 2013. Figures 2-1 through 2-3 show a summary of the studies’ findings. Caution should be used when comparing the results of the two studies because the aerospace industry definitions (sectors included) vary in each study. Also revisions of NAICS code definitions have an impact on the direct effect numbers.

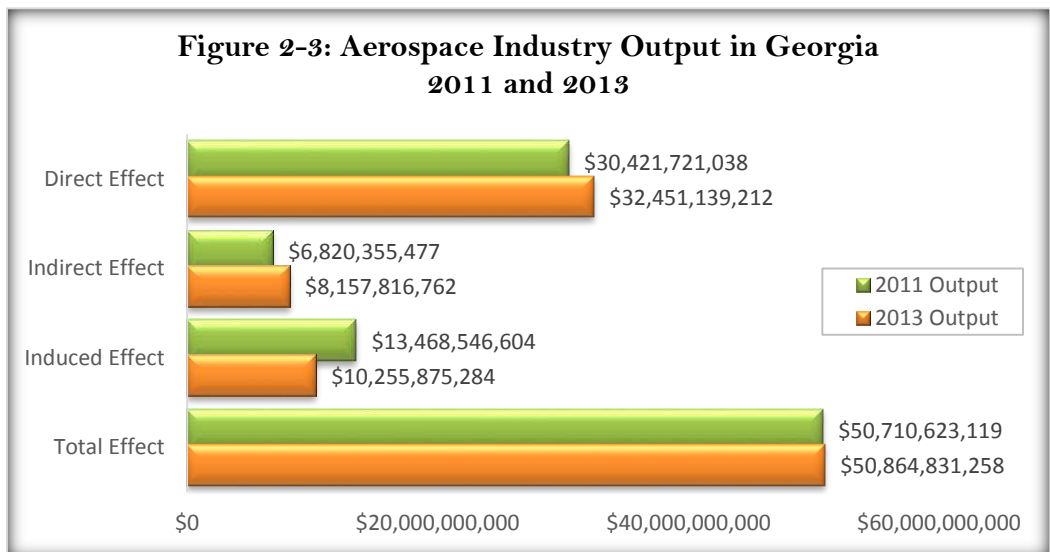
Aerospace direct employment in 2013 was very close to employment in 2011. However, the total impact was lower. The ripple effect of jobs created varies by industry and depends on the average wage rate. The higher the average pay, the higher the amount of dollars circulating in the state's economy and thus, generating more induced jobs.



As shown in Figure 2-2, the direct labor income in 2013 was higher than direct labor income in 2011, yet, the total effect was slightly lower. This is due to lower wage rates in 2013. The trend is

consistent with the trend of wage rates in the overall economy.

Direct output in 2013 was also higher than direct output in 2013. Total output was slightly higher than output in 2013. This could be reflective of increased productivity.



SECTION 3

Fiscal Impact Analysis

This analysis also includes a fiscal assessment of how aerospace affects state tax revenues. The fiscal impact analysis was calculated by estimating the revenues associated with the aerospace industry's total economic activity and subtracting the costs associated with providing state services to Georgia's households and companies associated with that activity.

Revenues included individual and corporate income taxes, sales and use taxes, highway taxes, fees, and miscellaneous revenues. Costs included education; public health, safety, and welfare; highways; administration; and miscellaneous. Table 3-1 provides the fiscal impact estimates based on total impacts. **When the costs of providing services to all employees were deducted from these revenues, net annual state revenues generated by the aerospace industry were nearly \$895 million.**

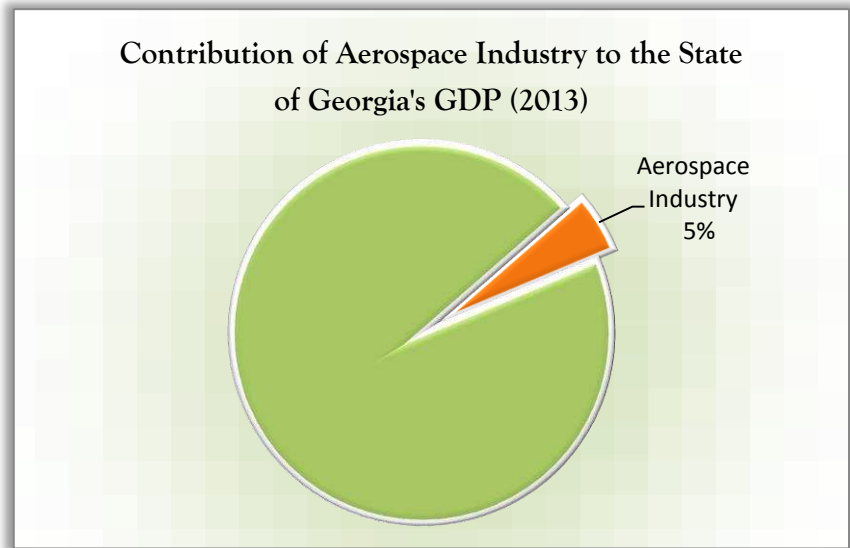
Table 3-1: Aerospace Fiscal Impact Analysis: 2013

Annual State Government Revenues	\$1,584,451,111
Annual State Government Costs	\$689,886,956
Net Annual Revenues	\$894,564,155

SECTION 4

Aerospace Industry's Contribution to Georgia's GDP

The activities of Aerospace industry generate significant economic activity in the state of Georgia. More important, the industry creates and supports high-paying jobs for Georgia's citizens. In 2013, **aerospace supported 219,178 total jobs which equaled to 4 percent of the state's employment, and it contributed nearly \$23 billion to the state's GDP or 5.3 percent.**



SECTION 5

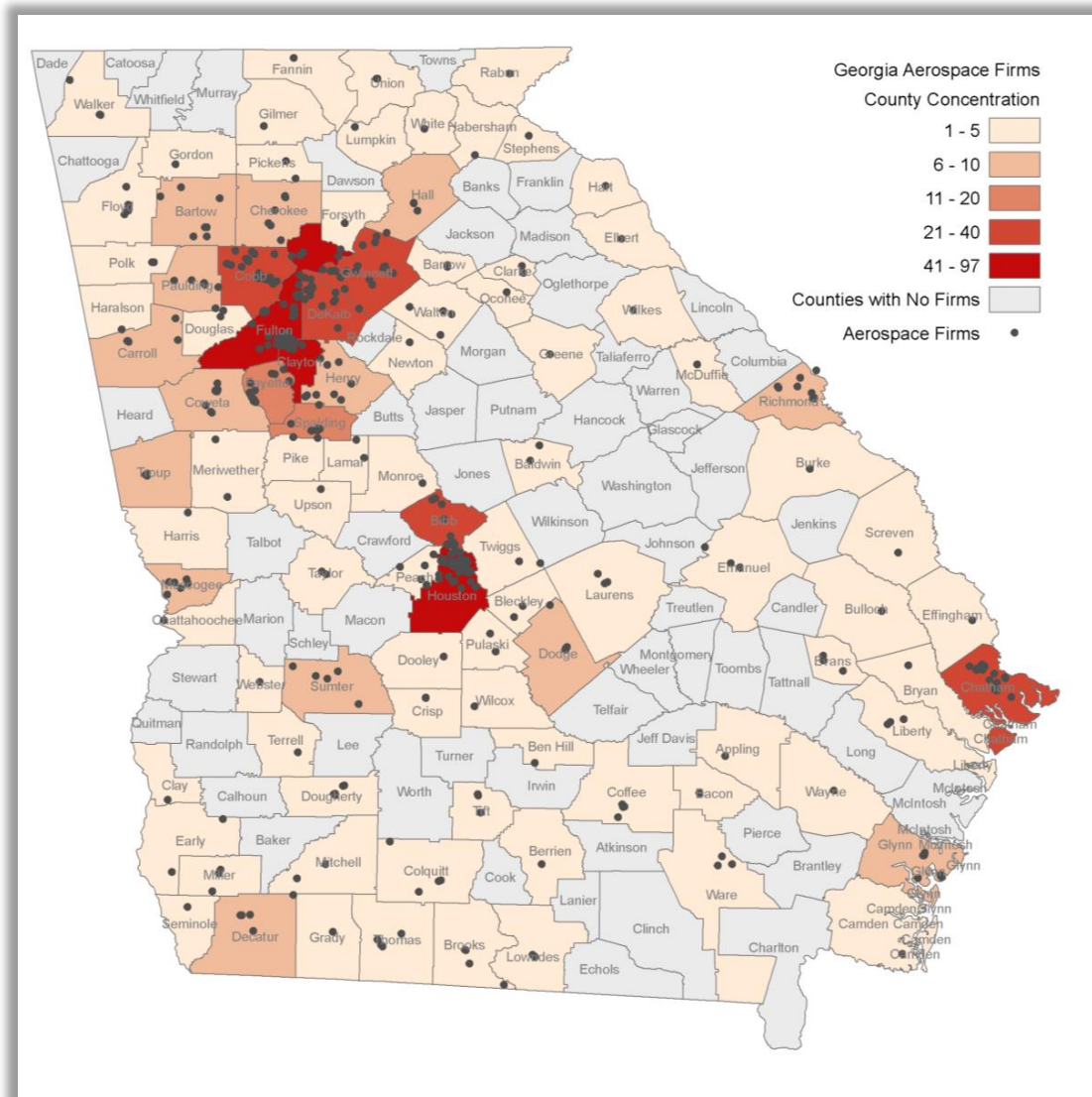
Location of Aerospace Firms

Georgia's diverse aerospace industry includes a range of firms that service and repair aircraft, provide air transportation, and operate flight schools.

The following map shows the location of aerospace firms in Georgia. Firms were geocoded and mapped based on physical

addresses. Incomplete addresses were either not displayed on the map or mapped based on the address information available – e.g., P.O. Box or zip code maps to the center of the 5-digit zip; city name only maps to the center of the city.

Figure 5-2: Georgia Aerospace Firms by County: 2013



SECTION 6

Unmanned Aircraft Systems (UAS) Companies

Unmanned aircraft systems (UAS) have been used for decades evolving from being used for basic operations to currently being used in a number of applications across many industries. Given the growing use of UAS in the commercial and civil market, this study quantifies the economic impact of this sector in the state of Georgia.

The Georgia Center of Innovation for Aerospace researched and identified more than 20 UAS companies currently operating in the state of Georgia. However, we were able to get employment data for only 12 companies; therefore, the impact includes only these 12 companies. Table 6-1 shows a list of UAS companies operating in Georgia in 2013.

No.	Company Name	No.	Company Name
1	Absolute Aerospace	7	South-Pak, Inc
2	Area-I, Inc	8	SRI International
3	Argon Corporation	9	TechJect, Inc.
4	Barco Federal	10	Frank E. Hagan, P.E., LLC
5	Elan Technologies	11	Guided Systems Technologies, Inc.
6	Elma Electronic, Inc.	12	Holder Ag Consulting

Using data provided by the Georgia Department of Labor,¹ it was determined that the above companies employed 101 people in year 2013 who earned nearly \$8.8 million in wages and salaries and generated \$30.4 million in economic activity. The spending by these companies and their employees generated additional activity in other sectors of the state's economy. Overall, UAS companies in 2013 created and supported 265 jobs with wages of \$16.6 million and generated nearly \$52 million of economic activity.

Table 6-2: Economic Impact² of Unmanned Space Systems Companies in Georgia: 2013

	Direct	Indirect	Induced	TOTAL
Employment	101	76	88	265
Wages & Salaries	\$8,783,355	\$4,134,195	\$3,666,967	\$16,584,517
Output	\$30,353,503	\$10,703,221	\$10,935,979	\$51,992,704

¹ Source: Georgia Department of Labor, ES202 data (Firm level data)

² The economic impact was calculated using companies' self-reporting employment and NAICS code data.

APPENDIX

Methodology, Definitions, and References

METHODOLOGY AND DEFINITIONS

The economic impact of the aerospace industry was measured using IMPLAN, an economic impact assessment model customized to reflect Georgia’s economy. The model estimates the multiplier (indirect and induced) effects of direct economic activity for each sector of the aerospace industry.

Direct Impacts

Direct impacts measure employment, wages and salaries, and expenditures of goods and services within the aerospace industry.

Indirect Impacts

Indirect impacts result from the purchase of goods and services by suppliers to the aerospace industry.

Induced Impacts

Induced impacts result from the expenditures of aerospace employee wages and salaries.

REFERENCES

Bureau of Economic Analysis Input-Output Sectors as contained in “IMPLAN Pro: Data Guide,” Minnesota IMPLAN Group Inc., Stillwater, MN, 2013.

Georgia Department of Labor, ES202 Wage and Employment Data: 2013.

North American Industrial Classification System (NAICS),
<http://www.census.gov/epcd/www/naicstab.htm>

U.S. Department of Labor, Bureau of Labor Statistics, “Employer Costs for Employee Compensation,” <http://data.bls.gov/cgi-bin/surveymost>