

TO: Spaceport Camden

FROM: The Center for Business Analytics and Economic Research

DATE: October 5, 2020

SUBJECT: Business Development Linked to U.S. Spaceports

## Introduction

Spaceport Camden is examining the possibility of developing a satellite launch facility in Camden County. The Center for Business Analytics and Economic Research (CBAER) at Georgia Southern University was asked to examine the current and potential business development linked to U.S. spaceports to gauge interest and viability of the project. CBAER began this analysis by investigating the economic value linked to the space industry. Between 2012 and 2017, the U.S. commercial launch industry revenue grew from about \$100 million to \$1.7 billion.<sup>1</sup> The industry uses dedicated spaceports as launch sites, licensed and regulated by the Federal Aviation Administration, Office of Commercial Space Transportation. This office has licensed 12 spaceports in the United States<sup>2</sup> all of which are listed here:

1. Burns Flat, Oklahoma, operated by Oklahoma Space Industry Development Authority
2. Cape Canaveral Air Force Station, Florida, operated by Space Florida
3. Cape Canaveral Spaceport/Shuttle Landing Facility, Florida, operated by Space Florida
4. Cecil Field, Jacksonville, Florida, operated by Jacksonville Aviation Authority
5. Colorado Air and Space Port operated by Adams County, Colorado
6. Houston Spaceport at Ellington Airport, operated by Houston Airport System
7. Midland International Airport, Midland, Texas, operated by Midland International Airport Texas
8. Mojave Air and Space Port
9. Pacific Spaceport Complex Alaska, operated by Alaska Aerospace Development Corporation
10. Spaceport America, New Mexico, operated by New Mexico
11. Space Coast Regional Airport, Titusville-Cocoa Airport Authority, Florida
12. Wallops Flight Facility, Virginia, operated by Virginia Commercial Space Flight Authority

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<sup>1</sup> Commercial Space Transportation. (2019, May). GAO-19-437, retrieved from <https://www.gao.gov/assets/700/699301.pdf> on March 16, 2020.

<sup>2</sup> Active Licenses. (2020, April). *Federal Aviation Administration, Commercial Space Data*, retrieved from [https://www.faa.gov/data\\_research/commercial\\_space\\_data/licenses/#operatorLicenses](https://www.faa.gov/data_research/commercial_space_data/licenses/#operatorLicenses).

## Comparison Spaceports

Using this list, the team looked for spaceports that met one of these criteria: 1) matched with the current operational plan for Spaceport Camden, 2) had conducted launches or testing for space vehicles or components, or 3) are currently working to attract new launch or related support industries to their facilities. In addition to these criteria, the team excluded spaceports in Florida. The space transportation infrastructure in Florida is among the best known and most active in the United States. This state is also host to Cape Canaveral, which is one of the oldest and best-known spaceports in the world.<sup>3</sup> Due to these advantages the team looked to other states to find comparison facilities.

Based on these criteria, five spaceports were selected, and each is listed here:

1. Pacific Spaceport Complex-Alaska, Kodiak Island, Alaska
2. Mid-Atlantic Regional Spaceport, Wallops Island, Virginia
3. Spaceport America, Sierra County, New Mexico
4. Colorado Air and Space Port (Front Range Airport)
5. Houston Spaceport at Ellington Airport

Launch methods differ at individual spaceports. Both the Pacific Spaceport and the Mid-Atlantic Regional Spaceport are Federal Aviation Administration (FAA) approved for vertical launches, while Colorado Air and Spaceport and Houston Spaceport are FAA licensed to supply horizontal launch services. Only Spaceport America can currently accommodate both styles of launch. While horizontal launches are the standard method approved for this facility, it does allow operators to launch vertically for vehicle testing purposes.

In addition to the listed selection criteria, each of these spaceports has engaged in one of these activities over the past several years:

1. Has launched a satellite within the last two years;
2. Has made significant investments in infrastructure designed to attract new businesses; and/or
3. Has added a new business to the spaceport facility.

The team examined business development on either the launch side or on the support/research side of the operation. Many of these facilities are growing by adding a missing segment of the market to their existing ventures or by expanding a strong point of the operation. Taken together in our analysis, the goal of these spaceports is to add new businesses to their facilities. To aid in this process, many of them are making capital investments to ensure that startup and existing companies in the industry locate at or near their spaceports. Outlined

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<sup>3</sup>State Support for Commercial Space Activities. *Federal Aviation Administration* retrieved from [https://www.faa.gov/about/office\\_org/headquarters\\_offices/ast/media/State%20Support%20for%20Commercial%20Space%20Activities.pdf](https://www.faa.gov/about/office_org/headquarters_offices/ast/media/State%20Support%20for%20Commercial%20Space%20Activities.pdf).

is a description of the comparison of spaceports, a list of companies with operations at these facilities, and a brief report of future developments at the spaceports.

#### Pacific Spaceport Complex-Alaska, Kodiak Island, Alaska,

**Spaceport:** PSCA is the launch site owned by Alaska Aerospace Corporation, which is a quasi-governmental organization tasked with growing the Aerospace industry in Alaska. The PSCA supports vertical launches for vehicles seeking to reach a polar, sun synchronous or high inclination orbit.<sup>4</sup> It focuses on launching small satellites for federal agencies and private companies.

**Company:** This spaceport has developed a partnership with *Aurora Launch Service, Astra Aerospace,* and the *U.S. Department of Defense.* Due to the remote location on Kodiak Island this spaceport is primarily focused on developing launch operations.

- Aurora Launch Services, LLC, located in Anchorage, Alaska, was founded by Alaska Aerospace Corporation to be a private rocket launching company. This company handles the operational details of launching rockets for PSCA. Aurora's home base is PSCA, but it is looking for new opportunities worldwide.<sup>5</sup>
- Astra is launching small rockets from the spaceport. This company is working to create a small, inexpensive rocket that can be mass-produced to facilitate frequent launches. The plan is to launch these satellites into low Earth orbits. This three-year-old startup has been operating in stealth mode for much of its existence.<sup>6</sup>

**Future Development:** This organization is planning to continue to maintain a diverse launch operation. For example, in 2019, Alaska Aerospace met with at least six government customers, more than twelve commercial launch companies, and two international entities. The organization plans to make additional investment in security camera and barricades at PSCA while continuing to invest in remote launch technologies. By investing in technologies, Alaska Aerospace seeks to decrease costs and increase efficiencies, thereby, making it possible to increase the number of launches taking place at PSCA.

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<sup>4</sup> Pacific Spaceport Complete-Alaska. Viewed on April 4, 2020. *Alaska Aerospace*, retrieved from <https://akaerospace.com/capabilities/pacific-spaceport-complex-alaska-psca>.

<sup>5</sup>About Us Our Purpose. (2020). *Aurora Launch Services*, retrieved from <https://auroralaunchservices.com/#about-us-header>.

<sup>6</sup> Vance, Ashlee. (2020, February 3). "A Small Rocket Maker Is Running a Different Kind of Space Race." *Bloomberg Businessweek*, retrieved from <https://www.bloomberg.com/features/2020-astra-rocket/>.

Mid-Atlantic Regional Spaceport (MARS), Wallops Island, Virginia

**Spaceport:** MARS was founded in 1997 and currently has two launch pads. The facility is located close to the NASA Wallops Flight Facility, which has a 55-year history, having launched more than 16,000 rockets near the MARS site.<sup>7</sup>

**Company:** *Rocket Lab* is a leader in small satellite launches. It opened its launching operation at MARS in 2019.<sup>8</sup> This location was projected to bring 30 jobs in construction and an additional 30 jobs in day-to-day operations, which could grow to 100 jobs as launch frequency increases.<sup>9</sup>

**Future Development:** To support the development of the aerospace industry, the Wallops Research Park was created to help attract both launch and support companies. This site has more than 200 acres ready for development. The necessary basic infrastructure has been installed in this research park, including a taxiway, runway, waterline, sanitary sewer, broadband fiber and three phase electric service.<sup>10</sup>

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<sup>7</sup> Virginia Space, Overview. viewed on April 4, 2020 *Virginia Commercial Space Flight Authority*, retrieved from <https://www.vaspace.org/index.php/about-virginia-space/overview>.

<sup>8</sup> Commonwealth of Virginia. (2019, December 13). "Governor Northam Celebrates Opening of Rocket Lab Launch Pad at Mid-Atlantic Regional Spaceport." Retrieved from <https://www.governor.virginia.gov/newsroom/all-releases/2019/december/headline-849938-en.html>.

<sup>9</sup> Selinger, Marc. (2018, October 23). "Space Startup Rocket Lab to Build Launch Pad in Virginia." *Clearance Jobs*, retrieved from <https://news.clearancejobs.com/2018/10/23/space-startup-rocket-lab-to-build-launch-pad-in-virginia/>.

<sup>10</sup> Wallops Research Park Information. Viewed on April 6. *Accomack County Virginia*, retrieved from <https://www.co.accomack.va.us/businesses/wallops-research-park-information>.

### Spaceport America, Sierra County, New Mexico

**Spaceport:** Spaceport America was built to be a spaceport and is located next the U.S. Army's White Sands Missile Range. It has 6,000 square miles of restricted airspace and has both a runway for horizontal and a launch pad complex for vertical launches.<sup>11</sup>

**Company:** Three companies have opened locations at this spaceport and currently use this facility as one of their locations. These companies include

- *Virgin Galactic* is the anchor tenant and, in 2019, relocated more than 100 staff members to Las Cruces, New Mexico, which is about 70 miles from Spaceport America. This spaceport will be the primary launch for this space tourism company. It is moving most of its operation from Mojave to Spaceport America.<sup>12</sup>
- *SpinLaunch, Inc.* is a company developing new ways to launch rockets. This Long Beach, California-based company has invested \$7 million at spaceport America to develop a testing facility.<sup>13</sup>
- *UP Aerospace, Inc.* has developed a launch operation center and the Space Propulsion Center. The operation center can conduct launch operations, assemble launch vehicles, and prepare payload. The Space Propulsion Center can test and manufacture solid rockets. It includes a "remotely controlled state-of-the-art mix and cast complex, final assembly facility, and rocket motor static test stand and instrumentation."<sup>14</sup>

**Future Development:** A five-year plan has been developed and seeks to improve the infrastructure already present at the spaceport. The goal of these projects is to increase the services offered to current and future clients. These projects would cover equipment, facilities, and transportation. All totaled, these upgrades could equal about \$10.5 million when completed.<sup>15</sup>

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<sup>11</sup> About US. (2019). Spaceport America, retrieved from <https://www.spaceportamerica.com/about/>.

<sup>12</sup> Finfrock, Rob. (2019, May 15). "Virgin Galactic Is 'Coming Home' to NM." *AInonline*, retrieved from <https://www.ainonline.com/aviation-news/aerospace/2019-05-15/virgin-galactic-coming-home-nm-spaceport>.

<sup>13</sup> Barba, Tannya. (2019, May 9). "Facility Building Launch Pad Breaks Ground at Spaceport American." Retrieved from <https://kfoxtv.com/news/local/new-test-facility-breaks-ground-in-new-mexico-05-09-2019>.

<sup>14</sup> About UP Aerospace Inc. (2019). *UP Aerospace*, retrieved from <https://www.upaerospace.com/about>.

<sup>15</sup> Spaceport America (2020, January). *Spaceport America Economic and Fiscal Impact*, retrieved from <https://riograndefoundation.org/wp-content/uploads/2020/03/2-13-20-Spaceport-Full-Report-Final.pdf>.

### Colorado Air and Space Port (Front Range Airport)

**Spaceport:** Approved by the FAA in 2018, the Colorado Air and Space Port will be at the center of commercial space transportation, research, and development in Colorado. It is the new name for the Front Range Airport and is in the Denver metro area. It hosts the Colorado 5<sup>th</sup> Battalion, 19<sup>th</sup> Special Forces Group (Airborne), Colorado National Guard armory, as well as the Colorado Department of Transportation Aeronautical Division and Colorado State Patrol office.<sup>16</sup>

**Company:** Two companies linked to space flight are located at this spaceport.

- *Reaction Engines Ltd* has developed a new high-temperature airflow engine testing facility to test its new SABRE™ engine. This engine can reach speeds five times the speed of sound. This is the UK-based company's second test facility and its first in the United States.<sup>17</sup>
- *PD Aerospace* has signed a letter of intent to explore a future development at the spaceport. The partnership is investigating opportunities that could include testing PD Aerospace aircraft takeoff and landing using a horizontal launching position. This company is located in Nagoya, Japan, and has a research and development facility in Heiman City, Japan.<sup>18</sup>

**Future Development:** These are projects to add private sector jobs and increase revenue. This space port is part of Adams County, Colorado, and is also tasked with becoming a facility that is viewed as a “model space craft operations, efficiency and safety.”<sup>19</sup>

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<sup>16</sup> Aerospace Partners. (2020). *Colorado Air and Space Port*, retrieved from <http://coloradoairandspaceport.com/aerospace-partners>.

<sup>17</sup> Reaction Engines Begins Construction of High-Temperature Airflow Test Facility in Colorado. (2019, June). *Colorado Air and Space Port*, retrieved from <http://coloradoairandspaceport.com/news/reaction-engines-begins-construction-high-temperature-airflow-test-facility-colorado>.

<sup>18</sup> Colorado Air and Space Port, PD AeroSpace Sign Letter of Intent. (2019, April). *Adams County Regional Economic Partnership* retrieved from <https://www.adamscountyed.com/colorado-air-and-space-port-pd-aerospace-sign-letter-of-intent/>.

<sup>19</sup> Adams County, Colorado, 2020 Adopted Budget. Viewed on April 14, 2020. retrieved from <http://www.adcogov.org/annual-budget>.

## Houston Spaceport at Ellington Airport

**Spaceport:** This facility is an FAA-licensed spaceport that can be used for launch and landing of suborbital and reusable launch vehicles. It also has lab and office space with additional space for large-scale hardware production facilities. It is part of Ellington Airport and hosts a NASA joint-use facility, U.S. military and several other general aviation tenants.<sup>20</sup>

**Company:** Two space-related companies are linked to this development.

- *Intuitive Machines* is currently operating the Houston Spaceport. The company is working on a lunar lander scheduled to fly to the moon in 2021.<sup>21</sup> This project will carry cargo from NASA and other customers. This company was awarded one of nine NASA contracts under the build Commercial Lunar Payload Services program. It can now compete to build task orders to payloads to the moon in future missions.<sup>22</sup>
- *FlightSafety International* is working to develop a new learning center. This company plans to offer flight simulators for several different aircraft and as well as training area for flight attendants and maintenance workers.<sup>23</sup>

**Future Development:** The spaceport is working on a Phase 1 expansion that will cover 154 acres. Included in this construction project are new streets, water and sewer infrastructure, electric services, and communications facilities. This project should be completed during the first half of 2021.<sup>24</sup>

Each of these spaceports represent a different approach to the development process. For Houston Spaceport and Colorado Air and Space Port, the focus has been on adding related businesses while the Mid-Atlantic Regional Spaceport, Spaceport America and the Pacific Spaceport have worked to attract tenants focused on launching rockets before working to attract related industries. Another way that several spaceports are currently being used is as test sites for new products and technologies. Several examples of locations that have been used in this manner include Spaceport America, Pacific Spaceport Complex and Colorado Air and Spaceport.

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<sup>20</sup> About Houston Spaceport. (2020). *Houston Spaceport*, retrieved from <https://www.fly2houston.com/spaceport/about/>.

<sup>21</sup> Magee, Jake. (2020, January 10) Houston Spaceport to Reach Major Development Milestones, Community Impact Newspaper, retrieved from <https://communityimpact.com/houston/bay-area/development/2020/01/10/houston-spaceport-to-reach-major-development-milestones-in-2020/>.

<sup>22</sup> Foust, Jeff. (2020, April 14). "Intuitive Machines Selects Landing Site for CPLS Mission." *Space News*, retrieved from [spacenews.com/intuitive-machines-selects-landing-site-for-clps-mission/](https://spacenews.com/intuitive-machines-selects-landing-site-for-clps-mission/).

<sup>23</sup> Moffat, Christie. (2020, February 13). "Property Development Is Starting to Take off at the Houston Spaceport." *Bisnow Houston*, retrieved from <https://www.bisnow.com/houston/news/economy/how-the-space-industry-is-creating-opportunities-for-houston-cre-102953>.

<sup>24</sup> *Ibid.*

Even though development strategies, incentives, and other services offered by the spaceports are important, several other specific regional factors also impact the growth of spaceports. One of these factors is area of space, which is assessable from the launching spaceport. For example, a polar orbit is more accessible from Spaceport Alaska while Wallops Island would be a better position for a northern latitude or equatorial type of orbit. Along with these factors both sites allow for launch over water, which could help to reduce operational costs when compared to other locations.

The second factor covers the previous developments that have taken place in the community. These previous developments include connections with a federal space program, military base/program, or federal research and development lab. These locations can leverage either the human capital related to these existing developments and/or the protected airspace linked to these developments. In the selected spaceports, Pacific Spaceport, Wallops Island, New Mexico, and Houston Spaceport all have links to federal space or past military development. The Colorado Air and Space Port is one of the first locations with no existing federal links.

Although each of these spaceports take a different approach to development, some similarities are shared. For example, each has made an investment in infrastructure and licensing before a guaranteed return is present. This investment has included creating development-ready sites. These sites have either hosted primary businesses in the launch industry or secondary businesses that are developing innovative technologies or products to use in space flight.

Finally, the ways that each spaceport is currently being used are similar to the development process taking place at Spaceport Camden. For example, the focus on small launch vehicles announced in December 2019 is similar to some of the rockets being launched at Spaceport Alaska and MARS in Virginia.<sup>25</sup> In addition, entering into a partnership with Opifex Global to explore the development of commercial astronaut training facilities close to Spaceport Camden is similar to the strategy being employed by Spaceport Houston and Colorado.<sup>26</sup> The Houston Spaceport is looking for companies to build businesses that can drive human capital development.

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<sup>25</sup> Spaceport Camden. (2019, December 19). "Camden County Outlines Decision to Refocus FAA Review to Small Launch Vehicles." Retrieved from <https://www.camdencountyga.gov/DocumentCenter/View/11459/Camden-County-Outlines-Decision-to-Refocus-FAA-Review-to-Small-Launch-Vehicles>.

<sup>26</sup> Spaceport Camden. (2020, May 11). "Commercial Astronaut Training Facility Eyed for Spaceport Camden." Retrieved from <https://www.camdencountyga.gov/DocumentCenter/View/11782/Commercial-Astronaut-Training-Facility-Eyed-for-Spaceport-Camden>.



## NAICS Code Business Analysis

The team also made an additional effort to identify industries directly involved in the space industry and secondary industries that might be used to support growth of the overall space sector. This is a major part of developing a spaceport because many technologies developed for terrestrial uses are now used in the space industry. Overall, this is a paradigm shift from the beginning of the space age when technologies and products were created for use in space exploration. Then, after the initial use was completed, many of these technologies and products found a secondary terrestrial market.<sup>27</sup>

Today, more technologies and the related products are developed to, first, meet a terrestrial demand and then, find a home in the space industry. For example, in the technology industry (IT) increases in “processing power, data storage, camera technology, solar array efficiency, and micro-propulsion have fed into a variety of space-related areas.”<sup>28</sup> This has dropped the cost of moving goods into space and opened up opportunities for communities interested in being a part of the developing space industry. It is common for these communities to work to develop public/private partnerships to support the development of the launch and goods producing segments of the space industry.<sup>29</sup>

The **direct space** segment was defined using a list of industries by the Space Foundation, an industry advocacy group. This group focuses on supporting the development of a commercial space flight industry in the United States. These six-industry sectors are outlined here:

- Search, Detection, and Navigation Instruments (NAICS 334511)
- Guided Missile and Space Vehicle Manufacturing (NAICS 336414)
- Guided Missile and Space Vehicle Propulsion Unit and Parts Manufacturing (NAICS 336415)
- Other Missile and Space Vehicle Manufacturing (NAICS 336419)
- Satellite Telecommunication (NAICS 517410)
- Space Research and Technology (NAICS 927110)

The Congressional Research Service has also used these six NAICS codes to define the private space sector.<sup>30</sup>

To identify the secondary market, the team used the **Aerospace Industry in Georgia**. A total of 36 NAICS codes used in the 2013 Economic Impact of Georgia’s Aerospace Industry was used to

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<sup>27</sup> Lal, Bhavya. (2016, Summer). “Reshaping Space Policies to Meet Global Trends, Issues in Science and Technology.” Issues.org, retrieved from <https://issues.org/reshaping-space-policies-to-meet-global-trends/>.

<sup>28</sup> *Ibid.*

<sup>29</sup> *Ibid.*

<sup>30</sup> Canis, Bill. (2016, December 12). “Commercial Space Industry Launches a New Phase.” *Congressional Research Service*, retrieved from <https://fas.org/sgp/crs/space/R44708.pdf>.

define the secondary market. This report was prepared for the Center of Innovation for Aerospace as part of the Georgia Department of Economic Development by the Enterprise Innovation Institute at the Georgia Institute of Technology. Table 1 displays the listed codes.

Table 1: Aerospace Industry in Georgia			
Core Industry		Support Industry	
NAICS	Industry Title	NAICS	Industry Title
336411	Aircraft manufacturing	115112	Soil preparation, planting, and cultivating (aerial dusting or spraying)
336412	Aircraft engine and engine parts mfg.	321920	Wood Container & pallet manufacturing
336413	Other aircraft parts and equipment	326211	Tire manufacturing, except retreading
336414	Guided missile and space vehicle mfg.	327120	Clay Building Material and Refractories Manufacturing
336415	Space vehicle propulsion units and parts mfg.	331318	Other Aluminum Rolling, Drawing, and Extruding
423110	Parts Wholesaler	332510	Hardware manufacturing
423860	Other transport. Goods merchant wholesalers	332912	Fluid power valve and hose fitting mfg.
481111	Scheduled passenger air transportation	333923	Overhead cranes, hoists, and monorail systems
481112	Scheduled freight air transportation	334511	Search, detection, and navigation instruments
481211	Nonscheduled air passenger chartering	334519	Other measuring and controlling device mfg.
481212	Nonscheduled air freight chartering	336360	Motor vehicle seating and interior trim mfg.
481219	Other nonscheduled air transportation	424720	Petroleum and petroleum products merchant wholesalers (except bulk stations, terminals)
488111	Air traffic control	532411	Transportation equipment rental and leasing
488119	Other airport operations	541511	Custom Computer Programming Services--Aerospace
488190	Other support activities for air transport	541715	Research and Development in the Physical, Engineering, and Life Sciences
611512	Flight training	541922	Photographers specializing in aerial photography
611519	Other technical and trade schools	811420	Reupholstery and furniture repair
811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance		
926120	Transportation program administration		

*Source: 2013 Economic Impact of Georgia's Aerospace Industry, Center of Innovation for Aerospace, Georgia Dept. of Economic Development*

For this analysis, the three duplicate codes used by both the Space Foundation and Georgia Tech have been removed from the secondary analysis. These three codes are listed in Table 1 and include Search, Detection, and Navigation Instruments (NAICS 334511), Guided Missile and Space Vehicle Manufacturing (NAICS 336414), and Guided Missile and Space Vehicle Propulsion Unit and Parts Manufacturing (NAICS 336415). This means that the secondary market for this analysis will be based on the remaining 33 industrial sectors.

In a final note on the selection process, neither the direct space industry or the aerospace industry NAICS definitions is fully comprehensive for every economic activity that takes place in the space industry. Instead, these definitions should be used as a starting point for the systematic review of sectors most likely to be linked to the manufacturing, technology, and aerospace industries that support private space flight development.

To further illustrate the developing nature of this type of analysis, the Bureau of Economic Analysis (BEA) at the U.S. Department of Commerce is currently working to develop a Space Economy Satellite Account (SESA). This account will be used by BEA to estimate the “relative importance of the space sector on the U.S. economy.”<sup>31</sup> This work is scheduled to be completed by the end of 2020 after public comment has been taken.<sup>32</sup> When this work is finished, it will provide another way to estimate the overall size and value of the space sector across the United States.

Considering these factors, the team will use the six industries outlined by the Space Foundation to define the **direct space** industry. This information will serve as an estimate of the current size and scope of the existing industry in Georgia and Camden County. In economic development, it is typically easier to attract new businesses to areas where similar businesses have already located. Therefore, including the information in this analysis is another way to highlight the potential development linked to the spaceport.

The research team also used gross regional product and gross surplus to highlight the overall financial contribution to the economy, in which gross regional product is the total sum of all economic activity. On the other hand, gross surplus includes the consumption of capital (business spending on equipment), corporate/business profits, proprietor’s income, self-employment income, and other property income (such as rents and interest).<sup>33</sup> The data

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<sup>31</sup> Highfill, Tina, Georgi, Patrick, & Dubria, Dominique. (2019, December). “Measuring the Value of the U.S. Space Economy.” *Survey of Current Business U.S. Bureau of Economic Analysis* retrieved from <https://apps.bea.gov/scb/2019/12-december/1219-commercial-space.htm#next-steps>.

<sup>32</sup> *Ibid.*

<sup>33</sup> Bureau of Economic Analysis (2018, April 13). *Gross Operating Surplus*, retrieved from <https://www.bea.gov/help/glossary/gross-operating-surplus>.

included in this analysis covers both the state of Georgia and Camden County. Table 2 lists the findings for the direct space launch industry.

	State of Georgia		Camden County, Georgia	
Year	Gross Regional Product	Gross Surplus	Gross Regional Product	Gross Surplus
2008	\$126.30	\$51.58	\$42.06	\$11.20
2009	\$150.60	\$51.59	\$66.57	\$14.54
2010	\$209.06	\$102.07	\$91.58	\$34.06
2011	\$214.53	\$101.97	\$85.61	\$31.81
2012	\$223.15	\$103.77	\$87.34	\$36.94
2013	\$236.97	\$116.39	\$95.95	\$41.72
2014	\$283.58	\$149.03	\$121.32	\$55.33
2015	\$274.45	\$136.64	\$115.03	\$45.93
2016	\$273.20	\$142.35	\$120.59	\$53.12
2017	\$242.47	\$120.69	\$106.28	\$46.93
2018	\$237.92	\$117.28	\$94.55	\$41.75

\* All dollars in millions Source: JobsEQ, Exported on April 7, 2020

This sector has increased since 2008 for both Georgia and Camden County; statewide GRP has grown by 88 percent and in Camden County by 125 percent. Based on this information, some of this growth came from the private sector because gross surplus measures private investments linked to this sector and these figures are increasing at a faster rate than the GRP data. These sectors are linked because, in 2018, Camden County accounted for 40 percent of the statewide total. This means that development in Camden could have a considerable influence on the statewide development of this industry.

The monetary variables were not the only data points used in this analysis. The team also examined employment, wages and a location quotient based on employment. Location quotient (LQ) measures a region's (county or state) level of specialization relative to a larger geographic area (i.e., United States). An LQ score represents an industry's share of regional employment divided by the same industry's share of the national employment in that sector. For example, an LQ of 1.0 for the launch sector means that the region and the nation are equally specialized in the launch sector; while an LQ of 2.0 means that the region has a higher concentration of employment in the launch sector when compared to the rest of the nation.<sup>34</sup>

<sup>34</sup> "What Are Location Quotients (LQs)?" (2008, January 11). *Bureau of Economic Analysis*, retrieved from <https://www.bea.gov/help/faq/478>.

Table 3 lists the current impact that the direct space industry is having on the state of Georgia and Camden County.

Table 3: Direct Space Industry-Location Quotient, Total Wages and Employment						
	State of Georgia			Camden County, Georgia		
Year	Location Quotient	Total Wages*	Employment	Location Quotient	Total Wages*	Employment
2008	0.09	\$62.600	730	7.62	\$23.586	225
2009	0.11	\$83.025	891	12.64	\$41.305	362
2010	0.12	\$89.659	919	15.03	\$46.509	398
2011	0.13	\$96.065	956	13.64	\$44.831	353
2012	0.14	\$100.471	966	13.08	\$41.898	333
2013	0.14	\$99.491	934	13.34	\$46.286	329
2014	0.15	\$110.044	977	14.69	\$54.522	365
2015	0.14	\$109.229	955	14.23	\$55.735	363
2016	0.14	\$103.071	930	17.58	\$54.683	372
2017	0.13	\$95.956	861	15.71	\$48.749	343
2018	0.12	\$101.471	878	13.88	\$44.897	316
2019	0.12	\$109.054	926	11.31	\$41.714	278

\* All dollars in millions Source: JobsEQ, Exported on April 7, 2020

Camden County has a significantly higher level of specialization in the primary launch sector than does the state of Georgia. With an LQ score of 11.31, this area has already developed an elevated level of specialization in this sector. Due in part to this level of regional specialization the addition of a spaceport could help increase the employment and wages already present in this area.

Wages and employment in this sector have increased since 2008 despite some slowing down in recent years. Another factor is how the wages paid in this sector compare with the rest of the local economy. The average annual wages per worker in Camden County is **\$42,757 while the direct space sector average wages were \$150,190 in 2019**. This means that a typical job in the space sector earns **3.5 times the regional norm**. In Georgia, the average annual wage is \$53,266 while in the direct space industry the average wage in 2019 was \$117,767 in 2019. Taken together, many of the jobs in the direct space sector are currently paying above the state average.

For the secondary analysis, the team used the **aerospace industry**. For this report, the aerospace industry will be referred to as the secondary aerospace industry. Again, the region examined is the state of Georgia and Camden County. Table 4 lists the monetary variables previously used.

Table 4: Secondary Aerospace Industry Contributions to Gross Regional Product and Gross Surplus*				
	State of Georgia		Camden County, Georgia	
Year	Gross Regional Product	Gross Surplus	Gross Regional Product	Gross Surplus
2008	\$14,722.10	\$3,259.23	\$16.32	\$4.27
2009	\$14,784.21	\$3,499.02	\$11.22	\$2.62
2010	\$16,259.71	\$4,640.52	\$14.28	\$4.89
2011	\$17,310.50	\$4,835.37	\$12.08	\$4.15
2012	\$18,791.68	\$5,872.88	\$11.57	\$4.01
2013	\$19,579.20	\$6,081.32	\$10.13	\$3.61
2014	\$20,632.95	\$6,037.57	\$19.23	\$5.14
2015	\$22,331.07	\$6,958.12	\$40.32	\$7.77
2016	\$24,659.73	\$7,863.07	\$15.44	\$5.68
2017	\$25,246.20	\$8,063.11	\$34.49	\$13.65
2018	\$27,388.57	\$8,763.17	\$49.12	\$19.95

\*All dollars in millions Source: JobsEQ, Exported on April 7, 2020

With the secondary aerospace industry, the GRP growth has increased by about 86 percent in Georgia while the growth of these sectors in Camden County has been much faster in recent years while being more *uneven overall*. Looking at this industry in 2018, Camden County was a much smaller contributor to the overall aerospace industry with only 0.18 percent of the industry being in this area. This means that Camden County has a much smaller part of the secondary aerospace industry in Georgia. Based on information from Tables 2 and 4, Camden County is economically more prepared to add businesses in the direct space industry than the wider aerospace industry across the state.

Next, the team examined the same LQ, total wages and employment variables used in the primary space industry analysis. Table 5 shows the secondary aerospace industry data for these variables.

Table 5: Georgia Aerospace Industry Location Quotient, Total Wages and Employment						
	State of Georgia			Camden County, Georgia		
Year	Location Quotient	Total Wages*	Employment	Location Quotient	Total Wages*	Employment
2008	1.21	\$8,046.65	131,872	0.52	\$10.79	210
2009	1.26	\$7,797.42	129,048	0.43	\$8.32	164
2010	1.27	\$8,156.93	128,989	0.48	\$9.11	173
2011	1.28	\$8,811.45	133,191	0.40	\$8.20	150
2012	1.27	\$9,134.70	134,794	0.34	\$7.29	132
2013	1.25	\$9,536.18	134,490	0.34	\$6.51	132
2014	1.27	\$10,326.35	138,614	0.49	\$12.87	202
2015	1.24	\$10,950.51	140,561	0.84	\$29.46	360
2016	1.22	\$12,051.77	141,279	0.49	\$9.71	181
2017	1.23	\$12,362.74	143,560	0.75	\$19.51	281
2018	1.21	\$13,186.84	147,526	0.84	\$23.94	326
2019	1.11	\$12,516.06	140,067	0.82	\$24.65	331

*\*All dollars in millions Source: JobsEQ, Exported on April 17, 2020*

Using LQ scores as a guide for the secondary aerospace industry, Georgia has some advantages when compared to the national economy. Camden County is increasing its share of the aerospace industry while still lagging the state figures.

## Business Attraction Wins in Georgia

Based on the 2020 Aerospace manufacturing attractiveness rankings prepared by PricewaterhouseCoopers, Georgia ranks first in attractiveness for aerospace companies just ahead of second ranked Ohio, third ranked Washington and other top ranked states including Texas, Florida and California. This report noted that there are more than 800 aerospace companies in Georgia. These companies produce \$10.8 billion in aerospace products which is the top export category for Georgia and it “represent the second largest manufacturing industry in the state.”<sup>35</sup>

One of the State of Georgia’s major initiatives to attract Aerospace companies includes the Georgia Center of Innovation for Aerospace (GCIA). This center acts as the “technical industry expertise, and personal connections to support collaborative research and business partnerships to help the industry connect, compete and grow.”<sup>36</sup> GCIA also operates the GUARD Initiative, which works to connect aerospace companies to the Department of Defense (DoD). This multiple phase effort seeks to develop strong companies that can service the needs of DoD and simultaneously serve the needs of non-DoD related customers. This allows the companies receiving support to develop a diversified client base which could minimize the impacts of any changes in DoD funding/purchasing, changing priorities/mission, etc.<sup>37</sup>

As of FY 2017 “the majority of Georgia’s DoD spending is related to professional services like scientific research, engineering and construction, and installation support.”<sup>38</sup> Although services are important, “nearly one-third (34 percent) of Georgia’s DoD spending is related to aircraft, ships, submarines and land vehicles.”<sup>39</sup>

Due to these and other community-led efforts, companies have been choosing to come to Georgia. The team examined press releases for the state of Georgia to find companies that have relocated or expanded in Georgia between 2015 and 2019. To be selected for this list, businesses had to have a NAICS code that matched either of the two groups discussed previously, or the business operation had to note that its product, or service is designed to serve the aerospace market. This is not intended to be a census of all space or aerospace businesses locating or expanding in Georgia, rather, it should be used as an example of the

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<sup>35</sup> 2020 Aerospace Manufacturing Attractiveness Rankings. (2020). *PwC*, retrieved from <https://www.pwc.com/us/en/industries/aerospace-defense/assets/pwc-ffg-aerospace-defense-manufacturing-annual-report-2020.pdf>.

<sup>36</sup> Georgia Centers of Innovation. (2019). “About the Center Where Aerospace Takes Off, Georgia USA.” Retrieved from <https://www.georgia.org/georgia-centers-of-innovation/aerospace/about>.

<sup>37</sup> The GUARD Initiative (2020). “Georgia USA.” Retrieved from <https://www.georgia.org/guard-initiative>.

<sup>38</sup> *Ibid.*

<sup>39</sup> *Ibid.*



types of businesses that are currently choosing to grow in Georgia and are linked to the direct space or secondary aerospace industry. Table 6 displays this information.

Table 6: Businesses Linked to Space or Aerospace Industry					
Reason	Year Announced	Company Name	Location	Announced Jobs	Announced Investment
Relocation	2015	Constellium, Inc.	White	150	\$32 M
Expansion	2015	Suniva	Norcross	500	\$96 M
Relocation	2015	Stefanini	Atlanta	400	N/A
Relocation	2016	Honeywell	Atlanta	800	\$19 M
Expansion	2016	Keysight Technologies	Atlanta	200	\$13.9 M
Expansion	2016	Pratt & Whitney	Columbus	n/a	\$65 M
Expansion	2016	Valmiera Glass	Dublin	425	\$90 M
Expansion	2017	Meggitt Polymers & Composites	Rockmart	211	\$30 M
Expansion	2017	Pratt & Whitney	Columbus	500	\$386 M
Relocation	2017	Sysnet Global Solutions	Atlanta	500	\$2 M
Relocation	2018	SK Battery America	Commerce	2,000	\$1.67 B
Relocation	2019	Dean Baldwin Painting	Macon	115	\$21.45 M
Relocation	2019	Preci-Dip	Bryan County	100	13.6 M
Expansion	2019	Parsons	Augusta	80	N/A
Relocation	2019	Exabeam	Atlanta	20	N/A
Relocation	2020	Enchem	Commerce	300	\$61.35 M
Expansion	2020	NearShore Technology	Atlanta	30	N/A

*Source: Georgia Newsroom, Georgia Department of Economic Development*

As noted in Table 6, Georgia has had some success attracting businesses. The state saw nine businesses relocate to Georgia, and it had eight major expansions between 2015–2019. These businesses have expanded across the state of Georgia with most companies coming or expanding in the Augusta, Columbus, Macon, and Savannah areas. While Atlanta does remain a major draw, it is not the sole beneficiary of the of the direct space or secondary aerospace industry.

Another factor that can add business development efforts is the development of public/private partnerships. For example, engine maker Pratt & Whitney has worked with Fort Benning and the Georgia Quick Start program to fill job openings using exiting military personnel, military spouses and retirees who are planning to remain in Columbus after their service in the Army is

complete. This company has also worked to support local schools’ effort to develop STEM labs.<sup>40</sup>

Finally, the team has also included the selection criteria used to select each business included in this analysis. Table 7 displays whether the match is due to a NAICS code or publicly available information on the product/service that is being marketed to the direct space or secondary aerospace industry.

Table 7: Businesses Linked to Space or Aerospace Industry		
Year Announced	Company name	Selection Criteria
2015	Constellium, Inc.	Area of focus of the company <sup>1</sup>
2015	Suniva	Solar cell manufacturer; work w/ federal agencies incl. NASA and DOD <sup>2</sup>
2015	Stefanini	NAICS code match
2016	Honeywell	Area of focus of the company <sup>3</sup>
2016	Keysight Technologies	NAICS code match
2016	Pratt & Whitney	NAICS code match
2016	Valmiera Glass	Area of focus of the company <sup>4</sup>
2017	Meggitt Polymers & Composites	NAICS code match
2017	Pratt & Whitney	NAICS code match
2017	Sysnet Global Solutions	NAICS code match
2018	SK Battery America	Batter cell manufacturer <sup>5</sup>
2019	Dean Baldwin Painting	NAICS code match
2019	Preci-Dip	Area of focus of the company <sup>6</sup>
2019	Parsons	Area of focus of the company <sup>7</sup>
2019	Exabeam	NAICS code match
2020	Enchem	Working to develop replacement for lithium ion batteries <sup>8</sup>
2020	NearShore Technology	NAICS code match

- Sources: 1. Constellium, Inc. <https://www.constellium.com/markets-applications/aerospace/space>  
 2. Suniva <http://www.suniva.com/government.php>  
 3. Honeywell, <https://www.honeywell.com/en-us/industries/aerospace>  
 4. Valmiera Glass <https://www.valmiera-glass.com/en>  
 5. SK Battery America <https://dol.georgia.gov/featured-employers/sk-battery-america>  
 6. Preci-Dip <https://www.precidip.com/en/Markets/Preci-Mil.html>  
 7. Parsons <https://www.parsons.com/solutions/space/>  
 8. Enchem <http://www.enchem.net/eng/Content.php?basecode=22>

<sup>40</sup> Rasmussen, Patty. (2019, December 1). “Reaching New Heights Innovation, Infrastructure and Capabilities Fuel Growth in Georgia’s Aerospace Industry.” *Georgia Trend*, retrieved from <https://www.georgiatrend.com/2019/12/01/reaching-new-heights/>.

## Conclusion

The private space industry in Georgia currently accounts for \$237.9 million in GRP and \$94.6 million for Camden County in 2018. The private space industry is part of the aerospace industry which had at least 17 businesses expand or relocate to Georgia between 2015 and first part of 2020. Based on a 2020 report prepared by PricewaterhouseCoopers, Georgia ranked first in attractiveness for business in the aerospace manufacturing industry. This put Georgia ahead of other states including, Ohio, Washington, Texas, North Carolina, Indiana, Arizona, Michigan Florida and California. The report also noted that Georgia has more than 800 major aerospace companies with some of these aerospace businesses already located in Camden County.<sup>41</sup> The Camden County Joint Development Authority has noted that aerospace companies Lockheed Martin and BAE Systems are major employers in the community.<sup>42</sup> It is hoped that the development of the aerospace industry will support the wider development of the private space industry.

The spaceport locations examined in this memorandum are working to leverage their regional assets to attract new businesses. Following this model, Spaceport Camden is seeking to leverage local resources to serve the small satellite market. Several of these assets related to the community and its location include launch angles that are remarkably similar to Cape Canaveral, a seaside location, Naval Submarine Base Kings Bay, and potential partnerships with Cecil Spaceport in Jacksonville, Florida. These are several assets that have made this area attractive to business in the space industry even without regular launches.

Spaceport Camden has recently signed an MOU with Opifex Global to explore the development of a commercial astronaut training facility in Camden County.<sup>43</sup> Another recently signed MOU between Alaska Aerospace Corporation and Spaceport Camden seek to establish common operational procedures.<sup>44</sup> The Alaska Aerospace partnership could give companies that provide launch services the ability to reach both polar and equatorial orbits while following the same set of procedures. Through the matching of these procedures, it is likely that both locations could see an increase in launch actives. This growth in launches

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<sup>41</sup> *ibid*

<sup>42</sup> Major Employers, Camden County Joint Development Joint Development Authority, retrieved from <https://launchcamden.com/camden-county-data-profile/major-employers/>

<sup>43</sup> Commercial Astronaut Training Facility Eyed for Spaceport Camden. (2020, May 11). *Spaceport Camden*, retrieved from <https://www.camdencountyga.gov/DocumentCenter/View/11782/Commercial-Astronaut-Training-Facility-Eyed-for-Spaceport-Camden>.

<sup>44</sup> Alaska Aerospace Corporation and Camden County Sign MOU. (2020, June 15). *Spaceport Camden*, retrieved from <https://www.camdencountyga.gov/DocumentCenter/View/11835/Alaska-Aerospace-Corporation-and-Camden-County-Sign-MOU>.

could increase demand for local support services in Camden County. Both MOUs demonstrate this facility is already attracting interest from developers.

The space economy scorecard from The Space Foundation noted that space-related partnerships have quadrupled over the past 20 years, which is leading more organizations into space-related development. Building on this information, in 2020, a forecast from SpaceWorks Enterprises noted that the nano/microsatellites (1–50 kg) market is projected to need 1,800–2,400 launches over the next five years. The majority of this demand will come from either commercial or civil operators.<sup>45</sup> This forecast means that demand for launching small satellites is present in the market, and the spaceports that are ready to meet this demand, including Camden County, will be able to growth along with this market. As launches become more regular in Camden County, support industries will start to develop and grow. The local industries that are supporting these launches should increase the economic value generated by the spaceport.

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<sup>45</sup> Nano/Microsatellite Forecast, 10<sup>th</sup> edition. (2020). *SpaceWorks Enterprises*, retrieved from <https://www.spaceworks.aero/nano-microsatellite-forecast-10th-edition-2020/>.