2020 Aerospace manufacturing attractiveness rankings

A geographic assessment for aerospace manufacturing investments

pwc

Introduction

Our seventh annual edition of aerospace manufacturing attractiveness rankings arrives at a precarious moment in the industry's history. By April 2020, the COVID-19 pandemic had plunged commercial aviation into crisis mode, with global revenue passenger kilometers (RPKs) nosediving by 94% compared to the same month a year earlier. International flights ground to a near-complete halt.[1] By June, RPKs were down 87% against the year-ago period. Meanwhile, the International Air Transport Association (IATA) forecasts that 2019 levels will not be restored until 2024.[2]

A rash of challenges ensued, including cash flow and liquidity, resulting in aggressive government support, supply chain disruptions and, naturally, unprecedented revenue shortfalls. Airlines are estimated to rack up net losses of $84 billion in 2020.[3] And, at the time of this report's publication, concerns surrounding a resurgence of the virus dampen hopes for a speedy, V-shaped economic recovery and a rebound of air travel demand. How long a recovery to 2019 demand levels may take is still far from certain, but most industry leaders are projecting possibly three to five years.

The current turbulence comes on the heels of an impressive 2019. The top 100 aerospace and defense (A&D) companies (by revenue) saw a record $780 billion in revenue — 5% over 2018[4] — despite the grounding of the 737 MAX, which was the primary contributor to a $25 billion revenue reduction at Boeing. RPKs set a new record, growing at 4.2% in 2019 — down from 7.3% growth in 2018, but growing at roughly double the GDP for the past two decades.[5] Airbus' and Boeing's order backlogs ended 2019 at around 13,000 aircraft.[6]

In the wake of strong demand in 2019, demand for military equipment has remained relatively unscathed by the pandemic. Some governments across the globe bolstered their defense infrastructure due to increasing global security concerns. In 2019, the US increased defense spending by 6.6%, while Europe increased it by 4.2%, compared with 2018.[7]

As production volumes are adjusted and supply chains mitigate risk, the 2020 aerospace manufacturing attractiveness rankings are a helpful resource when considering where to concentrate production in both the near term and long term.

Until COVID-19 appeared, the emphasis for the past two decades had been on expansion. Now, the emphasis should be on liquidity and de-risking the supply chain, while planning for a return of volume in three to five years. De-risking the supply chain has many considerations, including protecting the capability of financially vulnerable suppliers, potential vertical integration and deglobalization.

At the same time, aerospace manufacturing capacity took decades to build, and it should be kept agile in order to fully rebound, with an expected return potentially three to five years. Many A&D companies may emerge from the crisis changed — and even enhanced. Industry stakeholders fully grasp that in order to survive a disruption of this scale, they may need to become more resilient, agile and innovative.

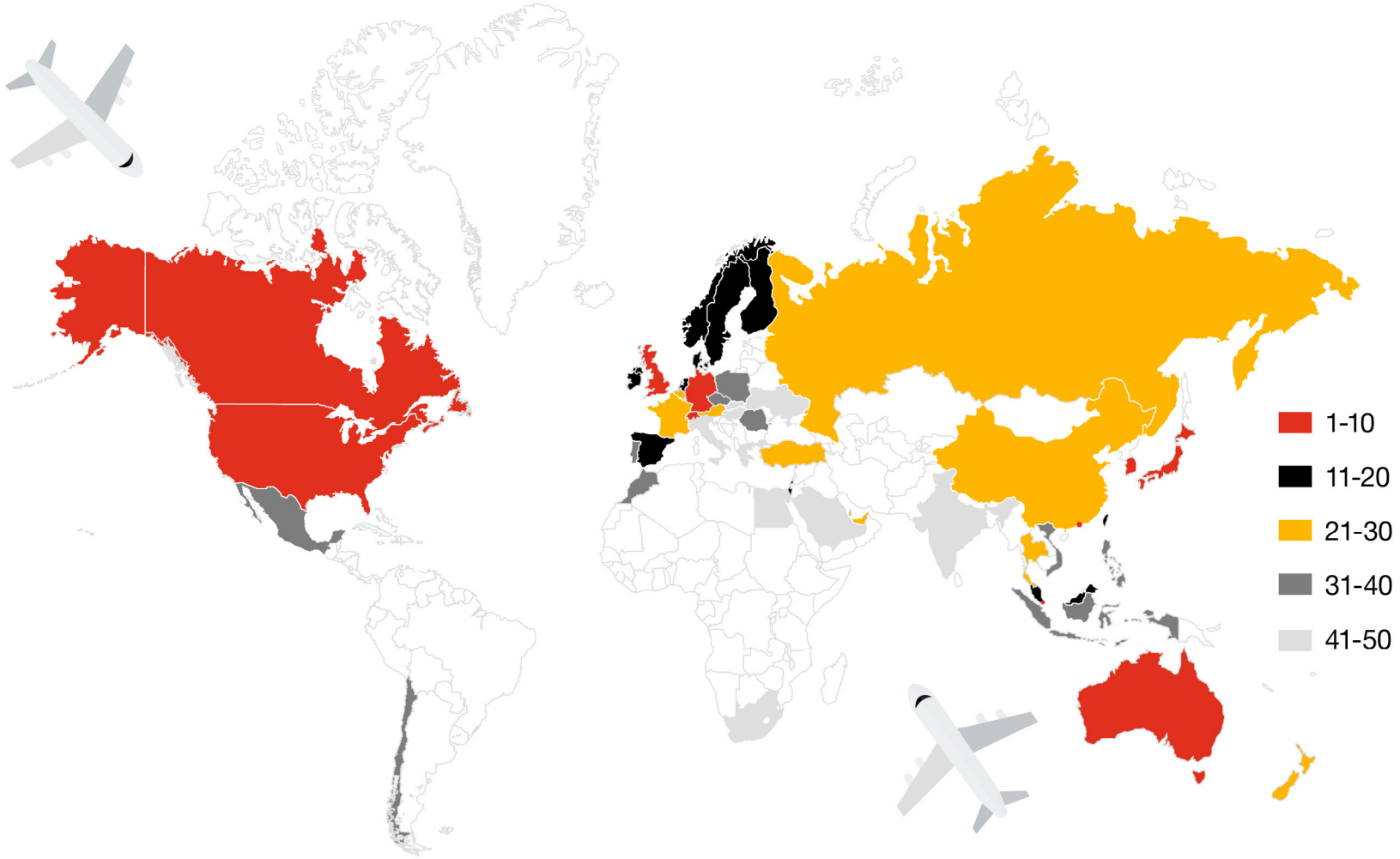
The PwC rankings are based on a weighted score of category and subcategory rankings. Ranking categories include cost, economy, geopolitical risk, infrastructure, labor, industry and tax policy. Geopolitical risk has been excluded from state rankings, as the risk is similar for all the states. The categories comprise several discrete metrics, which are then aggregated and weighted to arrive at the final rankings. While both state and country rankings use comparable metrics, there are slight differences in each measure's relevance to the ranking and the availability of quantitative information. For more details on the ranking methodology, please see the Appendix.

Ultimately, demand for commercial air travel (as well as cargo freight) will recover, but it's still uncertain what that recovery may look like, and how long it may take. Indeed, the pandemic may exert permanent changes on the global commercial aviation industry.

We hope the 2020 edition of our aerospace manufacturing attractiveness rankings can help inform both commercial and defense spheres, and consider locales that may help support their strategic plans of reinvention or rebalancing during this unprecedented period. That support may include capturing cost efficiencies, adopting digital technologies, building supply chain resiliency, or accommodating new customer needs and preferences in a post-pandemic world.

1 "International Air Traffic Founders as Covid Rates Surge," AINonline.com, July 1, 2020.
2 "COVID-19 June data and revised air travel outlook," IATA, July 28, 2020.
3 "Economic Performance of the Airline Industry," IATA, June 2020.
4 Capital IQ, PwC analysis
5 "Slower but Steady Growth in 2019," IATA, February 6, 2020
6 "Airbus and Boeing Report December and Full-Year 2019 Commercial Aircraft Orders and Deliveries," DSM, January 21, 2020.
7 "Global defense spending is on the rise in an unstable world," BBC, February 14, 2020.

Country Rankings



Top 10 country/region rankings for aerospace attractiveness

Country/region	Final Rank	Cost	Labor	Infrastructure	Industry	Geo-Political Risk	Economy	Tax Policy
United States	**1**	4	3	8	1	3	6	25
Singapore	**2**	15	6	4	2	14	11	7
Canada	**3**	3	1	20	6	4	31	19
South Korea	**4**	14	45	2	19	7	12	21
Japan	**5**	37	9	1	10	1	5	51
Australia	**6**	1	27	17	24	6	18	28
United Kingdom	**7**	20	5	10	17	10	16	27
Germany	**8**	43	7	7	5	2	7	46
Switzerland	**9**	13	15	14	25	15	9	20
Hong Kong	**10**	21	14	3	39	34	29	2

Below is a closer look at the top five countries in our ranking:

United States

The US remains at the top of this year's rankings, with $277 billion in 2019 sales (the world's largest) and $28.8 billion in CapEx.[8] The country's dominance is supported by a large and productive labor force and relatively favorable tax environment, following tax reform. In 2019 the A&D workforce numbered 867,000 direct employees, including about 63,000 aerospace engineers.[9,10] The US was also the global leader in A&D exports in 2019, generating $141 billion in revenue and ranking as the US' top net export.[11] The country's top ranking was further strengthened by growth in revenue passenger miles from international and domestic travel in 2019.[12] Out of the top global 100 A&D companies, as many as 34 are based in the US.[13]

On the defense side of the industry, the country's federal defense spending has been on the rise steadily since 2016. US military spending hit $717 billion in 2019, up from $649 billion in 2018.[14] The US aerospace industry also attracts significant foreign direct investment (FDI), which totaled nearly $22 billion at the end of 2018 (latest figure available).[15]

Singapore

Singapore, perennially strong in our rankings, edged up to the number-two slot, with improved rankings in infrastructure (number one in both port infrastructure and electricity supply) and cost categories. Singapore is Asia's leading solution provider for aircraft maintenance, repair and overhaul (MRO) needs, accounting for 10% of the world's aerospace industry's MRO output.[16] It is also home to more than 60 foreign and domestic aircraft parts producers.[17] Rolls-Royce and Pratt & Whitney, for instance, carry out research and manufacturing operations at a dedicated government-affiliated facility that has 6,000 employees and its own 1,800-meter landing strip.[18]

In early 2020, major A&D players — including GE Aviation, Rolls-Royce and Safran Aircraft Engines — signed agreements with the Singaporean government to invest $360 million

8 IHS data
9 US Bureau of Labor Statistics https://www.bls.gov/cps/cpsaat18.htm
10 US Bureau of Labor Statistics https://www.bls.gov/oes/current/oes172011.htm
11 IHS Connect
12 Federal Reserve Bank of St. Louis https://fred.stlouisfed.org/series/RPM
13 Evalueserve Analysis
14 "Here's how much global military spending rose in 2018," Defense News, April 29, 2019.
15 https://www.selectusa.gov/servlet/servlet.FileDownload?file=015t0000000J2X2
16 "Singapore aerospace industry transformation map eyes 1,000 new jobs by 2020," The Straits Times, January 17, 2018.
17 "Southeast Asian aerospace takes off on back of budget carriers," Nikkei, July 08, 2019.
18 Ibid.

over the next five years for new or expanded production and MRO facilities.[19] In January 2020, the government launched a new initiative, Industry Connect, to identify talent and upskill them in smart-factory technologies.[20] The government continues along its aerospace "industry transformation map" (established in 2018) with the ambition of creating 1,000 new jobs and improving productivity through increased automation of operations and materials handling, as well as enhancing software and engineering capabilities.[21]

Canada

Canada, ranked third in this year's index, has resided in the top five since 2014, the inaugural year of our index. This year, Canada maintained its strong scores across all seven of our ranking categories.

Canada's aerospace and defense industry has tripled its global market share in the last two decades, making it the fifth largest aerospace producer in the world. Most (77%) of the industry's products are manufactured for commercial aircraft, and 82% of the products — the highest globally — are exported.[22]

The country's A&D industry is supported by an educated labor force, a low level of geopolitical risk and significant industry size. In 2019, Canada's A&D industry revenue remained flat, albeit strong, at about $16 billion, while capital expenditure rose by 8% to $1.55 billion over 2018.[23] Canada's aerospace industry and its value chain added $20.3 billion in GDP and 160,000 (direct and indirect) jobs.[24] The country's A&D industry invested $1.4 billion in research and development — roughly a quarter of total manufacturing R&D in Canada.[25]

In 2018, the Aerospace Industries Association of Canada (AIAC) launched its "Vision 2025" initiative, including areas of focus for aerospace industry stakeholders, including: strengthening workforce skills; deploying new innovations (e.g., carbon-neutral flight and unmanned vehicles); and advancing Canada's position in space technology.[26]

South Korea

South Korea bumped up to the fourth spot in this year's index (from 10 in 2018, and 20 in 2017), with a substantial improvement of its ranking in the cost category (from 25 to 14).

With 2019 sales of $9.33 billion, the country continues to dig in as one of the world's top A&D hubs. In December 2019, the government launched a policy to further ramp up its competitiveness in the A&D sector, which includes breaking into new markets and increasing demand for inbound travel, financing aircraft acquisitions, and cutting airport fees and investing in local MRO enterprises.[27] The policy also called for increasing the number of slots at Incheon International Airport to as many as 70 per hour, with preference to inbound carriers. The country is also investing heavily in innovation: Its R&D investment as a percentage of GDP is number one in the world — 4.8% in 2018, up steadily from 3.1% a decade earlier.[28]

The country's defense industry is also on track to becoming a rapidly growing A&D export juggernaut. Toward this aim, South Korea continues to offer incentives for international industrial collaboration — particularly cross-border commercial ventures with foreign defense contractors. The government recently introduced an offset banking system, which provides offset credits to foreign defense

19 "Singapore's aerospace industry gets $360m investment," Flight Global, February 12, 2020.
20 "JTC launches new initiative to attract talent and improve skills of workers in SMEs," Straits Times, January 15, 2020.
21 "Singapore aerospace industry transformation map eyes 1,000 new jobs by 2020," Straits Times, January 17, 2018.
22 PwC, https://www.pwc.com/ca/en/industries/aerospace-defence.html
23 Aerospace Industries Association of Canada website https://aiac.ca/industry-statistics/
24 Ibid.
25 Ibid.
26 "Aerospace Industries Association of Canada launches Vision 2025 to chart course for Canadian aerospace sector growth and investment" AIAC website, October 9, 2018.
27 "South Korea launches new policy to boost aviation industry," Ch Aviation, December 12, 2019.
28 World Bank https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=KR

companies that manufacture (and export) weapon system parts in collaboration with Korean firms.[29] The country has established a partnership with Indonesia to develop the first full-size mock-up of the KF-X fighter jet.[30] In October 2019, Korea Aerospace Industries developed a less costly — and less stealthy — alternative to the US-built F-35.[31]

Japan

Japan, consistently a strong performer, ranked number five this year, supported by its sizable and skilled labor force and strong government support of the A&D industry. The country is making inroads in regional aircraft. In 2019, Mitsubishi Heavy Industry Ltd., the country's leading aerospace company, began certification flights on its long-anticipated 88-seat passenger aircraft — the Mitsubishi Spacejet — the first passenger jet developed by a Japanese company in five decades. However, the Spacejet program has been dogged by numerous delays and is now expected to begin deliveries in 2021.[32] The aircraft, with a 2000-mile range, is aimed at meeting a need from fast-growing, low-cost regional airlines for smaller, narrow-body aircraft with lower fuel costs.[33] The future of this new aircraft hangs in the balance, as the commercial aviation sector still faces serious challenges from the COVID-19 pandemic, and the prospects for a speedy rebound in air travel demand remain unclear. In June 2020, Mitsubishi Heavy Industries Ltd. announced it would acquire Bombardier Inc.'s CRJ regional-jet program for $550 million, a move that further raises the country's ambitions of becoming a global player in regional commercial aircraft production.[34]

Japan also has continued to undertake numerous defense industry initiatives aimed at developing and enhancing its global competitive advantage. One such program targets threats in space and cyberspace with a space domain mission unit (SDMU), which was launched in April 2020 and is expected to be fully operational in 2022.[35] The SDMU will carry out space situational awareness (SSA) and passive counter-space operations to protect Japanese satellites.[36]

29 "How South Korea's New Offset Rules Can Strengthen Defense Cooperation With the US," The Diplomat, July 19, 2019.
30 "South Korea unveils fighter jet mock-up amid program challenges," Reuters, October 15, 2019.
31 Ibid.
32 Japan Times, June 13, 2020. https://www.japantimes.co.jp/news/2020/06/13/business/corporate-business/mitsubishi-aircraft-slash-over-half-workforce-restructuring/#.XwXOH-d7k2w
33 "Mitsubishi's new jet is exactly what Boeing doesn't need right now," Fast Company, April 18, 2019.
34 Mitsubishi Heavy Industries website https://www.mhi.com/news/story/190625.html
35 "Japan To Stand Up Space Domain Mission Unit In April 2020 To Counter Threats To Satellites," Spacewatch, January 20, 2020.
36 Ibid.

Notable events in other countries

United Kingdom

The United Kingdom slipped from the fourth spot to the seventh, as uncertainty surrounding economic conditions lingers post-Brexit. The country fell appreciably in the cost category (from 4 to 20) and the industry category (from 8 to 17). On the heels of the 2016 Brexit referendum, the 2019 FDI flows into the UK hit their lowest mark in six years, with the number of foreign investment projects dropping by 14% to 1,782 — marking the second consecutive annual fall since March 2017.[37] The country's ranking fell in both the cost and industry categories in part by newly instituted Brexit policies that have affected the UK A&D industry unfavorably, particularly concerning supply chains, EU-funded research and development investment, access to skilled workers and strategic business partnerships with EU-based companies. Despite the uncertainty ushered in by Brexit and a dip in its rankings, the UK remains an attractive hub for aerospace manufacturing.

India

While India was little changed in our ranking in 2019 (moving from 37 to 42), the Indian government reached a milestone decision in May 2020 to raise FDI limits (the ownership stake foreign defense companies could hold in Indian companies) from 49% to 74%.[38] This could potentially trigger a wave of foreign direct investment in the country's defense industry by some of the world's biggest defense companies. In addition, the recent announcement on the list of 101 defence platforms & equipment by the Indian MoD which will progressively face an embargo for imports is expected to act as a catalyst in driving investments in local design and manufacturing capabilities.[39] This aligns with the country's ambitions to promote a home-grown aerospace program supported by global A&D companies that manufacture in India and help build out a "Made in India" industrial base, as well as to nurture a world-class A&D workforce.

Lockheed Martin developed and designed its F-21 fighter jet around the needs of the Indian Air Force and is working with India's Tata Group on the program as a potential strategic partner. However, it is unclear whether the government will ultimately commit to purchasing the aircraft.[40] In July 2019, Lockheed Martin signed memorandums of understanding to mentor three Indian start-ups that contribute to its supply chain: Terero Mobility, Sastra Robotics and NoPo Nanotechnologies.[41] In April 2019, Boeing expressed interest in developing a modern aerospace ecosystem in India to co-develop F/A-18 Super Hornet upgrades as part of the country's advanced medium combat aircraft (AMCA) program.[42]

37 "Foreign investment into UK falls to lowest level in six years," Financial Times, June 26, 2019.

38 "India opens up defence manufacturing; foreign firms can hold 74 pc stake," The Tribune, May 16, 2020.

39 "MoD's big push to Atmanirbhar Bharat initiative," Ministry of Defence, August 9, 2020.

40 "Does India Really Want the American-Built F-21 Fighter (With F-35 DNA)?," Yahoo News, July 4, 2020.

41 "Lockheed inks Memorandums of Understanding with three Indian start-ups," Business Standard, July 20, 2019.

42 "Boeing plans to build 21st-century aerospace ecosystem in India," Business Today, April 2, 2019.

Considerations for your business

Passenger travel and cargo freight declined dramatically in early 2020 due to the COVID-19 pandemic, and it is still uncertain how long a recovery to 2019 levels may take. In any case, airlines continue to struggle in the face of diminished revenue and cash flow. Producers of commercial aircraft, likewise, have been buffeted by cancelled or postponed orders, which have, in turn, placed pressure on the entire commercial aviation supply chain ecosystem.

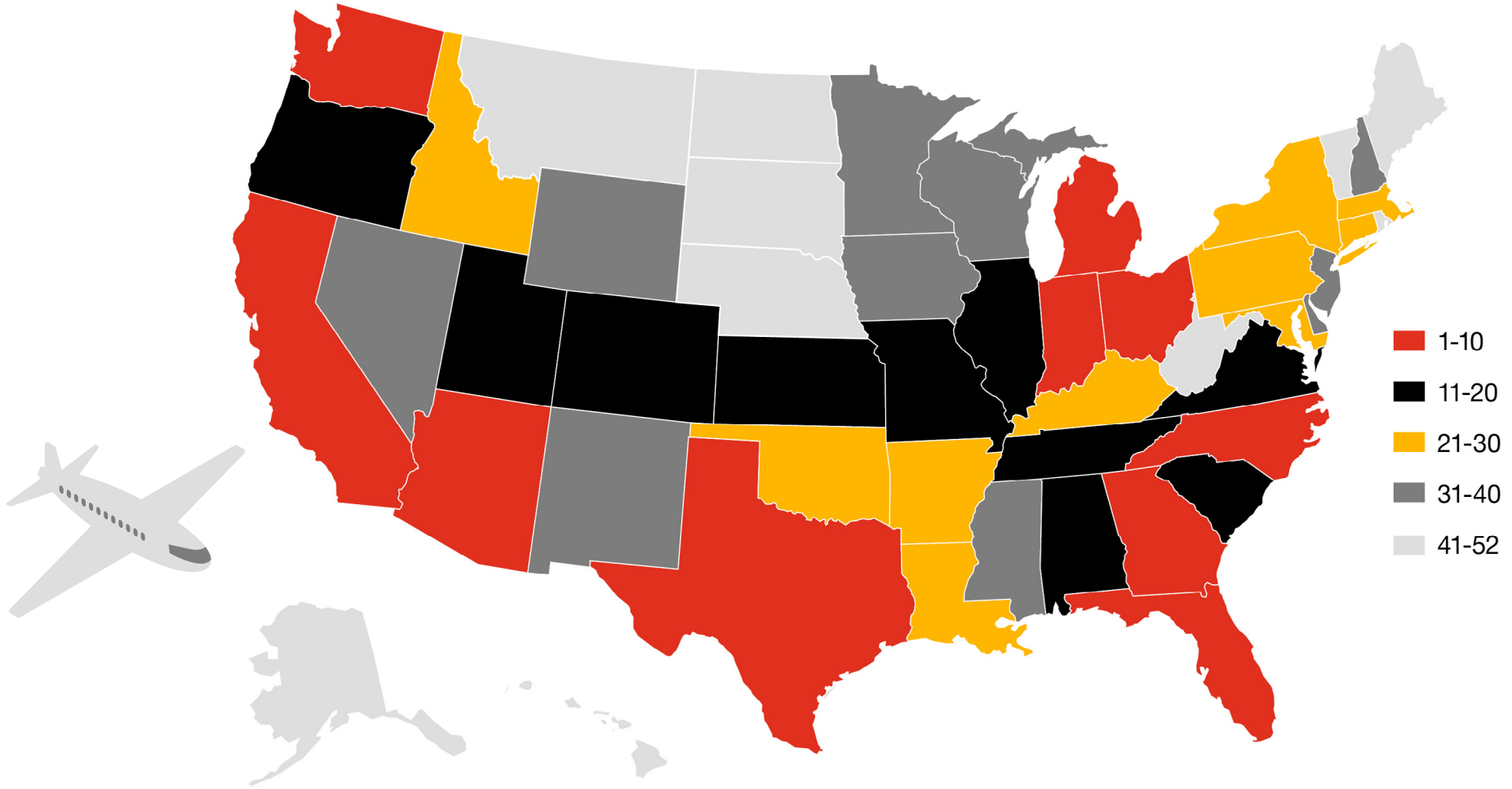
COVID-19 has caused some companies to reassess their global supply chain footprints — with potential supplier risk now carrying a higher premium — and to consider alternatives to build in resiliency, such as putting insourcing or even onshoring on the table. Moving the supply chain to the OEM's home territories — or to countries such as Mexico, Vietnam or the Philippines — can reduce risk and may also offer benefits, such as lower labor costs, favorable government policies and economies of scale. Manufacturers should also review their purchase and supply contracts to determine what force majeure rights and obligations may apply.

Also, as the global economy continues to struggle to recover to pre-pandemic levels, the industry will also likely ramp up cost-cutting innovations through automation and develop products and services embedded with 4IR technologies including artificial intelligence, industrial internet of things, data analytics and 3D printing. And, finally, commercial aviation players may need to approach the customer differently and accommodate new preferences, needs and expectations post-COVID-19.

Suppliers should evaluate their businesses and financial resources to gauge the impact of the coronavirus pandemic. They should proactively identify opportunities to improve their liquidity position and protect themselves as much as they can while the crisis lasts. Immediate and significant declines in operating cash flow may push companies to rely more heavily on revolving credit facilities. Those that have available borrowing capacity should consider drawing on their existing credit lines, hedging against possible risk that unforeseen subsequent events will make borrowing unavailable.

The need for advanced military equipment will likely further push global defense spending. The current backlog of aircraft orders — as well as future orders of one of the most fuel-efficient aircraft, the 737 Max — can help manufacturers reach record production levels. This expected demand for military systems and aircraft will likely force manufacturers to reevaluate their supply chain. Therefore, defense manufacturing companies should be prepared to reconfigure and/or expand their global supplier footprint to accommodate demand.

State Rankings



Top 10 state rankings for aerospace attractiveness

State	Final Rank	Cost	Labor	Infrastructure	Industry	Economy	Tax Policy
Georgia	**1**	10	12	1	5	10	4
Ohio	**2**	30	15	6	4	4	1
Washington	**3**	33	3	17	1	3	13
Texas	**4**	37	8	20	2	1	25
North Carolina	**5**	19	21	12	7	7	2
Indiana	**6**	22	33	3	10	14	3
Arizona	**7**	15	17	15	6	19	8
Michigan	**8**	27	9	28	14	12	7
Florida	**9**	39	23	2	8	6	18
California	**10**	47	6	22	3	2	43

Below is a closer look at a few notable industry initiatives or other indications of significant growth among the five most highly ranked states:

Georgia

Georgia climbed to the top ranking after being runner-up last year, continuing its position as a stalwart top-10 finisher in our index. The state ranked in the top 10 in all categories except labor, with its ranking in infrastructure rising from 15 to number one. The state's A&D workforce of 108,000 is employed by more than 800 aerospace companies. Aerospace products, valued at $10.8 billion, account for the state's top exports and represent the second largest manufacturing industry in the state, representing $57.5 billion in economic impact.[43]

In 2018, Georgia cut its top corporate income tax rate from 6% to 5.75%.[44] Hartsfield-Jackson Atlanta International Airport is one of the world's most traveled airports, averaging 2,700 flights daily, moving 100 million passengers and more than 650,000 metric tons of cargo each year. The state's Savannah and Brunswick ports are also among the busiest in the nation (with Savannah the fastest-growing).[45] Some of the largest A&D players operate in Georgia, including Lockheed Martin Aeronautics (based in Marietta and the former base for Martin Marietta, which merged with Lockheed in 1995), Gulfstream Aerospace, Airbus Aerial, Pratt & Whitney and Meggitt Polymers & Composites.

The Georgia Center of Innovation for Aerospace promotes business partnerships and inter-company collaborations to help nurture the state's A&D expertise. In April 2019, Macon-Bibb County, Central Georgia Technical College and Robins Air Force Base joined the Central Georgia Aviation Partnership to nurture workforce development, offering training at a military aircraft maintenance facility (formerly Boeing's manufacturing facility).[46]

Ohio

Ohio ranked second among US states this year, buoyed by its attractive corporate tax structure, healthy economy and strong industry presence. This year, Ohio ranked number one in the tax policy category, up from eight last year. (The state has no corporate income tax but does levy business taxes on gross receipts.) With an A&D workforce of 38,000, Ohio is also the largest US state supplier to Boeing and Airbus.[47] The state has an A&D ecosystem of more than 550 aerospace and aviation A&D organizations, including Battelle Air Force Research Laboratory, the Ohio Unmanned Aircraft Systems Center and the NASA Glenn Research Center.

43 State of Georgia website https://www.georgia.org/industries/aerospace
44 "State Corporate Income Tax Rates and Brackets for 2020," Tax Foundation, January 2020.
45 State of Georgia website https://www.georgia.org/competitive-advantages/infrastructure
46 "CGTC, Robins Air Force Base join forces for 'groundbreaking' aviation partnership," The Telegraph, April 5, 2019.
47 State of Ohio website https://www.jobsohio.com/wp-content/uploads/2020/02/JO-Aerospace_Brochure_FA.pdf

Ohio is also becoming a hub for innovations in urban air mobility and autonomous aviation systems. Aircraft engines and parts accounted for the highest export value of $5.9 billion in 2019 (11.1% of Ohio's total exports).[48] The state is home to GE Aviation, which won a $140 million contract from the US Defense Logistics Agency in April 2020 for military turbofan plane engine supplies.[49] The Ohio State University Aerospace Research Center also plays a key role in academic research and industry partnerships in aerospace engineering. In December 2019, Precision Castparts, a manufacturer of aerospace industry parts, invested $128 million to develop two facilities at the Mason R&D Park East.[50]

Washington

The state of Washington secured the third position in our rankings, primarily due to its strong industry presence, educated labor force and strong economy. Washington, home to aviation giant Boeing, persists as a year-in, year-out top performer. The state has developed, over decades, a deep and wide A&D ecosystem that goes well beyond Boeing, with some 1,400 aerospace and related companies. Washington is the country's long-standing A&D hub, with some 100,000 workers manufacturing about 1,400 aircraft and unmanned aerial systems a year — some nine out of 10 commercial aircraft in the country.[51]

In August 2019, the Supersonic Flight Alliance — formed by AeroTEC, the Port of Moses Lake Airport, Choose Washington and the Aerospace Futures Alliance — proposed a 300-mile flight corridor to test supersonic aircraft.[52] In May 2019, Mitsubishi Aircraft opened its US headquarters in Renton to spearhead the development of Mitsubishi Aircraft's regional jet program.[53] The state has also grown quickly as a space technology cluster, including SpaceX, Aerojet Rocketdyne, Blue Origin, Kymeta and Spaceflight Industries.

Texas

Texas saddled in at fourth in our ranking, returning to the top 10 following a number-two rank in our 2018 index report. The state's 2019 GDP growth of 4.4% was the strongest in the nation, fortifying its overall ranking, along with its continued strength in the labor category (leaping from 32nd last year to eight).[54] In May 2019, the state government approved additional tax benefits for aerospace companies, representing potential tax savings of $64 million over the next five years. Texas's A&D industry employs some 130,000 workers at about 1,300 aerospace and aviation companies, including Lockheed Martin, Raytheon and Boeing.[55]

Lockheed Martin's F-35 Lightning II assembly line, located in Fort Worth, has played a significant role in delivering 478 F-35 aircrafts as part of the $34 billion contract from the US Department of Defense.[56] In 2019, Raytheon announced plans to extend its presence by building a 200,000-square-foot advanced "smart factory" in McKinney, which is expected to employ about 500.[57] The state also hosts 15 military bases and NASA's Lyndon B. Johnson Space Center.

North Carolina

North Carolina rose from number seven to number five this year, boosted by its favorable corporate tax structure (its flat 2.5% rate is the lowest in the nation), relatively low labor costs, low electricity costs and healthy economy. The state has the second fastest-growing

48 Ohio's Top 10 Exports World'sTopExports.com, April 6, 2020.
49 "GE Aviation in Ohio wins $140M jet engine contract," Dayton Daily News, April 14, 2020.
50 "Deal paves way for $128M investment in Mason, creation of 190 jobs," Journal News, December 11, 2019.
51 State of Washington website http://choosewashingtonstate.com/why-washington/our-key-sectors/aerospace/some
52 "Business group proposes 300 mile supersonic flight test corridor," Aerospace Testing International, October 17, 2019.
53 "Mitsubishi Aircraft opens new US headquarters in Washington," Aerospace Technology, May 13, 2019.
54 "Gross Domestic Product by State: 4th Quarter and Annual 2019", Bureau of Economic Analysis, April 7, 2020.
55 "New law gives Texas aerospace industry a tax break. Will it affect property tax relief?," Fort Worth Star-Telegram, January 2, 2020.
56 "Lockheed Martin lands $34 billion contract to build nearly 500 F-35 fighter jets," Fort Worth Star-Telegram, October 29, 2019.
57 "Raytheon expanding $5 billion Texas presence with new McKinney facility, 500 high-tech jobs," The Dallas Morning News, August 22, 2019.

aerospace manufacturing industry, now home to more than 200 aerospace maintenance and defense aviation companies, such as Boeing, GE Aviation, Lockheed Martin, Cessna and others — as well as more than 400 suppliers.[58] The state's manufacturing workforce of about 460,000 is the tenth largest in the nation.[59]

Major US military bases Fort Bragg, Camp Lejeune and Seymour Johnson enhance the state's A&D ecosystem, as do its deep-water ports in Wilmington and Morehead City.[60] In December 2019, Aircraft Solutions USA announced plans for a $100 million aircraft recycling facility at Lenoir County's Global TransPark, which is expected to create 475 jobs.[61] In August 2019, Honda Aircraft initiated the $15.5 million expansion of its R&D facility at the Piedmont Triad International Airport in order to increase production capacity of the low-wing HondaJet, boosting the company's total investment in the state to $245 million.[62]

Notable events in other states

South Carolina

South Carolina was this year's biggest gainer, soaring from a ranking of 29 last year to 14 this year. Tailwinds included improved rankings in the index's tax policy, labor and economy categories. The state is home to approximately 400 private enterprises employing some 19,000 workers — with 5,000 jobs created over the 2011-2019 period. Sales of aircraft exports totaled $12.4 billion in 2019, up 56% from the previous year.[63] Boeing South Carolina — which assembles the 787 Dreamliner jet and other commercial aircraft programs in North Charleston — alone employs nearly 7,000 workers.[64] The state is also home to Boeing Research & Technology, IT Center of Excellence, Propulsion Systems, Interiors Responsibility Center, and Engineering Design Center, and it manufactures Boeing's 787-10.

58 "North Carolina: The State of Aviation," North Carolina Department of Transportation, June 16, 2020.
59 State of North Carolina website https://www.nccommerce.com/business/key-industries-north-carolina/aerospace-defense
60 Ibid.
61 "Aircraft Solutions Investing Nearly $100M In North Carolina," Businesfacilities.com, December 20, 2019.
62 "Honda Aircraft Begins $15 Million Expansion in NC Aerospace Hub," Assembly Magazine, August 5, 2019.
63 State of South Caroline website https://www.sccommerce.com/industries/aerospace-industry
64 "Boeing dropped several hundred jobs in SC but increased employment overall," The Post and Courier, February 4, 2020.

Oklahoma

Oklahoma inched up from the 30th spot to the 28th and strengthened its position as one of the most important A&D hubs in the country. The state's A&D industry, which has a long-standing history of aviation innovation and is one of the state's fastest growing, has a workforce of some 120,000 and hosts over 1,100 aerospace entities.[65] Oklahoma's aerospace sector contributes $44 billion to the state's economy. It hosts five military installations, including Tinker Air Force Base, which has the largest MRO facility for the U.S. Department of Defense and employs more than 3,000 civilians and contractors.[66]

The state has two well-developed A&D clusters: Oklahoma City (including Tinker Air Force Base, Boeing, Northrop Grumman and FAA) and Tulsa (including American Airlines MRO). In addition, the Mike Monroney Aeronautical Center is the country's central FAA and USDOT support and training facility.[67] In May 2019, Boeing was awarded a $14.3 billion contract to redesign and test weapons systems on B-1 and B-52 bombers. Kratos Defense & Security Solutions opened a 100,000-square-foot unmanned aircraft production plant in late 2018 to manufacture its Firejet and Valkyrie advanced aircraft.[68] The state also offers workforce tax credits to aerospace companies that hire engineers.

Alabama

Alabama's ranking lifted to 11th in this year's index, up from 25th, driven in large part by improved rankings in the labor and infrastructure categories. In 2019, the state built on its steady progress toward becoming one of the nation's leading A&D hubs. Lockheed Martin broke ground on a new facility in Courtland to develop, test and produce supersonic missiles for the US Military.[69] Airbus began production of its A220 family of aircraft in Mobile and announced plans to produce at least 40 A220s annually by the middle of the next decade.[70] Also in 2019, Dynetics opened a new structures testing facility in North Alabama to produce parts of NASA's Space Launch System (SLS) Universal Stage Adapter and to carry out testing for United Launch Alliance's (ULA's) Vulcan Centaur booster.[71]

Arizona

Arizona, ranked number seven this year, persists as a solid top-10 state in our index. In 2019, Raytheon announced it will add some 1,000 jobs to work on the company's billion-dollar contract with the Pentagon to build the Standard Missile 6 system.[72] In early 2020, Raytheon announced that a new unit, Raytheon Missiles & Defense, would be headquartered in Tucson. And, in October 2019, Able Aerospace announced it would invest $9 million to expand its Mesa repair facility and add over 200 jobs.[73] Northrop Grumman announced it would expand its satellite engineering and manufacturing plant in Gilbert — and add 200 jobs — to double production capacity by 2021.[74]

65 State of Oklahoma website https://www.okcommerce.gov/doing-business/business-relocation-expansion/industry-sectors/aerospace-defense/
66 Ibid.
67 Ibid.
68 "Kratos Defense and Oklahoma Leaders Announce Future Production Home of XQ-58A Valkyrie, Celebrate Completion of First MQM-178 Firejet," Kratos company press release, April 17, 2019.
69 "Scoring recent development contracts, Lockheed bets on hypersonic missile production," Defense News, September 17, 2019.
70 "Airbus Starts Building First A220s in Mobile," AINonline.com, August 5, 2019.
71 "Aerospace structural testing facility opens in Alabama," Aerospace testing international, October 9, 2019.
72 "2020 Gold & Silver Shovel Awards Project of the Year: Raytheon Keeps Growing in Tucson," AreaDevlopment.com, Q2 2020.
73 "Mesa aerospace company opens $9 million expansion, hires hundreds of employees," Fox10 Phoenix, October 18, 2019.
74 "East Valley's aerospace, aviation and defense hub grows as Northrop Grumman expands with 200 more jobs in Gilbert," Azcentral, January 31, 2020.

Considerations for your business

The US commercial aerospace industry has braved substantial disruption in the first half of 2020, and it appears it will likely continue facing challenges on numerous fronts for the rest of the year and beyond. While this year has been a painful one for OEMs and the supplier network — especially for those furloughed or laid-off — 2020 may actually be the year that the industry can make real improvements. The current urgency is helping drive some companies to fast-track initiatives, such as greater adoption of automation and smart factory technologies, innovations in workforce and training, and rebalancing supply chains to make them more resilient.

As our state ranking demonstrates, the US has strengthened its position as the world's most important hub for production of both commercial aircraft and military systems. Going forward, the states that continue to support the growth of A&D clusters will likely continue to attract the domestic and foreign investment they need to sustain themselves through the COVID-19 recession and to continue at the forefront of innovation — not only in what they produce, but, just as important, *how* they produce.

At the same time, the industry should attend to the perennial challenges of attracting talent and nurturing the next generation of engineers and shop-floor specialists. Greater collaboration with secondary schools, technical colleges and university systems is crucial. The industry would also do well to make a strong push for apprenticeship programs, especially in the wake of high unemployment in many of the country's A&D hubs.

Appendix

Ranking methodology

Ranking calculations

The 2020 country/region and US state rankings were determined through the combination of seven category ranks. The category ranks were all weighted equally, although the measures used to determine category ranks were weighted to account for relevance and the availability of quantitative information. Weight measures were determined through a collaboration between client service professionals and industry analysts at PwC, and they can be found in the "Measure Weights for Country and State Rankings" section. Measures with null values were given the lowest possible rank. The formulas below were used to compute ranking calculations:

Provided:

$$\frac{\text{Measure value}}{\text{Measure weight}}$$

Calculations:

$$\text{Rank}_{\text{Measure i}} = \text{Rank [Measure value]}$$

$$\text{Score}_{\text{Measure i}} = \text{Weight}_{\text{Measure i}} \text{ X Rank}_{\text{Measure i}}$$

$$\text{Rank}_{\text{Category n}} = \text{Rank [Score}_{\text{Measure 1}} + \text{Score}_{\text{Measure 2}} + \ldots + \text{Score}_{\text{Measure i}}]$$

$$\text{Final country rank} = \text{Rank [Final country score]}$$

Data resources

Seven public and private independent data sources were used in calculating the 2020 country/region rankings. Paid-for subscriptions included IHS and S&P,and public domain information was obtained from global associations such as Germanwatch and the World Economic Forum. PwC's "Paying Taxes 2019" report provided thorough data for the Tax Policy category.

Methodology changes

The country and state rankings combined a total of 32 and 36 metrics this year, respectively. The use of such a diverse dataset increases ranking validity.

Measure selection

The measures used in the 2020 Aerospace Manufacturing Attractiveness Rankings came from "Facility Location Selection for Global Manufacturing."[75] In cases where we were unable to obtain detailed data for certain metrics, we used proxy data. The following illustrations show the breakouts of country and US state rankings.

Measures used in country/region rankings

Labor	Infrastructure	Industry	Geopolitical risk	Economy	Cost	Tax Policy
Labor Force Total country labor force	**Quality of Roads** Quality of Roads	**Market Size** Total aircraft and spacecraft sales	**Population** Average annual population	**GDP** Real gross domestic product	**Operating Expenses** Aerospace operating expenditure as a % of sales	**Tax Ranking** Based on the overall ranking in PwC's "Paying Taxes 2019" publication
Basic Education Pupil-to-teacher ratio in primary education	**Quality of Railroads** Railroads	**Market Profit Margin** Aircraft & spacecraft net profit over sales	**Population Growth** Annual population growth	**GDP Growth** Real GDP growth	**Trend in Capex** Annual changes in aerospace capital expenditure	
Skilled Education Skill sets of graduates	**Quality of Port Infrastructure** Efficiency of seaport services	**Market Maturity** Total aircraft and spacecraft consumption	**Strategic Risk** Overall strategic risk rating	**FDI** New Foreign Direct Investment (FDI), net capital inflow	**Labor Cost Unit** labor costs index	
Advanced Education Ease of finding skilled employees	**Quality of Air Infrastructure** Airport connectivity		**Political Risk** Overall political risk rating	**Interest Rate** Interest rate policy	**Electricity Prices** Electricity price for industrial users	
Union Flexibility Cooperation of labor-employer relations	**Internet usage** Internet users		**Sovereign Risk** Credit risk rating	**Debt** Current account balance as a % of GDP	**Labor Productivity** GDP-to-employed labor force	
	Quality of Electricity Supply Electricity infrastructure		**Climate Risk** Climate risk index	**Unemployment Rate** Annual average unemployment rate		

75 Facility Location Selection for Global Manufacturing (UWM Digital Commons at the University of Wisconsin Milwaukee, August 2013)

Measures used in state rankings

Labor	Infrastructure	Industry	Economy	Cost	Tax Policy
Labor Force Production workers' annual hours for aerospace manufacturing	**Quality of Roads** Road condition by average roughness	**Industry Size** Total value of aerospace shipments and receipts	**GSP** Real gross state product (GSP)	**Energy Cost** Average price of electricity to ultimate consumer	**Corporate Income Tax** Corporate income tax burden
Basic Education % of people over 25 who have completed high school	**Quality of Railroads** Number of freight railroads by class	**Industry Profit Margin** Total value added in aerospace products and parts mfg.	**GSP Growth** Real GSP growth	**Transportation Cost** Transportation expenditure by State & Local Govt.	**Individual Income Tax** Individual income tax rate
Skilled Education % of people over 25 who have completed a bachelor's degree	**Quality of Air Infrastructure** Public and private airports, helicopters and seaplane bases	**Industry Maturity** Level of aircraft and spacecraft consumption	**CPI** Consumer price index	**Labor Cost** Average hourly wage, manufacturing	**TEBTR** Total Effective Business Tax Rate
Advanced Education % of people over 25 who have completed an advanced degree	**Internet usage** % of household with a broadband internet subscription	**Industry Growth** Growth in manufactured goods exports	**Exports** Manufactured goods exports	**Labor Productivity** Industrial production index for total manufacturing	
Union Flexibility Union membership rates by state	**Quality of Electricity Supply** Number of major disturbances and unusual occurrences	**Number of Companies** Total number of companies in the industry	**Manufacturing Output** Total manufacturing output	**Construction Cost** Total cost over created value of construction	
Technical Workers Technical workers as a percentage of all occupations		**Number of Suppliers** Total number of manufacturing firms	**Government Subsidies** Subsidies for durable goods manufactured		
Engineers Engineers as a percentage of all occupations		**Labor Cost** Total annual payroll in aerospace manufacturing			
Air Force Contractors Number of civilian personnel permanently assigned in Air Force					
AS9100 Certifications Active certifications count					
AS9100 Certifications Active certifications count Y/Y change					

Category weights and reference metrics

Country/region metrics

Category	Sub-Category	Reference Metric	Source	Weight	Category Sum
Cost	Opex/Sales	(Aircraft & Spacecraft - Operating Expenditures) (Aircraft & Spacecraft - Sales)	IHS Aircraft & Spacecraft Industry Outlook, January 2020	10%	100%
	Labor Cost	Index: Unit Labor Costs, US$ basis	IHS Global Economics, January 25, 2020	30%	
	Electricity Prices	Electricity Price, Industrial Users, USD/kWh	BMI 2019	30%	
	Labor Productivity	Labor Productivity: GDP-to-Employed Labor Force, US$	IHS Global Economics. January 25, 2020	30%	
Labor	Labor Force	Labor Force	IHS Global Economics, February 15, 2019	20%	100%
	Basic Education	Pupil-to-teacher ratio in primary education (Ratio)	WEF Global Competitiveness Index 2019	20%	
	Skilled Education	Skillset of graduates 1-7 (best)	WEF Global Competitiveness Index 2019	20%	
	Advanced Education	Ease of finding skilled employees 1-7 (best)	WEF Global Competitiveness Index 2019	20%	
	Union Flexibility	Sum of cooperation in labor-employer relations, 1-7 (best)	WEF Global Competitiveness Index 2019	20%	
Infrastructure	Quality of Roads	Sum of quality of roads, 1-7 (best)	WEF Global Competitiveness Index 2019	15%	100%
	Quality of Railroads	Railroads 0-100 (best)	WEF Global Competitiveness Index 2019	15%	
	Quality of Port Infrastructure	Efficiency of seaport services 1-7 (best)	WEF Global Competitiveness Index 2019	15%	
	Quality of Air Infrastructure	Airport connectivity	WEF Global Competitiveness Index 2019	25%	
	Internet Usage	Internet users (% of population)	WEF Global Competitiveness Index 2019	15%	
	Quality of Electricity Supply	Electricity infrastructure 0-100 (best)	WEF Global Competitiveness Index 2019	15%	

Category	Sub-Category	Reference Metric	Source	Weight	Category Sum
Industry	Industry Size	Aircraft & Spacecraft - Sales	IHS Aircraft & Spacecraft Industry Outlook January 2020	40%	100%
	Industry Maturity	Aircraft & Spacecraft - Consumption	IHS Aircraft & Spacecraft Industry Outlook January 2020	25%	
	Industry Growth	Aircraft & Spacecraft - Sales Percent Change	IHS Aircraft & Spacecraft Industry Outlook January 2020	10%	
	Industry Profit Margin	Aircraft & Spacecraft - Net Profits / Aircraft & Spacecraft - Sales	IHS Aircraft & Spacecraft Industry Outlook January 2019	25%	
Geopolitical Risk	Population	Population: Total	IHS Global Economics, January 25, 2019	40%	100%
	Population Growth	Population: Growth Rate	IHS Global Economics, January 25, 2019	5%	
	Strategic Risk	Overall Strategic Risk	IHS Country Risk Ratings, January 28, 2019	20%	
	Political Risk	Overall Political Risk	IHS Country Risk Ratings, January 28, 2019	20%	
	Sovereign Risk	Credit Risk Rating	S&P Capital IQ, December 31, 2019	10%	
	Climate Risk	Climate Risk Index	Germanwatch Climate Risk Index 2020	5%	
Economy	Outside Investment	BOP Direct Investment Balance or Net FDI (Net Capital Inflow), % of GDP	IHS Global Economics, January 25, 2020	5%	100%
	Interest Rates	Interest Rate: Policy	IHS Global Economics, January 25, 2020	5%	
	Debt/GDP	Current Account Balance as a % of GDP	IHS Global Economics, January 25, 2020	5%	
	Unemployment Rate	Unemployment Rate	IHS Global Economics, January 25, 2020	35%	
	GDP	Real GDP (Gross Domestic Product), US$	IHS Global Economics, January 25, 2020	40%	
	GDP Growth	Real GDP, Growth Rate, Year-on-Year	IHS Global Economics, January 25, 2020	10%	
Tax Policy	Overall Tax Ranking	Overall Tax Ranking	PwC Paying Taxes 2020	100%	100%

State metrics

Category	Sub-Category	Reference Metric	Source	Weight	Category Sum
Cost	Energy Cost	Average Price of Electricity to Ultimate Customers by End-Use Sector, Industrial	EIA Electric Power Monthly (September 2018 and 2017 YTD Data)	20%	100%
	Transportation Cost	Transportation Expenditures by State and Local Governments, Total	DOT BTS State Transportation Statistics	15%	
	Labor Cost	Average Hourly Wage, Manufacturing	US Census Bureau - American Fact Finder	25%	
	Labor Productivity	Industrial Production Index, Total Manufacturing	IHS US Regional Economics 2020	25%	
	Construction Cost	NAICS 023 Construction—Total Costs/ Total Value Created	US Census Bureau - American Fact Finder	15%	
Labor	Labor Force	Aerospace product and parts manufacturing - Production Workers Annual Hours	US Census Bureau - American Fact Finder	10%	100%
	Basic Education	Percent of people 25 years and over who have completed high school	US Census Bureau - American Fact Finder	5%	
	Skilled Education	Percent of people 25 years and over who have completed a bachelor's degree	US Census Bureau - American Fact Finder	10%	
	Advanced Education	Percent of people 25 years and over who have completed an advanced degree	US Census Bureau - American Fact Finder	10%	
	Union Flexibility	Union Membership Rates by State	Bureau of Labor Statistics	10%	
	Technical Workers	Technical Workers as a Percentage of All Occupations	National Science Board	10%	
	Engineers	Engineers as a Percentage of All Occupations	National Science Board	20%	
	Air Force Contractors	Number of civilian personnel permanently assigned in Air Force	US Department of Defense	10%	
	AS9100 Certifications	Active Certifications Count	Global Aero Clusters	7.5%	
	AS9100 Certifications	Active Certifications Y/Y Change	Global Aero Clusters	7.5%	

Category	Sub-Category	Reference Metric	Source	Weight	Category Sum
Infrastructure	Quality of Roads	Table 1-4: Road Condition	DOT BTS State Transportation Statistics	20%	100%
	Quality of Railroads	Table 1-13: Number of Freight Railroads by Class	Association of American Railroads	20%	
	Quality of Air Infrastructure	Table 1-10: Public and Private Airports, Heliports and Seaplane Bases	DOT BTS State Transportation Statistics	20%	
	Internet Usage	Percent of Households with a Broadband Internet Subscription	US Census Bureau - American Fact Finder	20%	
	Quality of Electricity Supply	Major Disturbances and Unusual Occurrences	DOE Office of Electricity Delivery & Energy Reliability	20%	
Industry	Industry Size	Aerospace product and parts manufacturing - Total value of shipments and receipts for services	US Census Bureau - American Fact Finder	20%	100%
	Industry Profit Margin	Aerospace product and parts manufacturing - Value added	US Census Bureau - American Fact Finder	5%	
	Industry Maturity	Manufacturing share of total GSP	NAM Manufacturing Data Table (2019)	5%	
	Industry Growth	Growth in Manufactured Goods Exports	NAM Manufacturing Data Table (2019)	20%	
	Number of Companies	Aerospace and Defense Firms	Capital IQ Company Screening Report	20%	
	Labor Cost	Aerospace product and parts manufacturing - Annual Payroll	US Census Bureau - American Fact Finder	10%	
	Number of Suppliers	Manufacturing Firms	NAM Manufacturing Data Table (2019)	20%	

Category	Sub-Category	Reference Metric	Source	Weight	Category Sum
Economy	GDP	Real Gross State Product (GSP)	IHS US Regional Economics 2019	10%	100%
	GDP Growth	Real GSP Growth	IHS US Regional Economics 2019	20%	
	Consumer Price Index	Consumer Price Index (CPI)	IHS US Regional Economics 2019	5%	
	Manufacturing Output	Total Manufacturing Output	IHS US Regional Economics 2019	30%	
	Exports	Manufactured Goods Exports	NAM Manufacturing Data Table (2019)	30%	
	Subsidies	Subsidies, Durable Goods Manufacturing	BEA - Regional Data 2019	5%	
Tax Policy	Individual Income Tax	Individual Income Tax Rate	2018 State Business Tax Climate Index	20%	100%
	Corporate Income Tax	Corporate Income Tax Rate	2018 State Business Tax Climate Index	40%	
	TEBTR	Total Effective Business Tax Rate	Total state and local business taxes 2019	40%	

Top 100 country/region rankings

Country/region	Final Rank	Cost	Labor	Infrastructure	Industry	Geo-Political Risk	Economy	Tax Policy
United States	**1**	4	3	8	1	3	6	25
Singapore	**2**	15	6	4	2	14	11	7
Canada	**3**	3	1	20	6	4	31	19
South Korea	**4**	14	45	2	19	7	12	21
Japan	**5**	37	9	1	10	1	5	51
Australia	**6**	1	27	17	24	6	18	28
United Kingdom	**7**	20	5	10	17	10	16	27
Germany	**8**	43	7	7	5	2	7	46
Switzerland	**9**	13	15	14	25	15	9	20
Hong Kong	**10**	21	14	3	39	34	29	2
Finland	**11**	2	13	13	32	19	54	10
Netherlands	**12**	22	11	5	36	12	28	22
Ireland	**13**	12	29	28	30	37	8	4
Sweden	**14**	11	12	15	20	13	41	31
Taiwan	**15**	18	25	6	28	23	13	39
Denmark	**16**	17	24	9	61	25	34	8
Israel	**17**	31	23	22	18	49	17	13
Malaysia	**18**	27	7	19	16	8	10	80
Norway	**19**	7	32	23	50	18	24	34
Spain	**20**	32	40	11	4	21	50	35
France	**21**	25	35	12	8	5	60	61

Country/region	Final Rank	Cost	Labor	Infrastructure	Industry	Geo-Political Risk	Economy	Tax Policy
New Zealand	**22**	23	51	29	37	30	37	9
Austria	**23**	10	39	17	53	20	30	44
United Arab Emirates	**24**	5	4	37	29	52	51	30
Qatar	**25**	8	31	39	47	62	33	3
China	**26**	33	10	30	7	11	1	105
Russia	**27**	44	38	38	11	33	26	58
Belgium	**28**	26	46	16	33	32	42	63
Thailand	**29**	41	50	40	38	17	3	68
Turkey	**30**	6	87	33	12	54	69	26
Portugal	**31**	35	47	24	62	29	43	43
Poland	**32**	51	90	31	13	22	4	77
Indonesia	**33**	54	17	49	48	16	15	81
Philippines	**34**	47	2	69	26	27	21	95
Czech Republic	**35**	55	70	44	45	31	19	53
Morocco	**36**	45	76	50	26	35	73	24
Romania	**37**	56	101	63	35	50	20	32
Vietnam	**38**	38	67	55	56	9	2	109
Chile	**39**	40	19	27	66	36	61	86
Mexico	**40**	57	34	43	3	46	23	120
India	**41**	60	26	45	21	26	32	115
Italy	**42**	34	73	21	15	28	45	128
Saudi Arabia	**43**	28	22	25	69	63	38	57

Country/region	Final Rank	Cost	Labor	Infrastructure	Industry	Geo-Political Risk	Economy	Tax Policy
Hungary	**44**	49	122	51	42	39	27	56
Kuwait	**45**	62	106	78	23	106	25	6
South Africa	**46**	36	82	53	46	42	95	54
Greece	**47**	24	91	32	52	68	78	72
Slovakia	**48**	46	116	60	67	45	56	55
Egypt	**49**	19	61	48	58	43	39	156
Ukraine	**50**	74	55	62	22	89	75	65
Bulgaria	**51**	48	112	58	51	76	66	97
Peru	**52**	42	102	79	57	38	47	121
Colombia	**53**	58	30	68	65	44	65	148
Costa Rica	**54**	65	41	97	41	89	73	66
Brazil	**55**	29	108	70	14	24	58	184
Iran	**56**	9	95	64	44	112	87	144
Argentina	**57**	30	72	66	59	59	68	170
Estonia	**58**	61	86	34	76	60	55	12
Tunisia	**59**	16	114	77	63	93	108	108
Pakistan	**60**	77	18	75	33	51	57	161
Lithuania	**61**	53	102	41	76	75	63	18
Luxembourg	**62**	67	56	26	76	78	44	23
Oman	**63**	131	54	56	43	64	129	11
Kenya	**64**	108	16	84	55	57	80	94
Bahrain	**65**	111	78	47	63	102	137	1

Country/region	Final Rank	Cost	Labor	Infrastructure	Industry	Geo-Political Risk	Economy	Tax Policy
Ghana	**66**	76	19	105	49	47	62	152
Latvia	**67**	63	93	46	76	84	82	16
Iceland	**68**	64	43	52	76	55	85	42
Bangladesh	**69**	107	74	87	9	72	14	151
Slovenia	**70**	71	69	42	76	74	49	45
Kazakhstan	**71**	72	60	59	76	41	36	64
Sri Lanka	**72**	70	37	57	71	71	64	142
Nigeria	**73**	73	75	108	31	73	77	159
Croatia	**74**	59	137	34	76	66	70	49
Panama	**75**	66	98	54	68	69	87	176
Jordan	**76**	94	42	61	70	116	106	62
Cyprus	**77**	68	57	67	76	86	100	29
Ecuador	**78**	89	53	93	40	100	79	147
Uruguay	**79**	69	118	82	72	56	104	103
Azerbaijan	**80**	118	28	36	76	91	72	40
Zambia	**81**	80	51	119	76	76	84	17
Senegal	**82**	100	36	94	74	40	48	166
Mauritius	**83**	100	77	85	76	87	99	5
Malta	**84**	75	89	86	76	114	59	78
Algeria	**85**	39	64	73	76	79	93	158
Serbia	**86**	81	81	71	76	83	90	85
Cameroon	**87**	79	48	121	75	80	52	181

Country/region	Final Rank	Cost	Labor	Infrastructure	Industry	Geo-Political Risk	Economy	Tax Policy
Venezuela	**88**	50	62	112	73	168	91	189
Angola	**89**	51	110	138	76	70	86	106
Ethiopia	**90**	78	84	103	76	65	22	132
Côte d'Ivoire	**91**	127	21	101	76	53	35	114
Georgia	**92**	122	132	65	76	131	98	14
Namibia	**93**	82	80	80	76	82	121	88
Moldova	**94**	123	120	90	76	147	81	33
Honduras	**95**	87	109	113	54	142	128	167
Botswana	**96**	90	128	104	76	67	111	59
Macedonia	**97**	114	135	88	76	137	110	37
Guatemala	**98**	96	44	115	76	85	116	104
Dominican Republic	**99**	110	62	76	76	88	89	150
Mongolia	**100**	119	111	109	76	113	101	71

Complete state rankings

State	Final Rank	Cost	Labor	Infrastructure	Industry	Economy	Tax Policy
Georgia	**1**	10	12	1	5	10	4
Ohio	**2**	30	15	6	4	4	1
Washington	**3**	33	3	17	1	3	13
Texas	**4**	37	8	20	2	1	25
North Carolina	**5**	19	21	12	7	7	2
Indiana	**6**	22	33	3	10	14	3
Arizona	**7**	15	17	15	6	19	8
Michigan	**8**	27	9	28	14	12	7
Florida	**9**	39	23	2	8	6	18
California	**10**	47	6	22	3	2	43
Alabama	**11**	12	22	16	8	24	20
Colorado	**12**	40	1	14	23	27	10
Virginia	**13**	26	5	26	22	23	12
South Carolina	**14**	9	18	46	16	11	17
Illinois	**15**	38	16	4	13	5	44
Tennessee	**16**	7	38	9	27	13	22
Missouri	**17**	31	35	25	18	21	6
Utah	**18**	14	11	41	31	26	5
Kansas	**19**	24	13	11	17	36	22
Oregon	**20**	29	14	13	19	22	33
Kentucky	**21**	5	44	27	25	25	15

State	Final Rank	Cost	Labor	Infrastructure	Industry	Economy	Tax Policy
New York	**22**	42	24	19	12	8	47
Pennsylvania	**23**	35	34	24	15	9	40
Massachusetts	**24**	51	2	34	24	15	30
Maryland	**25**	46	4	10	30	32	27
Connecticut	**26**	50	7	36	11	28	32
Arkansas	**27**	4	46	38	28	33	8
Oklahoma	**28**	8	31	48	21	30	19
Idaho	**29**	3	29	7	46	37	28
Louisiana	**30**	23	45	36	20	18	29
Nevada	**31**	1	51	39	34	29	14
Wisconsin	**32**	43	26	35	26	16	35
Minnesota	**33**	49	19	7	29	20	46
Iowa	**34**	18	41	30	33	30	41
New Hampshire	**35**	32	10	31	36	34	42
New Mexico	**36**	16	20	50	35	38	31
New Jersey	**37**	48	25	18	32	17	48
Wyoming	**38**	17	43	33	40	42	16
Delaware	**39**	6	32	21	47	47	36
Mississippi	**40**	11	49	43	38	35	26
Montana	**41**	2	37	23	48	48	39
Nebraska	**42**	21	42	32	37	39	34
North Dakota	**43**	28	40	39	39	41	22

State	Final Rank	Cost	Labor	Infrastructure	Industry	Economy	Tax Policy
South Dakota	**44**	13	48	29	49	50	11
Alaska	**45**	45	27	5	50	46	21
Rhode Island	**46**	25	36	50	43	40	37
West Virginia	**47**	19	50	44	42	43	45
Vermont	**48**	41	30	42	45	44	50
Maine	**49**	34	38	49	44	45	49
District of Columbia	**50**	36	28	47	40	49	51
Hawaii	**51**	44	47	45	51	51	38
Puerto Rico	**52**	52	52	52	52	52	52

Contacts

To have a deeper conversation about the aerospace manufacturing industry and the issues discussed in this paper, please contact one of the following:

Scott Thompson
Partner, US Aerospace & Defense leader
413.441.2702
scott.thompson@pwc.com

Cihan Ergul
Manager, PwC Intelligence
646.456.2143
cihan.ergul@pwc.com

About the PwC Aerospace & Defense practice

Imagine the power of 236,000 people with a common purpose — building relationships that create value for you and your business. That's PwC. Our people work with clients in the Aerospace & Defense (A&D) industry to build the value they seek.

Our A&D practice focuses on providing audit and assurance, tax and consulting services to many of the world's most successful companies. We leverage our diverse knowledge, experience and solutions to help companies meet the challenges and opportunities of doing business in the US market, and beyond. The depth and focus of our industry-specific training, thought leadership and professional global network demonstrates our commitment to the A&D industry in addressing complex issues that impact bottom-line performance.

At PwC, our purpose is to build trust in society and solve important problems. Find out more and tell us what matters to you by visiting us at www.pwc.com/us.