

# **Washington State Space Industry: Opportunities for Aerospace Suppliers**

**Summary Report  
January 2021**



## THE PROJECT

In the fall of 2020, the Snohomish County Economic & Workforce Recovery Task Force, in partnership with the Aerospace Futures Alliance (AFA), launched the Snohomish County Aerospace Resiliency Plan. The primary objective of this initiative was to develop actionable COVID-19 recovery and resiliency solutions for aerospace companies in Snohomish County.

As one part of this effort, AFA retained a team of space and satellite industry consultants to interview local space and satellite businesses and space industry experts. The goal of these interviews was to determine the extent of potential new business opportunities for Snohomish County aerospace businesses to supply to the growing Washington State space industry. This project was completed in December 2020, and this report summarizes the findings.

In addition to surveying the Washington State space industry, the consultants delivered a 90-minute educational webinar to Snohomish County aerospace companies. It offered a comprehensive introduction to the space industry, including market size and trends, and details about the space economy in Washington state. It also provided an aggregated summary of the potential supply needs of Washington state space companies and recommendations for selling and marketing to space companies based on insights captured from the interviews. Webinar attendees received a space reference information package with additional information on the space industry. The consultants also developed a marketing guide for Snohomish County aerospace companies looking to expand or pivot into the space industry. Finally, the consultants created a concept plan for marketing the Washington state space economy to drive greater awareness, engagement, and opportunity in the future.

## ABOUT THE AEROSPACE FUTURES ALLIANCE

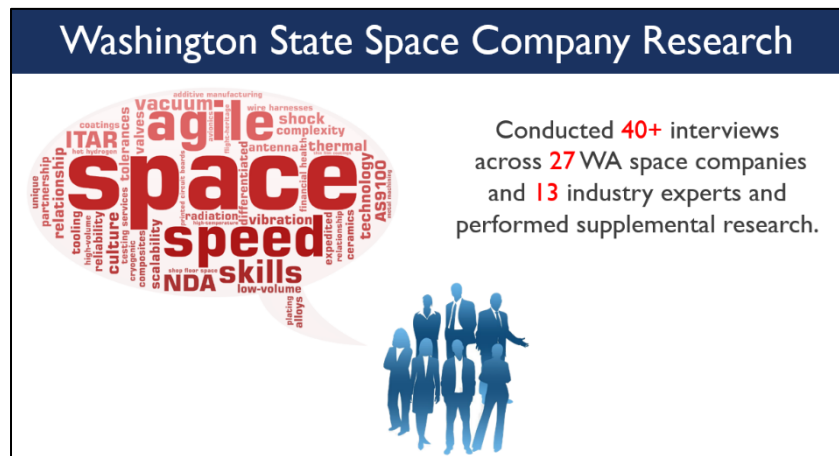
The Aerospace Futures Alliance advocates for Washington's aerospace industry and helps member companies connect and grow. Led by a coalition of leading aerospace employers in the state, AFA seeks to keep Washington State the recognized center of aerospace innovation and excellence around the world and to strengthen the state's aerospace industry year after year. Since its founding in 2006, AFA has achieved this vision through its efforts in advocacy and policy development, workforce development, training and education, and market intelligence. Get engaged at [www.afa-wa.com](http://www.afa-wa.com).

## PROJECT METHODOLOGY

The consultants interviewed 27 space industry companies located in Washington State and consulted with 13 space industry experts. The space companies contacted represented all segments of the space value chain: satellite components and manufacturing, launch vehicle manufacturers and service providers, satellite operators for both telecommunications and remote sensing, in-space services, ground station services, and space data analytics and information products.

During each interview, the team asked a series of questions with the goal of understanding the opportunities and challenges of supplying to the space industry and identifying the supply needs of Washington State space companies. The consultants captured this information by asking interviewees the following questions:

- What do you source externally today?
- Are there gaps that external suppliers could help you address?
- What are the most important capabilities you need from your suppliers?
- What advice would you offer aerospace companies looking to supply to the space industry?



The findings from the interviews were captured by the consultants and aggregated in an anonymized fashion. This report summarizes the overall findings. Throughout this document, paraphrased (approximate) quotations are included to give a sample of interviewee perspectives.

## KEY FINDINGS: SUPPLYING TO THE SPACE INDUSTRY

The consultants concluded that there are indeed opportunities for aerospace suppliers to provide products and services to the space and satellite industry in Washington State. However, complexities and nuances were identified that aerospace suppliers should understand before deciding whether or how to pursue space industry business in Washington State.

One example is the significant difference in supply needs identified for the traditional space industry relative to newer space initiatives and companies. Traditional space companies often manufacture and buy in low volume and have complex technical and performance requirements. By contrast, some of the newer space companies expect to manufacture in higher volumes and can trade some component or part-level performance in return for flexibility, faster turnarounds, and significantly lower cost.

There are also significant cultural and business practice differences among space companies. Newer, entrepreneurial space companies often exhibit cultural attributes and business models that borrow as much or more from the software and tech sectors than they do from aerospace. These newer entrepreneurial space companies are the dominant type in the Washington State space economy.

## CONSIDERATIONS FOR SUPPLYING TO SPACE COMPANIES

The consultants identified four key considerations applicable to aerospace companies interested in supplying to the space industry today: (1) Technical Excellence; (2) Standards and Certifications; (3) Manufacturing Volume; and (4) Space-Industry Culture and Business Practices.

### **Consideration: Technical Excellence**

Technical and performance requirements for space products vary greatly. Some space applications have significantly more demanding requirements for materials, performance or testing than the aviation industry. In other cases, aviation may have more stringent requirements. While the required level of technical excellence is application specific, interviewees more often emphasized the higher tolerances and standards necessary for spaceflight.

Key findings from the interviews include:

- Space companies want to understand the technical differentiators that enable a supplier to bring value to the space company. They want assurance that a supplier can meet demanding or specialized requirements for space applications. These considerations are often more important to the space company than understanding a supplier's existing products or services.
- Some space companies are building assemblies or satellites in larger volume and with shorter design lifetimes than traditional space programs. They may have less stringent requirements for reliability in some cases but will likely demand lower costs, more flexibility, and faster delivery.
- Some space companies may be willing to partner with capable suppliers to help them transition to space products and services. This is applicable when a supplier has a truly valuable capability and can meet scale, cost, and performance requirements.

*"Aerospace manufacturing capability should transfer to space, since the systems and electronics are at the top end of precision."*

*"I wonder if lower tier aerospace suppliers can build the very high tolerance components needed for long-duration [spaceflight]."*

*"The leap to space isn't all that difficult. Having a good quality system is key, since end-to-end standards are higher in space."*

*"Requirements are completely different for space than for aviation."*

*"[For some space applications] scalability is more important than component functionality. Resiliency can be achieved at the system level."*

### **Consideration: Standards and Certification**

Many space companies identified the importance of standards and certifications that apply to the space industry. Larger and more established companies frequently cited key certifications, such as AS9100, as “must have” table stakes for suppliers. By contrast, smaller and earlier-stage space companies usually cited key certifications as “good to have”.

The top two certification and compliance requirements cited were:

- Quality assurance and traceability (AS9100)
- US export controls and compliance requirements for space technology (ITAR)

*“AS9100 certification is the big one. This comes down from the end customer.”*

*“We’ve been flowing more requirements down to our subcontractors, such as AS9100 compliance.”*

*“[Big space companies] need to ensure suppliers are ITAR and export compliant.”*

Other standards mentioned by interviewees:

- Environmental verification requirements set by NASA and the space supply chain (GEVS 7000);
- Corrosion resistance requirements for certain space parts and assemblies (Table I materials from MSFC-STD-3029); and
- Software development requirements for mission critical systems (DO178C).

### **Consideration: Manufacturing Volume**

Space company representatives and industry experts believe that low volumes in the space industry, relative to commercial aviation, are the primary challenge for aerospace suppliers interested in space. This was perhaps the biggest single takeaway from all the interviews. Historically, space is a smaller sector than commercial or military aviation. Many space vehicles are one-off creations with, at best, a need to produce a few extra articles for testing.

*“Aerospace companies are used to volume. Space doesn’t usually offer volume.”*

*“The space industry is heavy on engineering, but light on volume manufacturing. There are limited machine shop opportunities.”*

However, interviewees do anticipate higher volumes for the space industry going forward. The advent of larger constellations of small satellites for communications, remote sensing and other applications is a key driver of this trend. Small satellites typically have shorter design lives and operate in a relatively more benign space environment. Resiliency can often be achieved at the architecture level. This

enables a faster, more risk-tolerant approach to design, development, and testing. It leads to a business model that demands a significantly lower cost structure and places a premium on supplier scalability. In the future, additional volume opportunities might come from space tourism, in-space operations and services, and other emerging space sectors.

*“We’re not so concerned about the ability of aviation companies to scale.”*

*“We are particularly open to outsourcing outside of the space industry given higher scalability [experience in other industries].”*

While this shift to higher volumes is underway in some segments of the space Industry, it’s still early. Many aerospace suppliers will not be able to easily access higher-volume opportunities in the near term. Aerospace suppliers will need to learn about the space industry, understand its diverse requirements by application and segment, and build credibility around their key technical differentiators. New suppliers will have to prove an ability to meet space needs, often by supplying in low volumes initially.

### **Consideration: Space-Industry Culture & Business Practices**

Like any industry, the space business has its own culture and language. While the traditional space sector shares many attributes with aviation and defense, newer entrepreneurial space companies typically have a culture and pace this is more like the technology and software industries. For the most part, members of the Washington State space ecosystem embody this new commercial space ethos. As the only major space cluster in the United States without a significant federal government space presence, the Seattle-area is probably the purest commercial space hub in the country. The most successful suppliers to the region’s space industry will likely be those who understand and embrace the entrepreneurial space culture and business practices.

Key findings from the interviews include:

- Space companies, especially some of the larger players in highly competitive markets, can be very secretive. They are hesitant to share information about their supply chain and requirements. Typically, they will not discuss these topics in detail without an NDA and a strong business rationale.
- As the space industry matures and manufacturing volumes increase, there is a trend to embrace a more standardized approach to design, development, and production. Commercial-off-the-Shelf (COTS) components for space may represent a growing opportunity for aerospace suppliers.
- While vertical integration may be a preferred strategy for some or many entrepreneurial space companies around the world, none of the Washington State space companies interviewed in this study mentioned vertical integration as an explicit, blanket strategy for their operations. Rather, interviewees who spoke about their outsourcing strategy tended to endorse a pragmatic, case-by-case approach to determining what elements to outsource or keep in house.

- The space ecosystem is small and tight knit but passionate and open to compelling new solutions. As is often the case for any business entering a new market, there is no replacement for “sweat equity.” New suppliers to the space industry will have to do their homework and pay their dues to earn credibility and win business.

*“We can’t share the types of products or services we need. This is propriety and sensitive. We look to the supply base for less proprietary things.”*

*“Suppliers showing promise are [often] outside of aerospace. Traditional aerospace companies struggle heavily to meet our needs due to speed.”*

*“Businesses need to have a realistic view on how to make a living in space ecosystems...figuring out their niche is extremely important.”*

*“We want suppliers who are financially strong and very transparent.”*

## SPACE COMPANY NEEDS

Based on space company interviews, the consultants identified four areas of potential supply needs for the Washington State space industry: (1) Specialized Machine Shops; (2) Testing Capacity and Scale; (3) Specialized Components; and (4) People, Skills and Recruiting.

### **Need: Specialized Machine Shops**

Many Washington State space companies cited the need for low volume, high complexity, rapid prototyping of specialized parts. Speed and flexibility are important to them. They are often looking for specialized materials, such as ceramics, composites, exotic alloys, or forged components. Demanding technical requirements are common, often related to high temperature, high pressure, and high stress on components and assemblies.

#### **Specialized Machine Shop Needs**

- Low volume, high complexity, rapid prototyping of specialized parts – speed and flexibility is important
- Ceramics precision machining – high temperature capable e.g., Silicon Carbides, Zirconium Carbide
- High temperature alloys and exotic material machining
- Forged components – pressure vessels, nozzles, pipes, high temperature alloys, turbo pumps
- Carbon fiber machining and fabrication for austere environments – lightweight, tough, UV and radiation resistant, thermal extremes

*“We are open to new machining and assembly suppliers with high quality and competitive prices.”*

*“[Standard] metallurgy and machining are things I worry the least about. There is so much supply out there.”*

*“We use outside machine shops for specialty work or expedited schedule recoveries.”*

### **Need: Testing Capacity and Scale**

Many of the space companies interviewed indicated that they work with external testing providers to meet specialized needs and to test large components and assemblies. They would prefer not to build out their own large-scale testing facilities and capabilities if they can purchase testing services externally. High performance, fast turnarounds, and flexibility are important requirements.

#### **Testing Capacity and Scale**

- Super high-quality, rapid turnaround testing support
- Testing support for vibration, shock, thermal at extreme stress levels
- Testing for larger components and assemblies
- Thermal vacuum testing for satellites
- Radiation testing for components and assemblies
- X-ray, ultrasound, and other forms of non-invasive testing of deep welds and assemblies
- Hot hydrogen testing at temperatures up to 2,000-3,000 Kelvin

Several of the interviewees suggested that testing services might be a good potential entry point into the space industry for aerospace suppliers. This “tip of the spear” strategy could enable a supplier to gain a foothold and establish credibility and skills. A successful testing services supplier could then expand and scale to additional business opportunities.

*“Testing is a big area of need. Vacuum chambers, vibration and burst testing are needed by space companies.”*

*“The space industry provides opportunities for testing, electronics, and specialized components.”*

*“Testing services might be a good entry point for suppliers who could then leverage that to grow into manufacturing subsystems.”*



### **Need: Specialized Components**

The need for specialized components and technologies were commonly mentioned by interviewees. Commercial-off-the-shelf (COTS) components are gaining traction for small satellites and for large constellations where lower costs are critical. However, the need for specialized, application-specific components and materials remains dominant for now.

#### **Specialized Components & Materials**

- Specialized, custom PCB design and fabrication
- Reaction wheels for satellite control
- Optics for star tracking and remote sensing payloads
- High strength synthetic fiber materials
- Active RF components, such as Low Noise Amplifiers
- Cryogenic equipment to handle liquid Oxygen and Hydrogen
- Control systems for instrumentation and actuators
- Digital and analog electronics for small satellites
- Valves and heaters for satellites
- Specialized coatings for tooling and components
- Cubesat components
- Radiation hardened flight computers and power systems
- Commercial-off-the-shelf (COTS) components
- Hermetically sealed custom packaging
- Precision, small-size additive manufacturing

### **Need: People, Skills and Recruiting**

Workforce needs were mentioned by many of the interviewees. Recruiting and hiring qualified talent is clearly a significant challenge for Washington State space companies. Many roles require a combination of a specific educational background and significant hands-on experience. The sweet spot seems to be people with relevant engineering, systems architecture or computer science degrees and 8-10 years of space industry experience.

The space workforce gap represents an opportunity for talented people in the local aerospace industry who are interested in transitioning into the space sector. This may also provide interim opportunities for skilled professionals who are currently furloughed.

While the difficulty filling engineering positions is among the most acute challenges for local space companies, there may be opportunities for aerospace suppliers to hire out a variety of skilled technical staff as augmentation resources. In some cases, a differentiated aerospace supplier might be an interesting acquisition target for a rapidly expanding space company.

## ENGAGING WITH THE SPACE INDUSTRY

### Marketing – Getting the Message Out

Space companies had good advice for aerospace suppliers when it comes to marketing. In essence, they said, “Up your game.” Many of the space and satellites businesses expressed a preference for researching relevant suppliers independently on their own timeline. For would-be suppliers, this places a premium on having an effective marketing program to create broad awareness. A modern web site and an engaging online presence that reflects space-specific messaging and thought leadership are key success factors for suppliers to the space industry.

*“Suppliers need to be good at their own marketing. If they are not, then we are probably not finding them.”*

*“Suppliers need to invest in their web sites. Getting relevant information from a web site is super helpful.”*

*“We find suppliers on our schedule by using Google search or databases.”*

### Networking – Making Key Connections

Many space companies and industry experts told of a common practice of finding new suppliers by asking employees or trusted colleagues about their prior experiences with suppliers or their existing knowledge of the supply base. This points out the need for aerospace suppliers to do effective, ongoing networking within the local space community. It pays for suppliers to stay in touch with key customer contacts as they move to new companies over the course of their careers. It also suggests the importance of leveraging customer references and case studies whenever possible.

*“Previous supplier relationships have come in part from word of mouth. People bring those relationships from previous jobs.”*

*“[We get a lot of our] new suppliers from people who come into [our company] from other jobs and had good experiences previously with certain suppliers.”*

*“[Selling to space companies] all comes down to networking. Networking with the [local space] community is potentially very powerful.”*

Finally, according to space industry experts, it is important for aerospace suppliers to leverage modern social media tools such as LinkedIn and Twitter to cultivate company and personal branding online. The modern space industry are avid users of online tools and social media. Space companies and their employees operate more like tech companies than traditional aerospace companies in this regard.

### **Selling – Speak the Language**

Space companies were not shy about offering suggestions for how suppliers could sell to them more effectively. Not surprisingly, they prefer suppliers who can speak the language of space and can clearly articulate a unique and relevant value proposition.

*“Suppliers need to know their value proposition well and be able to articulate it clearly. A lot of companies haven’t thought this through.”*

*“You have to know your customer’s problem better. You have to be the expert [in how your product will be used].”*

*“Unsuccessful suppliers talk about what they do, rather than what makes them valuable to us.”*

In general, Washington State space companies seem very open to working with local suppliers if they have the requisite capability. Some interviewees cited a strong preference for working with local suppliers whenever possible. However, some Washington State space companies are part of larger organizations in which most supply chain procurement decisions are made centrally and out of state.

*“We prefer working with local companies because of ease of working face to face and [reduced] lead times.”*

*“We use outside machine shops for lots of parts, specialty work or expedited schedule recoveries. We like to work with suppliers in Washington.”*

*“Our procurement decisions are made at corporate, not local to the region here.”*

Space industry experts advised aerospace suppliers to pay attention to which space companies are winning contracts, taking new orders, or receiving grant dollars. This “follow the money” approach can help drive a more focused selling strategy. Often it pays to engage with a space company when they are in research, development, test and evaluation phase for a new technology, product, or service. The size of the initial opportunity may be small, but the relationship could pay dividends over the long run.

Finally, feedback from space companies suggests that a one-size-fits-all sales strategy is unlikely to be effective. Smaller space companies may not have a supply chain management function. In this case, aerospace suppliers may need to work directly with Engineering or the Chief Technology Officer. By

contrast some mature or larger space companies have established buyers and supply chain professionals and may not look kindly on suppliers who circumvent their preferred process.

### **Supplier Database**

Several space companies thought it could be valuable to have access to a database of local aerospace companies they could use to source new suppliers. To be useful, the data would have to be independently vetted and kept up to date.

*“It would be valuable to have a database of potential suppliers if it were properly maintained. We could point our people to it, then do RFIs and narrow the list from there.”*

*“It would be good to have a database of who’s out there locally and what they do. This could be good for the whole ecosystem in Washington and help others outside our region find companies here.”*

### **SUMMARY**

The global space industry is dynamic and growing. This is especially true in the United States where entrepreneurial space companies are making headlines and disrupting traditional space business models. The Washington State space economy is a small but rapidly growing space ecosystem that is perhaps the purest commercial space hub in the country.

Interviews with Washington State space companies suggest there are opportunities for aerospace suppliers in our region to support and benefit from the growth of the local space economy. However, it’s certainly a case-by-case decision for suppliers. For some aerospace suppliers, pivoting to the space industry would be inappropriate due to complexity, cost, and volume considerations. For others, expanding into the space industry could diversify their business and provide a valuable long-term opportunity for growth.

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*“The aerospace supply base in Snohomish County has great assets for growth. It is broad, ready, diverse and pretty unparalleled.”*

*“There’s no one answer on whether aerospace suppliers can pivot to space. There is a big spectrum of capabilities in the supply base, and it’s really a case-by-case situation.”*

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## CONCLUSION

The consultants would like to thank the Aerospace Futures Alliance and Snohomish County for making this effort possible. This was a successful project that uncovered a wealth of information about the Washington State space economy, the supply needs of Washington State space companies, and best practices for aerospace suppliers to engage with space companies.

Snohomish County aerospace companies who participated in the webinar or received the follow-up information are now better informed about the opportunities and challenges of supplying to the space industry and meeting its unique requirements. The project also raised awareness within Washington State space companies of the capability of local aerospace suppliers and the importance of leveraging this unique asset in our region.

There is a compelling opportunity to harness the combined capability of our region's tremendous strengths in information technology, aerospace, and space to drive economic growth for Washington State in the 21<sup>st</sup> Century. Success will require active leadership and support from Washington State's space sector. Organizations like the Aerospace Futures Alliance and the Washington State Space Coalition can play a critical role in organizing the effort on behalf of the aerospace industry. In collaboration with State and local governments and the academic sector, the industry can position Washington State for long-term leadership in the dynamic, growing space economy of the future.

## PROJECT TEAM

Alliance Velocity was pleased to assemble and coordinate a team of experts for delivery of this project to AFA:

- Stan Shull – Alliance Velocity, LLC
- Matt Bancroft – BlueLines Consulting, LLC
- Sean McClinton – SDM Enterprises, Inc. and The Space Entrepreneurs
- Stayne Hoff – Aerospace Development, LLC
- Karli Barokas – Barokas Communications
- Jen Roane – Barokas Communications
- Jamie Mayer – Barokas Communications