

CHARTING THE COURSE

**Workforce Dynamics in Oklahoma's
Emerging Aerospace Industry**

September 2023



The Team

Alex Annarino
Research Advisor



Alex has worked in experience research for 16 years and in community development for eight years prior. She served as a technical advisor and consulting partner for the UAS workforce development interview project, helping the team architect their ethnographic interviews and follow a human-centered research process to explore and explain how emerging aerospace workforce development is experienced by stakeholders. Alex has led experience research across non-profit, healthcare and Fortune 500 companies in a variety of areas. She is a product experience research lead with a Fortune 19 healthcare company.

Emily Bell
Program Manager,
UAS Cluster Initiative



Emily has worked in economic development program management for nearly 15 years. As Program Manager for the UAS Cluster Initiative (UASCI), she develops and manages support programs aimed at fostering growth within the emerging aerospace ecosystem in Oklahoma. Prior to joining UASCI, Emily worked in various roles at the International Economic Development Council (IEDC). Emily served as product manager for the UAS workforce interview project, leading the research vision and the development of this report.

Paige K. Connor
Consultant



Paige has over two decades of experience in visual communication, customer experience strategy, and human-centered design. Her expertise spans print and digital product management, project management, and innovation, often leveraging design thinking methodologies. She currently serves as a consultant for DronePort Network and the UAS workforce project, enhancing communication and optimizing visual information presentation through a human-centered approach. She has worked with a diverse range of organizations, including media companies, universities, B2B, B2C, non-profits, renowned children's hospitals, healthcare providers and associations.

The Team

Emily Kretschmer
Research Intern



Emily is an experience designer and researcher. They served as a research intern for the UAS workforce development interview project, helping the team conduct human-centered research, process stories into data points, and communicate insights. They are an active leader, currently serving as a community manager in their student organization, the Future Leaders of UX, and previously serving as co-director for a university-wide annual design sprint. They are currently a junior at the Savannah College of Art and Design, pursuing their BFA in user experience design.

Craig Mahaney
Executive Director,
UAS Cluster Initiative



Craig is a nationally recognized leader in the emerging aerospace industry. As Executive Director of the UAS Cluster Initiative (UASCI), he serves as the primary expert and point of contact for UAS companies looking to start and scale in Oklahoma. He also serves on several ecosystem working groups, where he provides insights into ensuring growth of the industry within the state. Craig served as subject matter expert (SME) for the UAS workforce interview project, lending his expertise as necessary.

Sallie Traxler
Managing Director,
Development Capital
Networks



Sallie is a strategic mind behind organizations identifying and achieving their goals through thought partnership, innovation and capacity development. She has led and consulted with national and international organizations to drive strategic growth to meet emerging needs. Sallie is a Managing Director of Development Capital Networks, and previously served in senior leadership roles with DronePort Network, Council of Development Finance Agencies (CDFA), and National Business Incubation Association (InBIA). Sallie served as a thought leader on this project, connecting design thinking methods and the people who bring them to life.

About UAS Cluster Initiative

The enormous growth of the unmanned aerial system industry presents unprecedented opportunities for small businesses in Oklahoma and across the U.S. to grow and create new jobs, while attracting investment and driving technology to meet industry needs.



The Unmanned Aerial System Cluster Initiative (UASCI) is a U.S. Small Business Administration Regional Innovation Cluster (RIC), facilitating access to critical resources for young companies in the unmanned aerial systems (UAS) industry, helping them promote their products to potential customers, license technologies and access financing.

We are a first-class mentoring and matchmaking hub that targets the specific needs of small businesses in the UAS industry. We address these needs through access to our diverse network of successful entrepreneurs, venture capital and private equity expertise and practical training in technology commercialization.

Overview and Approach



9

INTERVIEWS

5

INDUSTRY PARTNERS

4

TRAINING/ACADEMIC
PARTNERS

This research project was undertaken by the UASCI to better understand the challenges and opportunities within the workforce development landscape in the Oklahoma emerging aerospace industry.

The team conducted ethnographic interviews to understand the needs and priorities of key ecosystem stakeholders within career and technical education, academia and industry and reviewed key literature and data related to workforce transformation. Overall, the approach explores the naturally occurring dynamics at play and seeks to understand patterns in experiences of groups of people in order to tell a comprehensive story.

The partners graciously gave of their time and expertise to share their experiences in the unmanned aerial systems UAS and advanced advanced air mobility (AAM) industry in Oklahoma. Their names and identifying information have been removed to protect anonymity and confidentiality.

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Executive Summary

We are entering into a new age of aviation. Very soon our skies will be filled with autonomous vehicles carrying everything from cameras to packages to people. Unmanned Aircraft Systems (UAS) and Advanced Air Mobility (AAM) are poised to revolutionize other industries including transportation and logistics, healthcare, agriculture, emergency services, infrastructure maintenance, and environmental monitoring. These flying vehicles will require an advanced workforce to design, build, program and maintain. In order to remain a top location for the UAS/AAM industry, the time is now for Oklahomans to unite to create a comprehensive workforce support ecosystem.

This report provides an overview of the workforce dynamics in the UAS/AAM industry in Oklahoma. It highlights several key challenges and opportunities in this emerging sector, with a focus on addressing the workforce gaps and opportunities. The key takeaways and recommendations from the research are as follows:

Challenges:

1. **Workforce Shortages:** There is a labor shortage of 36,000 workers in Oklahoma, impacting various sectors, which includes emerging aerospace. The shortage is a significant challenge that needs to be addressed to support industry growth.
2. **STEM Education:** Oklahoma faces challenges in STEM education, ranking 50th in STEM-related degrees among working-age adults. This deficiency in STEM skills is particularly problematic for high-tech fields like emerging aerospace.
3. **Technical and Soft Skills Gap:** The UAS/AAM industry requires workers with technical excellence and soft skills like entrepreneurship, curiosity, and perseverance. Finding individuals with both sets of skills is challenging.
4. **Recruitment of Experienced Workers:** Due to the developing state of the industry, hiring experienced workers often involves taking talent from partner companies and institutions, which can create competition for skilled personnel within the state.
5. **Local Workforce:** Many jobs in the UAS/AAM industry require a local workforce due to the need for hands-on collaboration. For states that struggle to attract out-of-state talent, UAS/AAM workforce challenges are exacerbated.

Opportunities and Recommendations:

1. **Governance and Collaboration:** Establish an industry-specific group or organization to facilitate collaboration among stakeholders, including industry leaders, training organizations, and academia. This group can help coordinate efforts to address workforce needs and foster cohesion within the ecosystem.
2. **Workforce Attraction:** Implement a workforce attraction campaign to draw experienced workers to jobs in the Oklahoma UAS/AAM industry. This could involve promoting the

exciting work being done in emerging aerospace and reasons Oklahoma is the place to do the work.

3. **Education and Training Alignment:** Strengthen the alignment between educational institutions and industry needs. Further develop streamlined pathways for students to gain relevant skills and degrees that meet industry requirements.
4. **Soft Skills Development:** Invest in programs and resources to develop soft skills in the workforce, aligning them with industry needs. Collaboration between academia and industry can help achieve this.
5. **STEM Education Enhancement:** Improve STEM education at K-12 levels to prepare students for careers in the UAS/AAM industry. Encourage partnerships between educational institutions and industry to expose youth to STEM careers.
6. **Regulatory Awareness:** Stay attuned to Federal Aviation Administration (FAA) regulations and changes, as they impact the industry's ability to innovate and grow.
7. **Diversity and Inclusion:** Ensure that workforce development programs promote diversity and inclusion within the emerging aerospace sector, considering recruitment from both urban and rural institutions.
8. **Support Ecosystem:** Enhance the overall ecosystem by developing support services and resources to help startups and entrepreneurs learn from failure and manage their businesses effectively.

Addressing the workforce challenges in the UAS/AAM industry in Oklahoma requires a multi-faceted approach involving collaboration, education, and a focus on both technical and soft skills development. By working together and aligning efforts, Oklahoma has the potential to become a robust hub for the emerging aerospace sector, ensuring its long-term success and growth.

Introduction

Workforce gaps plague many industries throughout Oklahoma, but the State is hardly unique in these challenges.

You need not look far to find headlines from nearly every state that highlight worker shortages which means Oklahoma will be competing with other states for talent and to fill jobs. As industry sectors diversify in Oklahoma, it is essential to ensure that the state's citizens are appropriately trained, both for the jobs of today and the future. A 2022 study of Oklahoma's workforce challenges identified a labor shortage of 36,000 workers and growing, impacting both rural and metropolitan areas, across virtually all sectors. Additionally, the research found that the fragmentation, misalignment, and lack of accountability in Oklahoma's current workforce delivery system urgently needed to be addressed in order to fill ongoing workforce needs.¹

The full picture appears to be even more challenging - Oklahoma ranks 50th out of 50 in STEM and STEM-related degrees or credentials held by working-age adults, 43rd in overall K-12 education outcomes, 45th in bachelor's degree attainment, and 35th in labor force participation rate.² These statistics, while hard to swallow for many sectors, are particularly challenging for high-tech fields, such as emerging aerospace.

There is a critical need to address the gaps through a broad strategic approach to ensure that the emerging aerospace industry can continue to grow in Oklahoma. In navigating these state-specific challenges, committees, boards, and working groups emerge as valuable catalysts for progress. These collaborative endeavors not only advance the collective objectives of various stakeholder groups but also serve as vital connectors within the UAS/AAM ecosystem. This network effect fosters the development of partnerships, secures additional resources for technological advancements, and enables important best practices information sharing.

While Oklahoma certainly has obstacles to overcome, there is momentum around the need to strengthen the workforce support system. In particular, Governor Kevin Stitt signed an Executive Order that created a Workforce Transformation Task Force. This group was charged with both evaluating the state's workforce delivery system and developing recommendations to enhance the effectiveness and coordination of stakeholder agencies and other entities. This work will be vital to transforming how Oklahoman's access training to meet the needs of the UAS/AAM industry.

There are other areas for optimism, as well. Below are just a few of the workforce support mechanisms that demonstrate the ecosystem's commitment to improving the State's position:

- The Oklahoma Aerospace Commission distributes \$335,000 annually to fund statewide programs aimed at exposing youth to STEM careers in the aerospace industry.

1 "Report of the Workforce Transformation Task Force", (2023)

2 Census Bureau Data, NAEP Scores, ACT/SAT Readiness Benchmarks, BEA data

- In 2022, Norman Public Schools launched the Oklahoma Aviation Academy. While enrolled, high school students can work towards bachelor's degrees, obtain UAS pilot certification, train to become aviation mechanical technicians, and gain exposure to computer science topics.
- Tulsa Innovation Labs has launched the Cyber Skills Center at Tulsa Community College, a program that targets a diverse group of working professionals looking to upskill in high growth, cyber security, and data analytics fields.

This report outlines the challenges and opportunities that Oklahoma faces in fostering a vibrant and diverse emerging aerospace sector. The time to act to ensure the health of the ecosystem in the future is now.



Industry Insights

Strategic Resource Allocation: Maximizing Impact

As will become evident throughout this report, the nascent state of the UAS/AAM industry lends itself to creative problem solving and innovation, but it also brings challenges. Most, if not all, companies are in the startup phase and, as is true with startup companies in other sectors, emerging aerospace leaders find themselves being extremely strategic in the allocation of their resources. Because of this, they often find themselves hiring experienced workers who can learn the companies' individual technologies and processes quickly.

“If it’s a choice of getting an A player, and they are out of state, versus a C player in-state, I’ll take the A Player. But if there’s two equal people, I want the one who’s here.”

Research and development (R&D) is an important component of the UAS/AAM industry and currently where much of the need for the workforce lies. R&D creates new or modifies existing technologies, requiring the need for people with background knowledge of those systems to innovate. Because startup companies have fewer resources to build a qualified workforce over time, an experienced worker who can hit the ground running can provide more immediate value.

In this case, interview participants from the industry specifically described an experienced worker as an individual who has practical working knowledge of autonomous aviation or allied industry. As the industry grows in Oklahoma, it will become increasingly important for industry to partner with training organizations, higher education institutions, policy makers and each other to ensure that learning pathways become more cohesive and integrated.

When recruiting for the few entry level hires that companies do need, existing relationships with training organizations and higher education institutions fulfill those needs. The newness of the industry and the small number of emerging aerospace companies in Oklahoma mean that recruitment of experienced workers, however, often is accomplished by taking talent from partner companies and institutions.

“The idea is to create a more connected support infrastructure, so that when startups experience failure, they develop in entrepreneurship and learn how to learn through failure. More importantly, the support infrastructure helps them learn how to manage their startups so that they can fail fast, fail small, and de-risk the potential for failure as they build their commercial success. Understanding failure and the nuances to mitigating and learning from failure in industry will aid the ecosystem overall.”

Beyond the immense need for technical skills, soft skills are also incredibly important to employers in the UAS/AAM space. Companies looking to hire seek out individuals with entrepreneurial spirit, perseverance, curiosity, and internal drive. In many cases, soft skills may carry more weight if a hire has some level of adjacent technical skill and the intellectual curiosity to tinker and figure things out.

One Vice President of Operations emphasized the value in hiring “will over skill:” prospects who have adjacent industry experience and are willing to learn. One recent opening was for a position reliant on electrical engineering. The prospect they offered the position to was a mechanical engineer who had tinkered and experimented with the software on his car. The value the engineer brought, despite his lack of direct experience, being “not the guy who just knows this stuff, but the guy who goes out and figures it out and learns it.”

Balancing the development of both technical and soft skills is challenging for industry leaders. Interview participants noted specifically that they have had to create internal professional development programs to ensure their workforce is upskilled in a way to keep up with the trajectory of emerging aerospace. This is resource intensive work, and often, companies don't have the internal mentorship structure, or even a deep roster of mentors on their teams.

Demand for workers is currently outstripping supply, and the scarcity of individuals possessing both technical excellence and entrepreneurial prowess is increasingly evident. As noted by company leaders, the key technical skills needed in the emerging aerospace industry, include computer science, community information systems, comprehensive knowledge of Federal Aviation Administration (FAA) rules and regulations, mechanical engineering skills, and understanding and expertise in UAS operations.

There is a clear gap in skills, especially in the software engineering space. In Oklahoma, 69% of software engineering jobs remain unfilled.³ In the Tulsa region, the production of computer science graduates is of a particular challenge. While the need for skills gained while pursuing a computer science degree is exponentially increasing, the production of graduates remains flat. It is estimated that 40% of AAM/electric vehicle (EV) jobs will require C++ computer programming expertise.⁴

Another key need for UAS/AAM industry in the State, as stated by our interview participants, is the need for a largely local workforce. For some jobs, like pilots, the reasoning for being onsite is clear. Because of current FAA regulations, UAS/AAM pilots

3 “Report of the Workforce Transformation Task Force”, (2023)

4 “Tulsa Regional Advanced Mobility Proposal”, (2023)

must fly the aircraft within the visual line of sight without special waivers. Many engineering jobs in other sectors, especially computer engineers, can be done remotely, but the leanness of emerging aerospace companies demands a balance between on-screen work and more hands-on adjustment. Oklahoma has strong public-private partnerships at play in the UAS/AAM industry. Having local employees contributes both to a growing company culture as well as to a burgeoning ecosystem environment.

Recruiting out of state experienced tech workers to Oklahoma can be difficult. It is important for the industry, and other ecosystem players in the State, to tell a compelling story of the promise of the industry and why Oklahoma is an exciting place to be. Building on the State's rich history of aerospace innovation and the burgeoning technology-based ecosystem will be important to counteract some historic misconceptions. It is important to do this change of perception work, not only for growth of individual companies but for the growth of the ecosystem itself. A change in perception leads to the change in energy surrounding an industry and will be key to expanding emerging aerospace ecosystem support services. The survival or failure of a startup business is part of the culture, but with just over 25% of startups surviving to year 15⁵, it is important to ensure that all founders feel supported, regardless of company outcome. The hope is that founders who have failed ventures will be more likely to start their next venture within the state if they have felt ecosystem support.

The emerging aerospace industry requires deep expertise and niches, and individuals with those specialized skills are few and far between. The industry must be forward-thinking and collaborative with their business competitors to chart the future. They must anticipate how to balance the current need for specialists with a potential need for generalists, as well as the staffing of other business areas including business development, regulatory expertise, and support staff. Finding the sweet spot for hiring, development, and growth is difficult in this environment. It is paramount that leaders are able to think strategically about how to best define the need as the industry scales.

5 Entrepreneurship and the U.S. Economy, Bureau of Labor Statistics, (2016)

Education Insights

Navigating the Landscape of UAS Education and Training

As we look at the higher education and training landscape in Oklahoma, considering the full picture of the system is key to identifying areas of promise and needed improvement. Finding and retaining qualified instructors and faculty is important, but creating space for support systems is equally crucial.

The career and technology education (CareerTech) program in Oklahoma is incredibly robust. These training organizations train individuals through various points in their careers. From programs that train high school students for jobs upon graduation, to company-specific industry training, CareerTech is nimble in their response to industry. Bridging the gap between institution and industry is also important for Community colleges and four-year universities to address the stated needs of industry within their ecosystems. This requires the hiring of support roles that not only interface with the emerging aerospace sector but work to diversify the industry and the relationships it fosters.

Equity in developing programs within educational institutions has become increasingly important and

will continue to be so as the emerging aerospace industry grows. Rural institutions have distinct roles, and sometimes different challenges to tackle. Often in those institutions, workforce development is not the sole responsibility of one position but is dispersed among many staff members and faculty. Because those institutions are often under resourced, they do not have the outreach mechanisms that larger community colleges and four-year universities have. This can lead to industry leaders being unaware of qualified individuals attending smaller colleges and universities.

As mentioned by industry interview participants, there is not an immense need for entry level hires in the current UAS/AAM ecosystem. In the instances that interns and new graduates are needed, those roles are often being filled by leveraging existing relationships between higher education and industry leaders. Not only does this ad hoc method allow potentially qualified people to be missed, but it puts additional stress on both higher education institutions and industry leaders to seek out people in real time. This also affects the pipeline of skills development.

“We haven’t done a lot of entry level hiring. But when we did, it was very difficult to find candidates. And the reality is, most of them came through people we knew.”

Just as industry leaders have identified the lack of “workplace readiness skills (e.g., problem-solving, teamwork, time management, and prioritization) that job seekers hold, our interview participants from CareerTech and academia found this imbalance as well. Specifically, they noted that while a trend in declining “workplace readiness skills” was evident before, the Covid-19 pandemic accelerated the trajectory of this loss. As a key challenge that was mentioned nearly universally amongst interview participants, it is clear that this is an issue that affects every level of the workforce development ladder.

Building upon soft skills will require concerted effort and resources, along with a robust partnership between ecosystem partners to ensure the skills being developed are in line with industry needs. Many in education have begun to implement changes to their support services to address this issue. However, there is a tenuous balance between the expansion of these services and displacing degree or training specific programming that presents challenges as institutions address these needs.

Because of the non-degree nature of its programming, CareerTech is nimble in its approach to curriculum development. Both community college and four-year university interview participants cited the built-in processes that prevent them from quickly developing programs based on industry need. This is especially problematic in a sector that is rapidly changing and developing, like emerging aerospace. Program development can take up to two years in those environments, leaving room for a lot of change within the industry in that time. Institutions have become creative to meet the demand, including creating non-degree programs that can retroactively be approved for credit after full curriculum approval. There are, however, challenges in this approach. Primarily, students are not eligible for financial aid for non-degree programs, leading to additional barriers to entry for lower income students.

A community college in Oklahoma was invited into a program with a national working group

“There aren’t enough sufficient mechanisms to make those connections. I end up doing a lot more than I would have expected, just with picking up the phone or sending emails and forwarding a resume to somebody I know in the industry, and saying ‘You ought to look at this young person.’”

to develop improvements in student outcomes. Through the program, they look at what happens to students after they complete their programs and use that information to determine which programs are high value and which need to be re-evaluated. For example, they identify which programs lead graduates into jobs with “family-sustaining wages” and determine how to lead more individuals, particularly from diverse backgrounds, into these programs. The Vice President of Workforce Development at this community college described how this collaboration has been beneficial in “having conversations and having leadership that understands that we can’t do things the way we’ve always done them.”

Often, higher education institutions and training organizations exist in silos, as each entity has their own point of view and operations. However, to ensure a thriving support workforce delivery system, these institutions must come together for a more streamlined, integrated perspective. College Park, a partnership between Tulsa Community College (TCC) and Oklahoma State University (OSU),

“I just think we have to innovate, higher ed has to innovate, we have to stop doing the things the way we’ve always done them”

is one example of how institutions are working together to create educational pathways for a more diverse group of students. The program streamlines the four-year degree process by allowing students to complete an associate’s degree from TCC, followed by a bachelor’s degree from OSU. The partnership recently added an engineering track, which will directly impact the emerging aerospace industry.

Interview participants in the education sector agreed that more pathways for working adults to continue their training is key to providing the experienced workforce the industry needs.

Workforce Pathway Touch Points

STAGES	Pre-College	Community / Trade	Four-Year	Industry
TOUCHPOINTS				
OPPORTUNITIES	<p>Improve STEM education at K-12 levels to prepare students for careers in the aerospace industry. Encourage partnerships between educational institutions and industry to expose youth to STEM activities and careers.</p>	<p>Strengthen the alignment between educational institutions and industry needs. Further develop streamlined pathways for students who desire additional training that requires advanced educational training.</p>	<p>Implement a concerted and coordinated workforce pathway effort to fill experienced worker jobs in the industry. Solidify relationships with industry, community colleges and technical schools. Further develop streamlined pathways for students to gain relevant skills and degrees that meet industry requirements.</p>	<p>Participate in an industry specific organization that would allow for their "voice" to be heard clearly. Group can foster collaboration between ecosystem partners and identify issues early on. Development of coordinated and concentrated workforce development strategy.</p>

Regulatory Challenges

Navigating The Regulatory and Technology Development Realities in the Emerging Aerospace Industry

For all stakeholders in the emerging aerospace industry, FAA regulations and rules serve as the bedrock upon which operations are built. These regulations dictate the boundaries within which the industry can innovate, collaborate and thrive. Introducing autonomous vehicles into the aerial landscape has immense challenges, and ensuring the safety of the public is paramount. The success of the emerging aerospace industry hangs in a delicate balance between innovation, growth, and the regulatory environment. National and state level working groups have emerged as critical hubs for stakeholders to converge, exchange insights, and collectively steer the industry toward responsible and productive growth.

The tension between entrepreneurial drive and the regulatory environment creates viability constraints for the industry. The FAA creates the regulatory pathway, and industry and academia must stay attuned to the immediate and forecasted changes so they can research and create within the space. Industry interview participants agreed that finding balance between innovation and operation within the regulatory

framework is challenging, and somewhat unique to the emerging aerospace sector.

Both startups and established businesses aim to achieve product market fit, ensuring growth and long-term viability. A key to achieving this is first achieve product solution fit, which is the alignment between a defined customer need and a business solution. The regulatory picture creates a tension to getting from product solution fit to product market fit, and eventually to scale.

The pace of regulatory activity sets the pace of the UAS industry in Oklahoma. One CEO and Co-Founder of a local UAS company described how this can affect development in the industry. Periods where regulations experience little change can slow development and be “really discouraging” for the industry, whereas periods of high regulatory activity, such as in 2016 with the launch of the Part 107 commercial drone rule, can be “a huge shot in the arm for the industry.” The co-founder described success in the industry as being able to endure “that roller coaster of changes in the industry.”

“Everything that we’re developing is really kind of stuck in this current paradigm of one pilot, one drone. We’re trying to keep an open mind and a framework for our development that says, okay, when we get beyond visual line of site, we know we need to be able to control a drone from the computer. But we don’t need to solve that problem today, because we don’t know when it’s going to happen.”

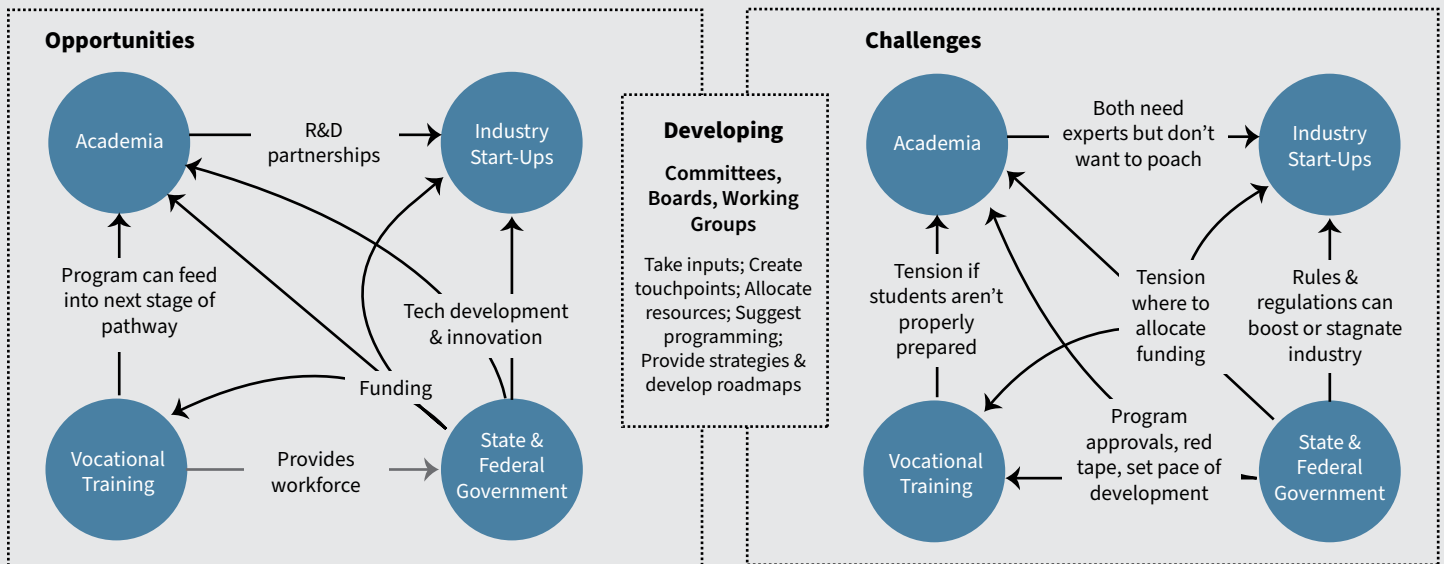
Conclusion and Recommendations

The aerospace industry has a long and storied history in Oklahoma. As technology adapts to a changing world, UAS/AAM has the potential to build upon that legacy.

Within the existing ecosystem, and through the support and resources the state can provide, the future of emerging aerospace has an opportunity to be one of the most robust ecosystems in the United States. There are many pieces falling into place to create an even stronger support structure to ensure that the workforce is available to companies as they start and scale. Building upon the pieces that have begun to fall into place, a few changes can add to the success of that shift.

While public-private partnerships and state and national level working groups are a key characteristic of success, it is clear that a UAS/AAM industry specific group is needed. One of the key tensions within the emerging aerospace ecosystem in Oklahoma is the lack of an objective convening body to facilitate a continued conversation about industry needs and academic opportunities. As noted previously, many workforce connections are currently being made on an ad hoc basis, and a strategic, sustained conversation is necessary to ensure there is as much cohesion and understanding amongst ecosystem partners as possible to ensure solid growth.

Ecosystem Resource Pathways



As Oklahoma continues to refine its statewide workforce delivery system, there is an opportunity for the emerging aerospace industry to ensure it has voices at the table. UAS/AAM is a key piece of Oklahoma's economic future, and, as such, ecosystem partners must advocate for policy changes needed to support the current workforce demands and advise on a strategic path forward.

A two-pronged approach is required to ensure long-term, sustained workforce support for the emerging aerospace industry. Currently, the sector requires a concerted and coordinated workforce attraction effort to fill the experienced worker jobs it needs now. Not only will this help individuals grow, but it will help diversify the industry, leading to more comprehensive collective knowledge within the ecosystem. It will also minimize the frequency at which companies need to look to peer companies within Oklahoma to fill their workforce needs.

While filling the needs of companies now is vitally important, bolstering the state's workforce pipelines internally is key to ensuring that the future of emerging aerospace remains bright in Oklahoma. This will require concerted efforts to improve STEM opportunities for K-12 students, as well as creating pathways to jobs within the industry and streamlining coordination.

This is a unique time both in Oklahoma, when the state is devoting time and resources to address workforce delivery system issues; and in the emerging aerospace industry, which is in a period of opportunity and growth. Now is the time for industry leaders to come together with training organizations, academia and other ecosystem partners to ensure that Oklahoma continues to be one of the most attractive places in the United States to establish UAS/AAM operations.

SUMMARY PROFILES

Summary Profiles

Participant 1

Participant 1 works at a UAS company. Their concerns expressed were mostly centered on difficulties finding experienced workers and how the slow movement of regulatory bodies inhibits industry growth.

“So, it’s a bit of a mixed bag for us, because we haven’t done a lot of entry level hiring. But also, when we did, it was very difficult to find candidates. And the reality is most of them came through people we knew.”

Insights

- Finding quality candidates to hire through outreach is difficult; the pool is small.
- Most hires are already seasoned in the industry, and need to be experienced enough to move quickly and deal with rapid industry changes.
- UAS/AAM technology is rapidly changing, and research and development is centered around improving technology, not building new technology from scratch, so new hires need to be familiar with foundational knowledge “building blocks” (such as drone code base, drone components).
- Regulatory bodies, such as the FAA, move slowly, which limits companies on the workforce hiring end, as they struggle to anticipate the direction the industry is heading and how long it will take to get there.
- Currently, there is no legal talent familiar enough with technology to effectively advise UAS startups.

Participant 2

Participant 2 works in workforce development at a community college. The concerns expressed, from the community college perspective, are that a majority of students are missing developmental skills and are needing to play catch-up as a result of the COVID-19 pandemic, that the sector/education relationship is less effective when education branches are not acting in conjunction with each other, and that community colleges are getting lost in building these sector/education relationships.

“We have to get the entire continuum of education partners in one room with the employers’, write and map these things out and build a system of how the employers are going to integrate our work with K through 12, Career Tech, Community College, four-year, and have a way to bring them to the table a few times a year, versus constantly being asked. I think that part of the issue is so many different players are trying to compete for their time, and then the employers get overwhelmed with it.”

Insights

- In Oklahoma, between career techs and four-year institutions, community colleges get lost in conversations and business engagement.
- Higher education has to innovate, but can't do so without changes on the accreditation end.
- For community colleges, the approval processes (on the institutional and state-end) for developing and modifying programs takes about one and a half years.
- For students, there is a lack of awareness about jobs in the UAS industry beyond drone piloting.
- New hires are lacking in soft skills/essential skills, which employers are unable to train them for, unlike technical skills.
- Each educational institution is approaching employers individually, which results in fighting for employers' time and overwhelming them. Branches of education pathways could work together to communicate with employers, but there needs to be a neutral third party to convene.

Participant 3

Participant 3 works for a UAS company. For drone piloting, new hires have to be trained on the job and there can be difficulties finding the right prospects. To the employer, through training and salary, it feels like more value is being provided to the employee than it is to the company. Currently, new hires are trained through Part 107 certification and mentoring, which is slow and cost-ineffective.

“If I’ve got to spend \$250,000, to hire the right employee to do the right job, then I’ll do it. But when we’re sourcing these people sort of by two or three at a time kind of thing, and they don’t really know anything. I feel like we’re providing more value to them.”

Insights

- New hires lack technical skills, and need to be trained on the job, primarily through mentoring, which is a slow process, and the new hires do not always work out.
- It is hard to identify the right prospects for a job. On paper, many candidates look the same. Essential soft skills/essential skills, like the ability to work hard and be independent, are hard to identify in a traditional interview setting.
- Comprehensive training programs would train for core knowledge, advanced computer skills, and provide flying experience.
- Industry-wide, there isn’t a solid feel for where the UAS industry is going to go.

Participant 4

Participant 4 works in a UAS company. Their primary concerns expressed were needing to pull in experienced talent from other states, but having difficulties getting candidates to relocate to Oklahoma, a generational workforce gap which could cause mentorship issues, and a lack of awareness of opportunities in the industry.

“We don’t have the people with experience who helped develop them. So, what you’re going to have and what I’m having, I’ve got really smart young 20 something year olds, engineers just out of undergrad or out of their master’s program, who are way smarter than I was at that age, but they have no one teaching them.”

Insights

- It is not difficult to find entry-level hires, but it is a struggle to find enough experienced workers to mentor them because of how nascent the UAS industry is in Oklahoma.
- There is a gap in middle-aged workers, so as the current elder generation retires, there is going to be a skillset loss which will strain mentorship opportunities.
- For roles where there is a lack of available talent in Oklahoma, trying to pull in candidates from other states is difficult because of a resistance to relocating. This unwillingness could be driven by factors such as: a negative perception about living in Oklahoma, high mortgage rates, and uncertainty in the UAS industry due to the state of regulations.
- There is a lack of awareness in opportunities for careers in the UAS industry driven by lack of advertisement from both the state and the industry.

Participant 5

Participant 5 works in a UAS company. They expressed that there are very few people who have direct qualifications/experience in UAS, so they end up hiring people with adjacent industry experience and training them in the industry. They tend to hire recent grads out of universities, but struggle to find experienced workers in-state as most experienced people are working for partner institutions rather than industry competitors.

“I don’t mind doing that out of state. Like, I don’t mind of which there are very few that have the experience I want, but I wouldn’t mind grabbing them from my competitors. That’s totally fine. That must be expected, like they’ll try to do the same thing to me. But the reality is in Oklahoma that would be really hard because you’d be hiring away someone who’s then expected to turn around and work with their former company as a partner.”

Insights

- The UAS industry is small, so the number of candidates with direct, in-depth experience of both aviation and autonomous engineering is limited. Instead, employers hire candidates with adjacent experience, such as in robotics, autonomy, aerospace, mathematics, or software engineering, then train candidates to build the necessary knowledge for the work.
- There are currently not enough local, qualified engineering graduates to support the Oklahoma UAS industry in being competitive with other states. The interviewee estimates there needs to be two to three times the number of qualified engineers currently being produced out of the universities.
- Employer focus on hiring recent graduates in state, and try to pull experienced hires from out of state. Due to the small pool of experienced candidates in Oklahoma, hiring an experienced candidate would likely mean pulling them from partner companies or institutions, rather than competitors.
- Growth and stagnation in Oklahoma’s UAS industry is driven by state regulatory activity, which fluctuates. Years that experience increased regulatory activity boost the industry.

Participant 6

Participant 6 is an administrator at a career technical institution. They spoke primarily of the role and capabilities of a career tech, the relationship of the career tech to the aviation and aerospace industry, and the relationship of the career tech to other educational institutions.

“You can turn the industry certification from an industry certification, six classes at a community college to an associates degree. Then you can take that associates degree and go to a four-year institution. They then have a bachelor’s degree in aerospace. You can then take that bachelor’s degree of aerospace and go to OU and get a master’s degree in aerospace. [...] I think it’s important, to have those ramps for individuals to get off for what they want to do and what’s best for them.”

Insights

- Employers are increasingly considering at the disposition/characteristics of a candidate when hiring.
- Industry training from an educational standpoint is not likely to change because the core of aviation has, for the most part, remained the same.

Participant 7

Participant 7 works at a four-year university. They discussed how the institution and companies partner together on projects. They also discussed how they interface with students, including mentoring and helping link students to industry, as there is not a good institutional mechanism for doing so.

“There aren’t enough sufficient mechanisms to make those connections. I end up doing a lot more than I would have expected, just with picking up the phone or send an email and forwarding a resume to somebody I know, or pick somebody I know in the industry, and saying you might want to look at this young person, and that’s not the way the system should work.”

Insights

- There is not a strong formal mechanism, from either the industry or education institutions for connecting graduating students to work in industry.
- Digitalization has caused a huge shift in the aerospace industry, but there is still a need for analog skills, which likely not go away. There is a balance between developing digital and analog skills.

Participant 8

Participant 8 works at a four-year university with a focus in early-stage startups. They discussed the challenges of early-stage startups in Oklahoma, the startup ecosystem, and how startups end up leaving the state, one of the reasons being a lack of experienced workforce in Oklahoma.

“All this cool stuff starting here in Oklahoma could have been here in Oklahoma, but we didn’t have enough of the experience, right? Because at that point they had venture funding like they needed people who do stuff because they were on a timeline. They weren’t looking at the new grad who was going to figure it out. They’re like, no, I need someone who actually understands that. And they just weren’t here.”

Insights

- When startups in Oklahoma fail, they tend to blame the ecosystem of the state itself due to negative perceptions of Oklahoma. They then move their efforts into other states.
- As startups in Oklahoma take off and their need for workforce expands, they have difficulty finding experienced workers in-state, forcing them to utilize a virtual workforce, and causing them to leave the state.
- There are resources in Oklahoma to assist startups from a legal perspective, but there could be a lack of awareness of these resources.

Participant 9

Participant 9 is a leader in UAS from the educational institution perspective. They primarily expressed skills needed for the UAS workforce and discussed academic program development.

No direct quote available.

Insights

- Development of new programs or curriculum is a multi-year process, but input is taken each semester for curriculum development.
- Students are not always prepared when transitioning from one level of academic institution to the next.



4045 NW 64th Street, Suite 405, Oklahoma City, OK 73116
email: info@uascluster.com

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