UNMANNED AERIAL SYSTEMS

The unmanned aerial systems (UAS) industry is a growing sector within agricultural technology, and Kansas joins the rest of the nation in seeing great opportunity in this emerging field. UAS technology is increasingly important as farmers and ranchers work to implement precision technologies into their management practices. Kansas is home to multiple manufacturers of agricultural equipment and technology companies, as well as a large aviation industry, and the combination of these industries creates an atmosphere that supports development of UAS technology. Additionally, educational support has already begun, with UAS-related degrees now available within the state.

Although the potential of this sector is vast, it is a relatively new field and carries several unique challenges which can serve as barriers to growth. Expertise is still needed from people with a background in UAS, a rare qualification, making it difficult to find a steady workforce. The effectiveness of UAS technology is dependent on capturing and applying data in a way that can maximize the potential of the system, and there remains a lack of a streamlined approach to fully utilize the data produced by UAS technology.

The UAS industry offers significant opportunities for growth, and to realize that potential will require input and discussion among key stakeholders across not only the UAS industry but in other agricultural sectors as well. New research in data collection and economic benefits of UAS will increase usefulness and demand in the agricultural industry. Additional steps to encourage and support entrepreneurs within this developing industry, including marketing and training, could expand new business opportunities. Collaboration between public and private entities to develop a strategic growth plan is an important first step.

STATUS

Nearly 90 percent of Kansas' land mass is devoted to farming and ranching, providing ample customers for agricultural technology applications. Pairing the prevalence of the agricultural industry with Kansas' pro-business climate and Midwest values makes Kansas a prime location for entrepreneurs to create or expand their businesses.

A growing sector within agricultural technology is the unmanned aircraft systems (UAS) industry. Trend analysis from the Association for Unmanned Vehicle Systems International estimates the economic impact of UAS integration to reach a cumulative $2.941 billion by 2025 and to create 3,716 additional jobs in Kansas.

Agriculture is anticipated to be the largest benefactor from UAS use. UAS technology is increasingly important in agriculture as farmers and ranchers work to implement precision technologies into their management practices. The skills, knowledge and expertise in the UAS field will play a role in many careers across the agriculture industry. When combined with the fact that agriculture and aviation are the largest contributors to the Kansas economy, the impact of UAS technology on the state is significant and has great potential for additional growth.

OPPORTUNITIES

In order to develop a strategic growth plan for the unmanned aerial systems industry it is important to understand the areas where Kansas has a comparative advantage and the best opportunities for growth or expansion.

Factor	Implications for Growth and Development Opportunities
Existing Customer Base	Over 46 million acres are devoted to farming and ranching in Kansas, nearly 90 percent of the state's total land mass. Kansas has an abundance of potential customers for agricultural technology companies that produce products for unmanned systems. Kansas is also home to multiple agricultural equipment manufacturers, which serve as potential customers for agricultural technology companies to develop strategic partnerships to enhance equipment with the latest precision technologies.
Human Capital	Kansas State Polytechnic boasts a strong aviation component and now offers one of the nation's first bachelor's degree programs in unmanned aircraft systems. Kansas State Polytechnic is nationally recognized for its expertise in the UAS field. Specific areas of study include UAS design and integration and UAS flight and operations.
Industry Relations	"Unmanned aerial systems" and "drone technology" are now common interchangeable terms. This is a positive for the industry, as the technology is no longer viewed as a threat, but as a tool in agriculture. In fact, management decisions now consider UAS as a key factor related to economic growth.

Factor	Implications for Growth and Development Opportunities
Policy Environment	Future policy changes that may result from research in the FAA's UAS Integration Pilot Program may give Kansas a comparative advantage over other agriculture states. The High Performance Incentive Program (HPIP) provides sales tax exemption on the construction, reconstruction and remodeling of facilities for projects greater than $50,000. Sales tax exemptions are also present for farm machinery and equipment and various ag-based inputs. These state tax code provisions make Kansas a more attractive state for growth or expansion. Also at the state level, the state of Kansas works closely with the agricultural industry to ensure its protection from overreaching federal regulation. At the federal level, Kansas is fortunate to have elected members of Congress who strongly support the agricultural industry. The Kansas congressional delegation will play an important role in influencing positive changes related to federal regulations or legislation, international trade, federal taxes, transportation rules, natural resources and more.
Supporting Infrastructure	Kansas is home to a large aviation industry. Several major aircraft manufacturers are located in Wichita, and together with their allied industries they create an atmosphere that promotes and supports future aviation technology, such as UAS.
Weather and Natural Resources	Agricultural technologies such as UAS can assist in addressing key challenges in other agriculture sectors, such as reducing usage of water, chemicals and fertilizers.

CHALLENGES

While Kansas is poised for major expansion in the UAS sector, the following factors represent challenges serving as barriers to achieving the objective of the strategic growth plan.

Challenge	Details of Challenge
Critical Infrastructure	A lack of affordable, livable housing in rural areas compounds the issue of a shortage of agricultural workers. The lack of consistent, reliable broadband access limits the ability of some farmers and ranchers to utilize UAS technological advancements fully.
International Trade	Access to international markets for technology products is a great potential revenue stream, but resistance to free trade agreements at the federal level can hinder this access. Trade tariffs can serve as a barrier for UAS hardware in production.

Challenge	Details of Challenge
Policy	Federal laws and regulations impacting the agricultural community as a whole include Waters of the U.S., the Endangered Species Act and more. These policies, while potentially not impacting UAS directly, affect the profitability of agriculture which creates downward pressure on farmers' ability to purchase and incorporate UAS into their management plans. Current FAA restrictions limit use of UAVs and create challenges.
Research and Information	While there are a lot of useful methods for capturing data related to crop production, there is a dearth of information and algorithms to actually interpret the data in a way that is helpful for a producer looking to make management decisions. There is a lack of user-friendly systems in place to leverage the data created through UAS technology.
Small Entrepreneurs	It is difficult for small entrepreneurs to have ready access to additional capital as a new company grows. The speed at which technology research and development grows can make business development difficult for tech companies. Marketing assistance is valued and will assist in the growth of this sector.
Workforce Development	Currently, there are very few people with a background in UAS technology. This makes the job market incredibly competitive. At the university level, it is hard to keep Ph.D. level faculty because they can be offered such lucrative salaries in the industry. Graduates with technical knowledge in engineering, agriculture, computers and technology will be necessary to fill the workforce needs of the technology industry. Community and technical colleges should be forward-thinking about working with industry to design appropriate associate degrees and certificates to meet future industry demand, to include data collection and interpretation. In addition to the technology workforce, the UAS industry needs engineers, operators and data interpreters. High-tech graduates do not think of Kansas as a place to go for high-tech jobs.

SUCCESSES

Key successes in the UAS industry:

- In 2018, Kansas was selected as one of 10 partners in the UAS Integration Pilot Program, with a proposal that seeks to leverage a statewide unmanned traffic management system to facilitate precision agriculture operations.
- Kansas has increased our national presence in the UAS industry by annual participation in Xponential, the annual trade show of the Association for Unmanned Vehicle Systems International.
- Northwest Kansas Technical College is actively engaged with local schools in recruiting as well as promoting UAS/ precision agriculture as an academic and career option to students from K-12 through postsecondary.
- Partnerships have been developed between several interested companies and either Kansas State Polytechnic and/or Northwest Kansas Technical College during 2018 in order to complete testing of UAS equipment.
- Kansas State Polytechnic became the first entity in the nation to achieve statewide access during flight operations. It has received a “beyond visual line of sight” waiver from the FAA.
- The Kansas Department of Transportation has named a director of UAS.

Unmanned Aerial Systems

GROWTH OBJECTIVE:

Develop Kansas as a leader in UAS technology, activity and expertise while also working to attract manufacturing, assembly operations and more.

OUTCOMES & ACTION ITEMS

Leaders from throughout the Kansas unmanned aerial systems industry will continue to collaborate in the development and implementation of a long-term strategic growth strategy with input and discussion among key partners. Industry-identified desired growth outcomes, initially developed in 2016 and expanded to include action items, will be implemented by industry and key partners and updated annually at the Kansas Governor's Summit on Agricultural Growth. Following are the proposed action items to continue building on the achievement of the UAS sector desired outcomes.

High Priority Outcomes

Seamless connectivity from mobile networks across all of Kansas. This is critical to adoption and implementation of UAS technology statewide.

ACTION ITEMS:

- Work with mobile companies to highlight potential for collaboration in expanding seamless connectivity statewide.
- Explore connection between existing cell infrastructure as well as nontraditional structures to serve as "towers."

Rules and regulations for the UAS industry that are based on sound science and data and that support business growth. The state's involvement in the Integrated Pilot Program offers opportunities for private and public collaboration in development of rules and regulations for the future of the industry.

ACTION ITEMS:

- Encourage participation of private entities to collaborate with the Kansas Department of Transportation in the IPP with appropriate applications and practices.
- Highlight the positive benefits of UAS through social media and other marketing outlets.
- Host yearly legislative day to promote the benefits of the technology.
- Monitor legislative initiatives at the state and local level that may inhibit growth.
- Work with appropriate agencies to ensure current regulations are available to the public and that they are enforced.

Imagery interpretation systems and algorithms in use with UAS systems that provide useful recommendations to farmers. With current UAS technology farmers and ranchers are not able to effectively use the data generated by UAS, nor create solutions and management decisions, such as fertilizer application plans.

ACTION ITEMS:

- Advocate for and secure funding for advanced research in algorithm development.
- Develop methods for best development of algorithms.
- Disseminate information to agriculture technology companies.
- Determine what applications are currently needed.

Partnerships among agricultural equipment enterprises that may find mutually beneficial results from incorporating UAS technology into the menu of features provided by their products.
ACTION ITEMS:

- Identify agricultural equipment companies that have a desire to or could benefit from incorporating UAS into products.
- Invite agricultural equipment companies to participate in IPP activities.
- Work to standardize the sharing and transfer of data between partners in production as well as the specific equipment used.

Increased UAS study and degree options at secondary and postsecondary educational institutions in Kansas
ACTION ITEMS:

- Evaluate which agricultural degree programs at Regents institutions complement the UAS industry, such as agronomy or biological and agricultural engineering.
- Expand support for a UAS minor in applicable departments.
- Strengthen the study options of UAS at Kansas State Polytechnic and Regents institutions.
- Promote UAS/precision agriculture as an academic option and a career to students from K-12 through postsecondary.

Kansas presence at regional and national UAS events in an effort to attract and establish unmanned aerial vehicle manufacturing, assembly operations, flight testing infrastructure and flight spaces to Kansas.
ACTION ITEMS:

- Continue participation at national UAS Summit & Expo.
- Continue participation at UAS Cluster Initiative events.
- Continue active participation and leadership at UAS Summit in Kansas.

Information showing a demonstrated return on investment from incorporating UAS technology into farm management decisions. Evidence of return on investment would promote farmer adoption of UAS, assist farmers in becoming more comfortable in utilizing the technology, and result in greater farm profitability.
ACTION ITEMS:

- Quantify return on investment based upon research and extension activities.

Medium Priority Outcomes

Partnerships between Kansas' existing military bases and the aviation industry to enhance the research, development and expertise of the UAS industry in Kansas.
ACTION ITEMS:

- Schedule quarterly meetings between Fort Riley and other military bases with Kansas UAS and aviation industry in order to share ideas on current efforts and identify methods for collaboration.
- Develop partnerships with interested companies in aviation/aerospace/UAS in Wichita area specific to agriculture systems for spraying and harvesting.
- Investigate repurposing Department of Defense training facilities and personnel for civilian agriculture purposes.

Research on applications in animal agriculture through collaborations between Regents institutions and industry, an area that remains largely untapped.

ACTION ITEMS:

- Research and create animal herd tracking systems that would track health and nutrients.

Business-friendly environment that attracts further expertise and innovation to the state.

ACTION ITEMS:

- Promote the Strategic Growth Initiative process, a pilot program to help counties and communities proactively seek potential business growth opportunities, working with KDA, the Kansas Department of Commerce and the Kansas Department of Transportation.
- Market the benefits of Kansas' business-friendly environment.
- Educate lawmakers on current infrastructure and policies that successfully create a business-friendly environment.
- Engage with legislators when proposed legislation threatens a pro-growth business environment in order to rectify negative results that may occur.