

**Welcome to the “Drone Zone”
Pursuing growth in Unmanned Aerial Systems within the Aerozone: A Thought Paper**

Seth Young, Ph.D.

For the Aerozone Alliance

April 2021

Executive Summary

The North Olmsted, Fairview Park, Brook Park, Berea, Middleburg Heights, and Rocky River area of southwestern Cleveland, as well as portions of the city of Cleveland near the Cleveland Hopkins International Airport, has been designated by the Cuyahoga County Planning Commission (CCPC) as the “Aerozone”, a location for economic development with a focus on the aviation and aerospace industry. The Aerozone Alliance, a group within the CCPC supporting development within the Aerozone, has taken a leading role in advancing the Commission’s mission of creating jobs, advancing industry, and generating economic development in this region.

One segment of the aviation and aerospace industry of specific interest to the Aerozone Alliance is Unmanned Aerial Systems (UAS), broadly defined as autonomously or semi-autonomously flown aerial vehicles, commonly known as drones. It is hypothesized that the UAS sector offers significant opportunities for economic growth in the manufacturing and production of UAS vehicles and components, end user private and public sector applications ranging from law enforcement to real estate, as well as opportunities to be a leading region in UAS research, training and education, and policy development. This paper provides thoughts on the feasibility of pursuing UAS related activities within the Aerozone.

As discussed in the paper, it is found that:

- **The targeting of UAS related businesses and activity is a feasible and potentially highly beneficial opportunity for the Aerozone.**
- **UAS is a high growth sector with more than 1.8 million registered drones with the Federal Aviation Administration since 2016.**
- **The UAS sector is forecast to create more than 100,000 jobs and an economic impact of more than \$82 billion for the United States by 2025.**
- **UAS activity has the great potential to leverage existing activity in the Aerozone, including activities at NASA Glenn, the Ohio Aerospace Institute, and several local companies currently involved in UAS related activities.**
- **There is potential for funding opportunities through multiple federal agencies to support the growth of UAS activity within the region.**
- **The Aerozone could be a hub for UAS education, training, and policy development with opportunities to lead the nation in safe and compatible UAS integration into metropolitan areas.**

It is hoped that the thoughts found within this paper will support the efforts of the Aerozone Alliance in their mission. Welcome to the Drone Zone.

Welcome to the “Drone Zone”

Pursuing growth in Unmanned Aerial Systems within the Aerozone: A Thought Paper

Introduction

The State of Ohio has long been known for its role in the advancement of aviation and aerospace. From the Wright brothers to Neil Armstrong and John Glenn, pioneers in aviation have given substance to the state’s moniker as the “Birthplace of Aviation”. That pioneering effort exists today, throughout the state including Northeast Ohio, with institutions from the Air Force Research Lab at Dayton’s Wright Patterson Air Force Base, to the NASA Glenn Research Center in Cleveland. Ohio, and Northeast Ohio in particular, has leveraged that pioneering spirit into major economic activity, as a leading production and manufacturing center for the aviation and aerospace industries.

This pioneering spirit continues with Ohio’s effort in advancing the growing Unmanned Aerial Systems (UAS) industry. UAS, or drones, may be considered one of the greatest advancements in aviation since the invention of the jet engine. Integrating other 21st Century advancements in computer technology, electric propulsion, satellite navigation, and digital communications, UAS is poised to revolutionize travel, logistics, agriculture, infrastructure management, and yet undiscovered areas of modern life. Ohio, and Northeast Ohio in particular, is uniquely poised to play a major role in pioneering UAS, creating jobs, advancing industry, and generating economic development that will propel the region through the 21st Century.

Poised to take the lead in pioneering UAS in Northeast Ohio is the Aerozone Alliance, a group within the Cuyahoga County Planning Commission (CCPC) focused on the economic development of the aptly named Aerozone region in the North Olmsted, Fairview Park, Brook Park, Berea, Middleburg Heights and Rocky River area of southwestern Cleveland, as well as portions of the city of Cleveland near the Cleveland Hopkins International Airport (CLE). The Alliance is focused on leveraging the facilities and knowledge base in the aviation, aerospace, and manufacturing sectors currently based in the area (such as the airport, NASA Glenn research center, and the Ohio Aerospace Institute (OAI)), to bring new “high paying technology jobs” to the region.

The UAS sector is of interest primarily due to the current existence of a small conglomerate of companies and other stakeholders within the Aerozone that see the potential for significant growth in this space. This growth includes a planned deployment of a full network of drone surveillance technology, which would contribute to a system of strategic drone traffic management, something that does not currently exist in widespread form. One particular sector of interest within the Aerozone are companies that focus on the deployment and tracking of UAS for commercial purposes. Example deployments of drones in this sector include facilities inspections, traffic and law enforcement surveillance, real estate and other aerial photography opportunities, agricultural management, and in the future, small package delivery and potential passenger service within

the region (known as “urban air mobility” or “UAM”). In addition, there is interest within the Aerozone to be a center of UAS production, training, and policy development for the region.

This thought paper will discuss the feasibility and opportunities for a UAS industry focus in the Aerozone. It will also address some challenges to keep an eye out for, as well thoughts on the steps required to make a successful drone industry sector an economic success in the region.

The growth of the UAS market

The UAS industry represents the largest significant new vehicle entrant to the aviation sector since the introduction of jet aircraft in the mid 20th century. For small aircraft that typically fly relatively short distances and relatively low altitudes, drones represent the newest entrant to aviation in more than a century. As of 2021, nearly 1.8 million drones were registered in the United States with more than a quarter of all registered drones noted to be used for commercial purposes. Major commercial activities include facilities surveillance, environmental monitoring, precision agriculture, real estate photography, law enforcement, and small package delivery.

UAS related manufacturing and production is also wide ranging and ever growing. UAS manufacturing is not limited to the drones themselves. Communications devices, package handling accessories, cameras and video equipment, sensor systems, lights, command and control equipment, as well as drone maintenance services, drone landing facilities, and drone surveillance and monitoring infrastructure are some representative technologies that are poised to grow as the UAS market grows.

The economic impact of the UAS market is highly significant. In a recent study, the Association for Unmanned Vehicle Systems International (AUVSI), the world’s largest non-profit organization supporting the UAS industry, estimates **that by 2025 more than 100,000 jobs will be created in the United States with an economic impact of more than \$82 billion** (Source: AUVSI Economic Impact Report).

UAS In Ohio

Much of the growing UAS industry within the State of Ohio has been located in the Dayton metropolitan region. Developing out of military research associated with the Air Force Research Laboratory (AFRL) at the Wright-Patterson Air Force Base, a number of organizations in industry and academia have emerged in the UAS space. For example, Sinclair Community College (SCC) has developed a UAS Center that focuses on applied research and training for drone operators in multiple sectors, including law enforcement, emergency response, and precision agriculture. Airports in the region, including Springfield and Wilmington, have become homes for UAS research-oriented operational activity. In central Ohio, The Ohio State University has also been active in UAS research and development. The University is a core member of the FAA’s Center of Excellence in Unmanned Aerial Systems Research (ASSURE). UAS integration with manned aircraft operations exists at The Ohio State University Airport. UAS activity is being integrated into the Columbus metropolitan area via the Columbus Smart City program (in 2016, the city of

Columbus won a \$40M grant from the United States DOT, to integrate smart vehicle technology into its transportation network).

The state of Ohio is also a base for the production of UAS systems themselves. For example, two notable Ohio based drone manufacturing and applications companies are located in the Cincinnati metropolitan area. Ohio Drone LLC: (<https://www.ohiodronellc.com/>) has developed a line of professional grade small drones capable of multiple missions, including infrastructure inspection, surveying, aerial photography / videography. The Workhorse Group (<https://workhorse.com/horsefly.html>) has developed UAS vehicles designed to be a market leader in autonomous small package delivery.

Through the Aerozone, there is tremendous potential for Northeast Ohio to grow in the UAS space, as well, having similar foundations and synergies as found in Dayton and in Central Ohio, as the Aerozone alliance supports a location within the Northeast Ohio region that has excellent synergies with the UAS sector.

UAS and the Aerozone

The Aerozone region is currently home to a number of aviation and aerospace industry leaders, such as the NASA Glenn research center and the Ohio Aerospace Institute, and the location of significant infrastructure compatible with UAS and component testing, production, manufacturing, repair, and servicing, including the Cleveland Hopkins International Airport and the international exposition (I-X) center. In addition, emerging companies in the UAS space are making a presence in the region.

The UAS related organizations within the Aerozone have the potential of supporting UAS related growth in the areas of manufacturing and production of UAS vehicles and related components, applications of UAS by various private sector companies, government and other public sector agencies, tracking and surveillance of UAS operations, training and education on the use of UAS systems, and developing policy for integrating UAS operations into a large metropolitan area.

The North Coast Drone Alliance (NORCODA) (<https://norcoda.org/>), is an independent, nonprofit professional association within the Aerozone alliance, connecting drone professionals in government, public safety, university, and commercial organizations, provides education, mentorship, training, and community to drone operators and those interested in the business of drones. Local UAS companies affiliated with NORCODA include: Tamarack Aerial Services: (<http://tasdrones.com/>), V1 Drone Media (<https://www.v1dronemedia.com/>), Twomileheavy Industries: (<https://twomile.com/>), and Avon Technical Services (<https://www.avonuas.com/>). These companies provide a wide range of UAS related services, all of which are pioneers in this new sector, while bringing positive impacts on the regional economy. These companies are excellent examples that represent NORCODA's strategic plan for providing economic impact to the region, through education, research & development, operational growth, and safety of UAS systems.

This base of industry and infrastructure provides for a wide range of opportunities for the region to create what may come to be known as a 'center of excellence' for UAS related industries, research, design, manufacturing, applications, management, and training.

The potential for UAS manufacturing and production within the Aerozone

There are a wide range of opportunities for the Aerozone to be a hub of UAS production, from the production of UAS vehicles themselves or the manufacturing and production of component parts and materials to UAS systems. Companies such as Cleveland-based **Zin technologies** (<https://www.zin-tech.com/>), for example, are well positioned to contribute to the growing UAS industry and would provide synergies within the Aerozone development. Specifically, Zin is a good fit to contribute to the design and manufacturing of UAS vehicles and components, with their strength in composite materials, electro-optical design analysis, and electrical systems, with specific applications to the design of UAS avionics systems, sensor systems, and power distribution systems.

In addition to manufacturing and production opportunities, service industries that support UAS activity have the great potential for growth in the Aerozone. For example, companies such as Cleveland-based **McPc** (<https://www.mcpc.com>), a data protection company, have tremendous opportunities to offer data protection and cyber security for UAS operations, as such operations may collect tremendous amounts of data, often sensitive data regarding UAS position location, payloads carried, and data recorded, such as traffic surveillance data, infrastructure health data, and agriculture yields.

There is certainly room in the market for growth in all sectors related to UAS. The potential for growth in skilled jobs in the area of drone aircraft and infrastructure development and maintenance, with a focus on remote sensing and information technology skill sets is very strong.

For the operation of drones and use of the associated technologies, there will be an ever growing need for formal training. Training ranges from FAA requirements to be a drone pilot (REF: FAA FAR PART 107 - Remote Pilot Certification), to training on operating drones for specific use cases, such as law enforcement, to training on operating associated drone equipment. Since 2016, more than 208,000 remote pilot certificates have been issued by the FAA, approaching 25% of the amount of currently issued pilot certificates for traditional "manned" aircraft. Upwards of 350,000 remote pilot certificates are forecast to be issued by 2025. (ref: https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2020-40_faa_aerospace_forecast.pdf)

Clearly there are opportunities for training, education, research, and the development of future uses of drones in other environments we haven't yet thought of.

Other benefits of developing UAS presence in Aerozone

Integrating 21st century advancements in electric propulsion, satellite-based navigation, high volume data analytics, and advanced sensor systems, UAS is among the latest technologies that is poised to revolutionize many elements of public infrastructure. For example, UAS is poised to

have the greatest impact on air transportation systems since the invention of the jet engine. The integration of UAS transportation systems, in the form of air taxis (see Joby Aviation: <https://www.jobyaviation.com/>), offer unprecedented opportunities to connect people within regional economic centers, such as 20 minute travel times from Cleveland to Youngstown, 30 minute travel times to Toledo, 45 minute travel times to Columbus, and 90 minute travel times to Dayton or Cincinnati. Within the Cleveland metro area, the presence of local UAS taxi services may increase access to traditional air transportation, for example 5 minute UAS taxi rides between the Cleveland Hopkins International Airport and downtown Cleveland, 10 minutes to Shaker Heights, or 15 minutes to Solon.

UAS is also poised to help solve the “last mile” solution, providing increased high-speed access to remote and otherwise underserved communities for small, often time-sensitive package delivery, providing, for example, the ability to transport emergency COVID vaccines from the Cleveland Clinic to the VA clinic in Hermitage in under 30 minutes.

As the proliferation of UAS increases in metropolitan areas such as Northeast Ohio, there will be an increasing need for UAS “traffic management”, including the development of technology and policy to effectively integrate UAS safely and efficiently into the larger metropolitan planning strategy, a challenge that is only beginning to be addressed. A presence of key UAS system users, developers, and researchers within the Aerozone will be poised to address these critical issues, positioning the region as being pioneers in drone traffic management, much the way Cleveland is known for operating the first electric automobile traffic signal. (<https://www.history.com/this-day-in-history/first-electric-traffic-signal-installed>).

UAS integration into a wider transportation management system is a particularly important issue for airports such as those within the Cleveland metropolitan area, including **Cleveland Hopkins (CLE)** and **Burke Lakefront (BKL)**. These facilities have the potential to be drone traffic hubs, increasing transportation access and economic development in the region while they also seek to mitigate safety issues associated with unregulated drone flying that may conflict with existing air traffic. UAS development within the Aerozone provides opportunities for these airports to be leaders in addressing these challenges.

Opportunities for Funding for UAS related development

While the UAS industry is growing, there are still many technical challenges as barriers to greater UAS proliferation. The Institute of Electrical and Electronic Engineers (IEEE) (ref: <https://ieeexplore.ieee.org/document/8011942>) notes that providing safe and efficient access to airspace for both manned and unmanned aircraft poses significant challenges that may require time to be addressed. These challenges include ensuring reliable command-and-control (C2), and detect-and-avoid (DAA) capabilities; communications with air-traffic-services; airspace design; and supporting automation, flight information, and mobility management. There is also a need for procedures, training, and policies that ensure safety of operations in the integrated environment. To this end, several federal agencies have supported advancements to overcome these challenges through research activities and funding opportunities available to aerozone

associated companies. For example, there has been an increasingly active history of opportunities to win grants through the Small Business Administration from a number of program sponsors including NASA, the DOD, and the DOT, in the area of advancing unmanned aerial systems and urban air mobility.

NASA and the aviation industry are involved in research that would greatly benefit from breakthroughs in UAS capabilities that could eventually enable the new Urban Air Mobility market. For example, remote sensing missions utilizing one or more UAS would benefit from autonomous planning algorithms that can coordinate and execute a mission with minimal human oversight. Detect and avoid algorithms, sensor fusion techniques, robust trajectory planners and contingency management systems that can enable Urban Air Mobility (UAM) and higher levels of UAS integration into the national airspace

The U.S. Small Business Administration's **SBIR / STTR** programs have a track record of grant opportunities for the advancement UAS in areas including the verification, validation and certification of complex and/or nondeterministic systems, Sensing, perception, cognition and decision-making, Cost-effective, resilient and self-organizing communications, and Improved survivability in degraded or off-nominal conditions.

Local and Federal Policies that would facilitate growth

There are a number of ways that Cleveland, Northeast Ohio, and the Aerozone Alliance may work together to establish local policy and be a national leader in providing input towards federal policies for the proliferation of UAS systems.

Establishing standards and protocols for managing drone traffic. Suggestions to consider include:

- Establishing standards and protocols for managing drone traffic, such as creating "Drone Zones", dedicated zones for drone operations such as airspace corridors and protected areas, and developing standard methods of surveillance and tracking of drone operations. Successful efforts on the local level may be highly influential towards directing policy on the state and federal levels.
- Creating expanded public education efforts with the goal of providing a greater understanding of drone operations to the general public.
- Further developing expanded opportunities for licensing and training for current and future drone operators.
- Creating funding opportunities through a "Drone Seed Fund" to spur entrepreneurial growth.

Challenges to growth

The UAS industry is in its nascent stage, with little in the way of established regulations and protocols. Furthermore, there has yet to be a standard public culture of how drones should operate within a metropolitan area. This is evidenced by increasing numbers of recreational and commercial drone operators flying their UAS aircraft in manners that may be perceived to impinge upon safety, security, and privacy. This in turn creates an aura of uncertainty among the public as to whether or not the proliferation of UAS is worth the risk.

The challenge, of course, is to overcome this perception. This is done by contributing to the establishment of rules, best practices, and enforcement measures that ensure UAS operations that are safe, as well as compatible with the other desires of the community.

Conclusion

There are few metropolitan regions in the United States so well poised to leverage the growing UAS as a catalyst for economic growth as Northeast Ohio's Aerozone region. The combination of existing infrastructure, an established aviation and aerospace business environment, and a roster of entrepreneurial ventures position the region to be leaders in UAS industry growth.

By developing a strategy for fostering existing entities within the Aerozone and attracting new compatible ventures, the Aerozone has the potential to be a leading hub for UAS-related production and manufacturing. In addition, the Aerozone has the potential to lead the nation in training and education of UAS operations, and creating policy for UAS that may be translated nationally.

Seth Young, Ph.D., A.A.E., CFI, is the John McConnell Chair of Aviation in The Center for Aviation Studies and Associate Professor of Civil, Environmental, and Geodetic Engineering at The Ohio State University in Columbus, Ohio. Dr. Young has more than 25 years of experience in academia and industry focusing on issues of management planning, operations, security, engineering, and financing of civil use airports. Dr. Young has published numerous journal articles in the aviation field and is a co-author of the leading texts on airport planning, design, and management. Dr. Young holds a Ph.D. in Civil and Environmental Engineering/Transportation and an MS in Industrial Engineering /Operations Research from the University of California, Berkeley, and a B.A. in Applied Mathematics from the State University of New York at Buffalo. Dr. Young is an accredited airport executive with the AAEE, a certified flight instructor, and holds an instrument-rated commercial airplane and seaplane pilot's certificate from the U.S. Federal Aviation Administration. Dr. Young, however, still needs to complete his remote pilot certification to fly his drone. Dr. Young may be reached via e-mail at young.1460@osu.edu.

