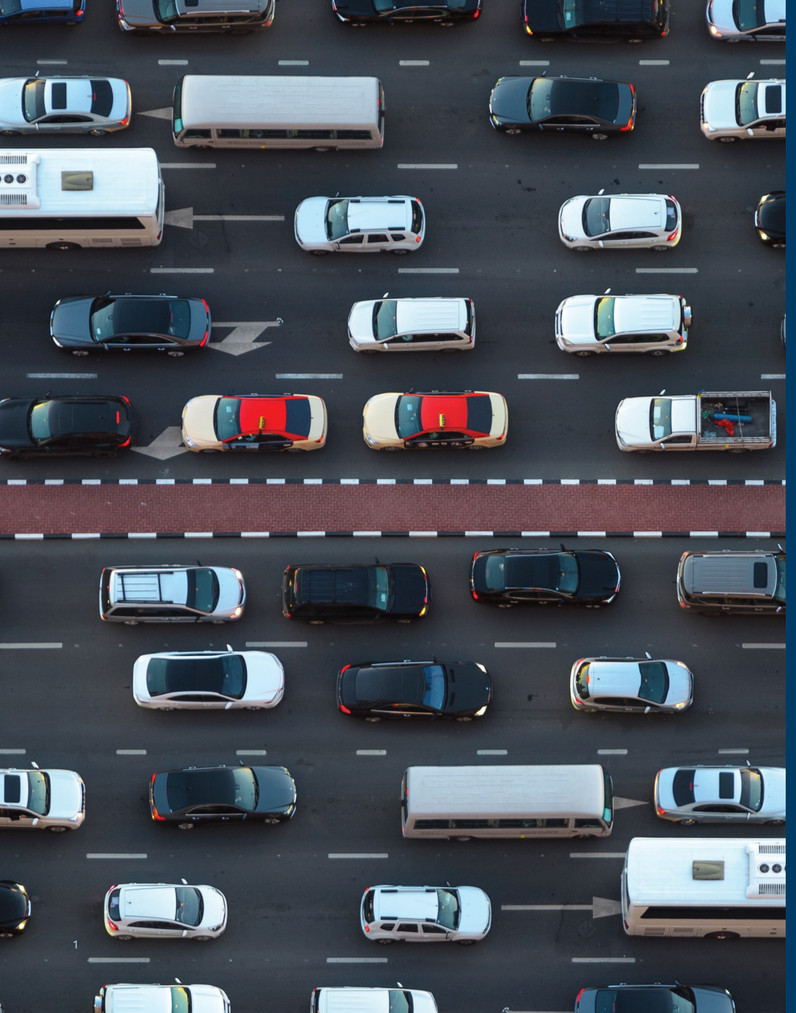
DEFINING THE ADVANCED AIR MOBILITY ECOSYSTEM OF TOMORROW

Unraveling AAM and its corresponding terminology to communicate the purposes of the concept to stakeholders, establish consistency among AAM ecosystem leaders and gain acceptance among the general public.



INTRODUCTION

Much like a heart stops beating when it loses access to blood, a city stops working when the people, or lifeblood of the city, can't move properly. This reality is playing out in the hearts of cities across the world. In fact, rapid rises in vehicle congestion have resulted in poor air quality and lost time and money for commuters—disrupting entire economies. In the freight industry alone, congestion has added approximately $74.5 billion annually to operational costs.[1] The losses for individuals are significant as well, with each person in the U.S. spending an average of 97 hours per year commuting, or approximately $1,348 annually, for a total of $87 billion in 2018. If the situation is not addressed, Americans will have lost $2.8 trillion from sitting in traffic by 2030. [2]

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Mobility experts have taken notice, however, and now public and private entities are working on an equitable solution that will not only reduce congestion, but also bridge the gap between urban cores and rural communities—in a way that meets the public's increasing demand for clean, affordable, sustainable transportation options.[1]

Their vision? A new aerial mobility ecosystem that opens up additional traffic lanes in the skies for innovative air vehicles, enabling people and goods to move faster, cheaper, cleaner, and safer than today. Government agencies, transportation leaders, and smart-city planners have had aerial mobility solutions on their radar for years, and now that the technologies—5G, AI and battery power, among others—are deploying, organizations are pivoting toward alignment to make this vision a reality.

GETTING OFF THE GROUND

One company that's leading a charge to create unity within the mobility ecosystem is the multinational professional services network known as Deloitte. The company is playing a large role in bringing together entities like NASA, the Federal Aviation Administration (FAA) as well as the private sector, to develop and explore viable solutions for advanced air mobility. Scott Corwin, Deloitte's Future of Mobility managing director, is on the frontline of this initiative.

"Deloitte is actively shaping the direction of the future of mobility ecosystem on a global basis. We are working with clients in every single conceivable sector that is engaged around mobility, and it now extends into places like healthcare and smart materials and chemicals, not just automotive and transportation," Corwin said. "It's obviously tech, but it sort of touches almost every walk of life. We are very busy bringing together players in the ecosystem to actually introduce this innovation into cities and into different geographies."

As industry players form alliances to bring these new technologies to the public, it is vitally important that stakeholders who are not directly involved in the industry understand what's at play. NASA is among the most prominent organizations to bring clarity to the greater public regarding the emerging industry by providing an all-encompassing term for this new breed aircraft capable of safe, reliable, affordable and low-noise vertical flight.[4] Coined *Advanced Air Mobility*, or AAM, the term grew out of a previous acronym, UAM, which refers to *Urban Air Mobility* and includes passenger or cargo-carrying air transportation services in an urban environment. However, the need for new transportation solutions extends beyond urban environments and into rural communities, and even farther, which is why NASA's intentional move to change the terminology was necessary. AAM ultimately describes the air transportation ecosystem that moves people and cargo between local, regional, intraregional, and urban regions that have not been served or are underserved by existing aviation —all using revolutionary new aircraft.

[1] https://www.logisticsmgmt.com/article/ignoring_congestion_on_u.s._highways_wont_make_it_go_away
[2] https://inrix.com/press-releases/scorecard-2018-us/#:~:text=Americans%20lost%20an%20average%20of,the%20top%2050%20urban%20areas
[3] https://www.nutanix.com/content/dam/nutanix-cxo/smart-cities/resources/eiu-nutanix-smart-cities-sustainability-article.pdf
[4] https://www.nasa.gov/aam

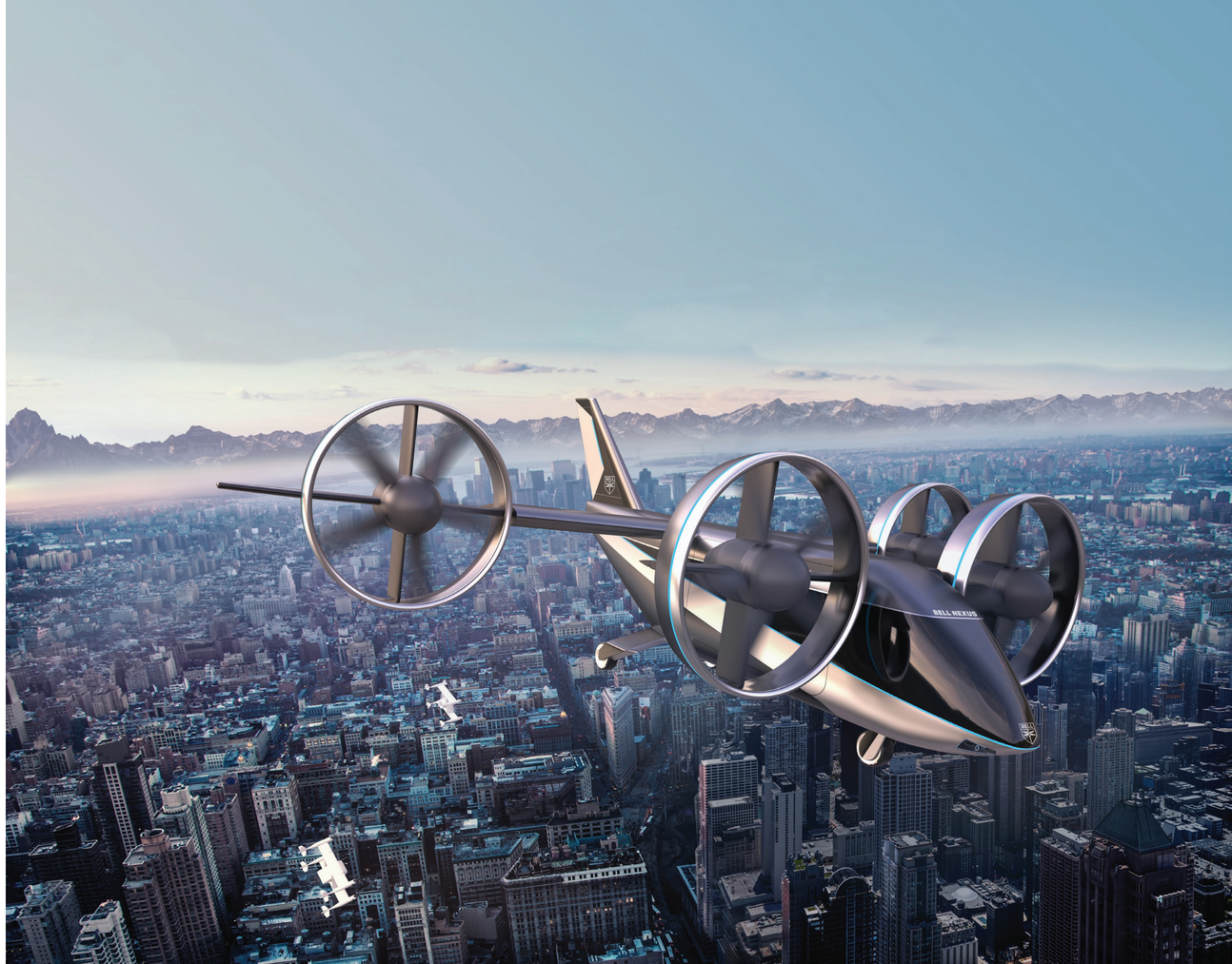
"On-Demand Mobility (ODM) was the state-of-the-art phrase in 2016, but after looking at market studies, we noticed it wasn't all about on-demand, so we pivoted to using *Urban Air Mobility* a few years ago as most of the emphasis in the community was surrounding this," NASA AAM Mission Manager Davis Hackenberg said. "While we believe this is still the right term around smaller Unmanned Aircraft Systems (UAS) and Electric Vertical Take-off and Landing (eVTOL), we didn't want to limit the scope of this emerging aviation market. We wanted people to understand that it's urban and rural, it's regional and interregional, local to your city – so we switched over to AAM to be all inclusive."

This overarching term encompasses developing and deploying aviation in transformative and innovative manners to provide aerial mobility in ways not typically seen today. AAM includes the transportation of passengers and cargo as well as aerial operational missions, such as infrastructure inspection or search-and-rescue operations. It also includes local missions of about a 50-mile radius in rural or urban areas, and intraregional missions of up to a few hundred miles that occur between urban areas, between rural areas, or between rural and urban areas.

"Those of us at the forefront of AAM must be clear about what we're saying to stakeholders," Bell Executive Vice President of Innovation and Commercial Business Michael Thacker said.

"As we continue to shape and define the future, we need to be explicit about what we mean and not assume everyone knows the acronyms associated with the industry. It's important to be effective communicators when we're having conversations about what AAM is as well as the challenges and the overall benefits it will bring to our communities."

So, why is this important? AAM vehicles, including Unmanned Aerial Systems (UAS), are already flying in and around select cities, demonstrating that AAM can be a viable solution for various roadblocks facing growing cities. It's only a matter of time before AAM technology becomes commonplace around the globe; and cities that adopt the technology first may find themselves at a competitive advantage economically over their neighboring counterparts. However, much of this emerging technology is foreign to those not directly involved in its development, which can lead to confusion about the purpose of AAM. Comprehension of AAM terminology and its benefits is a vital precursor to its widespread adoption by state, local and regional governments—especially if the AAM industry expects government leaders to incorporate these new technologies into their strategic city planning efforts.



DEFINING THE LANGUAGE

The good news is, some state and local governments are investigating AAM and how it may impact their local economies. In fact, the home state of The Wright Brothers is exploring this very thing. Ohio's Department of Transportation has enlisted Crown Consulting Inc., a technical support firm with three decades of experience working with the FAA and NASA, to look at the economic impacts of introducing urban and regional air mobility and UTM in air corridors to connect Ohio's major cities. Specifically, the firm will examine air taxis, drone utilization, autonomous cargo aircraft as well as medivac, organ transplant delivery and other AAM scenarios across the state.

But what is it going to take for cities, counties and states to move from concepting to actually leaning into collaborative efforts? Or when can we expect them to include these technologies into their five- and 10-year economic development, planning and zoning plans? The struggle to move forward with such a new concept like AAM lies, in part, in how planners are held to such a high standard by the public. While this is good practice, any misstep by planners will likely lead to public criticism. This dynamic has led to a risk-averse culture that often causes delays in pursuing projects that might shake up the status quo. [5]

"There's a lot of mayors and urban leaders who say, 'Try it in another city first. When you work out all the kinks, then bring it to my city,'" Los Angeles Mayor Eric Garcetti said to an audience at the 2019 CoMotion LA conference in Los Angeles.

Despite this reality, Mayor Garcetti and his team see the emergence of new technological solutions in a different light, according to his associate director of Mobility Innovation, Julia Thayne. "In LA, we're not 'future-phobic'; we're future-guiding," Thayne said in a World Economic Forum(WEF) blog post written by WEF Aerospace and Drones Project Lead Harrison Wolf. "We believe that Urban Aerial Mobility can be a meaningful part of our transportation network, but only if we work hand-in-hand with communities, companies, and cities across the world to ensure that outcomes are safe, secure, sustainable, and equitable."

The WEF and Mayor Garcetti's office have worked together for nearly one year, and are collaborating with the Los Angeles Department of Transportation (LADOT) as the agency conducts parallel technical research. As seen in Ohio, Los Angeles is not alone in this regard. Other metro areas, like Dallas-Fort Worth, San Diego and Boston, are moving fast toward AAM integration.

Yet experts agree that there is much left to do in educating city, county and state planners before they will make the leap from paper to pavement, or in this case, airways. It is the job of the AAM industry to educate the planning commissions on the economic, safety and environmental benefits of adopting AAM solutions to counteract current and future transportation problems. Once "local" policymakers realize that AAM is coming, it's safe, and expected to be vital to the economic growth of future cities, then the risk of not moving forward with AAM will be greater than pursuing it. This means officials may have to consider AAM solutions in their strategic planning efforts.

In the meantime, the general public must have a broad understanding of the initial societal impact before they trust these vehicles as a mode of transportation, and feel comfortable with thousands of vehicles making tens of thousands of flights between hundreds of vertiports across their cities daily. City adoption and public acceptance begins with trust, according to the Community Air Mobility Initiative, also known as CAMI. In a recent CAMI resource paper, titled *Components of Public Acceptance for AAM & UAM*, the organization stated that "public acceptance hinges on balancing benefits against adverse impacts, earning trust, and integrating successfully." [6]

"Current responses to traditional general aviation, particularly helicopters, and new technology such as 5G mobile connectivity provide examples of the widespread resistance that can be encountered when there is a lack of public trust and the direct benefit to the community is unclear," the paper stated.

The paper further explained that the four facets of public acceptance are trust, public benefit, integration and limited adverse impacts.

Corwin agrees that "public acceptance is absolutely critical. He added, "It's going to take a collective of government and the private sector, and technologists and NGOs, and organized labor and universities, to actually bring this together."

The utilization of the vertical dimension as a transportation network has become clearer and more defined over the years. As seen with NASA coining AAM, this has resulted in the industry adopting and changing various acronyms, based on the evolution of the emerging technology behind AAM. While flexibility is paramount to allow for the ebb and flow of change, it has led to a sense of confusion – not only in the industry but with stakeholders.

The following terms and definitions are key to understanding the AAM ecosystem:

AAM (ADVANCED AIR MOBILITY): The expansive, all-encompassing term to describe the safe, sustainable, accessible, and affordable aviation for transformational local and intraregional missions.

ODM (ON-DEMAND MOBILITY): Immediate and flexible air transportation where trip origin, destination, and schedule are dictated by the passenger.

UAM (URBAN AIR MOBILITY): An industry term for on-demand, highly automated (unpiloted), passenger or cargo-carrying air transportation services in an urban environment.

UAV (UNMANNED AERIAL VEHICLE): An aircraft without a human pilot on board and a type of unmanned vehicle.

UAS (UNMANNED AIRCRAFT SYSTEM): There are many terms for UAS technology such as Drone, Unmanned Aerial Vehicle (UAV), Unmanned Aircraft (UA), Unmanned Aircraft System (UAS) and small Unmanned Aircraft System (sUAS) – all of which can be used interchangeably.

MAAS (MOBILITY AS A SERVICE): MaaS relies on a digital platform that integrates end-to-end trip planning, booking, electronic ticketing, and payment services across all modes of transportation, public or private.

EVTOL: (ELECTRIC VERTICAL TAKE-OFF AND LANDING) eVTOL aircraft are powered electrically and can hover, take off and land vertically, and transition to horizontal flight.

UTM: (UNMANNED AIRCRAFT SYSTEM TRAFFIC MANAGEMENT) UTM is a "traffic management" ecosystem for uncontrolled operations that is separate from, but complementary to, the FAA's Air Traffic Management (ATM) system.

[5] https://www.smartcitiesdive.com/news/comotion-la-no-one-has-the-answer-to-a-perfect-partnership/567410/

[6] https://static1.squarespace.com/static/5d27bb3e330ac30001dc14fd/t/5f512185b3a9286771d5758e/1599152525417/CAMI+-+Public+Acceptance+for+UAM.pdf

[7] https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/consumer-business/deloitte-nl-cb-ths-rise-of-mobility-as-a-service.pdf

CHALLENGES AND OPPORTUNITIES

Most people today have grown up with the idea of flying cars, dating as far back as The Jetsons. While it sounds like something still very much in the future, realistically, the engineering of an aerial vehicle and all its corresponding components exists today. Extended battery life and density, as well as breakthroughs in network capabilities over the past five years, have made the dream of AAM a reality. And, now with the expansion of 5G and advances in IoT, a connected ecosystem of autonomous flying vehicles operating above cities is not far away.

"The biggest challenge right now is managing the development of these technologies to the point where they're considered safe and reliable, and then writing the rules around those technologies to operate in the broader air traffic system," said Mike Berry, President of Hillwood, one of the country's top real estate developers.

It took decades and countless collaborations and organizations to make the roadways safe according to today's standards – not to mention, the government agencies, public services and private entities that work together to ensure these roadways are maintained, laws are enforced, and emergency response is available. This type of collaboration will need to be developed for the aerial arteries and veins of the vertical highways.

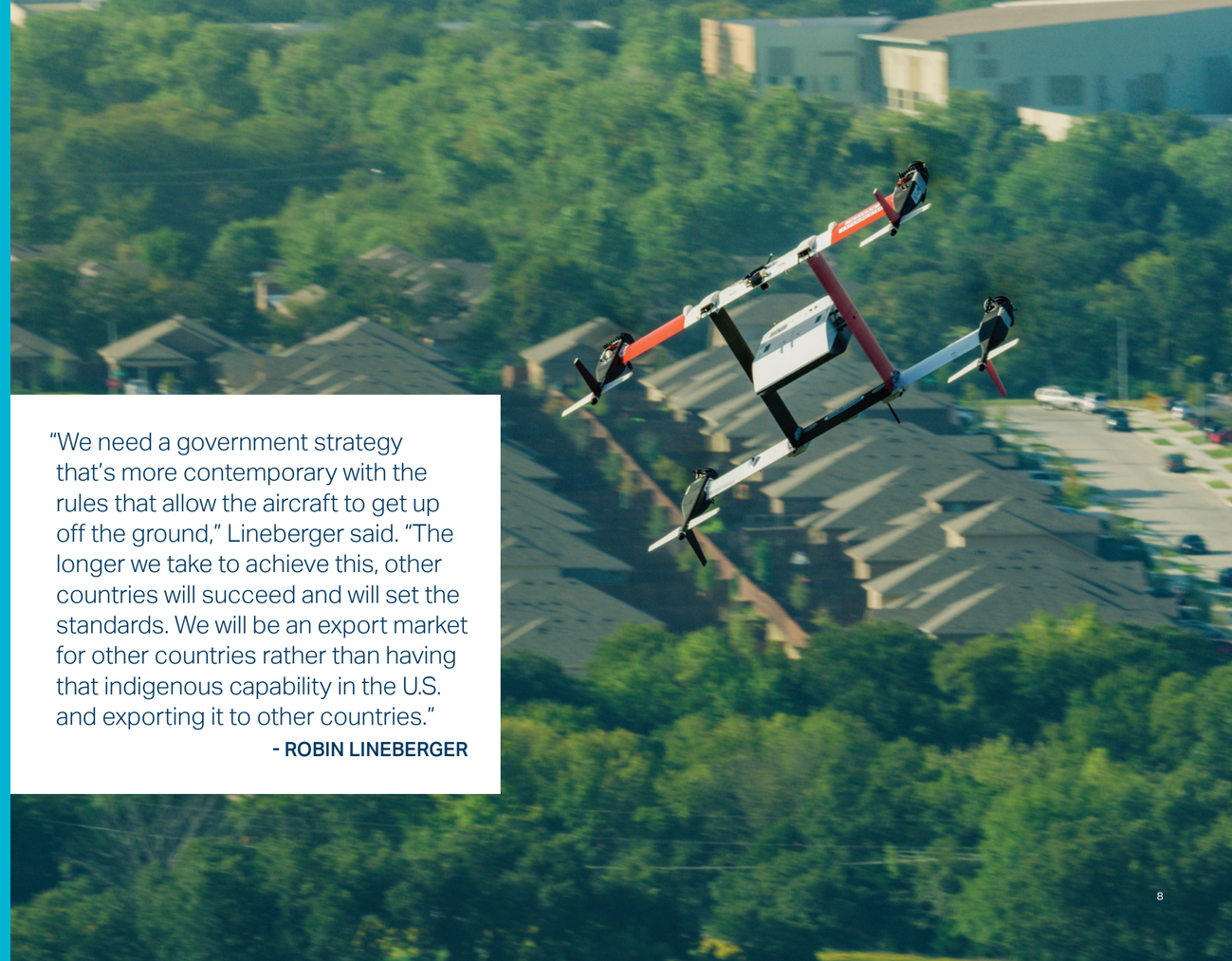
The structure of aerial pathways is revolutionary because it doesn't have to be linear like the roads – the network can be nodal – complementing the existing ground transportation system. Mapping out vertical navigation is a complex web and requires input from and partnership with federal regulators, local and state governments, telecommunications companies and even real estate developers, like Hillwood. AAM isn't one piece of technology existing in a controlled environment – it entails a complex framework of regulations and solutions working together.

Robin Lineberger, the leader of Deloitte's Aerospace & Defense industry practice, said the firm is advising utility companies and governments on how to introduce this in a responsible, governed way so that those involved understand the laws, the licensing and the implications of the data gathering. The challenge, according to Lineberger, is developing policy in which aircraft can be certified in a framework that will allow the industry to deploy an Unmanned Aircraft System Traffic Management (UTM) system that can integrate the vehicles into the air space in a seamless way. This framework would identify services, roles, responsibilities, information architecture, data-exchange protocols, software functions, infrastructure, and performance requirements for enabling the management of low-altitude uncontrolled aircraft operations.

"We need a government strategy that's more contemporary with the rules that allow the aircraft to get up off the ground," Lineberger said. "The longer we take to achieve this, other countries will succeed and will set the standards. We will be an export market for other countries rather than having that indigenous capability in the U.S. and exporting it to other countries."

The U.S. was the first to develop and certify aircraft, which has led to the nation enjoying global leadership in the marketplace for years. Not only that, the U.S.'s Air Traffic Control (ATC) system remains the safest in the world. [8] "Because of this, the rest of the world is following our lead," Lineberger said. "We need to lead on the framework and building this out, so the U.S. companies are the ones that service the rest of the world."

[8] https://www.airlines.org/news/faa-reauthorization-hearing/



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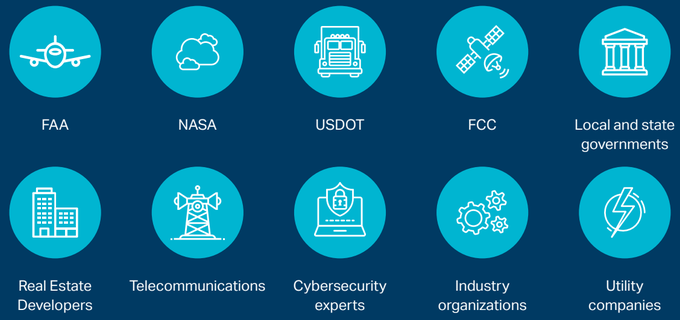
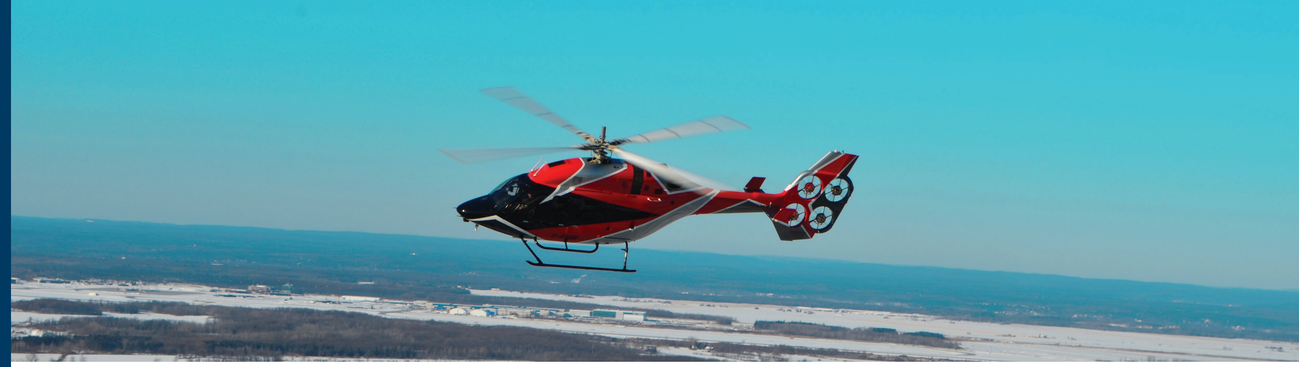
Fortunately, the U.S. has had experience managing vertical pathways in the FAA and its existing Air Traffic Management (ATM) system. The FAA just released its Concept of Operations (ConOps) in June 2020, detailing how it sees the rollout of UAM progressing. In the report, it states that it is looking at solutions that expand upon the current paradigm for manned aircraft operations and promote situational awareness and collaboration among operators.[9] While "lanes in the sky" will need to be developed, air vehicles can take advantage of existing landing sites for helicopters, airports and other infrastructure designed for the safety and efficiency of current aircraft.

This list of stakeholders demonstrates the complexity of implementation and the need to work hand in hand to create it.



[9] https://assets.evtol.com/wp-content/uploads/2020/07/UAM_ConOps_v1.0.pdf



SEAMLESS INTEGRATION

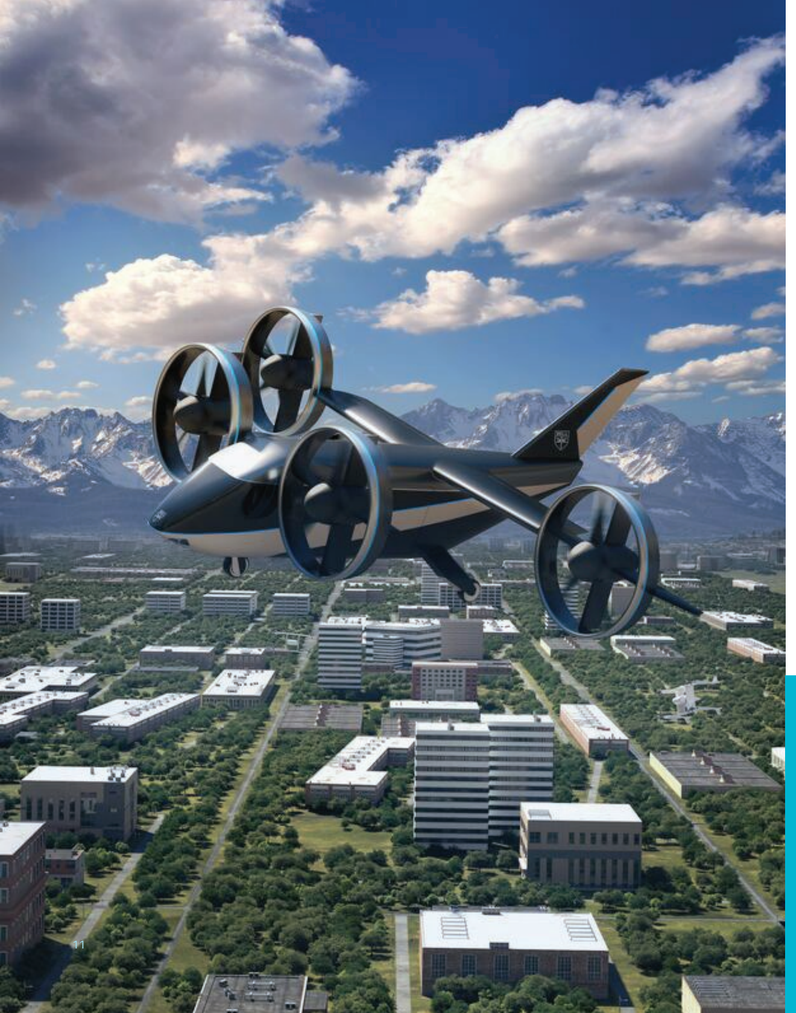
Rather than simply moving people and goods through the sky, AAM pioneers are focused on creating more cost-effective, convenient and sustainable solutions that traditional forms of transportation cannot achieve alone.

Shifting traffic from the ground into the clouds eliminates trillions of dollars spent on traditional infrastructure in maintaining roads. It adds a new level of convenience for both operators and passengers. Entire routes could be arranged across several transportation sources with the press of a single button from a smart phone. That information would go directly into an interface, like Bell's AerOS, a digital mobility platform that gives operators a 360-degree view into an aircraft fleet. By leveraging AI and IoT, the AerOS software would work in tandem with aircraft for real-time traffic monitoring and scheduling. The result could significantly reduce commuter times and improve traffic flow in the air and on the ground; not to mention, allow emergency services to reach residents inside or far outside of city limits in a fraction of the time spent traditionally.

"As we look at bringing public and private partners together around the world, we must consider how multi-modal infrastructure, meaning ground and air, truck and rail car, eVTOL and others, can play together in a way that provides mobility that meets citizens' needs. Our goal is to create economically vibrant areas and to bring all of the infrastructure to scale like vertiports, software, regulators and safe vehicles, without disrupting communities, but rather, enhancing them," Bell's Thacker said.

As experts like Lineberger evaluate how AAM will enhance current infrastructure, they're looking at curb space and ride-sharing capabilities, transportation bottlenecks, energy access, air quality and accessibility, among other aspects of the grid that are commonly in need of improvement.

"If Advanced Air Mobility is going to integrate into public infrastructure, which it has to in order to have a solid multi-modal experience, it needs to work seamlessly with the current public transportation infrastructure," Lineberger said.



This idea of integration is what an ecosystem is all about. Corwin explains, “It goes back to botany, and what’s really interesting about the sort of ecological ecosystems, is you have natural organisms that share an environment, and they compete, and they cooperate in terms of the use of the resources in that environment to build something collectively. It evolves. Species die off. Corporations will. Some will succeed, and new ones will succeed, and others will fail. That’s what an ecosystem is.”

Cities won’t accept AAM unless it has scaling capabilities and can ultimately be democratized, according to Lineberger. Access for all socioeconomical statuses will be key in rolling out AAM successfully, because a high level volume will be needed to make the solutions viable from a cost standpoint. As the volume increases, the cost will naturally come down and become affordable for all people, while sustaining its cost-effectiveness for the developers and operators of the technology.

“I do think that at the state and city level these technologies can be deployed to improve the quality of life of the citizens,” Lineberger said. “From a public safety standpoint, adopting these technologies for first responders will move medical supplies quickly and aid in search-and-rescue, recovery, surveillance and public safety.”

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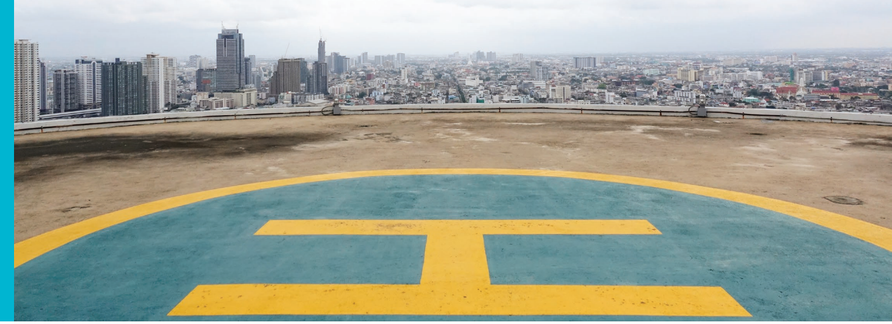
$5 TRILLION ANNUALLY

ESTIMATED SAVINGS SMART CITY TECHNOLOGIES COULD SAVE GLOBAL ENTERPRISES



SOCIETAL DEMAND

COVID-19 has proven the need for innovation around contactless delivery. Besides the movement of people, AAM is focused heavily on the movement of goods and products. Using autonomous, flying delivery vehicles equates to less contact with humans, and ultimately contagions. It could speed up the distribution of medical test kits and assist in supply chain management as a means of continuing commerce and health services in a safer way. More than half of 325 aerospace companies questioned about the future of AAM solutions believe commercial drone deliveries will be commonplace by 2023, as the public and private sectors seek safe ways to guarantee services while containing the spread of any viruses. [10]

It is estimated that smart city technologies could save global enterprises, governments and individuals $5 trillion each year.[11] AAM will be a big part of that savings. With the integration of existing transportation systems and future mobility options like aerial ride share, efficiencies would be streamlined, which is where the real return on investment would be noticed.

Urban areas will be the first to see AAM infrastructure updates as organizations like NASA continue grassroots efforts to promote public confidence and educate local government agencies on emerging aviation markets. The intent is to eventually bridge the gap between urban, suburban, rural and regional environments through one cohesive ecosystem. AAM will allow for the travel of people and cargo far beyond urban centers, extending the sense of community that currently exists in an urban area to rural communities. Access to medical care will be more convenient, food deserts will no longer be an issue and rescue services could be shortened drastically, in even the most remote areas.

While this type of convenience could be in the very near future, it will require consumer demand to make it viable. The public must use the system, which means it also needs to be affordable for everyone. According to a NASA study, 25% of the more than 2,500 consumers surveyed reported that they are comfortable with unmanned aerial technology. Approximately 25% of consumers reported they will not use UAS or eVTOLs when services become widely available. The study goes on to say, “ … that nearly half of all consumers surveyed are potentially comfortable with delivery and UAM use cases.” [12]

That number could rise once consumers understand the safety and the positive impacts of AAM on their daily lives. In fact, the emergence of AAM as a ride-sharing option may appeal to more consumers than once thought.

“There’s been a general trend where people are paying for services rather than owning assets. And so this is an opportunity for various mobility providers to be able to offer services for one-offs or a subscription," Rasheq Zarif, a future mobility tech sector leader with Deloitte, said. “And this is something that we’ve seen progressing from ride hailing services, on demand transit, or even when you’re buying a monthly pass for your public train transit system. Bell is looking in the forefront and saying, ‘okay, how do we take that applicability and take that to the air?’ Now you can have a subscription service, for example, to be able to take a helicopter ride or even a future eVTOL ride to go from A to B, whether it’s commuting or for a weekend getaway.”

[10] Protolabs Horizon Shift: Accelerated disruption in aerospace report
[11] https://www.globenewswire.com/news-release/2017/12/05/1228882/0/en/5-Trillion-Smart-City-Question-Posed-in-New-ABI-Research-Cheaper-or-Smarter.html
[12] https://www.nasa.gov/sites/default/files/atoms/files/uam-market-study-executive-summary-v2.pdf

Convenience and speed of delivery are perhaps the initiating factors that have pushed AAM forward, but not least important are the ecofriendly benefits. New technologies built into the aircraft, as well as the complex system integration between ground and air transportation, can provide a significant decrease in the output of air pollution. Aside from omitting harmful emissions that a traditional aircraft or ground vehicle disperses, the deployment of AAM vehicles will reduce traffic congestion, therefore leading to an overall decrease in the total number of hours individuals spend in gridlock on the roadways.

"We have the opportunity to replace carbon-based methods of delivery with green-based methods of delivery. And then, feeding the grid, recharging these vehicles on a grid that's generated through renewables," Lineberger said. "[AAM] offers a unique inflection point to build out a logistics scheme that's built on green rather than carbon. The societal benefit to the leaders in this market will be hundreds of billions of dollars of opportunity, significant economic growth and significant job creation in an area that is the next energy area, which is electrification, green and perhaps hydrogen."

AAM pioneers are also investing in the elimination of acoustic signature. The switch to electrification as well as advancements in rotors and wing design have all led to a drastic reduction in acoustic signature. Bell's electrically distributed anti-torque (EDAT) tail rotor is just one example of how OEMS are not only significantly reducing the acoustic signature of aircraft but doing so in a way that is safer and more cost effective to operate. The EDAT system includes four small fans within a tail rotor shroud. Each fan is powered by a separate electric motor that supplies electricity through generators driven by the turbine engines.

WHAT'S NEXT FOR AAM

According to the eVTOL Aircraft Director, there are about 300 eVTOL aircraft concepts throughout the world and many promise varying levels of opportunity.

"At Bell, we've remained steadfast in our pursuit of innovation," Thacker said. "Bell is focusing on safety, convenience, passenger experience and affordability. Our technological and logistical research in AAM is helping industry leaders and journalists convey a key message: 'there is a reality for autonomous aircraft in the vertical dimension as land and space become an issue.'"

The APT
IS FULLY SCALABLE TO HANDLE
500lbs AND
REACH SPEEDS OF UP TO
100mph

While Bell's expertise and credibility in aviation are helping companies throughout the world develop future networks for AAM operations, the technology company is also building its own fleet of AAM aircraft. To remain consistent with the industry terminology, Bell has coined its line of smart vertical lift systems as Intelligent Air Mobility (IAM) aircraft. The goal of Bell's IAM fleet is to safely and quietly move people, goods and data using sustainable energy. Bell is designing these IAM aircraft, including its Bell Nexus air taxi, to be all-electric, cost-effective and eventually accessible to the masses. Bell plans to power each vehicle with its digital mobility platform, AerOS.

Perhaps Bell's recent rising star among its cast of IAM technologies is its all-electric Autonomous Pod Transport (APT), a family of autonomous aerial solutions for cargo and data transport. In early 2020, the APT 70 completed a significant milestone when it performed its first beyond-visual-line-of-sight (BVLOS) flight while carrying a payload of 60 pounds. Later in the year, the APT 70 completed a joint flight demonstration with NASA as part of NASA's Systems Integration and Operationalization (SIO) activity. NASA SIO, which brought together industry partners to conduct demonstrations of potential commercial applications using different sizes of UAS, took place in September and was perhaps the APT 70's toughest challenge yet—and it succeeded on all accounts. The aircraft executed a BVLOS mission, with the assistance of visual observers and a prototype airborne and avoid system, throughout a complex urban environment, transitioning into and out of Class B airspace and modeling flight paths of future commercial UAS flights. Launching from Bell's Floyd Carlson field in Fort Worth, Texas, the APT 70 flew a preprogrammed 10-mile circuit path along the Trinity River, near DFW International Airport and all of its surrounding airspace and flight paths, representing one of the most complex commercial flight regions in the U.S.

The APT 70 has come a long way since its first autonomous flight occurred in 2019. And, according to Bell, the APT is fully scalable to handle payloads of up to 500 pounds and reach speeds of up to 100 mph. This will enable companies from all industries to utilize the technology's multi-use capabilities to transport everyday products like groceries, or deliver medical or military supplies.

Autonomy is a real game-changer in the future of mobility, whether on the ground or up above. Studies have shown that as technology has become more reliable, humans have played a progressively larger causal role in accidents, particularly in aviation. In fact, roughly 70-80% of all aviation accidents are attributable, at least in part, to some level of human error. As technology companies, like Bell, increasingly utilize autonomous solutions to move goods and people, industries will see improvements in overall safety, largely because the opportunities for human error will be minimized. Major airliners have been using fully automated flight control systems, like fly-by-wire, for decades now, and switching to autonomous systems is simply the next logical step toward safer flight.

70-80%
OF AVIATION ACCIDENTS

ARE ATTRIBUTABLE, IN SOME PART, TO HUMAN ERROR. [13]

[13] https://dvikan.no/ntnu-studentserver/reports/A%20Human%20Error%20Approach%20to%20Aviation%20Accident%20Analysis.pdf

Bell, which has an 85-year legacy in flight, maintains that a true timeline for a commercially viable ecosystem, based on where it stands today, is anytime between 2025 and 2030. Innovation leader Thacker explains, "It's not just about the aircraft. We can make things fly and fly safely. It's really about getting the system in place to be able to make it accessible to people and make it beneficial to society overall, whether that's getting to you faster, whether that's taking trucks and cars off the road, or whether that's making your ability to get from point A to point B in a more economical, more cost-effective and more timely way. All of those things are what we're trying to do with Advanced Air Mobility."

As the world competes to become first in launching AAM vehicles, its vitally important that the U.S. is first to the table, especially if it wants to enjoy the economic benefits like when aviation first took off in the 20th century. According to Lineberger, there is a large national security imperative for the U.S.

"Whether we like it or not, there will be militarized versions of all of this tech, and if we can't provide it to our military, then they will have to develop it themselves, and it will be on the taxpayers," Lineberger said. "It would be better if we let the companies generate the R&D, put these into commercial use, take the derivatives and put them into the military, and the design costs are paid."

"Building on the innovative work from Bell, and our other aerospace and defense businesses, we are embracing AAM through a collective effort, to focus on the entire ecosystem. We understand that one of the biggest challenges is ensuring the technology paces with the regulatory process at the federal, state and local levels to establish a safe, efficient and greener mode of transportation that's accessible to all," said Rob Scholl, SVP of Textron eAviation.

Fortunately, many companies in the U.S. remain at the forefront of AAM. In fact, Hillwood is closely involved with a public-private partnership that could be the first to launch a complex web of AAM aircraft. Together with Deloitte and other partners, Hillwood is developing a 27,000-acre AAM master-planned community near Dallas-Fort Worth (DFW), called Alliance Texas.

"It's an incredible, incredible sandbox in terms of this confluence of probably the most integrated and advanced ecosystem of supply chain and logistics, and it will be a testing ground and probably the earliest certified centers for drones and the commercial application of them," Corwin said.

Alliance Texas is built with a resilient infrastructure designed to support connectivity. It has been dubbed the "Mobility Innovation Zone" and is already equipped to handle use-case development in a controlled test environment—where AAM aircraft can access complex air space in a way that can't be done in other metro environments.

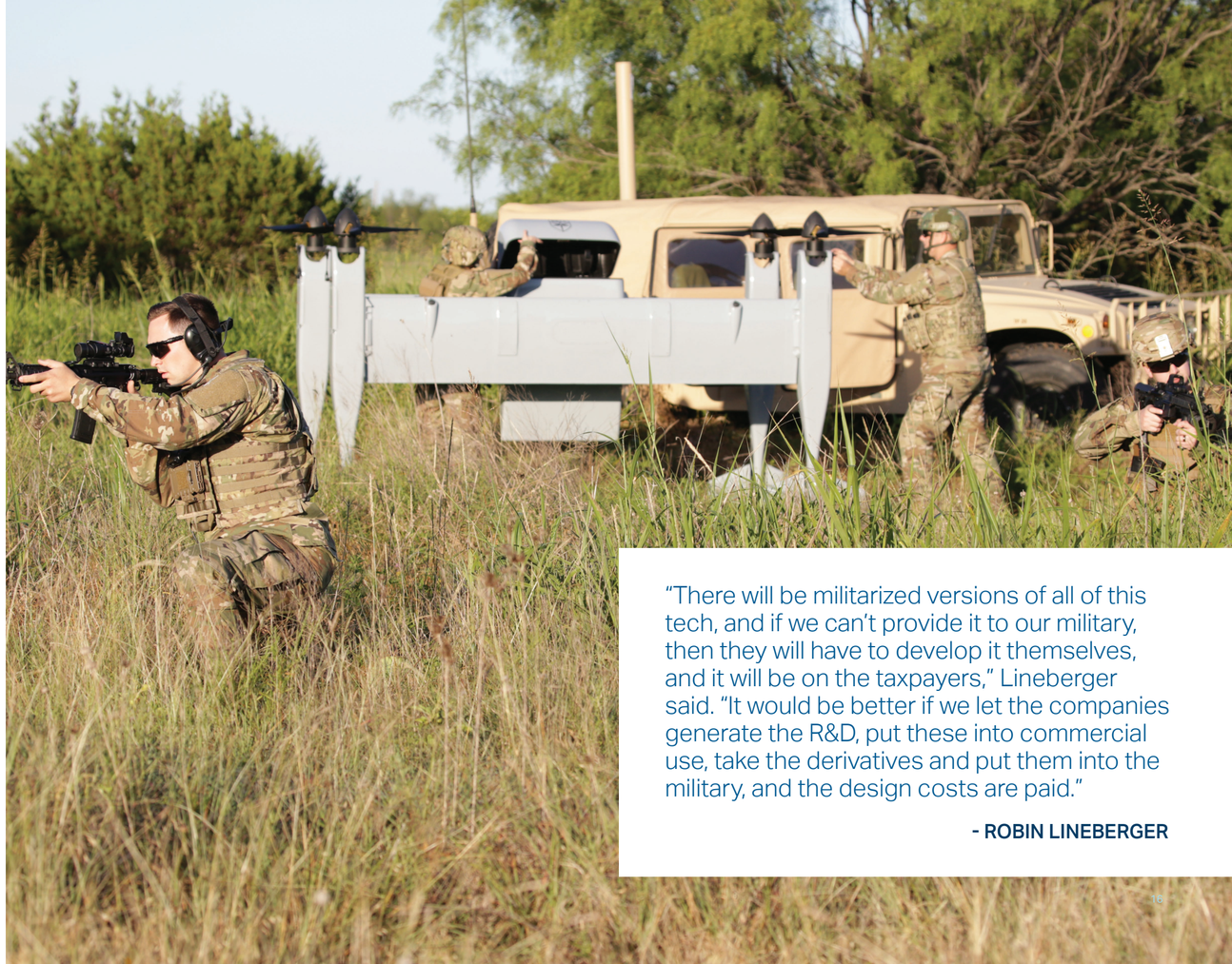
"Ultimately [the AAM ecosystem] will take the financial burden off our public infrastructure improvement system," Berry said. "Part of that gets translated into the technologies and the communication systems and the software that will have to be implemented to manage these aerial systems."

While the transportation cost to the public and local governments will eventually be improved in a working AAM ecosystem, funding will be needed to develop the infrastructure. Berry adds, "We need to start looking at funding needs that will be required to support these technologies, because there will be some new infrastructure—communications systems, air traffic control systems, data management systems—that will be partly in the public domain, and I think the public sector will need to fund."

Texas is a business-friendly state, which is why it is attracting AAM innovators, many of whom see the DFW region as a possible landing spot for launching AAM aircraft.

Berry agrees and has his eyes set on the DFW region and Alliance Texas for the initial launch of AAM for many reasons, including its close proximity to the Dallas-Fort Worth International Airport. A market of eight million people, DFW is also home to the FAA's southwest regional headquarters and a large number of aerospace and aviation companies, including Bell, Lockheed Martin, Sikorsky, Airbus and Raytheon. However, there are more than 50 other cities around the globe that are pioneering AAM programs, and the investments are rapidly increasing. [14]

[14] https://www.unmannedairspace.info/uncategorized/39-cities-pioneering-urban-drone-operations/



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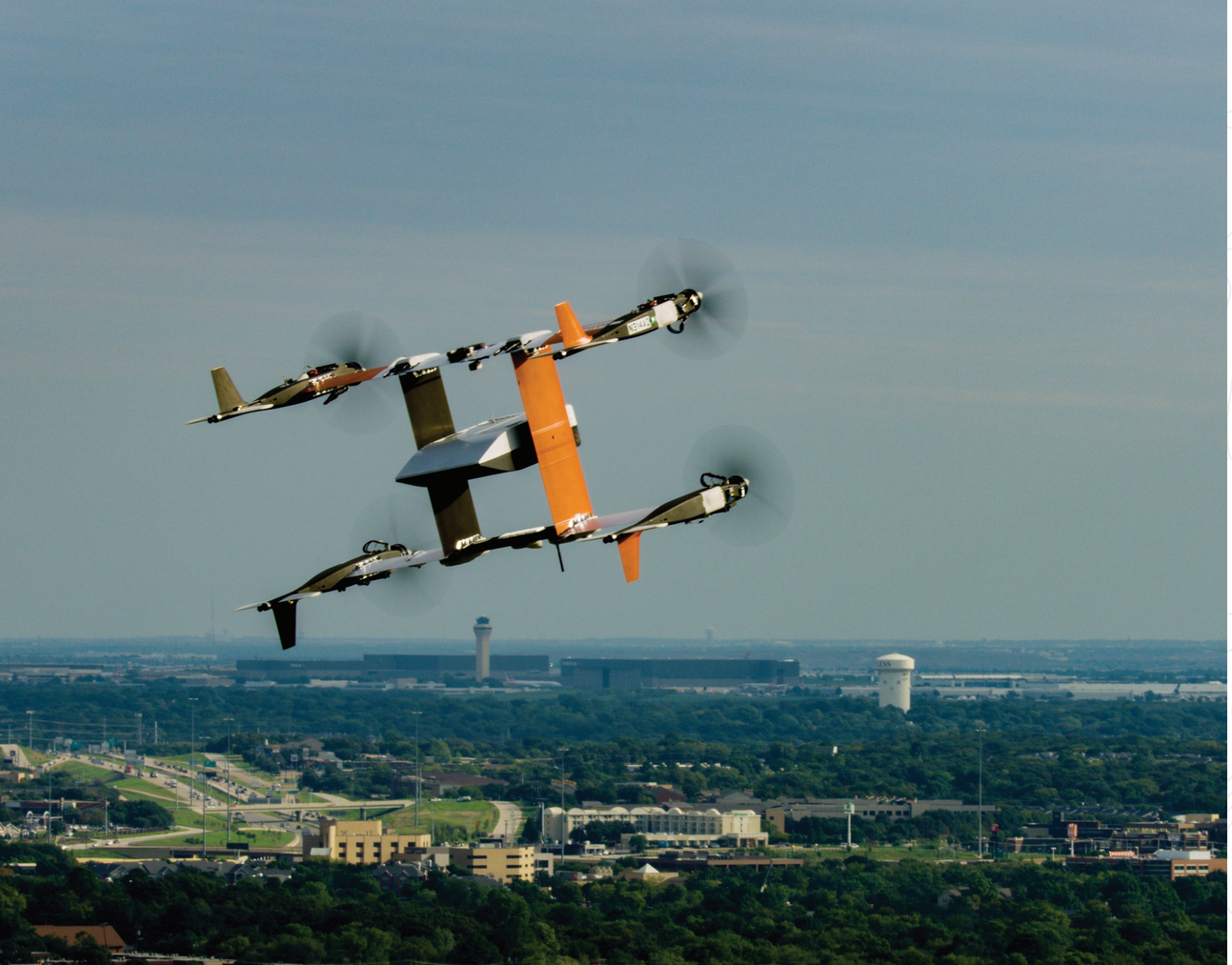
- ROBIN LINEBERGER



CONCLUSION

It won't be long before the world transitions to the skies to solve its mobility needs. The first countries, cities and regions to take flight will certainly have an advantage, both economically and militarily. U.S. organizations, government entities and agencies are already working together to develop an AAM framework that sets the standard for the rest of the world to follow. Meanwhile, the industry is achieving advancements in autonomy, AI, electric propulsion and other technologies to develop safer, quieter and more sustainable transportation solutions at costs never before achieved. Still, it must all come together with regulatory bodies and meet certification requirements. And by no means should local, state and regional governments and organizations wait for the technology or the regulatory framework to arrive before readying their part of the ecosystem. The AAM era is here and it's time to get to work.

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