



“Symphony of Destruction,” August 2012 **iDAWG Intelligent Deployable Augmented Wireless Gateway/Advanced Situational Awareness System** Evaluation (45 Public Safety Agencies + Syracuse University National Science Foundation Partnerships for Innovation WiGiT (Wireless Grid Innovation Testbed) Project + Rochester Institute of Technology PFI)

Secure Cloud Architecture vs Vulnerable and Malevolent Cyber- Physical Systems aka Drones/UAS: This is NOT a Test

Presentation to North Texas UAS Safety
& Integration Task Force Meeting
Oct. 27, 2020

Prof. Lee W. McKnight
School of Information Studies
Syracuse University
lmcknigh@syr.edu
with Dave Whitaker
NUAIR

Agenda:

A Drink from a Secure Cloud to Edge/UAS Firehose ;)

1) A Comic-Book Tale:

UAS to the Rescue v Cyberattack

2) But Seriously:

AV/UAS Security is No Joke

3) Architecting Things 101:

Secure Cloud Architecture

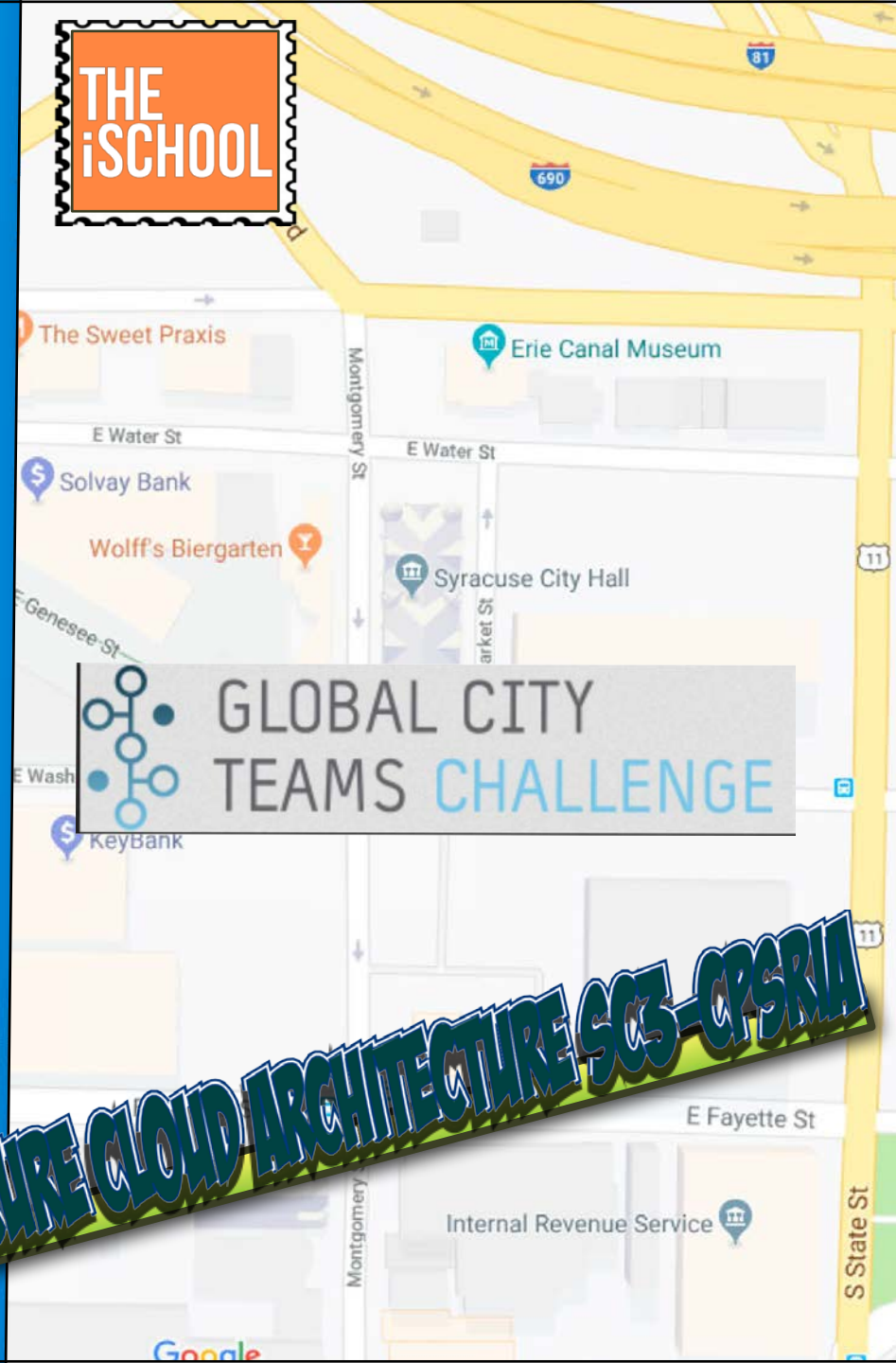
4) NUAIR: Unmanned Aerial
R&D/FAA Test Corridor Assures
Safe Commercialization

(in Public-Private Partnership
with North Texas, and maybe
AERPAW?)



A 'Gotham'
Tale
because...
sometimes
city officials
can't get out
of their own
way/lack a
sense of
humor :)

Stories from the Streets of Gotham
Vol. 1



Credit to
Artist/Cloud to Edge
Architect Geoff
d'Aelio, VMware,

Breaking news... Gotham has been hit by a Cyber Attack... affecting all Communications Towers...



ARGHHH!



Quickly Gotham's Chief Digital Officer Sam Edelstein springs into action and retrieves the Internet Backpack!

Mr. Mayor, we can use the backpack and get communications up and running in no time!

INTERNET BACKPACK TO THE RESCUE!



Sam, that's right. Great Idea!



Meanwhile... Mayor Quimby contacts the fire Chief to deploy the Drones to create the Mesh Network!

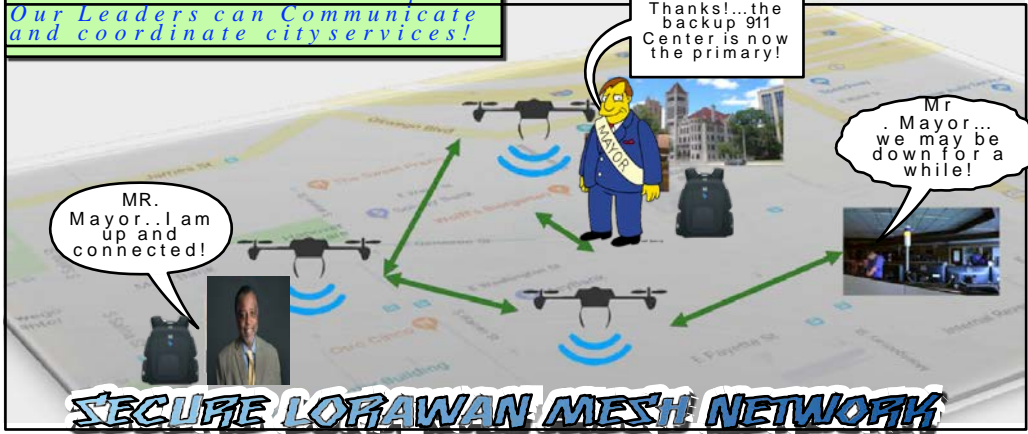
Our Heroes of the Gotham Fire Department prepare to launch their Drones...



The Drones are Up and beginning to connect the mesh network and the backpack has connected to the network...



4 minutes later....
 the Mesh Network is Setup...
 Our Leaders can Communicate
 and coordinate cityservices!



Deputy Mayor
 J. Phillip Thompson.
 It is great we can
 video chat by
 backpack and UAS!



Yes! IT is a
 great connection
 too!...



Never
 Remote,
 Always
 Secure and
 Connected!

During the Press conference the next day. An Intrepid reporter asks how they were able to resolve the issues so quickly!... Mayor Quimby?



Thanks to the City implementing NIST standards, following CPAC guidelines, and working with the Secure Cloud Action Cluster, what could have been a disaster was just another day at the virtual cloud office with our smart and Secure City's cyber physical Systems!

NYC Deputy Mayor J. Phillip Thompson image courtesy
<https://www1.nyc.gov/office-of-the-mayor/j-philip-thompson.page>

Mayor Quimby image courtesy Kevin Stockdale - Kevin+Dan Castellana CC BY 2.0
<https://commons.wikimedia.org/w/index.php?curid=5783508>

How bad is IoT security? 84% of Internet of Things adopters have experienced a security breach*

Malware 49%

Spyware 38%

Human Error 38%

Phishing 30%

Distributed denial of service attack 26%

Physical theft 25%

Skimming 18%

Ransomware 14%

Spear phishing 12%

**No Internet of Things-related security breaches
13%***

Don't know 2%*

Source: Kevin Ashton, HP Enterprises, **Making sense of IoT. How the Internet of Things became humanity's nervous system, 2017**



- **= 15% too clueless to realize they have been breached**

When UAS and Autonomous Vehicles are Hacked, Who is Liable?

The Good News: 'Existing laws and legal precedents....should be enough to address most claims arising from... hacked vehicles,' Rand concluded.

Source: Rand, 2019

"<U>AV vulnerabilities are complex, numerous, and likely to be widespread." Even so, insurance industry will be OK in event of massive cyberattack commandeering fleets of autonomous vehicles for 9/11 scale destruction.



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TECHNOLOGY ASSESSMENT

United States Government Accountability Office
Center for Science, Technology, and Engineering
Report to Congressional Requesters

May 2017

Internet of Things

Status and implications of an increasingly connected world

Device to Gateway

Cloud to Cloud

Device to Cloud

Device to Device



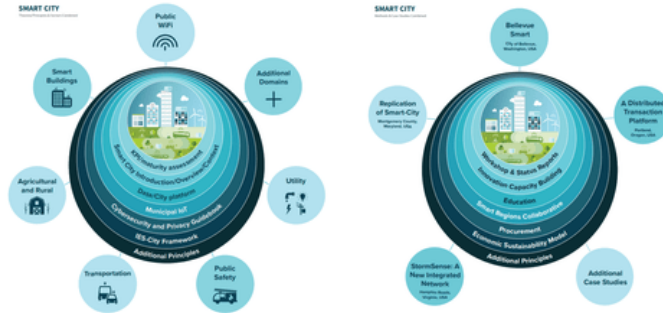
Because



= Things Management

Leading Smart City Examples with.. Cybersecurity, Privacy, Rights and Ethics By Design

NIST Smart City Privacy and Security Risk Management Framework, 2021



Smart Cities and Communities Framework Series, NIST Office of Cyberphysical Systems



Bay Area, CA

Two-year Plan, TECH-CARES
Smart City Cybersecurity Forum



City of Syracuse, NY

Syracuse Surge & NUAIR
Smart City Center & GENIUS NY
cpSriA Secure Cloud Architecture



Coral Gables, FL

NIST SCCF Smart City
Privacy & Security Case



Source: Lee W McKnight, Kevin Bornatsch, Eds., *Smart City and Community Challenge Cloud privacy Security rights-inclusive Architecture*, July 10, 2019, GCTC SC3 CPAC cpSriA

<https://gctc.opencommons.org/images/f/ff/CommunityCloudPrivacy.pdf>

#CISASummit

<https://smartsecuresocieties.org/>



Smart and Secure Cloud Architecture 101:

cyberphysical privacy, Security, rights-inclusive Architecture

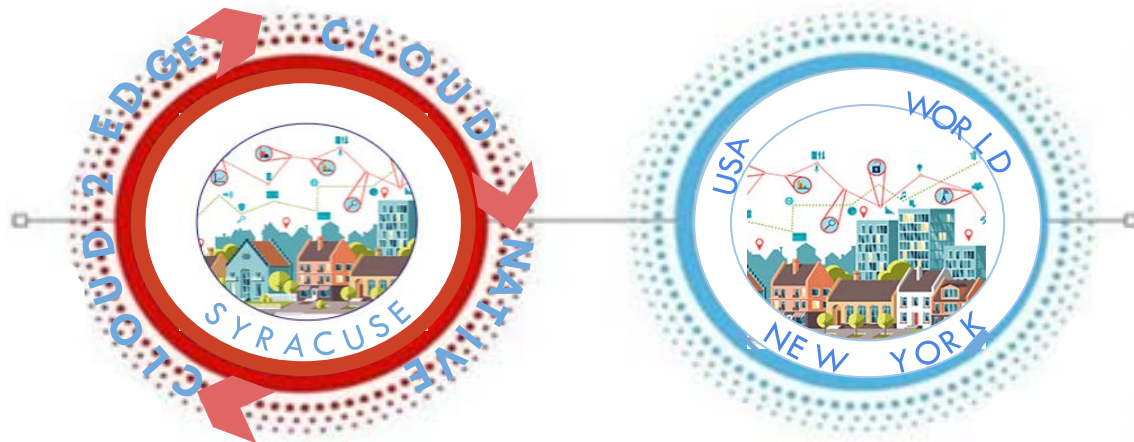
cpSriA scales: Cities, Counties, Regions, States, Nations; + Airports

Red sensitive data including personally identifiable information; so most controlled and restricted

Yellow medium sensitivity access controlled data which by law can be shared more widely; with monitoring; and

Green low sensitivity data - smart city/community civic/open data

Back your Red data up to a secure cloud. Please.



Courtesy Lee W McKnight, Kevin Bornatsch, Eds., *Smart City and Community Challenge Cloud privacy Security rights-inclusive Architecture*, July 10, 2019, GCTC SC3 CPAC cpSriA

<https://gctc.opencommons.org/images/f/ff/CommunityCloudPrivacy.pdf>

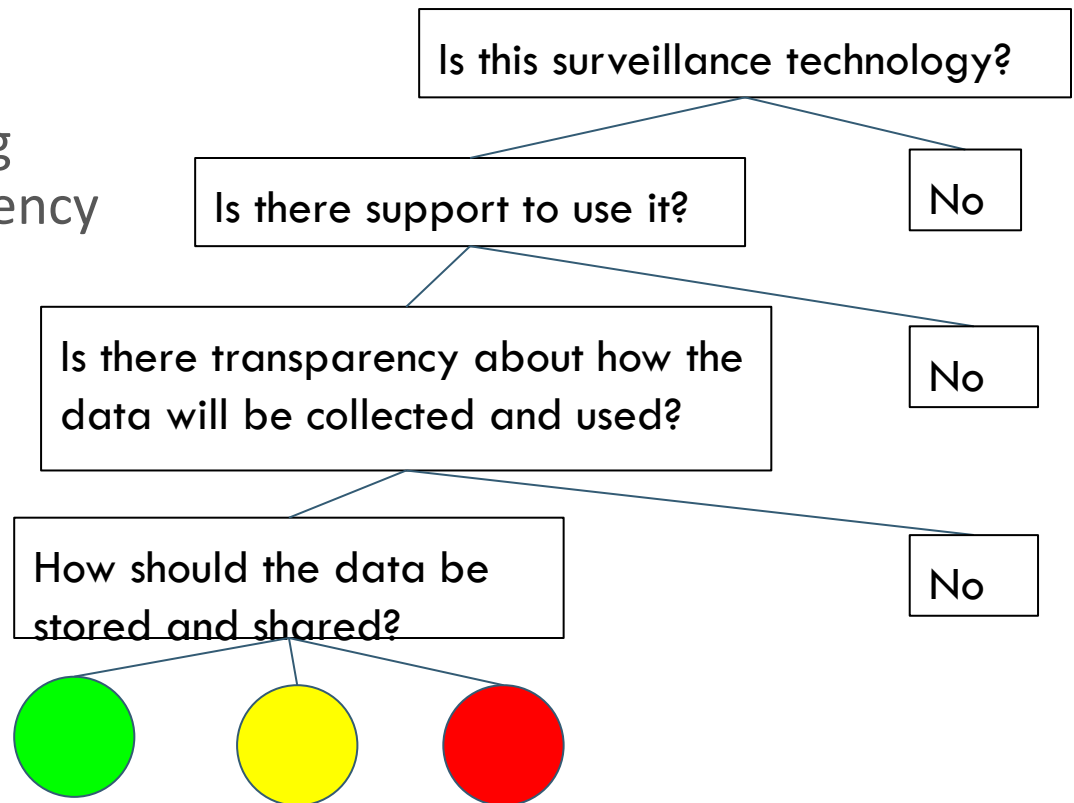
More Information: Kim Underwood, *SIGNAL Magazine*, AFCEA, May 2020

<https://www.afcea.org/content/cloud-architecture-offers-security-cities>

Risk Framework for Smart Cities & Communities...and their UAS data too

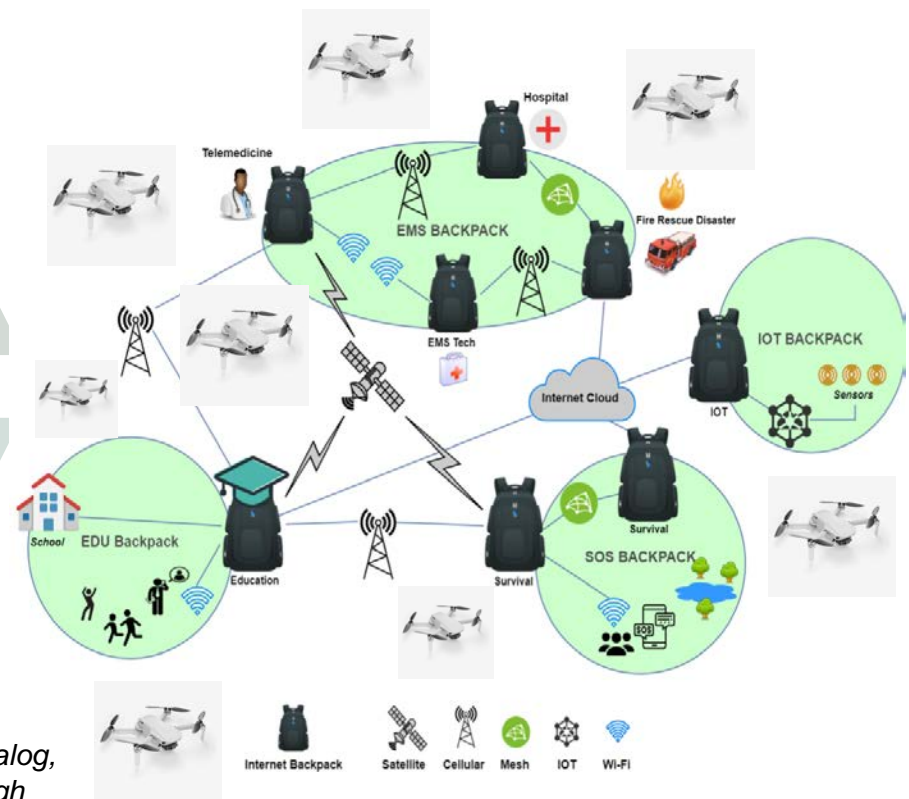
Syracuse Case Study

- Street Lights Status
- Catch Basin Monitoring
- Water Metering Frequency
- Facial Recognition Use



Source: Sam Edelstein, City of Syracuse, 3rd Secure Cloud
Architecture Action Cluster Meeting, 2.2020

Secure Cloud Architecture with UAS & Internet Backpacks= Smart City, Community & North Texas Worst Case Scenario Resiliency



“Cyber-Physical Systems (CPS) comprise interacting digital, analog, physical, and human components engineered for function through integrated physics and logic. Cyber-physical systems will bring advances in personalized health care, emergency response, traffic flow management.” NIST Office of Cyberphysical Systems <https://www.nist.gov/el/cyber-physical-systems>

Images courtesy Imcon International Inc. <https://imconintl.com>

Conclusions



Image Courtesy NUAIR

The Good News: Google/Alphabet’s ‘Wing’ delivery operational (near Virginia Tech). Amazon & UPS UAS Deliveries also FAA-Approved: excellent timing for North Texas UAS Safety & Integration Task Force work

The Bad News: More UAS Testing and Evaluation needed for cross-jurisdiction operation (i.e., from 1 municipality to another; e.g., from Dallas to Fort Worth)

The Ugly News: *“(U)AV vulnerabilities are complex, numerous, and likely to be widespread.”*

In sum: ***START WITH SECURE CLOUD ARCHITECTURE, OR YOU HAVE ALREADY SURRENDERED TO CYBERATTACKERS.*** Syracuse University & NUAIR happy to partner with North Texas to help nation & regions scale opportunities.



NEW YORK UAS TEST SITE

CAPABILITIES & INFRASTRUCTURE

27 OCTOBER 2020

Dave Whitaker
NUAIR Chief of Development
dwhitaker@nuair.org

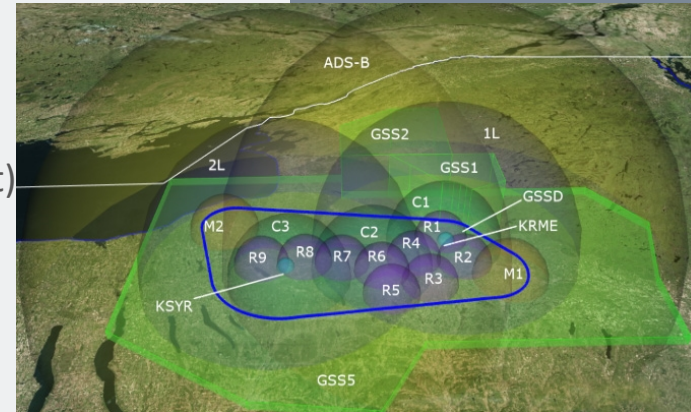
NYUASTS INFRASTRUCTURE

Griffiss International Airport

- 1,680 acres (680 ha)
- 11,820 x 200 ft (3,603 x 61 m) Heavy Runway
- Operating air traffic control tower (FAA contract)
- Wide body hangar facilities
- FAA Part 139, Class IV Certification

UAS Test Range

- 5,000 mi² of large UA/OPA ops up to FL 600
- 450 mi² small UAS ops up to 2500 ft AGL
- Real-time operations center including multiple USS
- Urban, rural, over water, linear infrastructure operations
- BVLOS and night flight operations capability
- Designated Airworthiness Representative (DAR)
- Test support including real-time and archived data



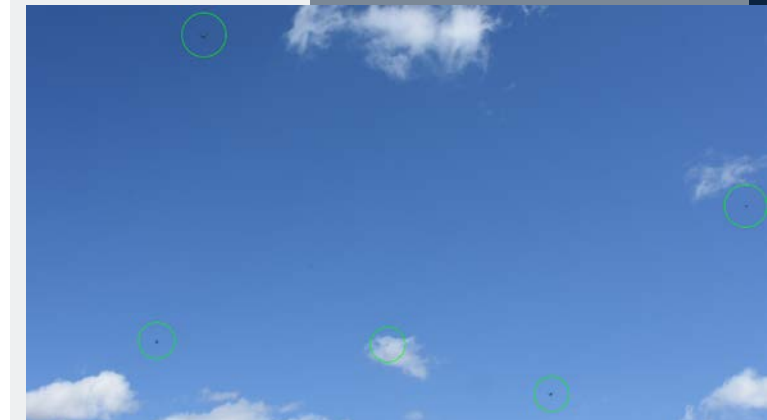
SUPPORTING SAFE UAS INTEGRATION INTO THE NATIONAL AIR SPACE (NAS)

Mitigating air and ground safety risk through procedure development & testing

- Detect and Avoid (DAA) including ACAS sXu
- ASTM s UAS Airworthiness Standards testing and validation
- Airworthiness Testing to the FAA Durability and Reliability (D&R) Means of Compliance
- UAS Traffic Management (UTM) testing and integration

Key Customers / Partners

- Industry
 - UAS manufacturers, operators, and users
- Public Safety
- FAA



FAA UPP 2 Overview

Unmanned traffic management Pilot program

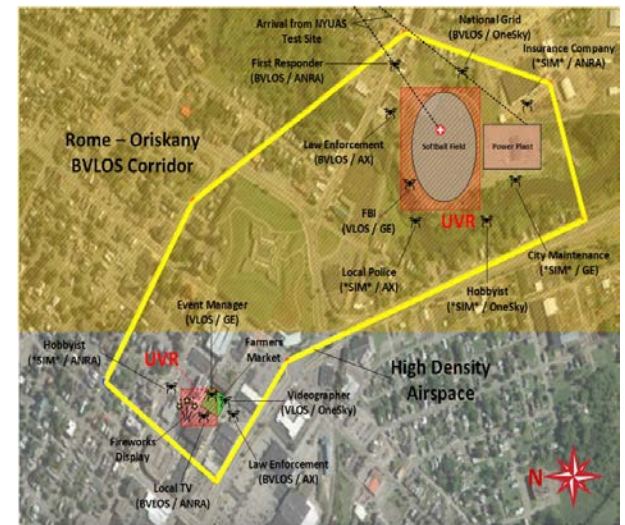
Multiple BVLOS operations in urban, high density, low altitude airspace with terrain/surface obstructions

Operations in controlled airspace at or below 400' AGL.

Shared awareness, strategic de-confliction, tracking, conformance monitoring, in-flight de-confliction of cooperative and uncooperative traffic using multiple USS

Establish and test procedures to enable simultaneous manned/unmanned operations

Final flight test scheduled for early November 2020



NYUASTS PARTNERSHIP OPPORTUNITIES

Test and Evaluation

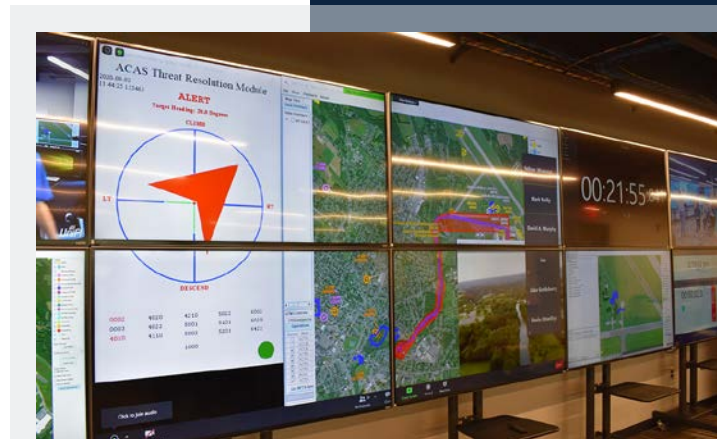
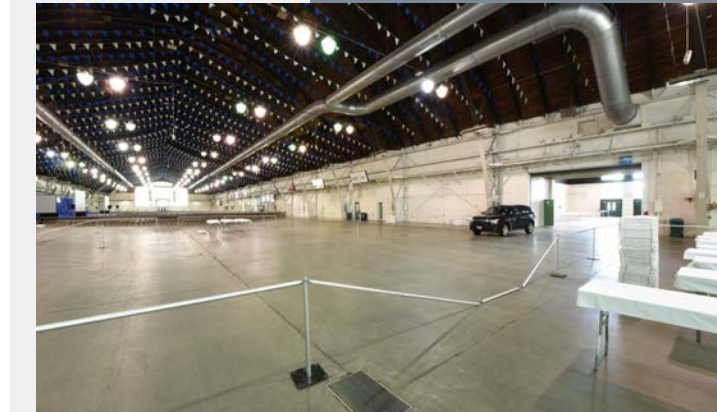
- Procedures, Air Worthiness, Operations
- Varied environments, terrain, airspace
- Flight capabilities and permissions

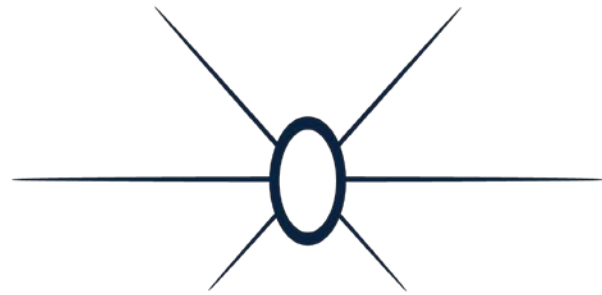
Fully Instrumented Environment

- Cooperative / non-cooperative
- Surveillance, communications
- Full data support for post-test analysis

Cyber Capabilities

- Large indoor ranges (hangers)
 - EMI shielded (2021)
- Smaller indoor ranges
- Expert partners





NUAIR[®]

MAKING FUTURE SKIES SAFER

QUESTIONS?



info@nuair.org



www.nuair.org

INTELLIGENT MOBILITY
& SMART CITY LIVING
LABORATORY



Curiosity Lab

at Peachtree Corners

WHAT RESOURCES ARE PROVIDED AT THE TRACK?



5G Wireless Environment

Powered by Sprint, 5G will be available to all companies testing or demonstrating on the track.



Fiber Optic Cable

The track has 1Gig dedicated fiber to support all IoT devices that will be tested or demonstrated.



Control Room

Located inside Innovation Center, the laboratory control center will allow companies to view live feed activity from the track and review all data being collected from the IoT devices



Dedicated Short Range Communication

Four roadside units with Bluetooth and DSRC combined data collection will be available at the Laboratory Operations Center.



Video Surveillance

20 Video cameras along the corridor will provide surveillance from the Laboratory Operations Center and additional data through IoT software.



Track Mapping

High definition map of the test track will be available for companies testing and demonstrating on the track.



Traffic Light

Access to real world traffic signal testing.



Industry Connect

By testing on the track companies will have connections to industry leaders in fields associated with smart cities, IoT and mobility.



Access to Sprint SME

Companies looking to integrate with 5G will have access to subject matter experts from Sprint to assist them with integration into a 5G wireless environment.



AUTONOMOUS PACKAGE & FOOD DELIVERY

KEY POINTS TO REMEMBER...

- Free use of 5G while using lab
- Laboratory is owned/operated by a single governmental entity
- No charge for the use of the facilities – Come test, demo and connect with other industry leaders to use the track and its resources.
- Proprietary information remains confidential – We do not share your information, property or test results with anyone.
- City has no interest in Intellectual Property – Our interest is in the economic development of our City.
- Track is insured– City has an insurance policy to cover autonomous vehicle testing.



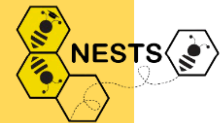
Beeznests Connection Ltd

A student exclusive freelance platform



Company Overview

The purpose of our student freelance platform is to enable students to obtain short and remote tasks, gigs, and opportunities which they can then add to their experiences. We aim to give students multiple opportunities so that they will feel better prepared when applying for a future full-time internship.



What does Beeznests offer to students?

1. Special Badges

Badges help you stand out on our platform

2. Exclusive opportunities

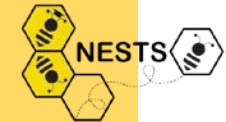
Remote tasks found nowhere else

3. Initiative projects

Create your own opportunities and projects on our platform

4. Student promotion

Feature yourself in the Student Storyboard section of our biweekly newsletter



Black Girls Drone is part of community!

The image displays a grid of six profile cards, each representing a different organization. Each card includes a logo, a name, a 5.0 star rating, a brief description, and a 'VIEW MORE' button. The 'BlackGirlsDrone, Inc.' card is highlighted with a red circle.

Organization	Country	Rating	Description	Followers
Bee City Canada	Canada	5.0 (0)	Director of Bee City Canada www.beecitycanada.org	1
GoGoFra	USA	5.0 (0)	A travel agency company on a mission to change the travel industry	1
EDify Talks	USA	5.0 (0)	Here at EDify Talks, we strive to EDUCATE the community, DIVERSIFY the narrative and END the stigma around eating disorders by developing resources to	2
zys	Canada	5.0 (0)		
BlackGirlsDrone, Inc.	USA	5.0 (0)		
Beeznests	Canada	5.0 (0)		

What are we trying to do for our community?

Support the student community. Enable students to develop their skills and experiences through short term, remote tasks. Additionally, enable students to earn some side income to support their schooling and education. All our opportunities are flexible and remote!





Thanks!

Any questions?

You can find us at:

- www.beeznests.com
- @Beeznests



Drones in the Classroom

NOVEMBER 14, 2020

World Changers Shaped Here



SMU®

Introduction

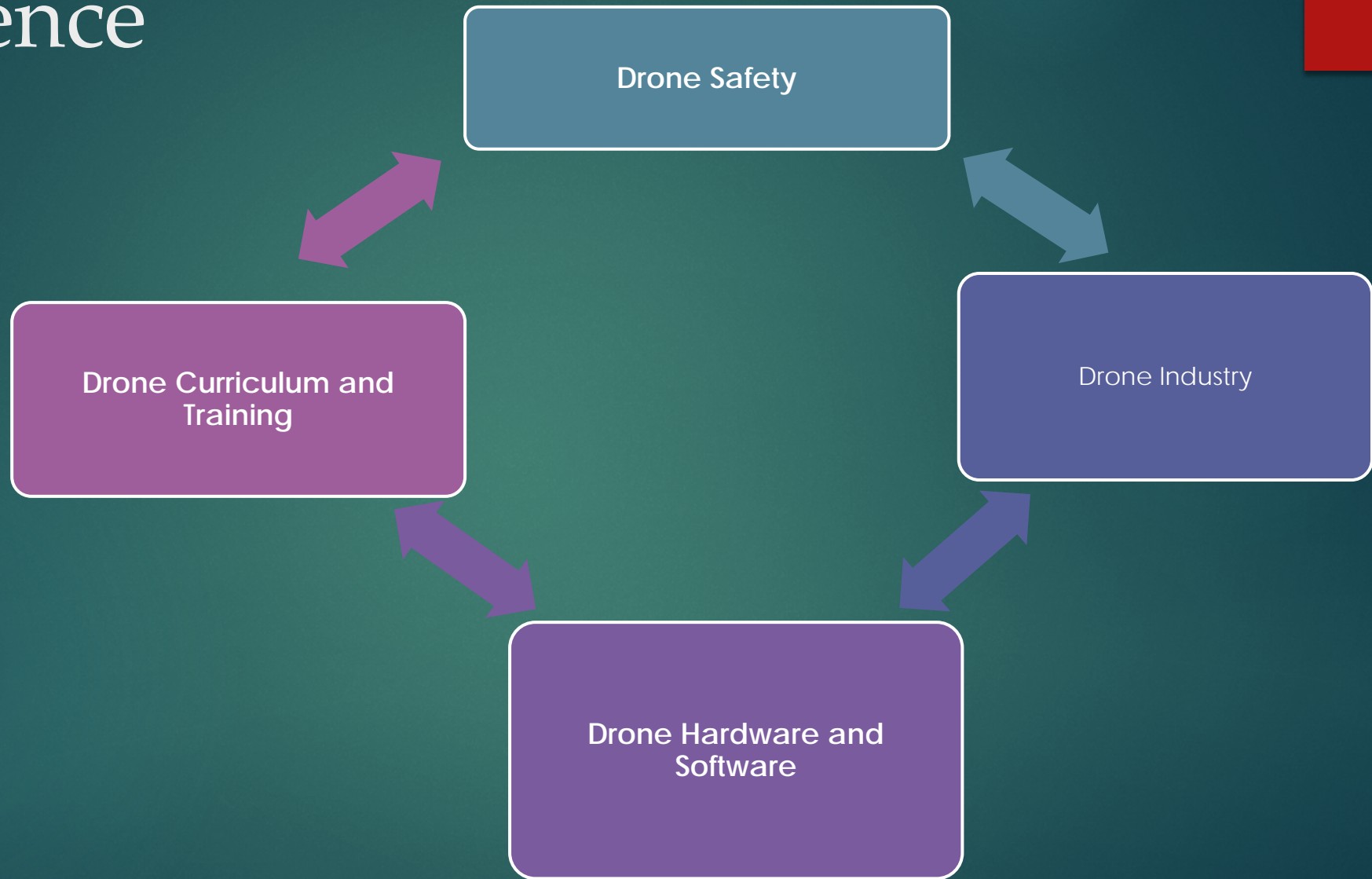


- ▶ Dr. Kenneth Berry at Southern Methodist University
- ▶ Worked with technology teachers for years: CTE, Computer Science, engineering competitions
- ▶ Growing interest among teachers around Drones

Drones are fun and inexpensive

- ▶ Last year 100 educators attended from around Texas attended
- ▶ This year we have gone Virtual
- ▶ Currently we have 150 registrants from all over the country and the world

Conference



Drones in the Classroom Conference

- ▶ When: November 14 from 9:00 AM to 4:00 PM
- ▶ Morning is a general session
- ▶ Afternoon breakout sessions
- ▶ Where: Online
https://smu.zoom.us/meeting/register/tJwkcOGsqz4sGt0UsBj_ZKlYsWBIfjFVmntQ
- ▶ Cost: Free

Drones in the Classroom

https://smu.zoom.us/meeting/register/tJwkcOGsqz4sGt0UsBj_ZKllysWBIfjFVmntQ

North Texas UAS Safety and Integration TASK FORCE

Next Steps

The Resolution

Goal

- To add UAS Integration into the Regional Transportation Councils (RTC) transportation planning process
- The Regional Transportation Council is the independent transportation policy body of the Metropolitan Planning Organization
- The RTC's 44 members include local elected or appointed officials from the metropolitan area and representatives from each of the area's transportation providers.
- The RTC administers Millions in transportation related funds

Proposed Deal Points

- Utilize transportation planning process (continuous, comprehensive, and cooperative)
- Support safe and responsible UAS activity
- Encourage agencies to support their public safety services use of UAS systems
- Adopt “pilot” programs to demonstrate the technologies properly operated in and around a metropolitan area
- Provide UAS-oriented educational offerings to prepare workforce development of UAS aircraft pilot certification standards
- Participate in the “North Texas UAS Safety and Integration Task Force Community Integration Working Group ”

Community Best Practices Forum

- Characterize community concerns
- Inventory available applications
- Inventory funding mechanisms
- Inventory available training
- Supplement existing transportation methods
- Prepare for natural disasters and other emergencies

Schedule

1. October STTC – Asking for feedback
2. November UAS Task Force – Asking for feedback
3. November RTC – Asking for feedback
4. January STTC – Update
5. January UAS Task Force – Update
6. February RTC – Update

Working Group Meetings

Meeting schedule next week 11.2.20 (agenda and virtual meeting information will be sent soon)

- Education and Public Awareness – 9:00 am to 10:00 am
- Legislation – 10:30 am to 11:30 am
- Training – 1:00 pm to 2:00 pm
- Integration – 2:30 pm to 3:30 pm

Upcoming Events

1. FAA's 2020 Rotocraft Safety Conference – October 27-29 (Free attendance)
2. Energy Drone & Robotics Global Gathering November 10-12
3. Drones in the Classroom Virtual Conference – November 14, Register Here (Free attendance)
4. InterDrone Online – December 15-17, Register Here
5. Know Before You Fly Your Drone Workshops – December 5th



Advanced Air Mobility



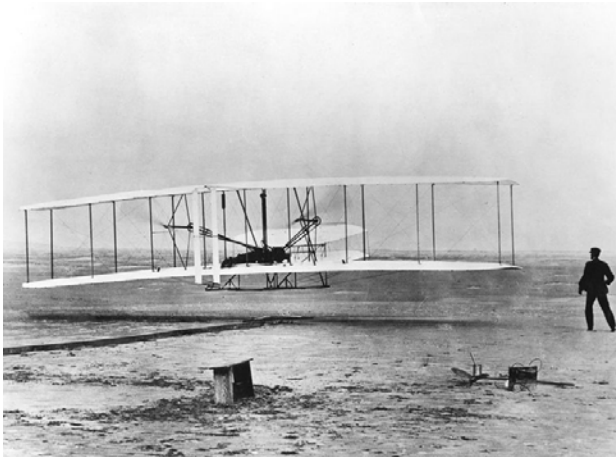
Aerospace Industries Association

- AIA represents more than 300 manufacturers and government service providers
- Membership ranges from prime contractors to family-owned small-parts suppliers
- We provide a forum for industry-wide collaboration on government policy issues, manufacturing standards, and advocacy efforts
- Supplier Management Council: made up of over 250 senior supply chain representatives from system integrators and manufacturers



What is UAM?

The next generation of air travel, which will blend into a cities' multi-modal transportation operations and will help transform the options for people to move within and between communities

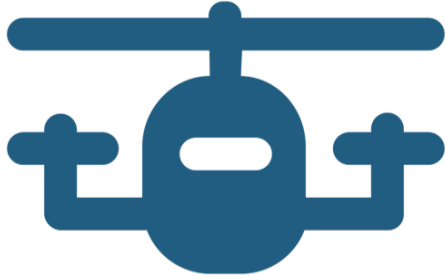


What is UAM?

- Powered by electric vertical take off and landing (eVTOL) aircraft
- Community friendly and 100x quieter than helicopters, with the safety record of aviation
- Initial operations to take place within existing regulatory authority



Industry Today



300+ vehicle designs



\$3 billion+ invested
in last 5 years alone



\$120 billion market
projected by 2030



\$10- \$20 billion in revenue
for operators projected by 2030

2023

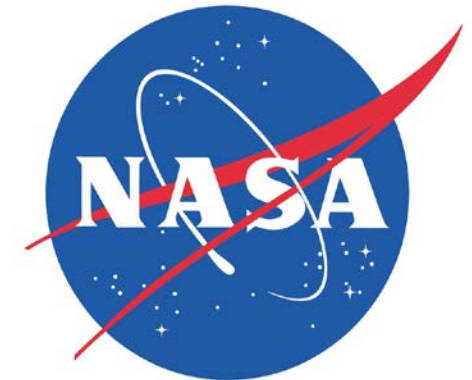
Initial operations

Governments bought in at all levels

- FAA
 - 10+ open certification projects
 - UAM CONOPs
- NASA
 - Advanced Air Mobility National Campaign
 - Advanced Air Mobility Working Groups
- Department of Defense
 - Agility Prime
- US Conference of Mayors
 - UAM Resolution passed at USCM Summer Meeting



**Federal Aviation
Administration**





Advanced Air Mobility Market Study

September 15, 2020

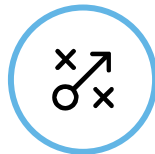
Deloitte and Aerospace Industries Association are conducting a research study into the critical factors needed to extend US leadership in the Advanced Air Mobility market



Examine the key steps that the US needs to take as a nation to **achieve global leadership in the new aviation market**



Analyze the **emerging aviation technologies** and examine the global race for technology leadership



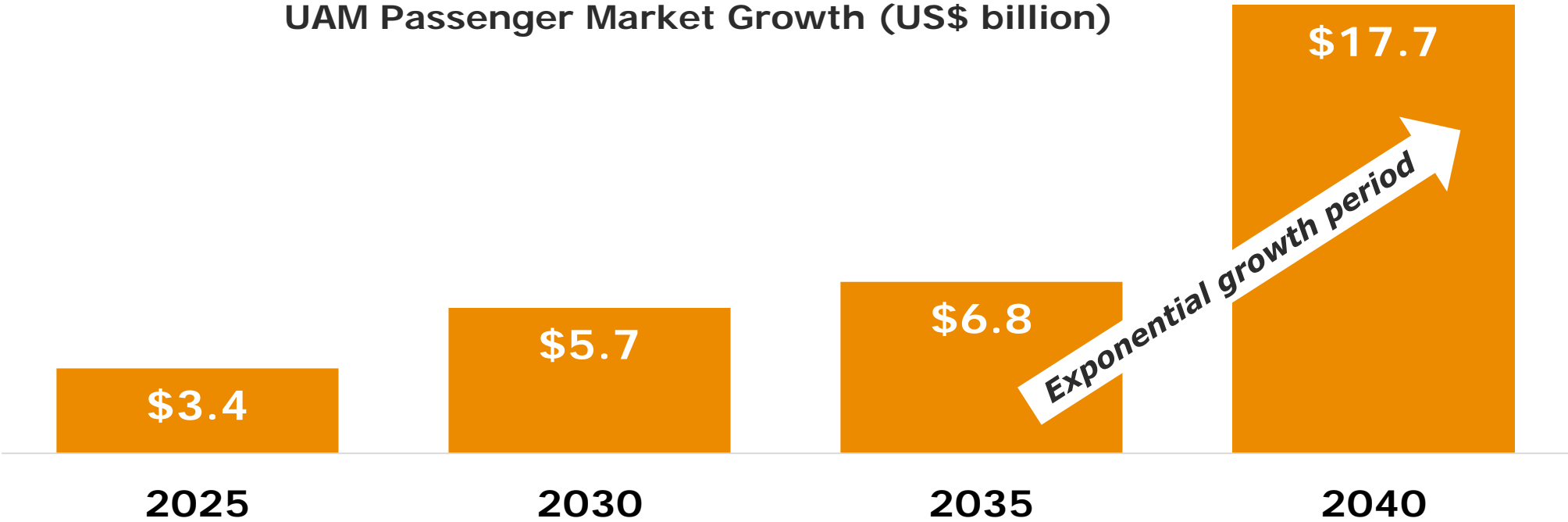
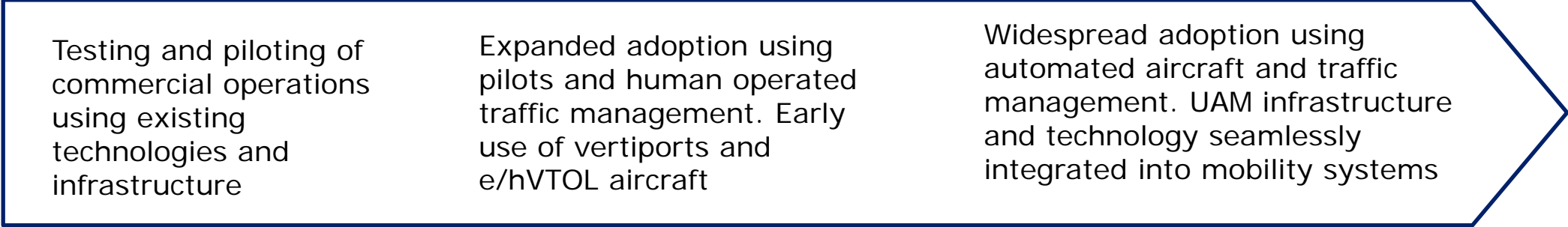
Understand the **market potential for advanced air mobility (AAM)**, current gaps, and recommendations on how to fill those gaps



Leverage both the US industry and the federal government's ongoing work to **shape the future of air travel**

In the new aviation market, air taxis will be a part of everyday commutes, drones will deliver packages across the country, and artificial intelligence will be widespread

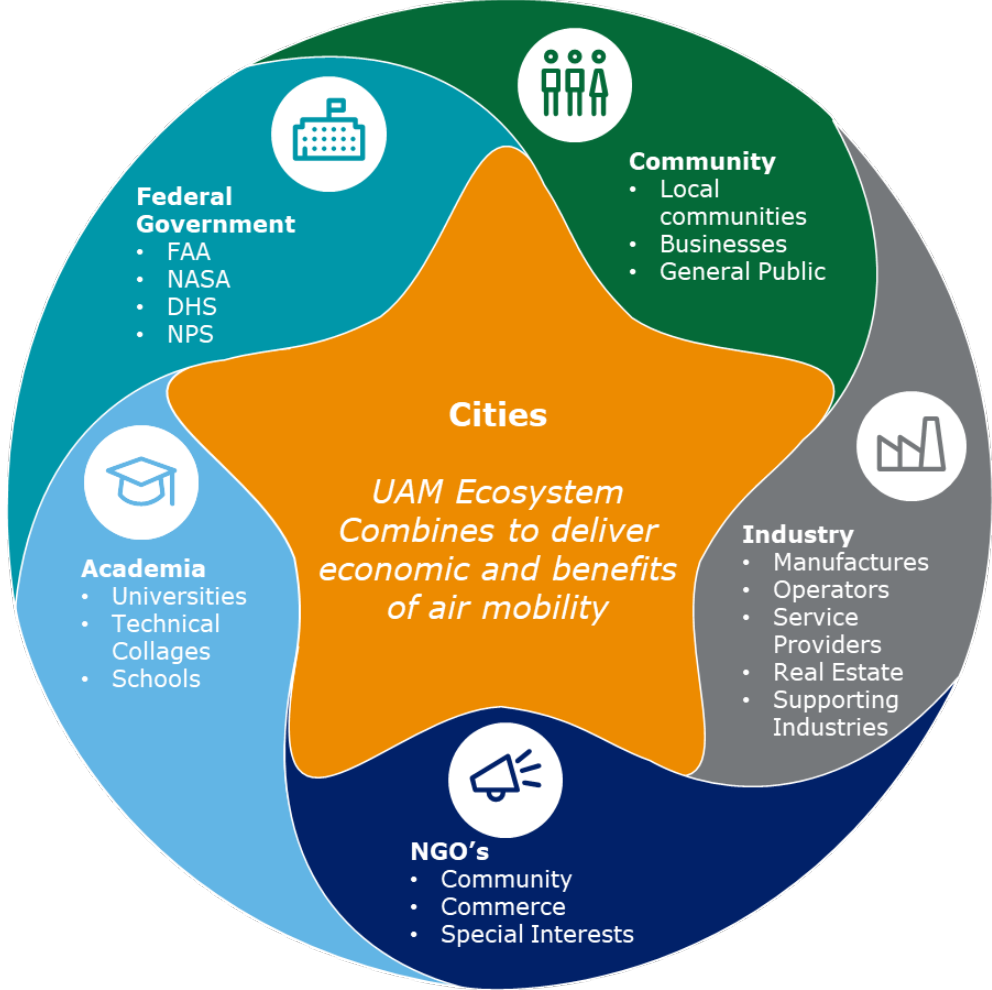
The market for passenger Urban Air Mobility (UAM) in the US is expected to reach \$18 billion by 2040, representing 20-30 of the global market. Much of this will be focused in cities



Source: Deloitte analysis based on data from research and analyst reports

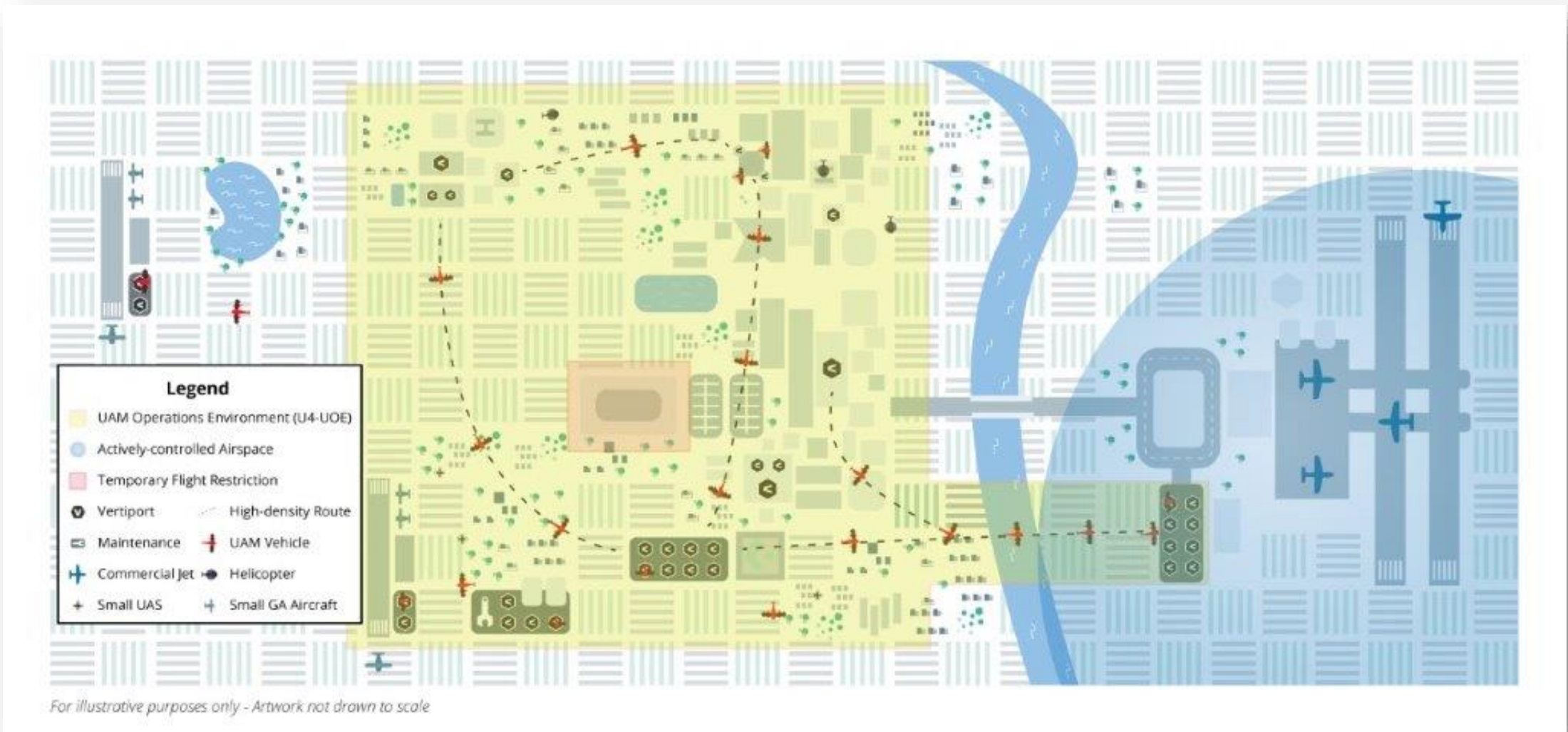
Study participants agree that cities are the focal point for UAM: developing mature UAM ecosystems alongside effective policy and planning frameworks in cities is critical

Cities Are the Focal Point for UAM



- Substantial and accelerating public and private investment
- Emerging market, characterized by new market players that will expand to a wide range of supporting industries and businesses
- Integrating and supporting future of mobility, integrating with intelligent transportation systems
- Capability to expand the geographical movement of goods and services in and out of cities
- Potential to address environment, congestion, and other social needs

UAM leaders interviewed anticipate that 10-20% of private and public transportation today will utilize UAM in 2031-2035 and drive significant economic and societal benefits



Source: NASA / Deloitte Urban Air Mobility Concept of Operations

However, a number of challenges must be overcome to realize the full potential of UAM



Air traffic management

Developing air traffic and airspace procedures to accommodate UAM, integrating unmanned air traffic management systems into the National Airspace System to accommodate high volumes



Technology maturity

Development of ground, aircraft and air traffic technologies to accommodate high volume urban air transportation safely and efficiently



Psychological barriers

Building passenger confidence in UAM safety and ride quality, as well as excitement and acceptance by local stakeholders (noise, safety, congestion, etc.)



Regulations

Adapting and evolving regulations for certification, operation, piloting as well as defining authorities and requirements for urban air transportation network development



Safety

Ensuring safety standards are maintained and building confidence across stakeholders (regulators, public, industry, etc.)



Infrastructure

Developing, planning and building UAM infrastructure and supporting systems integrated into transportation and city planning

Source: Deloitte analysis

Cities are challenged with planning/developing a transportation system that integrates aviation to maximize economic and societal benefit – safely and equitably

Community Integration –

Use cases that support public interest (e.g. equity, benefits/costs, job growth) and address community concerns

Integrated Transportation Planning –

Long-term multi-modal system strategy, modeling and planning

Harmonization/alignment Regulation & Roles –

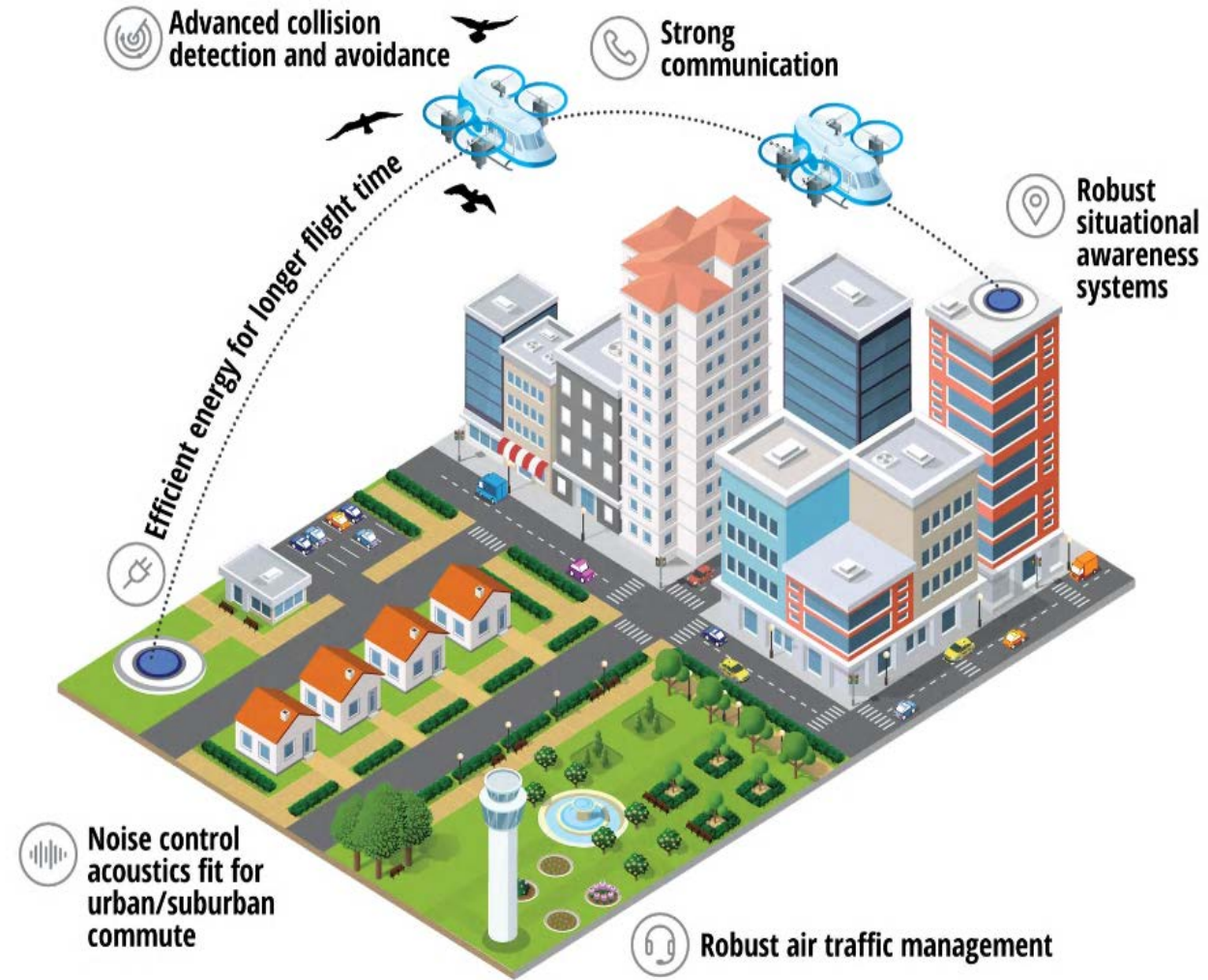
Define and align jurisdictions, authorities, roles, and approaches

Institutional capacity –

Build institutional capacity support for UAM development and ensure city priorities / needs are addressed (GDP, equity, environment)

Financing –

Consider financing, cost recovery, revenue generation associated with 4th dimension of transportation in cities



Effective strategies foster a UAM ecosystem tailored to local geographic, economic and societal characteristics to create jobs, drive innovation and support citizen interests/needs



How Cities Are Planning for UAM

Evaluate Potential

Assess the potential of air transportation and logistics (economic / societal)

Implement Agile Strategy

Define a framework to support and manage the UAM system for your city

Take First Steps

Build capacity, ecosystem, tools / process and community



Questions

How important is urban air mobility to the future of your city (package delivery, passenger flights, cargo, etc.)?

In one word, what is your top priority when considering UAM for your city?

Would you like more information?



🗨️ When poll is active, respond at **Pollev.com/dwightdecarm858**

🗨️ Text **DWIGHTDECARM858** to **22333** once to join



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