



# TEXAS TECHNOLOGY TASK FORCE

October 22, 2019



**1** Overview

**2** Recent Activities

**3** Today's Agenda

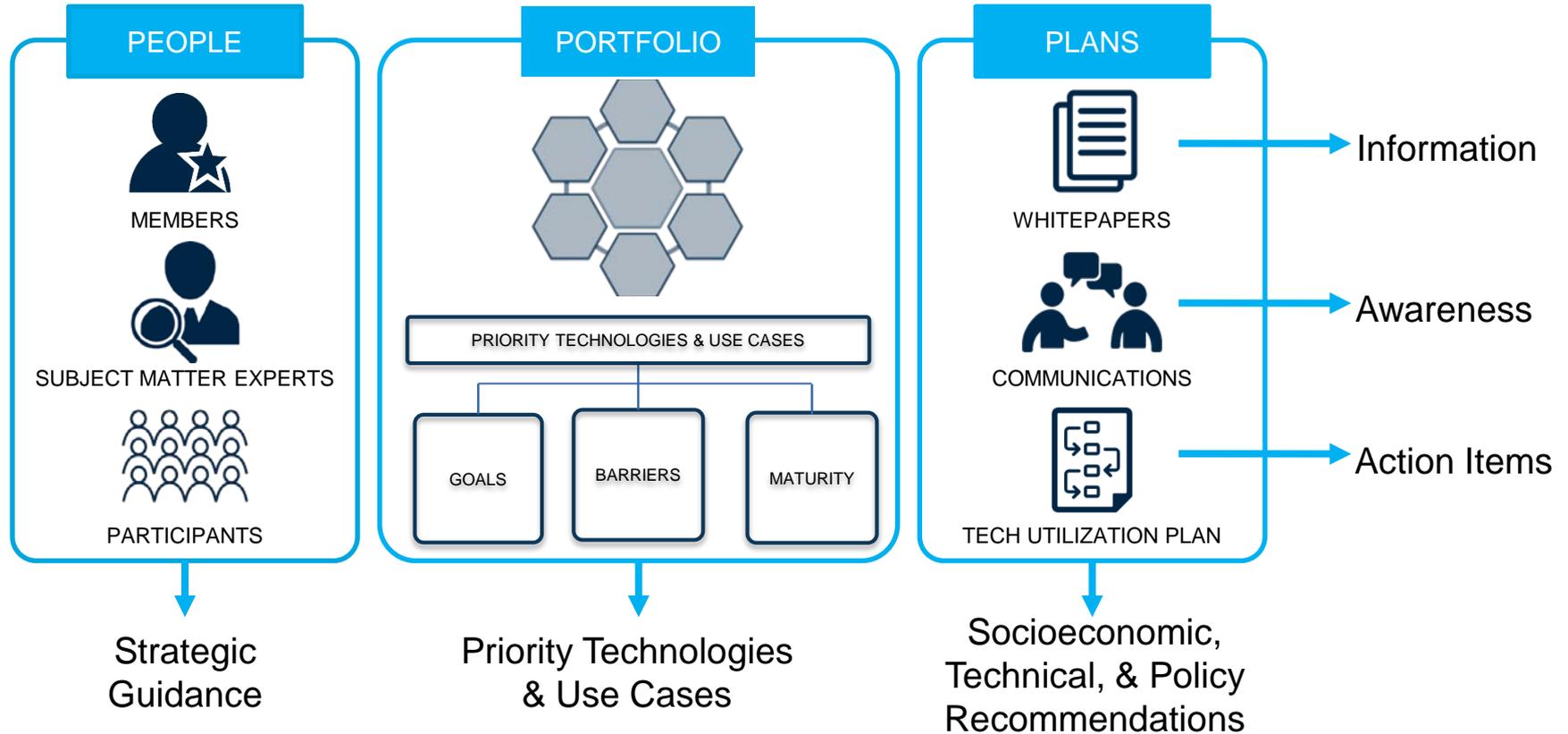


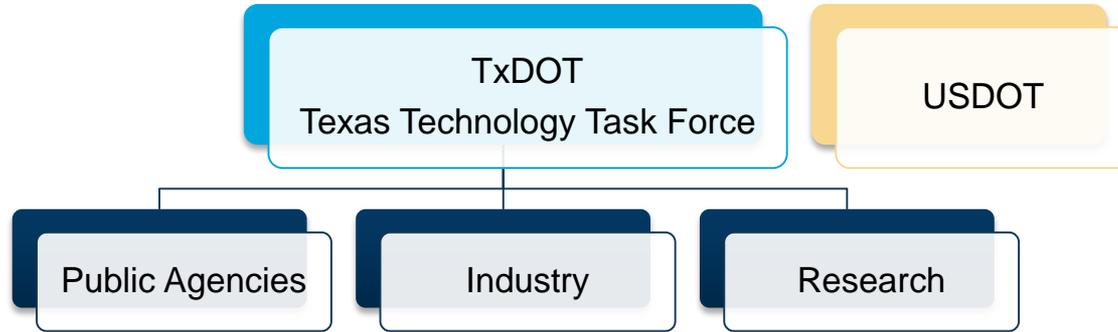
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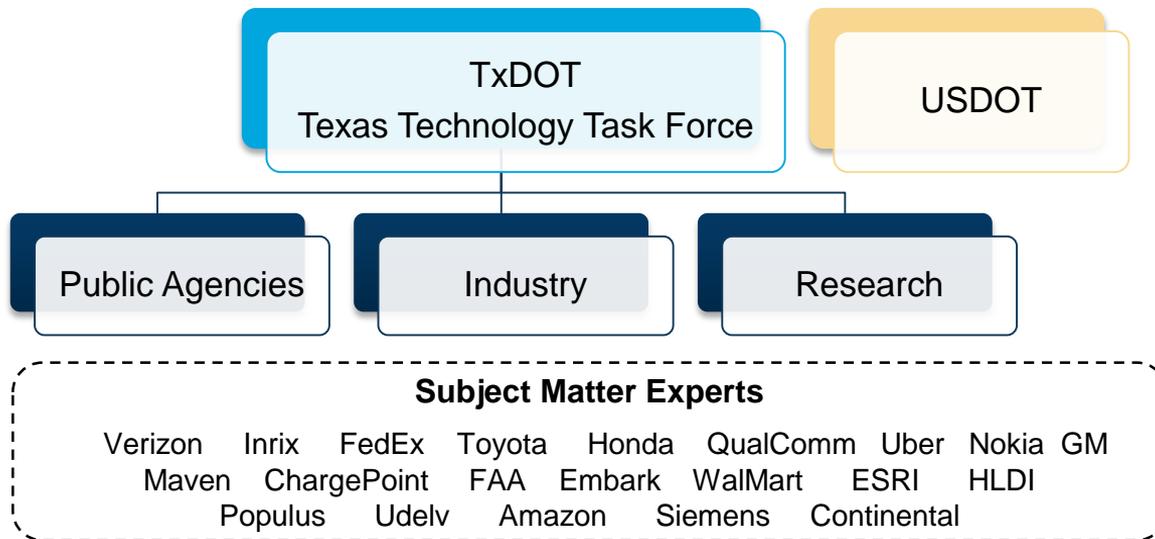
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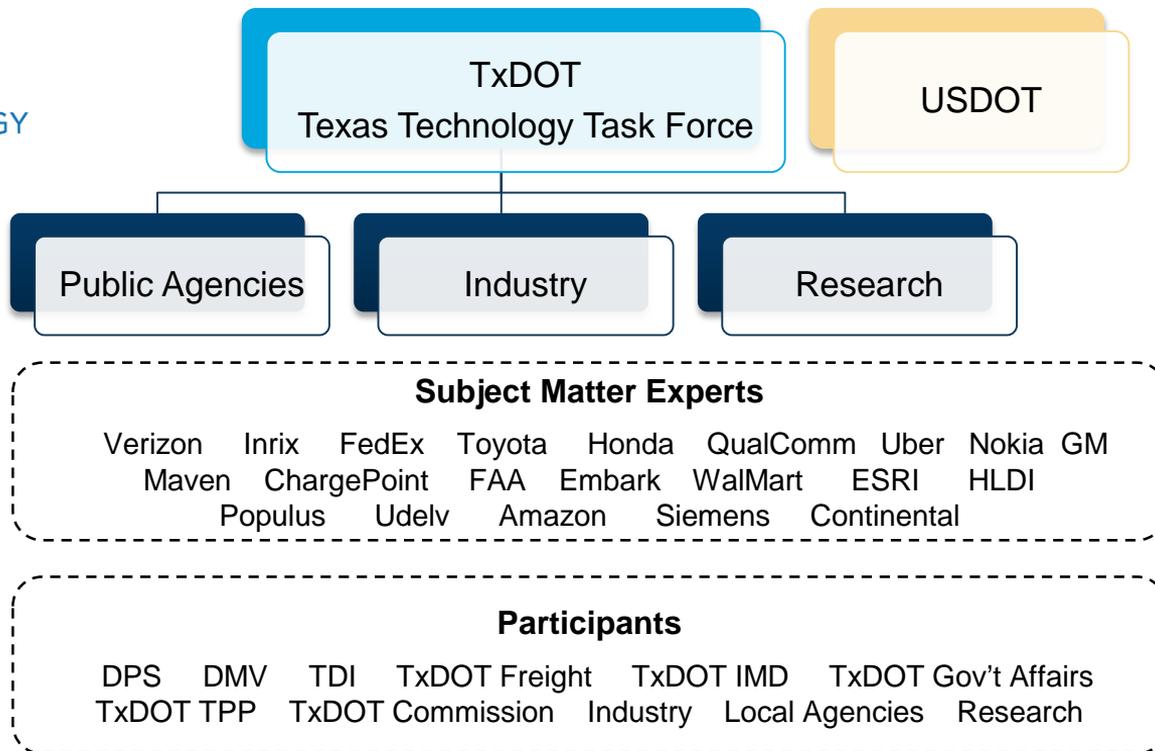
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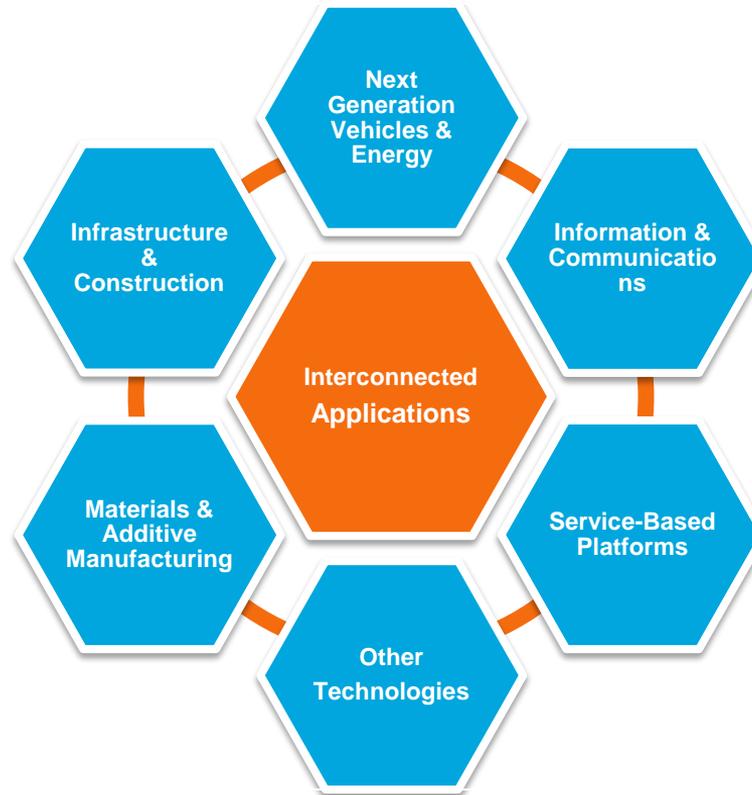
# Texas Technology Task Force: Overview













## Next Generation Vehicles & Energy

Automated Vehicles  
Connected Vehicles  
Electric Vehicles  
Unmanned Aerial Vehicles

## Infrastructure & Construction

Infrastructure Enhancements  
Construction Techniques  
Solar Powered Highways

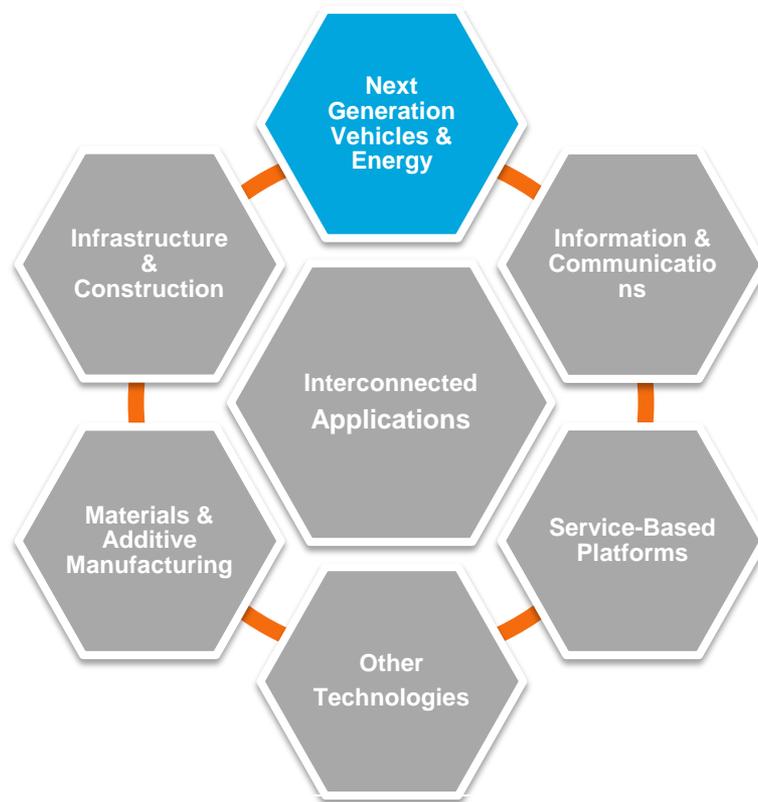
## Materials & Additive

### Manufacturing

Self-Healing Pavements  
Nanotechnologies  
3D Printing

## Other Technologies

Robotics  
Virtual/Augmented Reality  
Hyperloop



## Information & Communications

Cloud Computing  
Crowdsourcing  
Blockchain  
Big Data & Open Data  
Cybersecurity  
RFID  
Cloud & Edge Computing  
Data Standards & Interoperability  
Machine Learning & AI  
Telecommunications

## Service-Based Platforms

Mobility on Demand  
Micromobility  
Transportation Subscription Services  
Freight Brokerage  
Uber Elevate  
Last Mile Delivery



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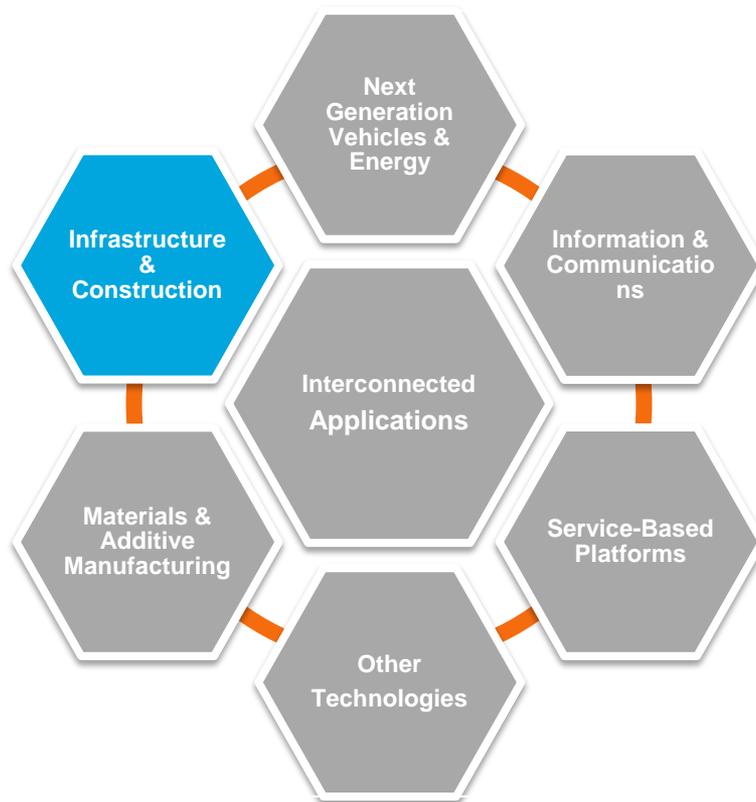
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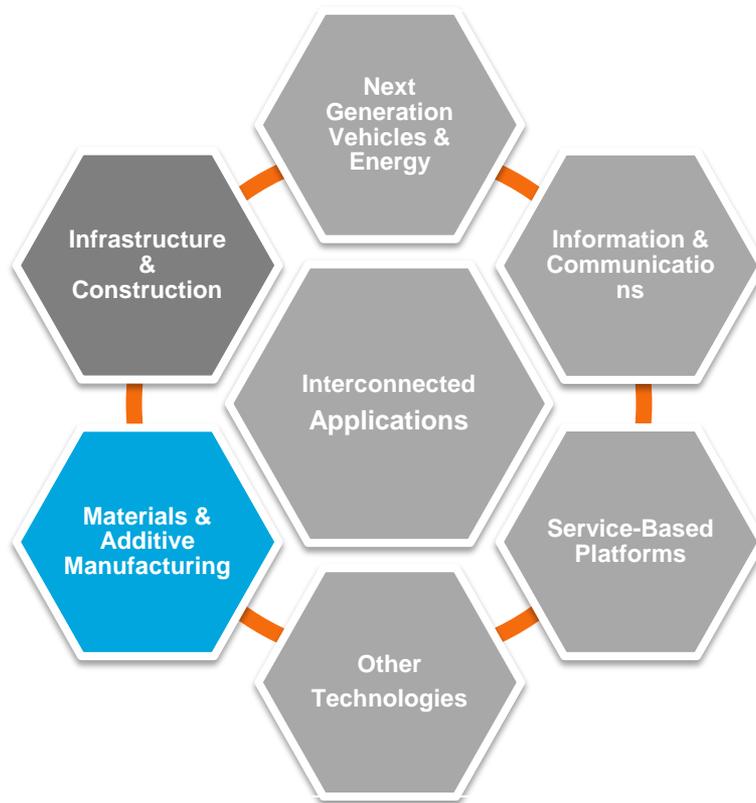
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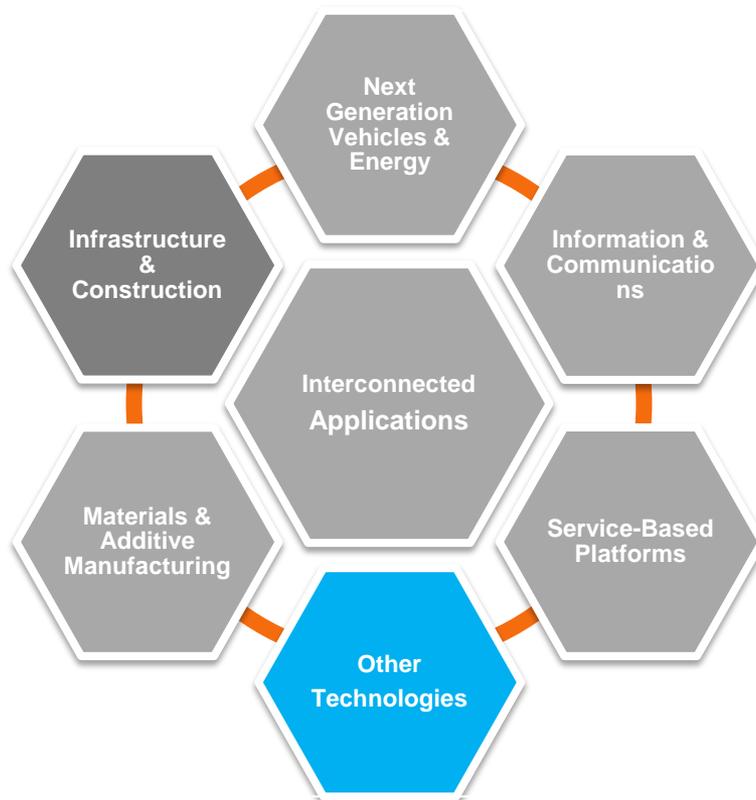
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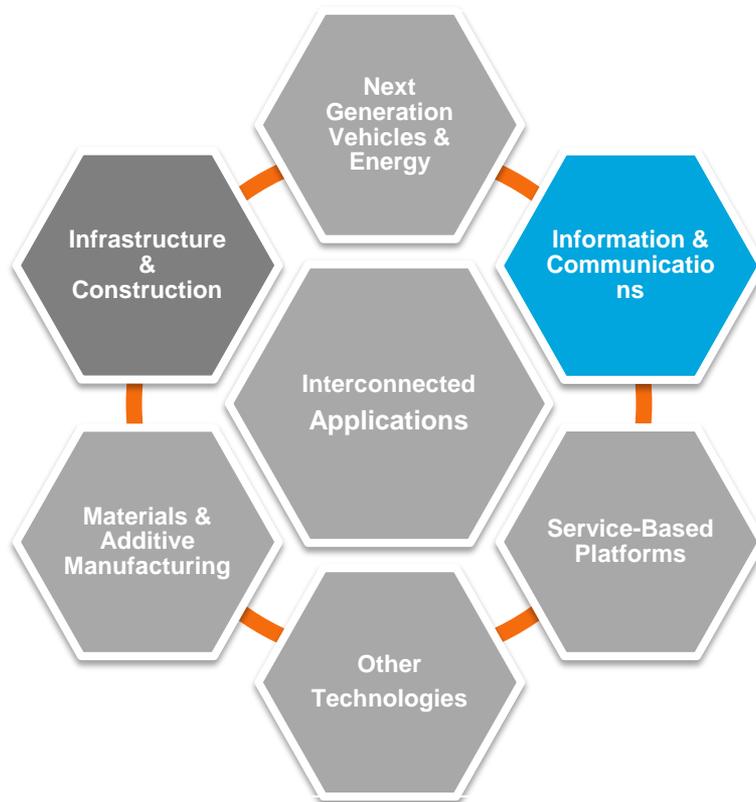
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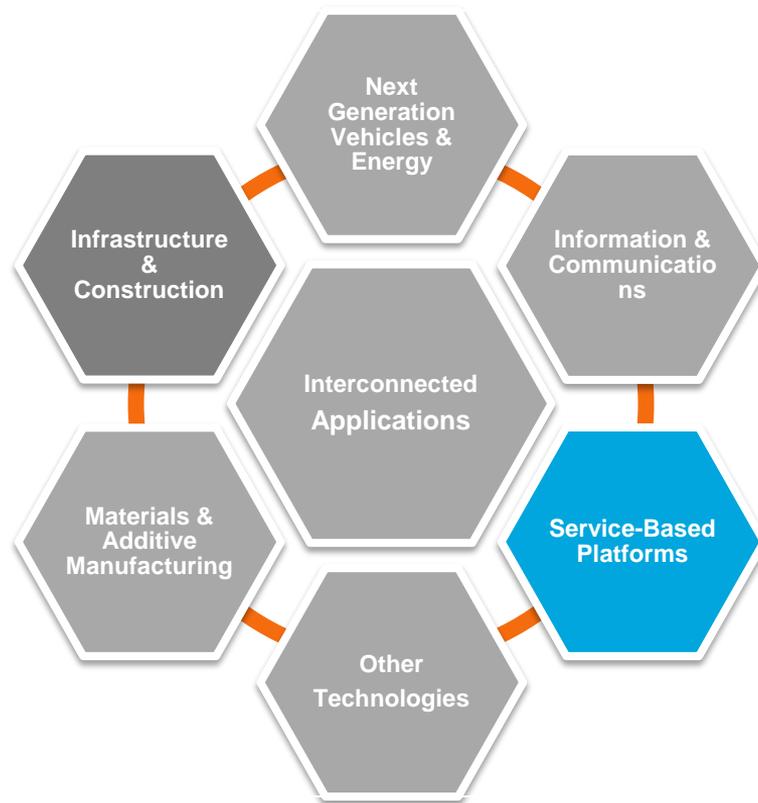
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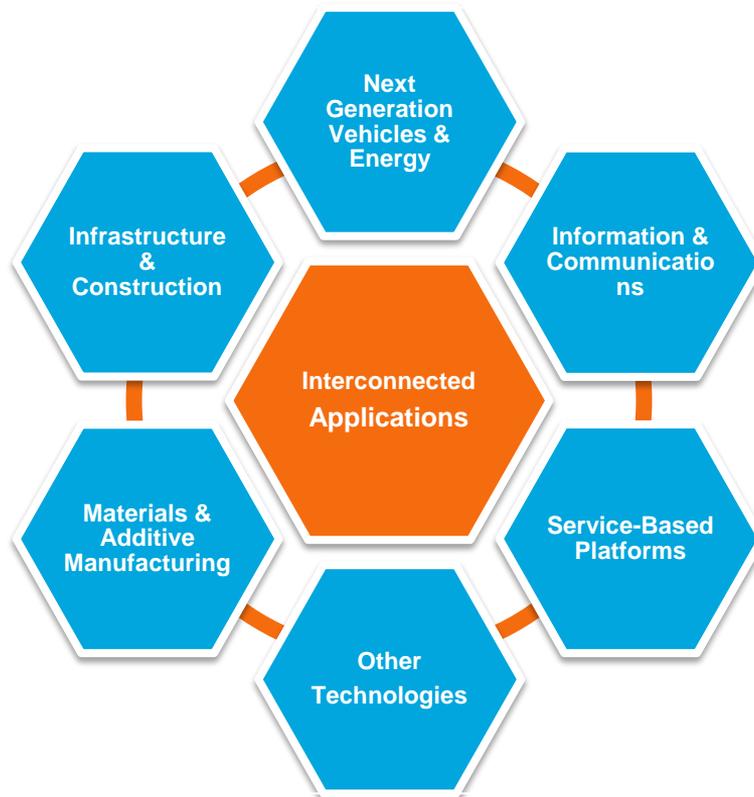
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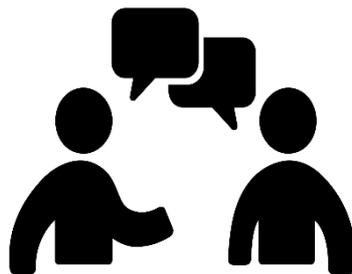
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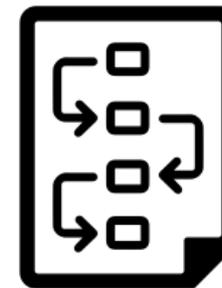
## White Papers

- Scenario Planning
- Data Sharing
- MaaS
- Connected Vehicle Applications



## Communications Plans

- Stakeholder Map & Collaboration Strategy
- Project Website



## Technology Utilization Plan

- Evaluation
- Best Practices and Lessons Learned
- Utilization and Recommendations



>> A strategic document to guide the anticipation and inclusion of advanced technologies for the Texas transportation system and within TxDOT



Emerging Technology  
Evaluation

Spring 2019



Best Practices &  
Lessons Learned

Fall 2019

Spring 2020



Recommendations &  
Utilization Roadmap

August 2020

# Priority Technologies (Goal Assessment)



Goal	Considerations
Safety	<ul style="list-style-type: none"> <li>• reduction in crashes</li> <li>• reduction in severity of incidents</li> <li>• improved pedestrian and bicyclist safety</li> </ul>
Congestion	<ul style="list-style-type: none"> <li>• reduce delay</li> <li>• reduce travel time</li> <li>• improve travel time reliability</li> <li>• increase availability of real-time travel information</li> <li>• improve speed</li> </ul>
Sustainability	<ul style="list-style-type: none"> <li>• reduction in emissions</li> <li>• reduction in gasoline consumption</li> <li>• reduction of environmental impact from built environment</li> </ul>
Accessibility	<ul style="list-style-type: none"> <li>• provide increased opportunity for travel on alternative modes</li> <li>• reduce cost of travel</li> <li>• expand availability of services to all areas</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>• preserve existing assets</li> <li>• enhance ability to inspect and monitor infrastructure</li> <li>• optimally utilize existing capacity</li> </ul>



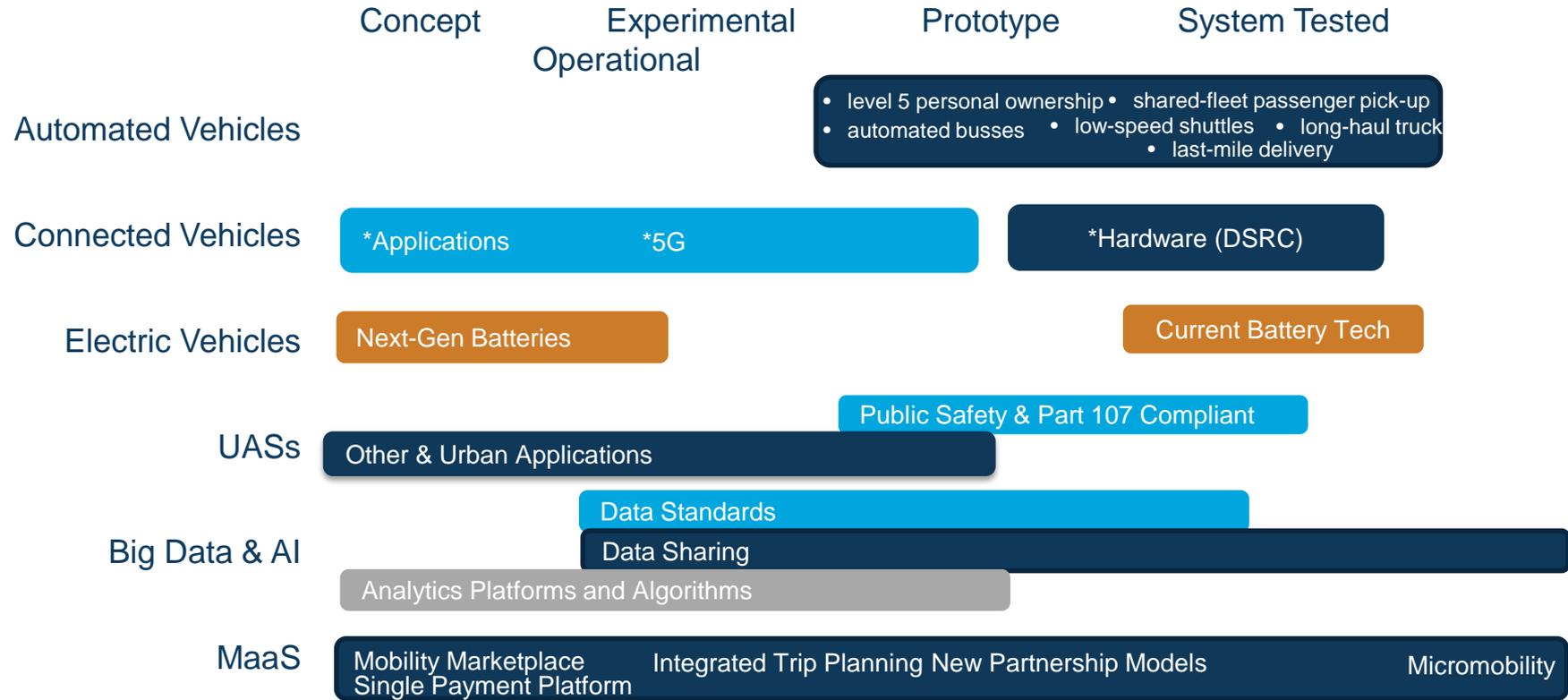
# Priority Technologies (Deployment Barriers)



Barrier	Considerations
Institutional & Regulatory	<ul style="list-style-type: none"> <li>• legislation is prohibitive</li> <li>• public agency workforce knowledge gaps</li> <li>• leadership support</li> <li>• political will</li> <li>• lack of uniformity in regulations across jurisdictions</li> </ul>
Public Concern & Cultural Acceptance	<ul style="list-style-type: none"> <li>• lack of awareness, education, and familiarity</li> <li>• public distrust</li> <li>• comfortable with status quo</li> </ul>
Infrastructure & Public Investment	<ul style="list-style-type: none"> <li>• requires significant public investment in enabling infrastructure</li> <li>• limited funding streams available for technology implementation</li> </ul>
Industry Readiness & Tech Maturity	<ul style="list-style-type: none"> <li>• research and development status of technology not market ready</li> <li>• technology is not reliable and consistent</li> </ul>
Cost to Consumer	<ul style="list-style-type: none"> <li>• cost of technology or service is prohibitive to users</li> <li>• cost. is not competitive with alternatives</li> </ul>
Privacy & Security	<ul style="list-style-type: none"> <li>• concerns about consumer privacy</li> <li>• concerns about cybersecurity</li> <li>• concerns about ethical use of technology</li> </ul>



# Priority Technologies (Technology Maturity)





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- Conferences
  - Houston AV Conference
  - Texas Tribune Fest
- Grant Applications
  - ADS Update
- Other Efforts
  - Governor’s CAV Task Force | October 23rd
  - Texas Mobility Summit | November 17-19<sup>th</sup> | San Antonio



1 Overview

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- Identify the trends and technologies driving innovation in unmanned aerial vehicles as well as early use cases and opportunities for future activities
- Discover outcomes and successes of past Task Force activities and how they have shaped TxDOT's internal initiatives
- Plan future activities of the Task Force including opportunities to collaborate with other TxDOT innovation initiatives



- 9:00 | Welcome and Opening Remarks
- 9:15 | Progress Update
- 9:30 | Roundtable Discussion: Unmanned Aerial Systems (UAS)
  - 9:35 | Topic 1: Baseline and Scan of UAS Initiatives
  - 9:45 | Topic 2: Use Cases and Applications
  - 10:30 | Break
  - 10:35 | Overview of National Policies and Activities
  - 10:45 | Topic 3: Enabling Technologies and Policies
- 11:30 | Facilitate Discussion on Opportunities and Roadmap for the Future
- 12:00 | Concluding Remarks on UAS
- 12:10 | Lunch
- 1:00 | TxDOT Innovation Programs
- 1:30 | Task Force Planning and Strategy Discussion
- 2:30 | Closing Remarks and Next Steps
- 3:00 | Adjourn



## Planning Session

- How does information from Task Force meetings & deliverables inform TxDOT activities?
- How can the Task Force continue to provide value & guidance to TxDOT?
- How can Task Force activities coordinate & support other technology & innovation activities (internal & external to TxDOT)?
- What are future priority activities & topics?



# TEXAS TECHNOLOGY TASK FORCE

October 22, 2019



## UAS Roundtable

- What can state regulators use to promote innovation throughout the state?
- How can TxDOT and its partners champion UAS adoption and implementation?
- What are the possible challenges or barriers to progress and how can we prepare for them?



Imaging structures

Rescue

Marketing

Film making

Fire Fighting

Site surveying

Recreation

Parcel Deliveries

Precision agriculture



Lighting Concert Shows

Search and rescue

Inventories

Insurance

Policing

Sports

Conservation

Weather monitoring

Environmental monitoring

# What does the UAS ecosystem look like?



(Credit: Deloitte)



## UAS Roundtable

- Provide guidance and recommendations for what Texas should anticipate and plan for regarding UAS deployment
- Provide guidance and recommendations for the roles and responsibilities for TxDOT in safely enabling UAS (technologies, infrastructure, policies, programs, etc.)
- Determine priority short- and long-term opportunities

An aerial view of a city at dusk, with a river winding through the lower left. The sky is filled with several drones of various sizes, some with glowing lights. White lines represent flight paths or communication links between the drones and various points on the city's skyline. The overall scene is futuristic and technological.

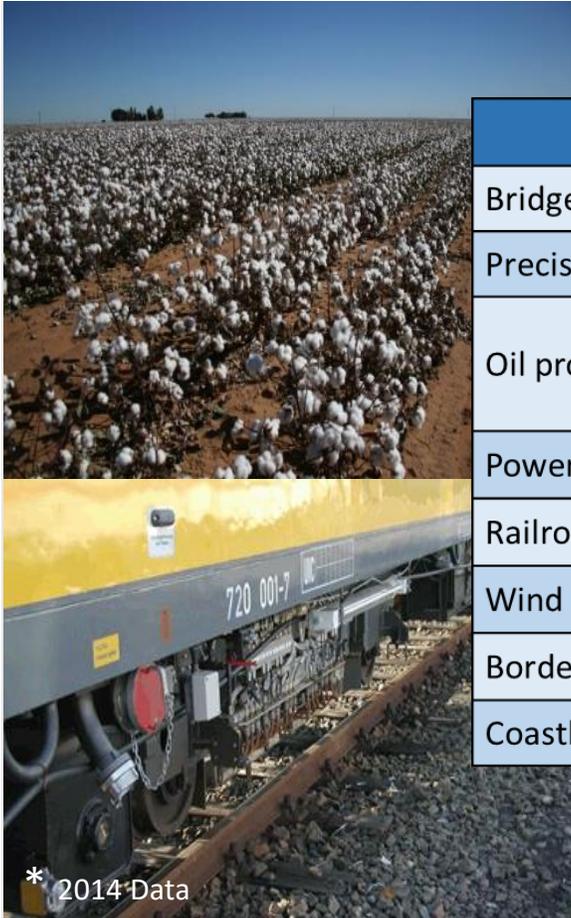
# Lone Star UAS Center of Excellence & Innovation

**Texas Technology Task Force**

22 October 2019

# Texas: A UAS Opportunity-Rich Environment

## Part 107 is a Key Enabler



UAS Market	State Ranking *	
Bridge Inspection	1	>50,000 bridges
Precision agriculture	1	>1M acres of farmland
Oil production monitoring	1	~500 offshore oil platforms >350,000 miles of pipelines
Power line inspection	1	>3,500 miles of power lines
Railroad track inspection	1	>10,000 miles of railroads
Wind turbine inspection	1	>7,000 wind turbines
Border inspection	2	>1,200 miles of border
Coastline monitoring	7	>3,000 miles of coastline



\* 2014 Data

# "This is complex stuff..."

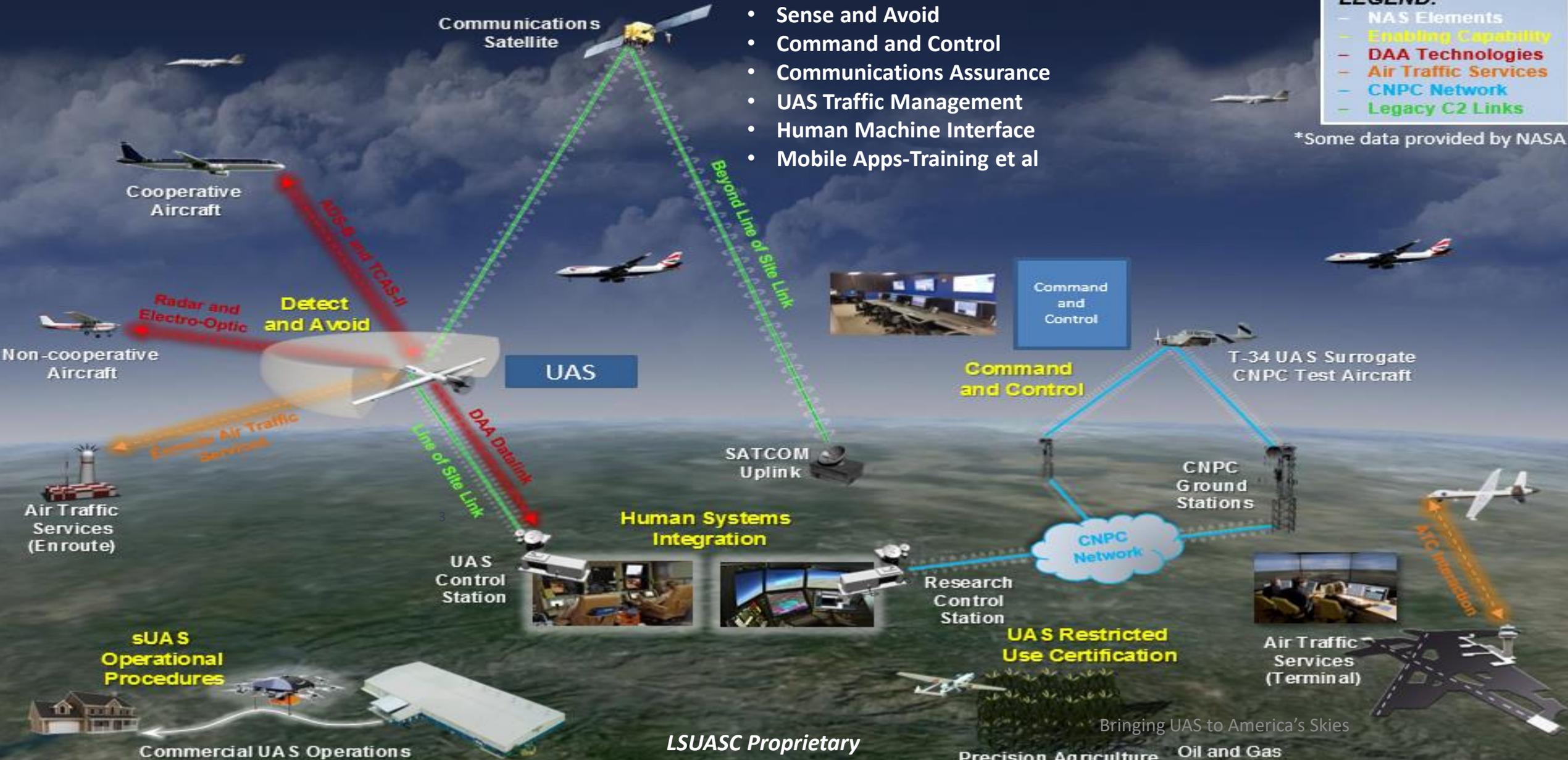
## Technology Enablers:

- Sense and Avoid
- Command and Control
- Communications Assurance
- UAS Traffic Management
- Human Machine Interface
- Mobile Apps-Training et al

### LEGEND:

- NAS Elements
- Enabling Capability
- DAA Technologies
- Air Traffic Services
- CNPC Network
- Legacy C2 Links

\*Some data provided by NASA



# LSUASC On-Going and Emerging Partnerships

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- Part 107: NASA Urban Environment Multi-Drone Testing (TCL4)
- BVLOS: NASA Urban Air Mobility Grand Challenge Planning Support
- BVLOS: Fixed Linear Asset Pipeline Patrol & Inspection
- BVLOS: Off-Shore Cargo & Package Delivery
- BVLOS: Urban Air Mobility (UAM) Ecosystem R&D and Testing Support
- Multi-Drone (Autonomous) DHS & Other HLS Container Inspection
- HB 2340 Support

BVLOS: Beyond Visual Line-of-Sight

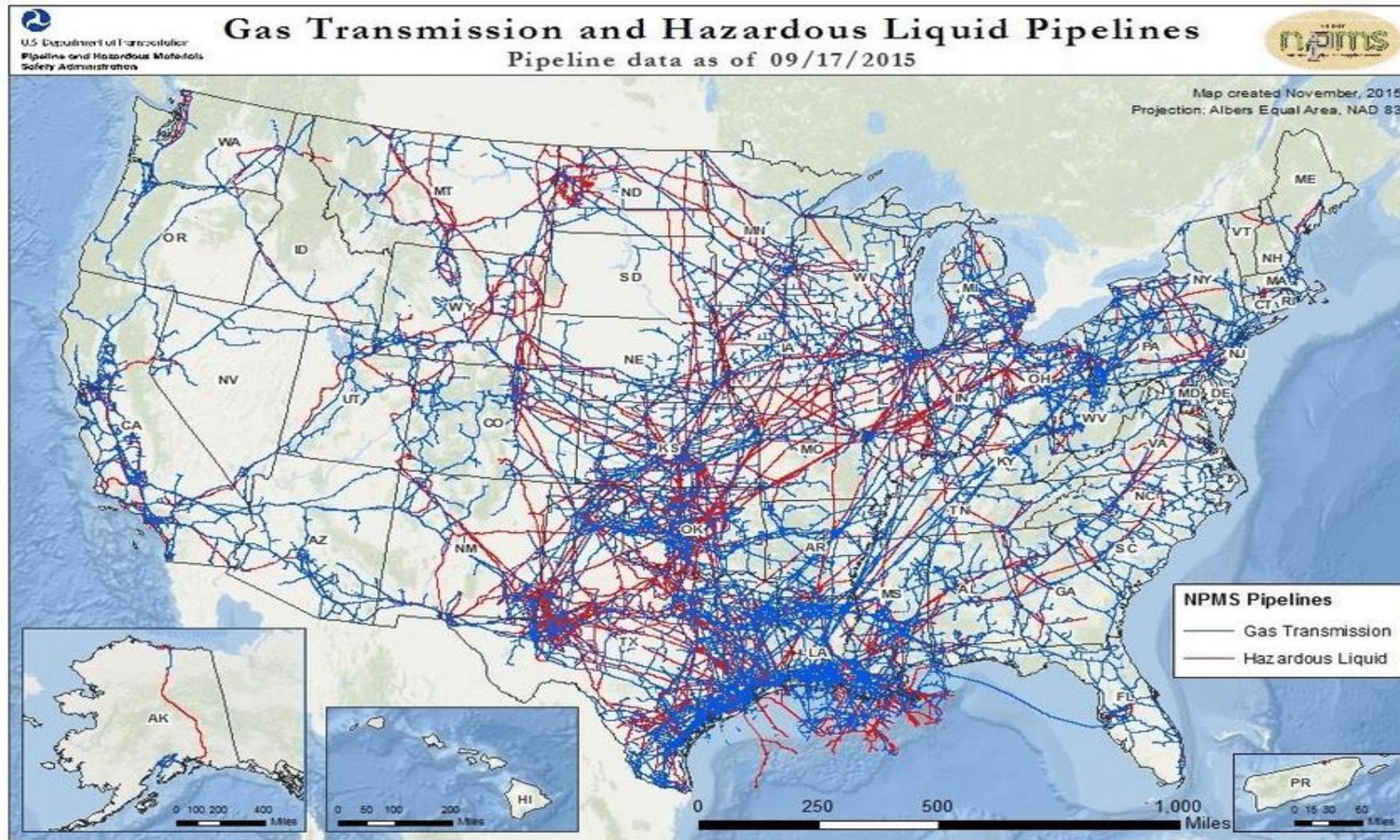
*The LSUASC is actively working with our Energy Sector Partners to develop more cost effective and safer UAS enabled work flow tools and procedures.*

*“Its about the data...”*



*Bringing UAS to America's Skies  
LSUASC PROPRIETARY*

# Total Miles of Pipeline (US and Texas)



**US Regulated  
Pipelines**  
1.7M miles

2.6M total  
(US DOT PHMSA)

**Texas Regulated  
Pipelines**  
466,623 miles

1/6 the US Total  
(RRC)

**US Active  
Pipeline  
Companies**  
3,000  
(US DOT PHMSA)

# US DOT PHMSA Pipeline Monitoring Requirements

“And its still...all about the data!”

US DOT PHMSA CFR Part 192 (gas) Regulations						
Facilities	3 weeks	Quarterly	6 Mo.	Annually	3 Yr	Acceptable Methods
Gas transmission lines, gathering lines and/or line segments (exposed or buried)	X					Aerial and/or ground
Atmospheric corrosion inspection of exposed portions of transmission lines, gathering lines						
Onshore					X	Ground
Offshore				X		Ground
Distribution lines in where anticipated movement or external loading can cause failure or leakage						
In business districts	X					Aerial and/or ground
Outside business districts	X					Aerial and/or ground
Exposed portions of distribution lines					X	Ground
US DOT PHMSA CFR Part 195 (hazardous liquids) Regulations						
Facilities	3 weeks	Quarterly	6 Mo.	Annually	3 Yr	Acceptable Methods
Hazardous liquid transport by pipelines	X					Ground
Right-of-ways and crossings under navigable waters				X		Aerial and/or ground
Underwater inspection and reburial of pipeline in the GOM				X		Ground



# Lone Star UAS Center of Excellence & Innovation

## NASA UAS Traffic Management TCL4 Overview

# Lone Star UAS Center of Excellence – NASA TCL-4 Summary

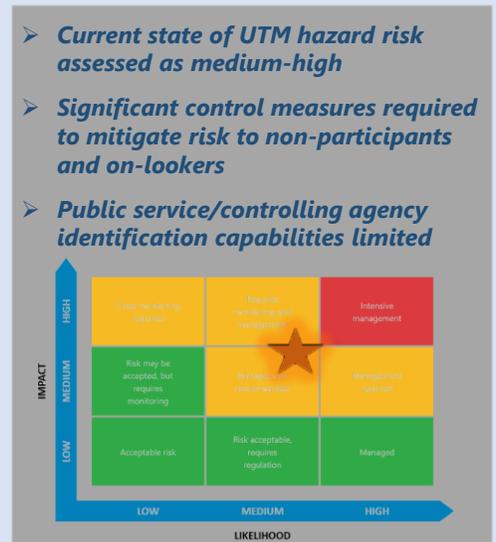
## Mission Background

LSUASC conducted a series of UAS flight demonstrations, collectively called the Technical Capability Level 4 (TCL4) Demonstration, to provide data on complex UAS operations occurring in an urban environment. All data supports NASA's continued UAS Traffic Management (UTM) project.

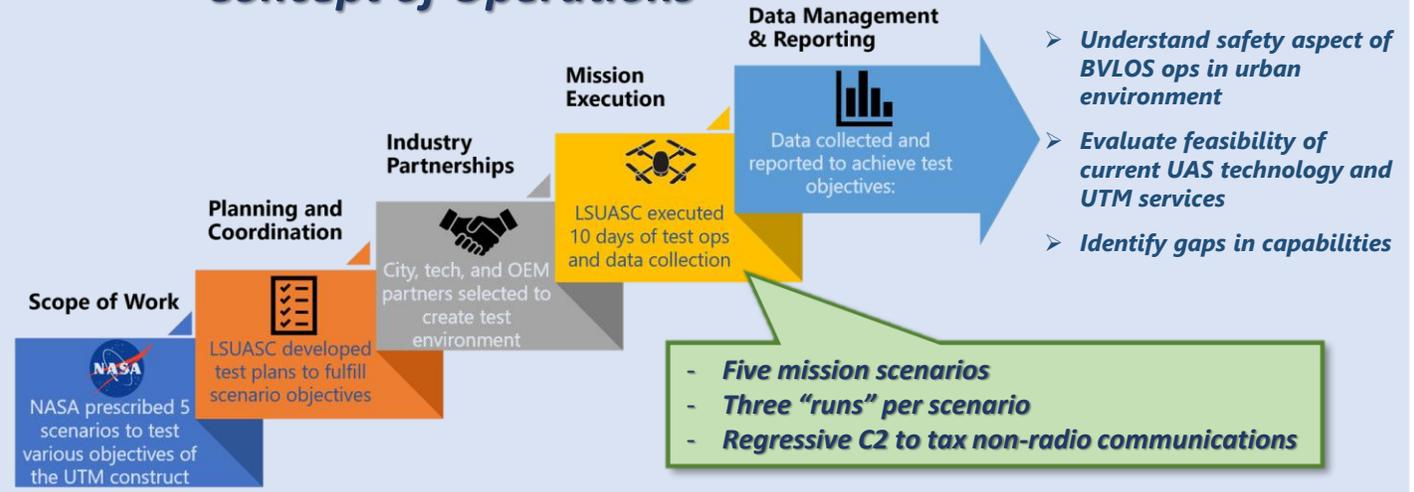
**Dates:** July-August 2019

**Location:** Corpus Christi, TX

## Partners



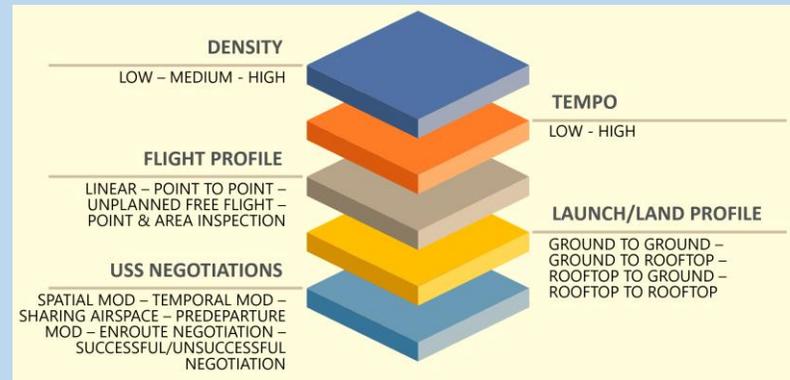
## Concept of Operations



## Trends & Observations

- Proven need to standardize all aspects of UAS operations from common terminology to USS programming
- Disconnect between reference factors such as map datums and altitude references
- Requirement for signals redundancy and non-GPS navigation to counter structural and electromagnetic interference
- Operating systems must be hardened for extreme environmental factors
- Community engagement and involvement is a critical enabler

## Results/Lesson Learned

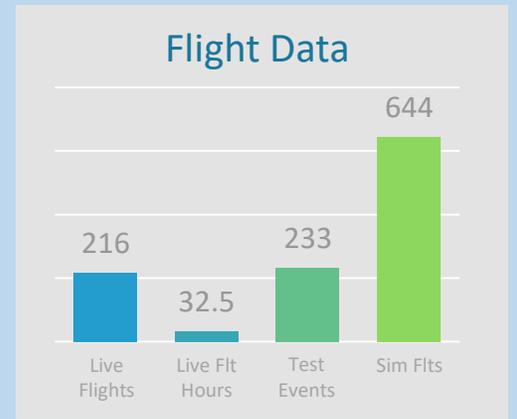


Sampling of Flight Characteristics:  
12 Groupings of 39 Unique Characteristics

Bringing UAS to America's Skies

LSUASC Proprietary

## Flight Data



# Scenario 4 CONOP – Urban Canyon



## Fire 8 Flight Route

- ALT: 400' AGL
- USS: AirXos
- All timings per Test Card



GCS



VO/SO



OPS

Airmap

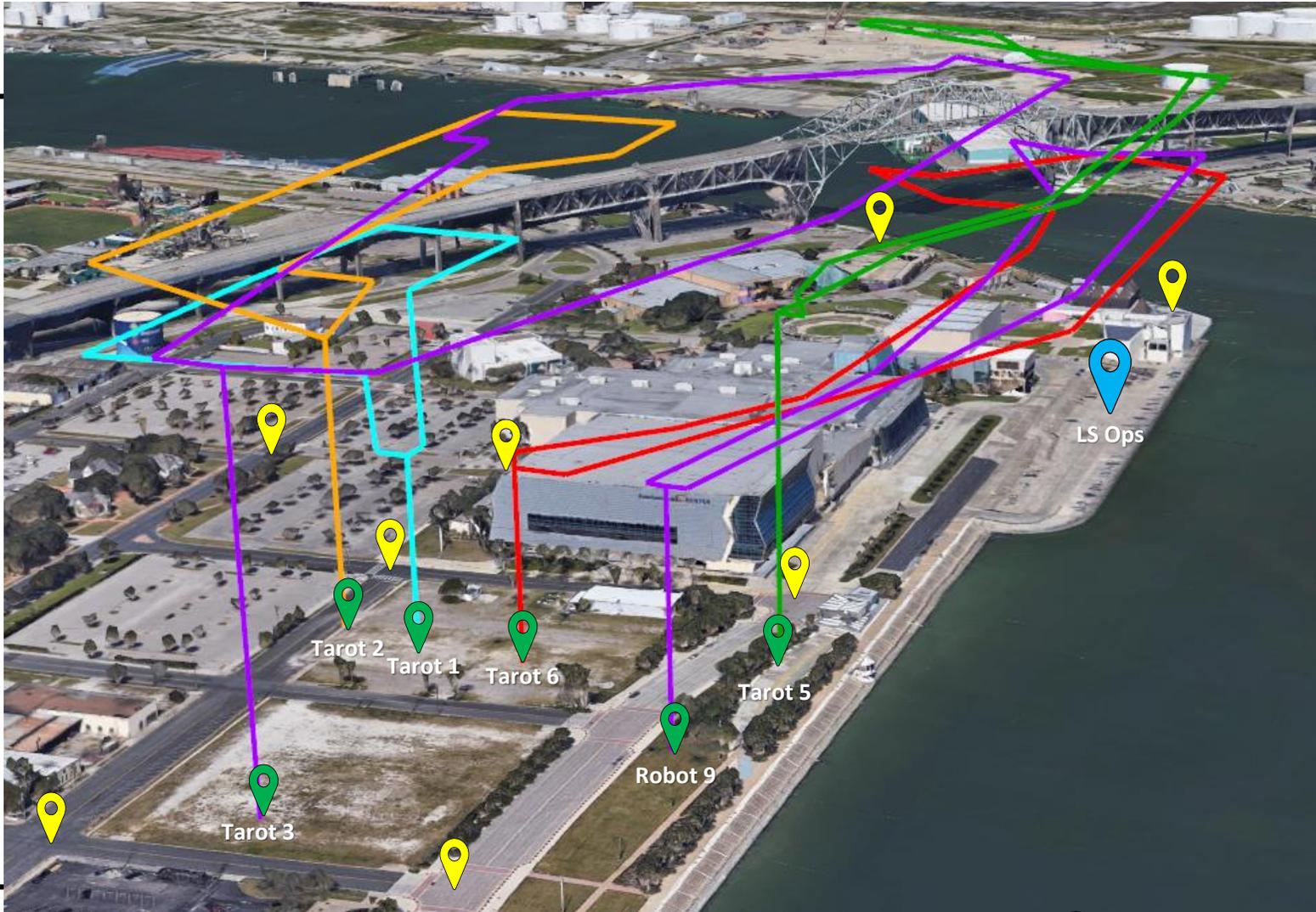
Airxos

Anra

Avision

Collins

# Scenario 4 CONOP – SEA District



## SEA District Flight Routes

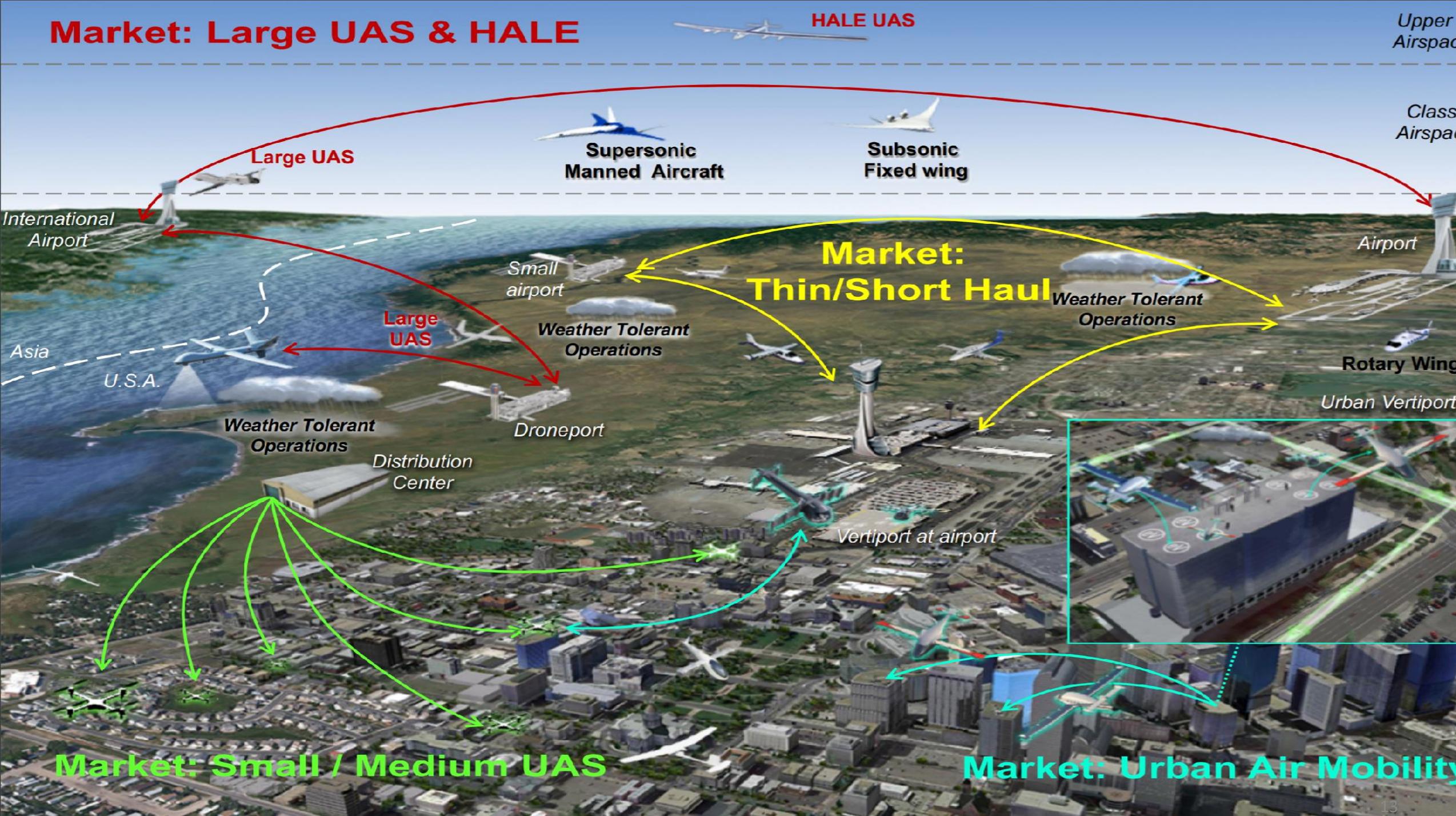
- Simultaneous Operations with multiple aircraft
- Tarot 1 – 250' AGL
- Tarot 2 – 300' AGL
- Tarot 3 – 400' AGL
- Tarot 5 – 350' AGL
- Tarot 6 – 200' AGL
- Robot 9 – 150' AGL
- All timings per Test Card

# sUAS Disaster Response

- Exercises conducted in March/April 2019 with Texas Task Force 1
  - HAZMAT focused Operational Readiness Exercise in March
  - Wide-area focused Search Skills Set Training/Exercise in April
  - LSUASC and TX-TF1 continue to build partnership for utilizing sUAS for Search-and-Rescue and disaster response for the State of Texas.
- Mass evacuation exercise conducted in June 2019 with Nueces County
  - Coordination with new County Judge and how to assist LSUASC's home County
  - Inter-local Agreement signed with Nueces County in October 2019 to provide Disaster Response capabilities to the County
  - Two more counties currently in the process of putting ILA's in place with LSUASC & TAMUCC



# Market: Large UAS & HALE



HALE UAS

Upper Airspace

Large UAS

Supersonic Manned Aircraft

Subsonic Fixed wing

Class Airspace

International Airport

Airport

Market: Thin/Short Haul

Small airport

Weather Tolerant Operations

Large UAS

Weather Tolerant Operations

Asia

U.S.A.

Rotary Wing

Weather Tolerant Operations

Droneport

Urban Vertiport

Distribution Center

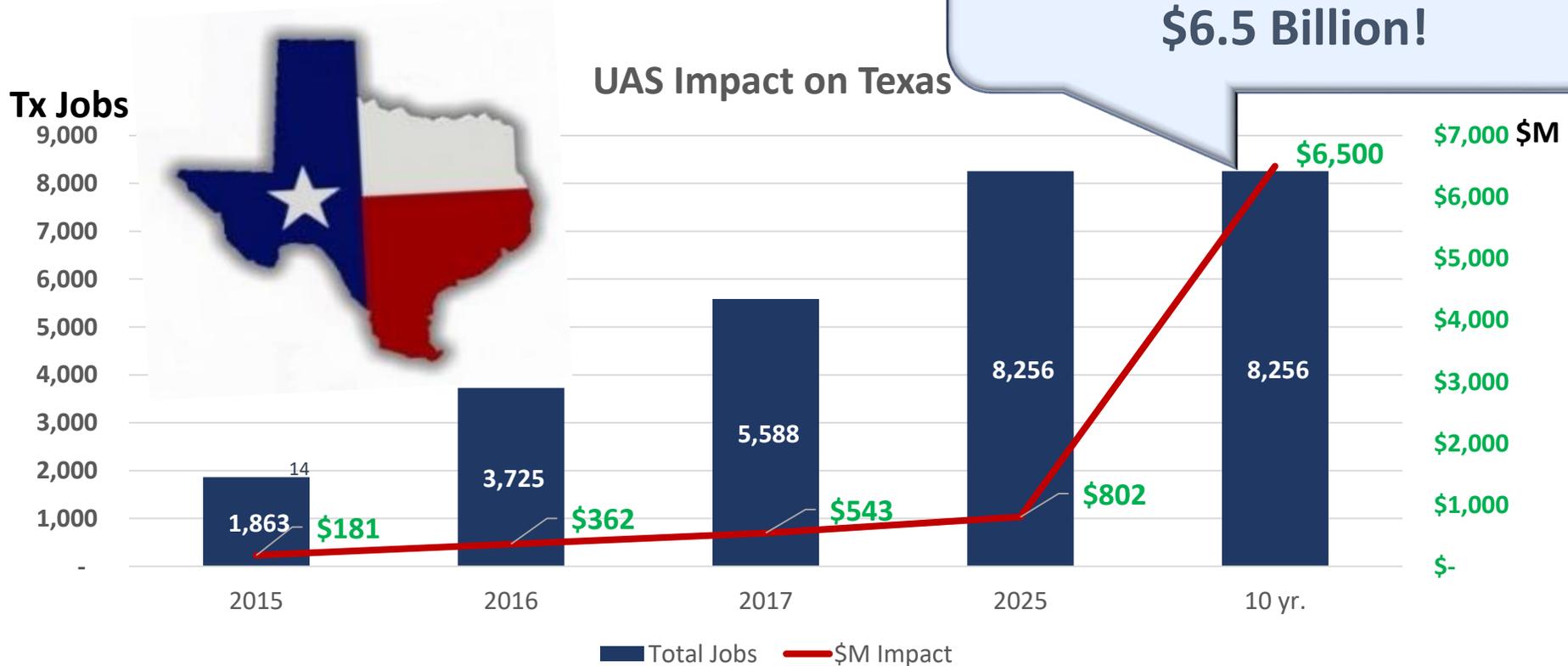
Vertiport at airport

Market: Small / Medium UAS

Market: Urban Air Mobility

# Based on a 2014 Study by the Association for Unmanned Vehicle Systems International (AUVSI)

10 Year cumulative impact in Texas over 8,000 jobs and \$6.5 Billion!





**Mike Sanders**

**Executive Director, LSUASC**

**Coastal Bend Business Innovation Center**

**10201 South Padre Island Drive**

**Corpus Christi, Texas 78418**

**361-825-5731**

**[Michael.sanders@tamucc.edu](mailto:Michael.sanders@tamucc.edu)**

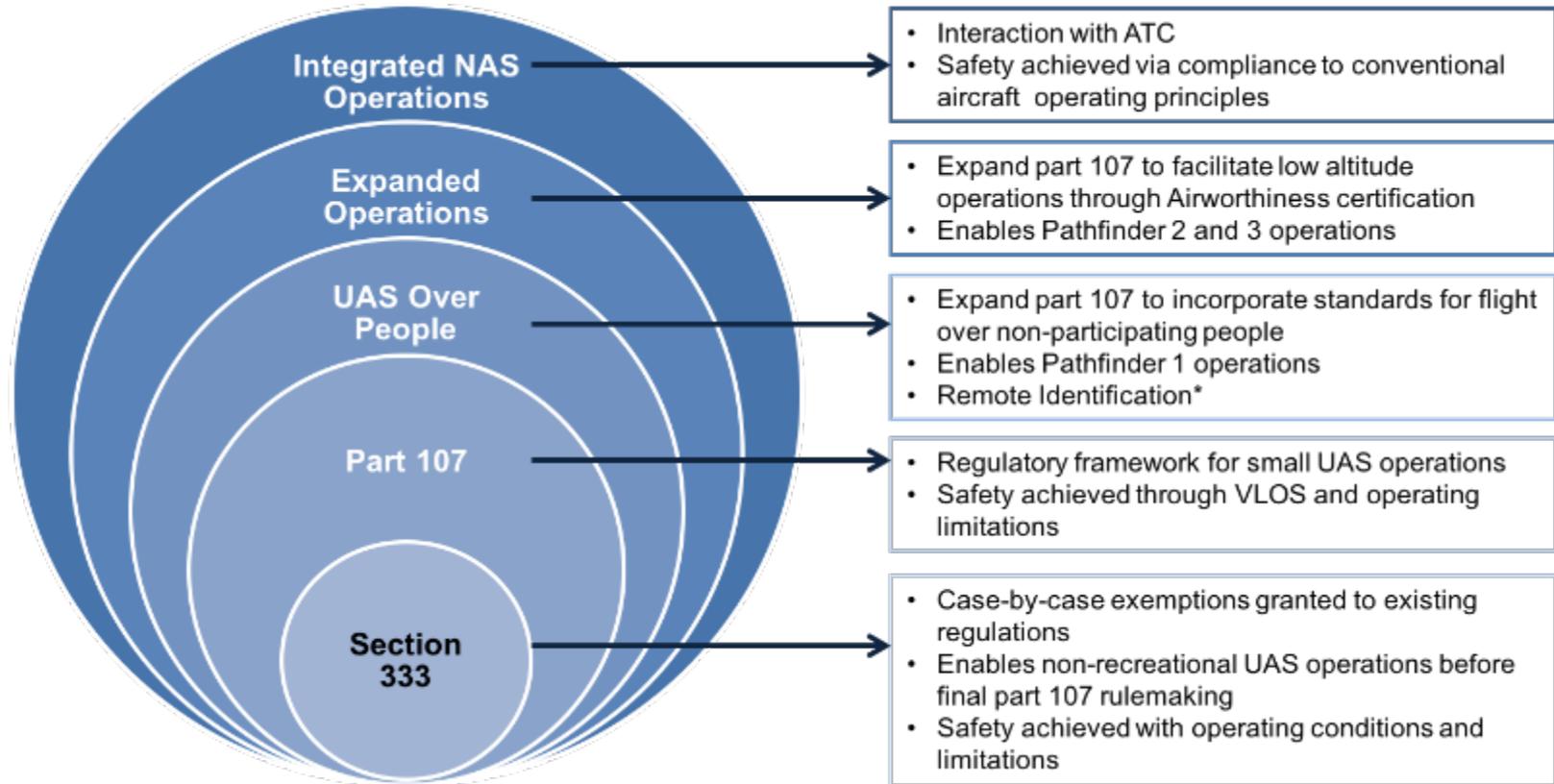
***The Urban Air Mobility Vision***

***Bringing UAS to America's Skies  
LSUASC Proprietary***

# Texas Technology Task Force: Overview of National Policies and Activities

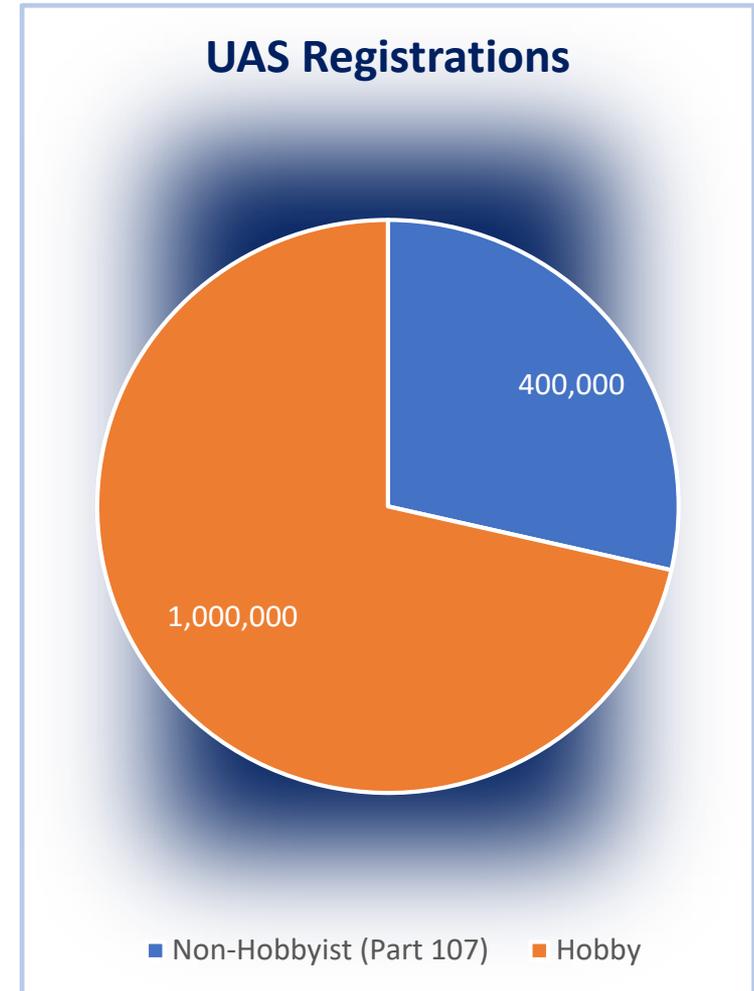
Tom McMahon  
SVP, Advocacy and Government Relations  
Association for Unmanned Vehicle Systems International

# Building the Regulatory Framework



# U.S. Regulations: Part 107

- Mandated by 2012 FAA Reauthorization Act
- **Took effect on Aug. 29, 2016**
- First clear regulatory framework on civil and commercial UAS operations
- Established a flexible, risk-based approach to regulating UAS
- Requires knowledge test, background check
- Approved operations include:
  - Only during daylight hours
  - One aircraft, one pilot
  - Within visual line of sight, <400 feet
- Certain operations allowed by waivers
- UAS Registrations (as of June 2019)
  - Total Registrations: 1.4M
  - Total Non-Hobbyist UAS: 400,000
  - Total Remote Pilot Certifications: 121,000



# Recent Proposed Rulemaking



- **Operations of sUAS Over People NPRM**
  - Three proposed categories of flights over people:
    - <0.55 lbs subject only to existing Part 107 requirements
    - >0.55 lbs subject to “performance standards” to limit damage in event of collision with a person
    - UAS with potential to cause more damage in event of collision than in Category 2 subject to performance standards and strict “operational limits”
  - Requirements on manufacturers to submit Declarations of Compliance
    - Must be accepted by FAA
  - Operations at night would be permissible so long as:
    - RPIC has completed all training requirements; and
    - UAS has an anti-collision light visible for three miles
- **sUAS Safe and Secure Operations ANPRM**
  - Sought comments for future UAS rulemakings on:
    - Stand-off distances
    - Payload restrictions
    - Critical system design requirements
    - Performance limitations
    - Unmanned traffic management operations



# Anticipated Rulemaking



- **Remote ID NPRM**

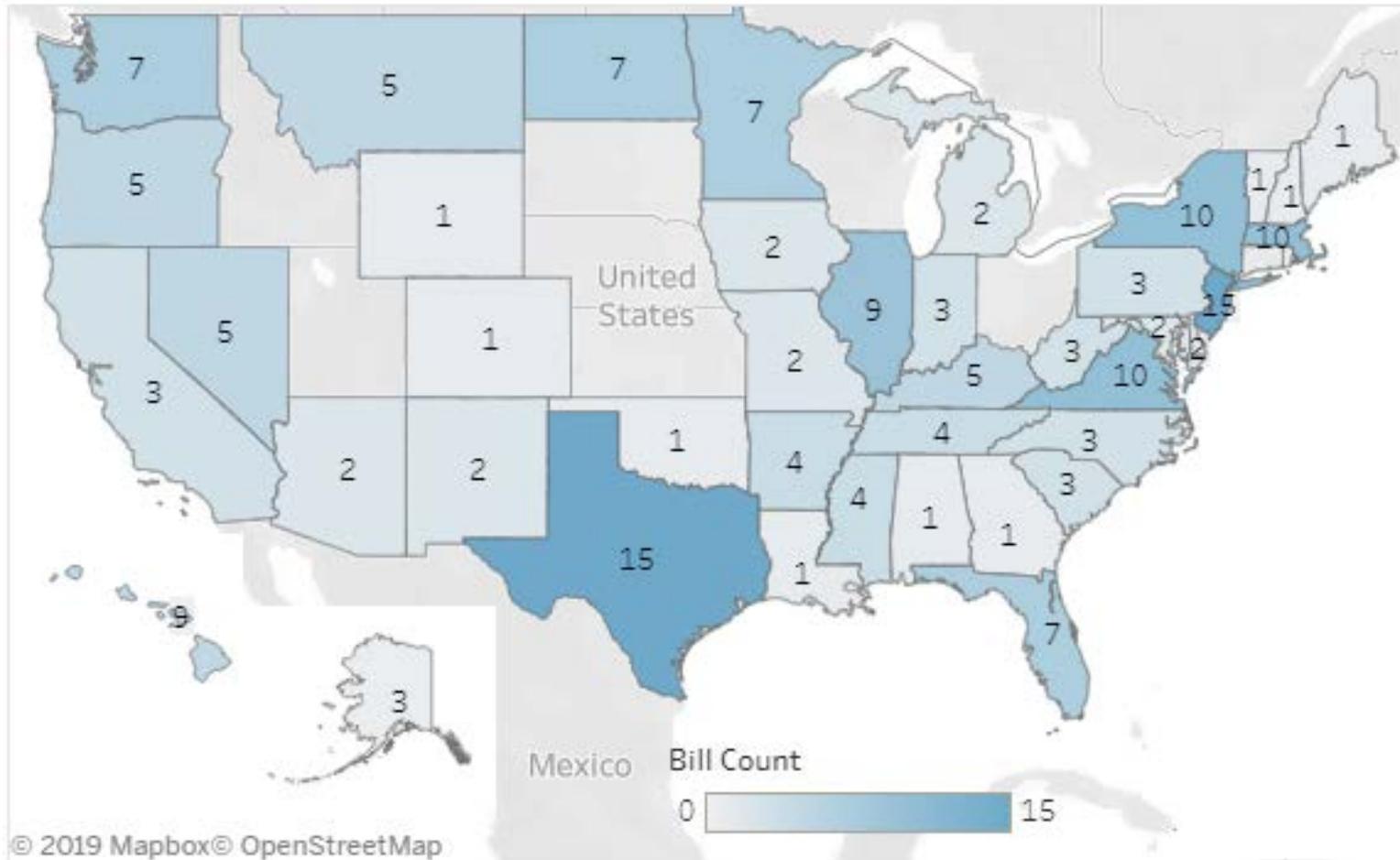
- FAA explicitly stated that it will not finalize any rules that allow commercial operations over people and at night without before finalizing its remote ID policy
- Aviation Rulemaking Committee (ARC) provided recommendations in 2017 on how to implement an ID and tracking system for UAS
- NPRM scheduled for December 2019

- **Critical Infrastructure NPRM (Section 2209)**

- Named for the section in the 2016 law
- Restrict airspace over fixed-site facilities, such as critical infrastructure
- Establish process for property owners to petition the FAA
- NPRM scheduled for September 2020



# UAS State Legislation – 2019



**LEAD  
WITH  
US**

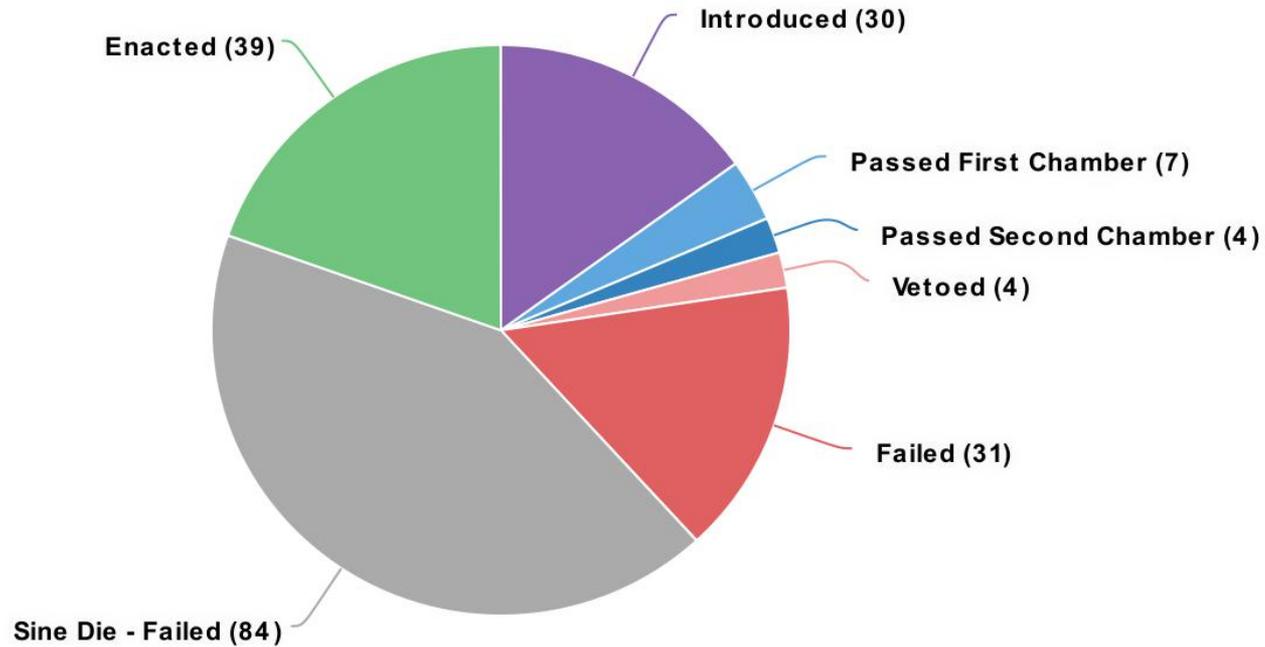
[www.auvsi.org](http://www.auvsi.org)

get **CONNECTED** get **INFORMED** get **INVOLVED**

# UAS State Legislation in 2019



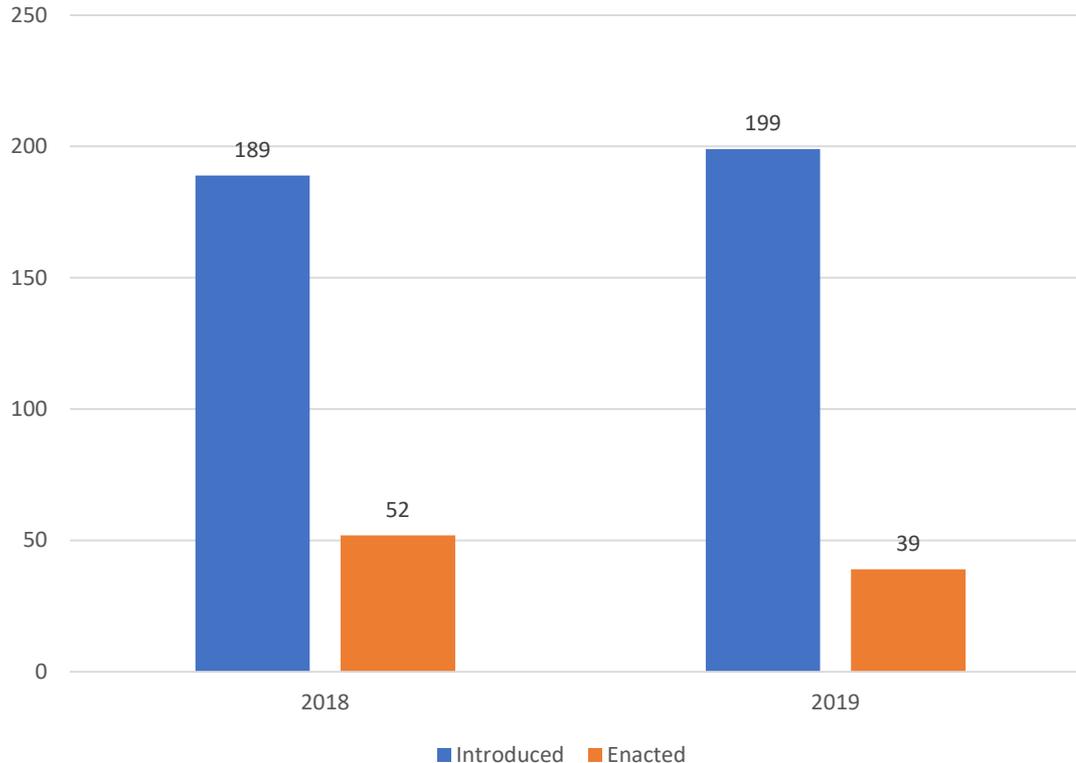
## Status Breakdown



# UAS State Legislation



State UAS Legislation by Year of Last Action



- Time remains in the 2019 sessions for bills to be enacted.
- The number of bills enacted in 2019 is 75% of the total number in 2018.

# UAS State Legislation – 2019



**Unlawful Acts**  
Use of drones to commit existing criminal acts (harassment, trespassing, etc.)



**Surveillance**  
Use of drones for filming and photography without prior consent



**Hunting/Fishing**  
Use of drones for hunting/fishing, or to prevent hunting/fishing



**Preemption**  
Preempting local UAV laws with state laws



**Funding**  
Grants and appropriations for drone procurement, education, and test sites



**Law Enforcement**  
Use of drones by law enforcement and military (procurement, warrant requirements, etc.)



**Security Concerns**  
Use of drones over critical infrastructure, prisons, hospitals, schools, sports stadiums, and during wildfires



**Study Committees/Education**  
Legislative task forces studying drone technology and impact



**Liability**  
Regulates UAV liability insurance, establishes liability for UAV usage

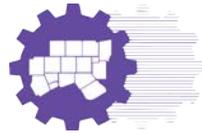


**Miscellaneous**  
Registration/insurance requirements, agricultural uses, etc.

# Texas Technology Task Force: Overview of National Policies and Activities

Tom McMahon  
SVP, Advocacy and Government Relations  
Association for Unmanned Vehicle Systems International

# UAS SAFETY AND INTEGRATION INITIATIVE



## North Central Texas UAS Task Force



### Safety



### Integration



### Education

- Know Before You Fly Workshops
- Airport/Military Facility Risks



### Legislation

- Regional Ordinance
- Statewide Legislation
- National Legislation
- Notice for Proposed Rule Making
- Permitting



### Training

- Training Standards
- PSURT/Enforcement
- Promote UAS Training



### Testing

- Metropolitan Testing Corridors
- Package Delivery
- Air Taxi
- Regional UAM Charter



### Public Awareness

- UAS Applications
- UAS Careers
- Public Outreach Strategy
- Bring Your Drone to the Park Day

## PRE-EXISTING COMMITTEES

Regional Coordination  
Committee

Regional Transportation Committee  
Surface Transportation Technical Committee  
Air Transportation Advisory Committee

PSURT Committee and Team  
Workforce Development

Lone Star UAS Center of Excellence  
UAS Werx  
Cumulus Technologies  
Hillwood Group

AUVSI Lone Star Chapter  
Regional Freight Committee

# Ways that Texas can utilize UAS Technology now (*“Know Before You Fly Workshops”*)



Disaster  
Response



Search and  
Rescue



Bridge and road  
inspections



Accident  
Reconstruction



Mapping and  
Surveying



Building Safety  
Inspections

# Future Uses



Urban Air Mobility



High Speed Package  
Delivery



Ambulance Drones

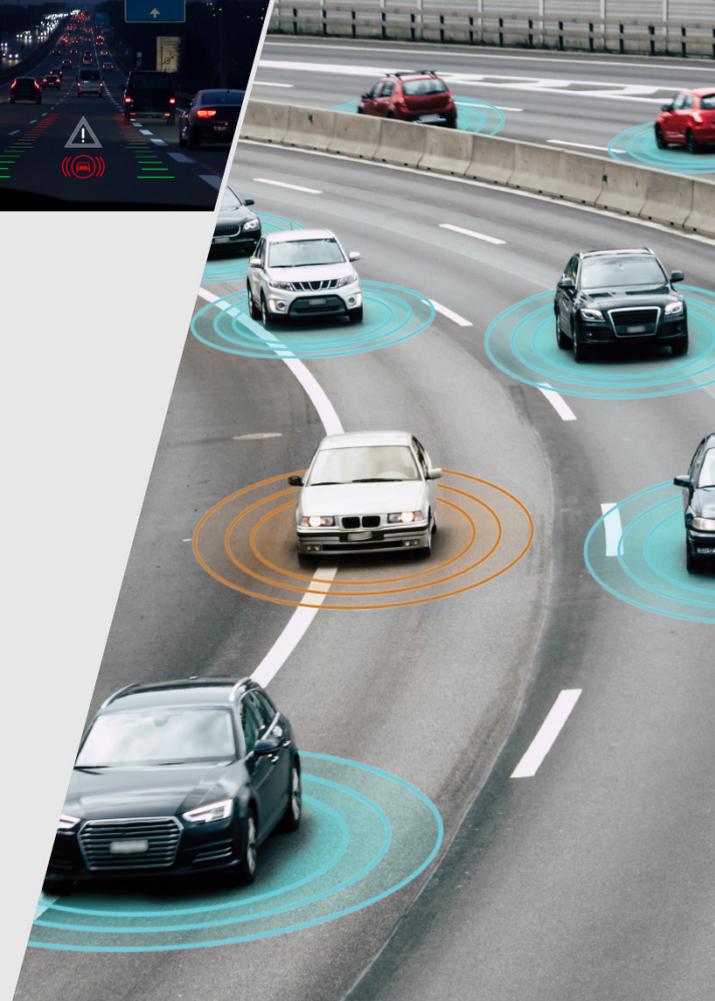


Rapid Response Police  
Drones



TEXAS TECHNOLOGY  
TASK FORCE

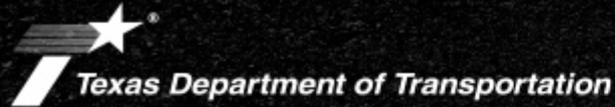
# Innovation & Transformation at TxDOT



October 22, 2019

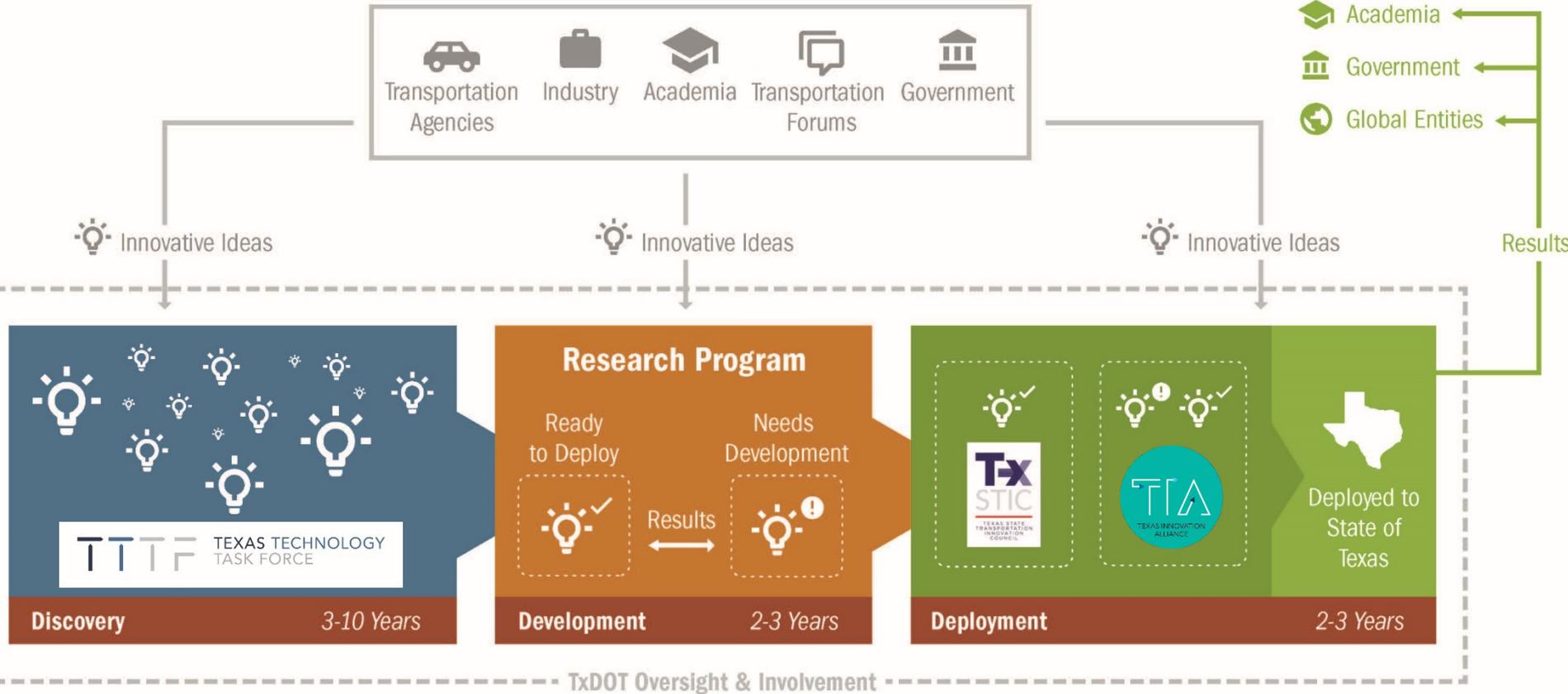


# November 7, 2000



**#EndTheStreakTX**

# Future Innovation and Transformation Planning





- Identify emerging technologies
- Analyze economic, engineering, and policy impacts
- Develop key strategies to integrate critical technologies
- Tech Utilization Plan





- Goals
  - To focus on taking research from its completed stage to actual use on the system
  - Regular meetings to discuss recent research either done within TxDOT, other states, or at the federal level that is ready for implementation
  - Builds another way to collaborate and share strategies for safety and mobility





- CAV Internal Workgroup:
  - Provide TxDOT leadership and staff with a singular place of contact to guide what CAV tasks the department is actively undertaking, and
  - Set the department's long term strategy for CAV
- TxDOT is also leading a statewide CAV Taskforce comprised of other state agencies, universities, and private stakeholders.
  - First meeting is tomorrow!



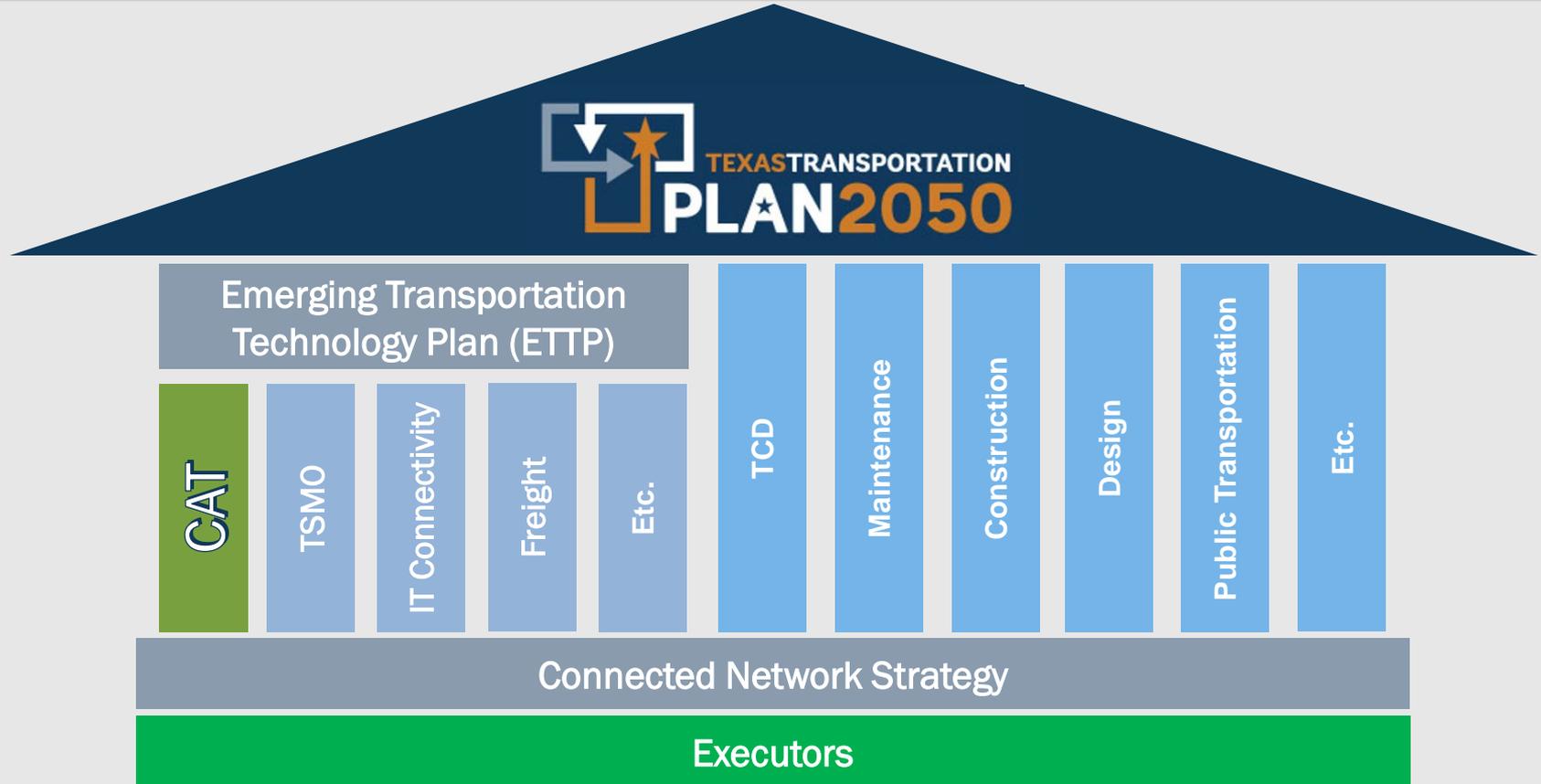


- Freight
  - Texas Freight Network Technology and Operations Plan
  - Texas Connected Freight Corridors
  - I-10 Corridor Coalition
- TSMO/ITS
- Unmanned Aircraft Systems
  - UAS Flight Operations and User's Manual





- Mobility Data Sharing Efforts
  - DriveTexas
  - Video Sharing pilot
  - Houston ConnectSmart
  - Lidar data sharing pilot
  - WAZE Connected Citizen Partner





- TxDOT is creating the state's first Emerging Transportation Technology Plan (ETTP).
- The ETTP aims to develop implementation strategies to integrate emerging transportation technology into state planning practices.
- Implementation strategies included in the ETTP will cover:
  - Data Management
  - Scenario Planning
  - Program and Project Development
  - Business Processes & Update Cycles



- Topics we have not addressed
- Topics to revisit
- Partnerships?
- Workshops/Strategy Meetings
- Variety of Meeting Types – webinars, future forums, etc.



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