

Texas Transportation Commission

Urban Air Mobility Advisory Committee

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Jeff Borowiec, Ph.D.

Senior Research Scientist

Presentation Outline

- Overview of the Literature Review
- Summary of Issues and Challenges
- Existing Relevant Texas Legislation
- UAM Pillars and Barriers/Maturity Levels
- Existing Texas Legislation and Laws
- Relevant Electric Vehicle Legislation
- Intersection of Local/State/Federal Regulatory Authority
- Roles and Responsibilities
- Deliverables and Timeline
- Questions

Literature Review

- Purpose
 - Provide background information on UAM/AAM
 - Develop materials for public meetings
 - Provide a starting point for the committee's work
 - Provide a focus on those areas that can help the state “facilitate the development of urban air mobility operations and infrastructure.”

Literature Review

- **TRID Database and Westlaw**
 - **TRID** is an integrated database that combines the records from TRB's Transportation Research Information Services ([TRIS](#)) Database and the OECD's Joint Transport Research Centre's International Transport Research Documentation ([ITRD](#)) Database. TRID provides access to more than 1.3 million records of transportation research worldwide.
- **Industry Publications**
 - Private, Governmental, Non-Profit
- **Existing State Legislation**

Literature Review

- **Numerous UAM/AAM Studies**
 - NASA Sponsored Market Studies (Booz/Crown/Deloitte)
 - National Academies: Advanced Aerial Mobility: A National Blueprint
 - Consulting Firms: McKinsey, KPMG, Others
 - Industry/Corporate Reports (Airbus/Wing)
 - Industry Trade Organizations (NATA)
 - Universities (George Mason, Georgia Tech, Virginia Tech)
 - States and Cities (Los Angeles, Ohio, North Dakota, Toronto, Others)

Literature Review

Emerging Topic Areas

- Legal
- Environmental
- Regulations
- Infrastructure
- Safety
- Operations
- Public Acceptance/Technology Adaption
- Demand

Other Key Issues

- Funding/Financing
- Facility Location
- Interoperability
- Business Models

Literature Review: Preliminary Takeaways

Regulation/Legal/Environmental Issues

- A lot of focus on privacy, noise, and nuisance issues and the various roles of the Local, State and Federal Governments.
- Most of the literature assumes safety standards and equipment certifications will be handled at the federal level, but that states will play a role in regulations surrounding privacy, airspace management, environmental conditions, and land use.
- Airspace or traffic management may rely on state legislation and regulation to avoid a patchwork of local rules. Greater flexibility should be considered with an urban air traffic management system as opposed to traditional air traffic control in terms of design separation but also rules relating to automated operations.
- Key areas for regulation: flight crew licensing and training, landing areas, maintenance regulations, requirements for operators, UAM traffic management, databases for obstacles and terrain, and security regulations for passengers and personnel.

Literature Review: Safety/Operations

- Standards and certifications are required for the new UAM vehicles, such as electric propulsion, tilt wing powered lift
- State regulations should consider the needs for an urban air mobility traffic management system (UTM), especially setting rules relating to minimum separation between vehicles in situations where a pilot may not be present
- There is a greater need for standards in UAM in terms of minimum separation because of the higher densities and the greater number of origin and destination pairs
- Key areas for future consideration will surround autonomous operations, safety, and in-vehicle requirements for user operability or “piloted” conditions.

Literature Review: Operations (Continued)

- One possible approach to allow more air traffic is by creating airspace “cutouts” separate from traditional traffic and does not require air traffic control services
- Routing models, or dynamic routing, for optimal and cost-effective scheduling are being researched. These models consider different factors affecting flight times such as maintenance, passenger transfer, refueling, and other incoming and departing flights.
- Designated airspace corridors over public rights-of-way and airspace leasing are also being studied.

Literature Review: Public Acceptance/Use and Demand

- Fast access and egress to vertiports as well as strong connections to other modes will be required to incentivize use of UAM.
- Acceptance and Adoption varies by demographics
- User's willingness to pay with relation to UAM is being studied to determine an appropriate cost of trips
- Initial UAM sites should be located in cities where demand exists, congestion is present, and people are wealthier. Weather can also impact where UAM is feasible
- A NASA market study found that to meet daily demand (about 55,000 trips) around 4,000 aircraft will be needed. Additionally, the market value of UAM demand was found to be worth approximately \$500 billion, but the initial operational and logistical issues could hinder how much of that value is captured.

Literature Review: Infrastructure

- The literature proposes installing TOLAs where unused land is available, noise is already present, and obstruction is minimal. TOLA could be installed within clover leaf clearings, barges, parking lots/garages.
- In terms of infrastructure design, the type of aircraft will affect the site dimensions and therefore costs. For example, a site for a 3-pod landing, including electric infrastructure, could cost anywhere from \$900 thousand to \$10 million to install.
- An investigation of Texas' electrical grid is necessary to integrate eVTOL in the state. This includes looking at upgrades, changes in electricity demand, and how use will change in the upcoming years.
- Infrastructure availability and capacity, along with cost, can be a major barrier to realizing demand potential.
- Potential use of existing, underutilized airports

Literature Review: Summary of Issues

The topics below and the challenges some of them may present are a starting point in identifying the role the state can play in facilitating the development of urban air mobility infrastructure and operations.

Not all of these will fall under the purview of this committee.

- **Airspace management and integration**
 - FAA responsibility
 - state, local, and federal roles
 - Telecommunications network/low-altitude connectivity

- **Regulatory/Legal**
 - Aircraft certification
 - Pilot certification
 - Aircraft maintenance
 - Privacy
 - Cybersecurity

Literature Review: Summary of Issues

- **Environmental**
 - Noise
 - Nuisance (visual)
- **Safety**
 - Aircraft safety
 - System redundancies
 - Emergency response
- **Operations**
 - Passenger interface
 - Ground handling of aircraft
 - Security
 - Safety (terminal area)
 - Signs, marking, lighting
 - Maintenance/repair
 - Business models

Literature Review: Summary of Issues

- **Demand**
 - Schedule/frequency
 - Trip costs
 - Markets/Trip routing/Origin-Destination
- **Workforce development**
 - Pilot demand/training
 - Aviation/aircraft technician
- **Public acceptance/ Community support**
 - Factors increasing acceptance
 - Demographic differences
 - Technology adaption
- **Consumer experience**
 - Pre-flight/in-flight
 - Seamless trip making
 - Modal connectivity

Literature Review: Summary of Issues

- **Social equity**
 - Accessibility/affordability
 - Disability access
- **Infrastructure**
 - Location
 - Charging stations
 - Energy capacity
 - Funding/financing
 - Certification/oversight
 - Revenue generation (replacement) at airports
 - Resale of electricity from a public utility
 - Communications
 - Information technology
 - Navigation equipment
 - Interoperability
 - Business models
- **Weather**
 - Reporting/forecasting systems
 - Aircraft Capabilities
 - Facility (vertiport) capabilities

UAM Pillars and Barriers

UAM Vision Concept of Operations (ConOps) UAM Maturity Level (UML) 4

(Deloitte/NASA)

- Airspace System Design and Implementation
- Individual Aircraft Management and Operations
- Airspace and Fleet Operations Management
- Aircraft Development and Production
- Community Integration

UAM Pillars and Barriers

Airspace System Design and Implementation: Design, regulate, and manage the airspace structure and supporting ground infrastructure to enable safe, efficient, equitable, and reliable UAM flights in and around metropolitan areas.

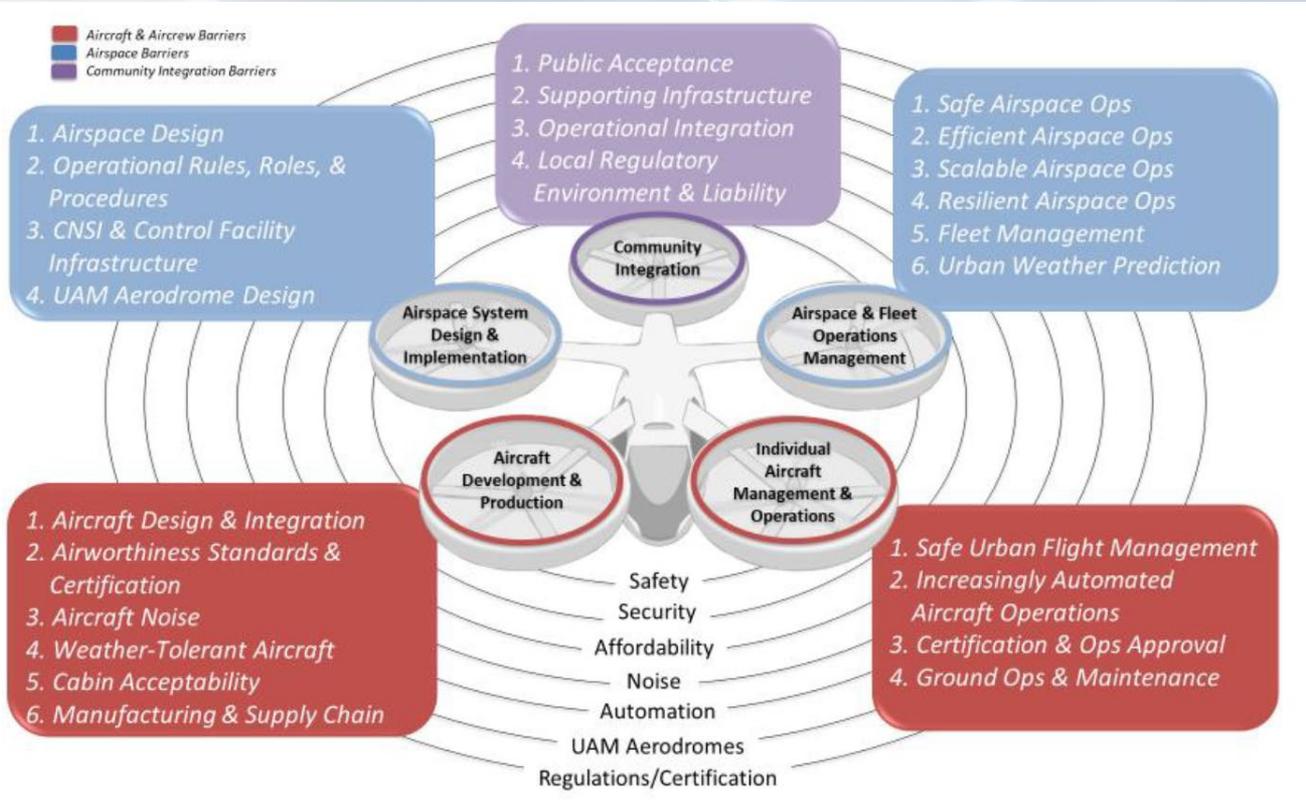
Individual Aircraft Management and Operations: Safely operate UAM aircraft in and around metropolitan areas while maintaining compliance with all required operational rules and procedures.

Airspace and Fleet Operations Management: Provide airspace operations management services as well as fleet operations management services that ensure safe, efficient, scalable, and resilient UAM operations in and around metropolitan areas.

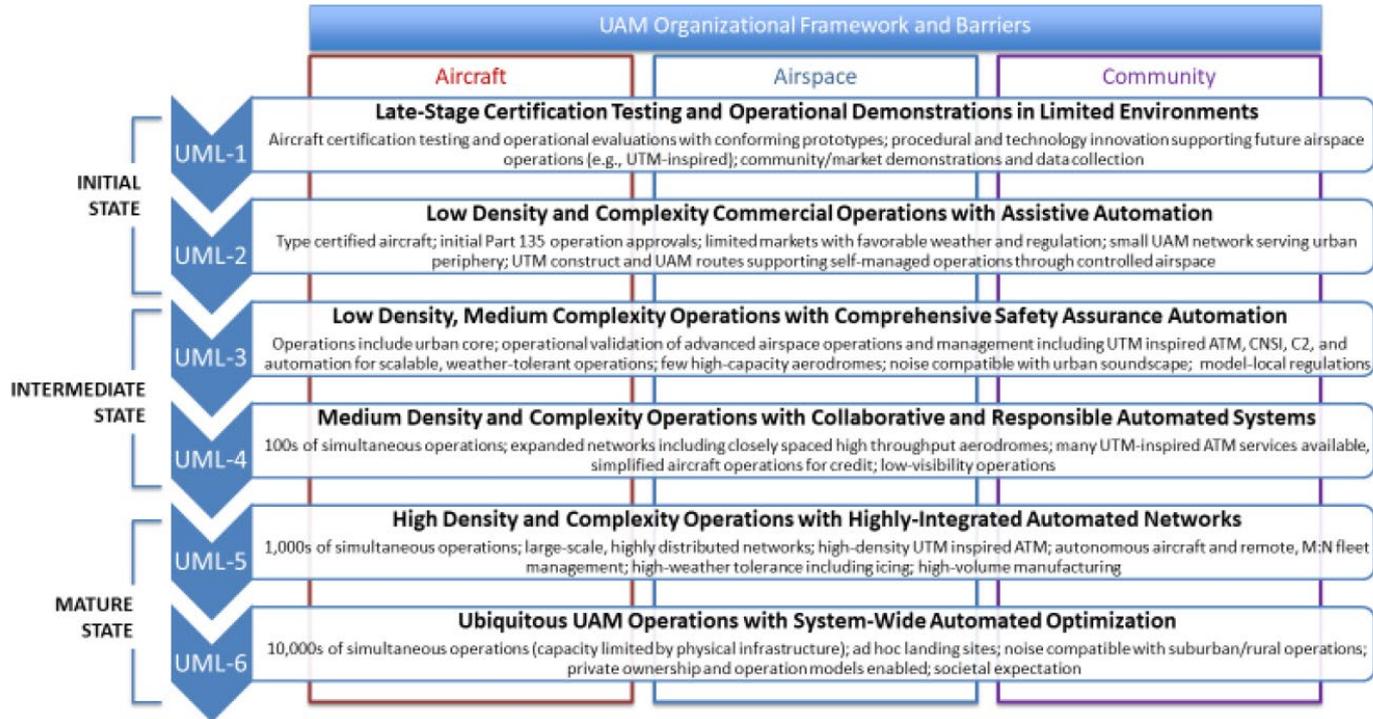
Aircraft Development and Production: Design, certify, and produce airworthy, mission-capable, connected aircraft that operate safely in all weather conditions required by the mission, with adequate passenger comfort and sufficiently low levels of noise.

Community Integration: Achieve public acceptance and community integration of UAM aircraft operations in and around metropolitan areas by addressing UAM-related social concerns such as safety, security, affordability, noise, privacy, emissions, regulatory compliance, and legal liability.

UAM Pillars and Barriers



UAM Maturity Levels



Existing Texas Legislation

Initial review of Texas Code shows no statutes which limit the ability to develop operate an urban air system if aircraft are operating at a height of 400 feet or greater. Some considerations include the following:

Noise

- Under current law, air navigation facilities (federally obligated) are required to provide adequate noise abatement and soundproofing for public buildings within 65 feet of the facility or which meet federal standards for requiring noise abatement assistance. It is anticipated that many of the vehicles utilized for urban air operations will be electric, lessening noise significantly, but there could be noise conflicts with buildings in very close proximity.

Privacy

- Texas statute does not prohibit the operation of aircraft in a UAM capacity, as long as these vehicles are operating at 400 feet or higher. Like privacy concerns with drones, privacy issues could arise. Under Texas General Code Section 423.006, there is statute related to civil action for an owner or tenant of privately owned real property in this state for an unauthorized image.

Existing Texas Legislation

Airspace

- Air rights is defined as a part of what is considered “real property” in Texas statute, but air rights are never explicitly defined. Airspace in urban areas is in large part controlled by the Federal Aviation Administration or local ordinances related to building heights, and many questions exist related to how much of the air above a property the owner actual owns and controls. Airspace above private property is no longer private at a certain point for air traffic, and airspace above private property is subject to reasonable air traffic travel.

Traffic Management/Operations

- While traffic management is a core issue in urban air mobility, Texas code leaves flexibility in certain situations for aircraft landing on county roads. There are also provisions for licensing ground vehicles at airports that may have some relevance to vertiports or UAM facilities.

Existing Texas Legislation

Year	State	Bill	Summary
1995	Texas	<u>SB 971</u>	This legislation requires a municipality to provide adequate soundproofing and noise reduction devices for each public building within the 65 or higher average day-night sound level contour as determined by the governing body in accordance with Federal Aviation Administration Advisory Circulars for replacement airports (1995 – recodification)
2013	Texas	<u>HR 3035</u> <u>SR1084</u>	Adopts two resolutions (HR 3035, SR 1084) addressing legislative procedures needed to enact their new drone law.
2013	Texas	<u>HB 912</u>	Enumerates 19 lawful uses for unmanned aircraft. The law creates two new crimes, the illegal use of an unmanned aircraft to capture images and the offense of possessing or distributing the image. “Image” is defined in the law as any sound wave, thermal, ultraviolet, visible light or other electromagnetic waves, odor, or other conditions existing on a property or an individual located on the property. Additionally, the measure requires the Department of Public Safety to adopt rules for use of UAS by law enforcement and mandates that law enforcement agencies in communities of over 150,000 people make annual reports on their use. Texas HCR 217 altered reporting requirements from the original HB 912.

Existing Texas Legislation

Year	State	Bill	Summary
2015	Texas	<u>HB 1481</u>	Makes it a Class B misdemeanor to operate UAS over a critical infrastructure facility if the UAS is not more than 400 feet off the ground.
2015	Texas	<u>HB 2167</u>	Permits individuals in certain professions to capture images used in those professions using UAS as long as no individual is identifiable in the image.
2015	Texas	<u>HB 3628</u>	Permits the creation of rules governing the use of UAS in the Capitol Complex and provides that a violation of those rules is a Class B misdemeanor.

Existing Texas Legislation

Year	State	Bill	Summary
2017	Texas	HB 1643	Adds structures used as part of telecommunications services, animal feeding operations, and a number of facilities related to oil and gas to the definition of critical infrastructure as it relates to UAS operation. Prohibits localities from regulating UAS except during special events and when the UAS is used by the locality. The legislation defines “special event.
2017	Texas	SB 840	Permits telecommunications providers to use UAS to capture images. It also specifies that only law enforcement may use UAS to captures images of real property that is within 25 miles of the U.S. border for border security purposes. The law also allows a UAS to be used to capture images by an insurance company for certain insurance purposes, as long as the operator is authorized by the FAA.
2017	Texas	HB 1424	Prohibits UAS operation over correctional and detention facilities. It also prohibits operation over a sports venue except in certain instances. The law defines “sports venue” as a location with a seating capacity of at least 30,000 people and that is used primarily for one or more professional or amateur sports or athletics events. An initial violation is a class B misdemeanor and subsequent violations are class A misdemeanors.
2021	Texas	SB 1202	Retail electric provider does not include a person not otherwise a retail electric provider who owns or operates equipment used solely to provide electricity charging service for consumption by an alternatively fueled vehicle.

Existing Texas Law

Texas Penal Code (Section 21.15)

- Invasive visual recording

Texas Government Code, Chapter 423. Use of Unmanned Aircraft

- Uses of unmanned aircraft

Texas Administrative Code (Title 31, Part 2, Chapter 65, Sub F, Rule 65.152)

- Use of drones to hunt, drive, capture, take count, or photograph wildlife.

Texas Administrative Code (Title 37, Part 1, Chapter 8, Sub B)

- Use of drones over the Capital Complex without authorization

Existing Texas Law

Texas Government Code, Chapter 423. Use of Unmanned Aircraft

- Governs when it is lawful to capture an image
- Operations over correctional facilities, detention facilities, critical infrastructure, sports venues
 - "...public or private airport depicted in any current aeronautical chart published by the Federal Aviation Administration..."
- Rules for use by law enforcement and reporting requirements
- Regulation of unmanned aircraft by political subdivisions
 - No ordinances regarding the operation of unmanned aircraft unless:
 - During special event
 - In regard to the political subdivision's use of an unmanned aircraft, or
 - The use of an unmanned aircraft near a facility or infrastructure owned by the political subdivision

Texas Legislation – Not Passed

HB 3403

relating to the operation of an unmanned aircraft that is outside the direct line of sight of the operator of the aircraft; creating a criminal offense; imposing a fee.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1. Title 3, Transportation Code, is amended by adding Chapter 27 to read as follows:

CHAPTER 27. OPERATION OF UNMANNED AIRCRAFT OUTSIDE DIRECT LINE OF SIGHT OF OPERATOR

Sec. 27.001. DEFINITIONS.

Sec. 27.002. APPLICABILITY.

Sec. 27.003. RULES.

Sec. 27.004. OPERATION OF UNMANNED AIRCRAFT IN AVIGATION

Sec. 27.005. ESTABLISHMENT OF AVIGATION EASEMENTS.

Sec. 27.006. AVIGATION EASEMENT BOUNDARIES.

Sec. 27.007. REQUIREMENTS FOR OPERATION IN AVIGATION EASEMENTS.

Sec. 27.008. ENTERING AND EXITING AVIGATION EASEMENT FOR PURPOSES OF LAUNCHING OR LANDING UNMANNED AIRCRAFT.

Sec. 27.009. USER FEES.

Sec. 27.010. TERMINATION OF AVIGATION EASEMENT.

Sec. 27.011. GEOFENCING OF CERTAIN PRIVATE PROPERTY.

Relevant Electric Vehicle Legislation

- SB1202 (2021) – Excludes electricity charging providers from the definition of electric utility or retail electric provider. The wording of the legislation also includes a provision for the Public Utilities Commission to exempt “a provider who owns or operates equipment used solely to provide electricity charging service for a mode of transportation” from either definition.
- HB1572 (2021) – Excludes the lessor or operator of electric generation equipment from the definition of utility.
 - Does not apply if the electricity generated will be resold or interconnected with the electric transmission or distribution system.
 - Owning/operating or leasing electric generation equipment does not classify you as a utility.
 - Does not apply if the electricity generated will be resold or interconnected with the electric transmission or distribution system.
 - If an airport/vertiport wanted to install solar panels to power their chargers, it would depend on the subsequent sale or not of that electricity. If it’s for your own use, you are not considered a utility.
- Prior to SB1202, Austin Energy had amended city code to state that restrictions on remetering or resale of energy did not apply to EV charging services.

The Intersection of Local, State, and Federal Regulatory Authority

Areas where this will likely come into play:

- Airspace Management
- Noise
- Infrastructure/Land Use Compatibility

Texas has seen regulatory action in these areas at the local and state levels in addition to existing federal laws.

The Intersection of Local, State, and Federal Regulatory Authority - Airspace

- The Federal Aviation Administration regulates and oversees civil aircraft operations in the National Airspace System
- At low altitudes, this issue becomes more complicated
- United States v. Causby
 - Landowners own surface airspace (immediate reaches)
 - Low-altitude flights, even within navigable airspace, can amount to a taking
 - Acknowledged state claims of sovereignty to airspace
- Beginning in the 1920s, states began making claims over surface airspace (Skorup)

The Intersection of Local, State, and Federal Regulatory Authority - Airspace

- Today, 19 states have these laws (Skorup)
- Until the 1950s, airport and airspace regulation had a local character tolerated by the federal government (Skorup)
- Some state and local governments continue to assert some control/restrictions
- Texas' legislation regarding airspace has largely been limiting where you are prohibited from flying
- 2018 FAA Reauthorization Act required the FAA to integrate small drones into the NAS
- FAR Part 107
- We have already seen some states and UAS test centers doing work on UAS Traffic management
- Solutions are likely to include state and local involvement

The Intersection of Local, State, and Federal Regulatory Authority - Noise

Aviation related noise is regulated by 14 CFR Part 150 - Airport Noise Compatibility and 14 CFR Part 161 - Airport Noise and Access Restrictions. These two regulations establish procedures for determining noise levels, mapping potential impact, and mitigating those impacts. They help to reduce noise impacts to incompatible land uses, such as residential areas.

- Part 161 specifically refers to access restrictions – airports with current restrictions under this part may struggle to accommodate new aircraft if this will significantly impact noise levels.

In Texas, state statutes only refer to county and municipal airports when discussing noise abatement. §22.026 requires them to provide adequate soundproofing and noise reduction devices for each public building “within the 65 or higher average day-night sound level contour”.

At the local level, some of the major cities in Texas have aviation noise ordinances, and there are currently no restrictions at the state level in terms of these ordinances. Many establish maximum sound levels for heliports and helipads that could apply to vertiports and vertipads.

The Intersection of Local, State, and Federal Regulatory Authority - Noise

Additional Federal Guidance

FAA Advisory Circulars

- [AC 150/5020-1](#) Noise Control and Compatibility Planning for Airports
- [AC 150/5000-9A](#) Guidelines for the Sound Insulation of Residences Exposed to Aircraft Operations

General observations:

- These regulations are intended to protect airports as well as reduce noise – it protects them from undue claims against the airport for acceptable levels of noise. The noise exposure maps are the primary method of tracking the land uses and acceptable noise levels.
 - Legal analysis indicates that Part 150 has not been fully tested under the law – meaning that the potential limitations on claims could be nullified.
 - Airports can acquire land for noise compatibility under The Uniform Act but must be approved by the FAA in a Part 150 noise study.
- Airports with existing restrictions under Part 161 may struggle to accommodate additional aircraft (dependent on noise level – would this impact the electric aircraft?)

The Intersection of Local, State, and Federal Regulatory Authority - Noise

State Level

Transportation Code

Title 3. Aviation

Chapter 22. County and Municipal Airports

Sec.22.025. LIMITATION ON DESIGN AND OPERATION OF AIR NAVIGATION FACILITIES. An air navigation facility established or operated by a local government shall be supplementary to and coordinated in design and operation with those established and operated by the federal and state governments.

Acts 1995, 74th Leg., ch. 165, Sec. 1, eff. Sept. 1, 1995.

*Sec. §22.026. **NOISE ABATEMENT.** (a) The governing body of a municipality that owns an airport and is a party to an executory grant agreement with the Federal Aviation Administration requiring the municipality to plan, design, and acquire land for a replacement airport shall: (1) comply with the Aviation Safety and Noise Abatement Act of 1979 (49 U.S.C. Sec. 2101 et seq.); (2) provide adequate soundproofing and noise reduction devices for each public building within the 65 or higher average day-night sound level contour as determined by the governing body in accordance with Federal Aviation Administration Advisory Circulars; or (3) award a contract for land acquisition services for the purchase of real property required for the site of a replacement airport, complete a master plan for the replacement airport, and provide the replacement airport. (b) AAA court may grant appropriate relief to enforce this section in a suit brought by an affected person. (c) In this section: (1) "Public building" means a church, public or private hospital, or building owned or leased by a governmental entity, including a public school. (2) "Replacement airport" means a new airport that is planned, designed, and constructed to replace a municipal airport operating on August 28, 1989. (d) Expired. Acts 1995, 74th Leg., ch. 165, Sec. 1, eff. Sept. 1, 1995.*

The Intersection of Local, State, and Federal Regulatory Authority - Noise

Municipal level

City of Austin

City of Dallas

City of Houston

City of San Antonio

All have ordinances in place regarding noise levels and airports and/or heliports

The Intersection of Local, State, and Federal Regulatory Authority - Infrastructure

FAA Office of Airports – Vertiport Design Standards (FAA Presentation September 8, 2021)

- Urban Air Mobility (UAM) concepts and technologies are set to revolutionize transportation systems.
- One major part of the UAM ecosystem is the concept of landing sites and facilities that have the capability to service vertical takeoff and landing (VTOL) aircraft
- Advisory Circular (AC) 150/5390-3 “Vertiport Design” was cancelled on July 28, 2010 due to lack of compatible aircraft use.
- The FAA Office of Airports working with the FAA Technical Center engaged industry through a Request for Information (RFI) to solicit aircraft type and design information. The RFI received nine submissions.

The Intersection of Local, State, and Federal Regulatory Authority - Infrastructure

- A minimally developed facility is required to be defined for the boarding and discharging of passengers and cargo by VTOL aircraft.
- Not One Size Fits All -These facilities may have a variety of configurations depending on the level of throughput that is expected at that facility and the characteristics of the aircraft they plan to support.
- The infrastructure design standard for these facilities will be developed following the completion of the FAA Office of Airports research effort which will determine the varied aircraft design characteristics and Concept of Operations.
- Input is being sought from across the industry.

The Intersection of Local, State, and Federal Regulatory Authority - Infrastructure

- Vertiport Electrical Infrastructure Study being conducted by the National Renewable Energy Laboratory (18-month study)
- Focus on Vertiport charging needs, cybersecurity, hazards evaluation
- FAA coordinating with NREL and manufacturers
- FAA is working to identify potential landing (test) sites
- NREL is working with both manufacturers and site owners

The Intersection of Local, State, and Federal Regulatory Authority - Infrastructure

The operational requirements of these facilities will include:

- Landing area design and layout/geometry
- Approach/departure paths
- Load bearing requirements
- Electric propulsion and charging stations
- Safety requirements for batteries and other hazardous materials
- Noise requirements
- Rescue and firefighting requirements
- Vertiport Automation

The dimensional requirements of the landing area will depend on an aircraft's Critical Dimensions (CD) and maximum gross takeoff weights. For certain aircraft designs the CD needed for their aircraft will be less or equal to the current heliport design regulations

The Intersection of Local, State, and Federal Regulatory Authority - Infrastructure

Timeline for Vertiport Guidance

- Vertiport Interim Guidance – June 2022
- End of Research Effort – September 2023
- Vertiport Advisory Circular – September 2024

Roles and Responsibilities

Federal Aviation Administration

- Regulate and oversee civil operations in the NAS
- Provide regulatory and operational framework for UAM operations
- Define and provide airspace constraints (NOTAMS, TFRs)

City/State/Local Governments

- Develop and enforce zoning regulations for UAM aerodromes
- Develop and enforce noise ordinances
- Influence development of flight procedures (approaches/departures/high-density routes)
- Take on an increased role of managing aviation-related and aviation-adjacent issues requiring their approval (location, infrastructure upgrades, noise abatement)

Deliverables and Timeline

- Literature Review is a starting point for the committee's work
 - Your input is critical
 - *“...the advisory committee shall report to the commission and to the members of the legislature the committee's findings and recommendations on any changes to state law that are needed to facilitate the development of urban air mobility operations and infrastructure.”*
- Preliminary Draft Report: December 31, 2021
- Public Hearings/Meetings: January 15, 2022 – April 30, 2022
- Draft Report Due to Advisory Committee: June 1, 2022
- Final Report Due to TxDOT: August 1, 2022
- Report (Findings and Recommendations) Due to Legislature: September 1, 2022

Questions?



Texas A&M Transportation Institute

1111 RELLIS Parkway

Bryan, TX 77807

info@tti.tamu.edu

979-317-2283

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