Unmanned Aircraft Systems (UAS)

Regional Workshop
April 1, 2015
Assist local governments in –

PLANNING for common needs

COOPERATING for mutual benefit

COORDINATING for sound regional development

240 member governments including 16 counties, 170 cities, 24 school districts, and 30 special districts
Departments

Community Services
Emergency Preparedness
Environment & Development
Research & Information Services
Transportation
Workforce Development
NCTCOG’s Role

As the Metropolitan Planning Organization for the Dallas-Fort Worth area, NCTCOG is required to maintain a long-range transportation plan.

Mobility 2035 – Aviation Policy as approved by the Regional Transportation Council

<table>
<thead>
<tr>
<th>MTP Reference #</th>
<th>Aviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV3-001</td>
<td>Improve the efficiency, safety, air quality, and access related to aviation.</td>
</tr>
<tr>
<td>AV3-002</td>
<td>Provide input to the National Plan of Integrated Airport Systems and Texas Airport System Plan.</td>
</tr>
<tr>
<td>AV3-003</td>
<td>Encourage compatible land-use planning surrounding airports in the region.</td>
</tr>
<tr>
<td>AV3-004</td>
<td>Establish a comprehensive and integrated Aviation Education System in North Central Texas.</td>
</tr>
</tbody>
</table>
NCTCOG’s Role

Data collection
  • Track regional UAS operations

Planning
  • Infrastructure, necessary security enhancements, airspace, and airport land-use compatibility

Communication
  • Organize regional UAS group
  • Facilitate outreach and education for regional UAS activity

FAA Funded Airport System Plan approved May 2012
# Air Transportation Technical Advisory Committee

## VOTING MEMBERS
- Denton Enterprise Airport
- City of Fort Worth
- Mid-Way Regional Airport
- Alliance Air Services
- Mineral Wells Airport
- City of Rockwall
- City of Decatur
- Grand Prairie Municipal Airport
- Majors Field Airport
- Lancaster Regional Airport
- City of Ennis
- City of Dallas
- Mesquite Metro Airport
- Granbury Regional Airport
- Addison Airport
- DFW Airport
- SKY Helicopters, Inc.
- Arlington Municipal Airport
- McKinney National Airport
- Cleburne Regional Airport

## NON-VOTING MEMBERS
- Spinks Airport
- Bell Helicopter
- Federal Aviation Administration
- NAS Fort Worth, JRB
- National Business Aviation Association
- Greater Irving-Las Colinas Chamber of Commerce
- Meacham Airport
- Texas Department of Transportation Dallas
- Executive Airport
- Aircraft Owners and Pilots Association
- North Texas Regional Airport
- Association for Unmanned Vehicle Systems
- NCTCOG Executive Board
Regional Coordination

ATTAC Concerns

Privacy
Conflict with manned aircraft
Notification/approval
Operator training/education

Source: ATTAC UAS Survey

NCTCOG Staff Actions

• Committee UAS Workshops – 2014/2015
• Developed online information clearinghouse www.nctcog.org/uas
• Drafted regional guidance report
• Engaged industry stakeholders
• Briefed policy officials and coordinated with FAA
The Purpose Today

Listen to concerns of aviation community regarding UAS operations

Understand operational requirements of UAS users in North Texas

Communicate current regulatory information and outreach materials

Document UAS impacts to North Texas airports and airspace

Facilitate and recommend best practices based on feedback from stakeholders

Coordinate with FAA and other industry groups
Not the Purpose Today

Debate legality of federal or local regulation

Duplicate, infringe upon, or contradict FAA, Test Sites or other efforts

Create absolute policy or regulation of use UAS in North Texas

Solve all facets of UAS industry impacts

Restrict all UAS operations
Meeting is being audio recorded for summary note taking.

Presentations and meeting materials will be sent to attendees.

Quick Polling Device survey at the end of the meeting (anonymous).

Hold questions and discussion until after presentations.

What are Unmanned Aircraft Systems?

- Control station
- Data links
- Telemetry
- Communications, navigation
- Control, sensor operators

Source: FAA
Example Applications

Transportation
• Accident Recreation
• Asset Management

Public Safety
• Missing Persons
• Disaster Response
• Police Force Multiplier

Environment
• Agriculture
• Conservation
• Weather Monitoring

Surveys/Inspections
• Utility Pipelines
• Cargo Trains, Passenger Rail Lines
• Construction
Real Estate, News/Media, and more…
Senate UAS Hearing (3/24)

Hearing entitled, "Unmanned Aircraft Systems: Key Considerations Regarding Safety, Innovation, Economic Impact, and Privacy."
Coverage begins at 2:30 pm.
Airspace Concerns

“FAA reports pilots have seen up to 25 cases per month of drones flying above the regulated limit of 400 feet, with some flying as high as 2,000 feet in the air.” -CNN

October 2014: FAA investigates **UAS crash in Dallas Love Field’s airspace.** -NBC DFW
Airspace Concerns
Authorized UAS Operations Framework

Public Entity/COA

Hobbyists

Private/For Hire*

*Limited approval through exemption process or special airworthiness certificate.
Federal Policy, Guidance

- FAA Modernization and Reform Act of 2012 (FMRA) Subtitle B: Unmanned Aircraft Systems (Sections 332-336)
- FAA Guidance for Law Enforcement
- Temporary Flight Restrictions for Sporting Events
- Presidential Memorandum: Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, and Civil Liberties in Domestic Use of Unmanned Aircraft Systems

Source: FAA UAS Regulations & Policies
State of Texas Privacy Act

Examples of Lawful UAS Imagery Capturing

Professional, scholarly research

FAA UAS test site airspace

Operation, exercise, or mission of any branch of US military

Consent of real property owners/occupants

By law enforcement authorities

Source: National Conference of State Legislatures
Local, State UAS Initiatives

- Texas A&M Corpus Christi Texas UAS Test Site
- University of Texas at Arlington Research Institute
- University of North Texas
- City of Arlington Police Department
- Center for Innovation Unmanned Systems Consortium
- Mineral Wells, NCTCOG, other regional partners...

Source: Lone Star UAS Center of Excellence and Innovation (LSUASC)
Key rules from FAA proposal for commercial drones

Max speed: 100 mph
Max weight: 55 lbs
Max altitude: 500 ft.
Fly during daylight only

Operator requirements:
- At least 17 years old
- Have passed initial, recurring tests
- Obtain operating certificate
- Vetted by TSA

Must be directly visible by operator

Rules don’t allow for drone deliveries as envisioned (sorry Amazon)

Source: Federal Aviation Administration

Kyle Kim @latimesgraphics
Public comment period open until April 24.

You may comment at: www.regulations.gov.
Short Break
Topics

• FAA Texas Test Site
  – LSUASC: Lone Star Unmanned Air Systems Consortium
  – UTA Involvement

• FAA sUAS Center of Excellence

• Privacy Overview
  – FAA concern is safety
  – FAA does not enforce privacy compliance
Texas FAA UAS Test Site Overview

Created by the Texas A&M System Board of Regents Oct. 31, 2013

Awarded by FAA: Dec. 30, 2013

Expertise/technology
Proposal support
Research capacities/infrastructure
Proposal support

Proposal support & industry expertise
Investment (time, effort & cash)
Proposal support/research capacities
Investment (time, effort & cash)

Facilities & infrastructure
Political support
Aviation expertise, chase planes
Funding and facilities

LSUASC Test Site: Proposed May 6, 2013
JTA, MTSI, ASI, AVMET, BayTech/NASA
UTARI, UTSA, SWRI, TXTECH
Camber Corporation (LSI): October 2012
TAMUCC
TEES CANVASS
The State of Texas, Texas A&M System TXDOT/Aviation Corpus Christi, Beeville, Port Mansfield
LSUASC: The Test Site

Proposed LSUASC Test Ranges

- Chase Field & Corridor
  - Beeville TX
  - Former CNATRA base
- Duval 1 (Ag & rangeland)
- Duval 2 (Ag & rangeland)
- Gulf (100% maritime)
- Big Bend
  - High plains
  - Davis Mountains
  - State and national parks

Airspace designed by David Frame of Jerry Thompson Associates, former FAA ATC Houston supervisor with 35 years’ experience.
LSUASC: Facilities

LSUASC Mission Control Center
Command and control
Data collection & storage
Human-factors RDTE
ATC communication
Incident management

Headquarters
Coastal Bend Business Innovation Center @
Texas A&M University-Corpus Christi
LSUASC: Economic Impact

2013-2017

- Development: $49.6 million
  - $29.2 million (infrastructure)
  - $20.4 million (P&M)
- R&D: $49 million (estimate)
  - Team: $25 million
  - Range users: $24 million
- Jobs: 1,247
  - Direct: 244
  - Indirect: 637
  - Induced: 366

This economic-impact study was a requirement of the LSUASC proposal to FAA and was calculated by Dr. Jim Lee, an economics professor at TAMU-CC.
LSUASC: Economic Impact

National impact (AUVSI study)
- 1-3 years: $13.6 billion
  +7,000 jobs
- 1-10 years: $82.1 billion
  +103,700 jobs

Statewide impact (AUVSI study)
- 1-3 years: $1.3 billion
  +5,500 jobs
- 1-10 years: $6.5 billion
  +8,200 jobs

Port Mansfield (LSUASC estimate)
- Infrastructure: $1.5 million
- Employment: Range ops manager

AUVSI, 2013
LSUASC: 6 Mar 2015 Flight
UTA and LSUASC

• LSUASC Member
  – Active support
  – 1/3 of research topics in proposal

• Active COA
  – approved Jan 2014, 2013-CSA-134

• Ongoing UAS and related unmanned systems research efforts
UTA UAS Activities
Research Landscape

Aircraft
- UAS Airworthiness (TS)
- Ground & Airborne SAA (TS)
- Detect & Avoid (COE)

Communications
- Command & Control Link (TS)
- Control & Communication (COE)
- Spectrum Management (COE)

Airspace
- Low Altitude Ops (COE)
- Air Traffic Control Interoperability (COE)
- UAS Traffic Management (COE)
- UAS Wake Separation Standards for UAS Integration into the NAS (COE)

Airfield
- Airport Ground Operations (COE)

Overall
- UAS System Safety & Data Gathering (TS)
- Human Factors (COE)
- UAS Crew Training & Certification including Pilots (COE)

Environment
- Environmental Impacts of UAS Operations (TS)
- Noise Reduction (COE)
UTA Research Topics
(current and proposed, by COE Topic)

• **Air Traffic Control Interoperability**
  – Development of a Low-Cost UAS Tracking Systems to Augment the NAS Air Traffic Monitoring System
  – Aerial Refueling of Unmanned Aerial Vehicles

• **Control and Communication**
  – Neurocognition, Controls, Efficient Communication, and Enhanced Decision for Fast Satisficing in Autonomous Military Systems
  – Distributed Control, Learning, and Adaptive Interfaces for Heterogeneous Variable Topology Multi-Agent Nonlinear Systems
  – Games and Learning for Cooperative Nonlinear Systems and Internal Structure of Coalitions on Graphs
  – Tethered Quadcopter
  – Dynamic Models of Communication Delays and Network Latency in Simultaneously Determining the Position and Relative Distances Between Multiple Tracked Targets
  – Cooperative Guidance and Path-Planning Algorithms Based on Probabilistic Threat Exposure Maps Enabling Emergency Landing Site Selection Based on Pre-Deployment and Real-Time GIS Data
  – Wind Field Construction for Trajectory Prediction and Conflict Avoidance
  – Impact of Trailing Wake Vortex and Turbulence on UAS Operations and Control
  – Intelligent Automatic Emergency Landing Site Selection
  – Navigation of UAS in GPS Denied Environments Using Terrain Maps and IMU
  – Multi-Sensor Fusion and Redundancy Management Using Evidence Theoretic Adaptation
  – Multi-Robot Localization and Navigation
  – Modeling, Control and Simulation of Morphing & Flapping Wing Vehicles
  – Nonlinear Guidance and Cooperative Control of Multiple Aerial Vehicles

• **Detect and Avoid**
  – Simulation of Aerial Refueling of UAS Systems
  – Collision Avoidance by Cooperative Target Tracking Where Network Connectivity Changes Arbitrarily
  – Obstacle Detection and Avoidance Using Probabilistic Threat Exposure Maps
  – Multi-UAS Conflict Prediction, Avoidance and Prevention Using Conventional Internet and Cellular Network Infrastructures to Provide Indirect Location and Trajectory Information for Small UAS

• **Human Factors**
  – Human-in-the-Loop Control of Multi-Agent Aerial Systems Under Intermittent Communication
  – UAS Control and Manned/Unmanned Aerial Vehicle Coordination in the Presence of Time Varying Communications Constraints
  – Predicting Hybrid Airspace Interactions Where Unmanned and Manned Aircraft Coexist
  – Computer Vision Methods for Recognizing Thousands of Signs
  – Assistive, Self-Personalizing Human-Machine Interfaces
  – Multi-Modality Human-Robot Interaction Environment
  – Simulation research for autonomous guidance to pilot UAS in adversarial environments

• **Unmanned Aircraft Crew Training and Certification, Including Pilots**
  – Development of a High Fidelity Simulation Environment for Pilot Training, UA Crew Training and Management of Contingencies

• **Air Worthiness**

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* Items in green are from the Test Site proposal
FY2014 UAS and Aircraft Relevant Awarded Research

• Sensing
  – “Nanomembrane Imaging Sensor Array System”; Industry Customer; EE
  – “LIDAR Studies”; USDA; EE
  – “Practical Co-prime and Nested Samplers and Arrays for Radar and Radar Sensor Networks”; ONR; EE

• Sensor Data and Network Analysis
  – “A New Automated Data Integration, Annotations, and Interaction Network Inference”; NSF, CSE
  – “Collaborative Research: Opportunistic and Compressive Sensing in Wireless”; NSF; EE
  – “Smart Grid Wireless Networks: Capacity and Achievability”; NSF; EE

• Materials and Coatings
  – “Conformal Hybrid Organic/Inorganic Antireflective Coatings”; Industry Customer; EE
  – “A Combinations Approach to Design of an Aerospace Grease”; Industry Customer; MSE
  – “Affordable Material Qualification for Composite Rotorcraft Structures”; Research Partner; MAE
  – “Hypersonic Material and Structures”; Industry Customer; CHEM

• Dynamics
  – “Development of Engineering Tools for Non-Linear Transient 3-Dimensional Rotordynamics”; Industry Customer; MAE
  – “Foil Bearing for Electric Motor-assisted Turbochargers for UAS/UGS Application”; Industry Customer; MAE

• Operations
  – “Use of UAV to Support Intelligent Transportation Operation and Management”; TTI; UTARI
FAA sUAS COE and UTA

- UTA addresses all 6 of the solicitation criteria
- Affiliate status with Georgia Tech / TAMU team
- Key dates
  - 12 Aug 2014  Final solicitation
  - Apr 2015  Expected award announcement
UAS & Privacy

Per FAA, the Site Operator must:

• Have privacy policies governing all activities conducted under the OTA, including the operation and relevant activities of the UAS authorized by the Site Operator.
• Make its privacy policies publicly available;
• Have a mechanism to receive and consider comments from the public on its privacy policies;
• Conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback;
• Update its privacy policies as necessary to remain operationally current and effective; and
• Ensure the requirements of its privacy policies are applied to all operations conducted under the OTA.

The Site Operator’s privacy policies should be informed by Fair Information Practice Principles.
Texas Privacy Laws

• Any image **inadvertently captured** by activity on the LSUASC test site shall be promptly and totally destroyed; PROVIDED,
  ✓ That demonstrable proof exists of such an image.
• LSUASC recognizes a **common-law right** to privacy.
  ✓ All test-site research and development activities are planned and executed to **protect homesteads from unreasonable intrusion** in a way that is highly offensive, unjustified and unwarranted.
• LSUASC test-site activities shall take all necessary precautions to ensure that **a person’s likeness** not be published without consent and in a way that benefits or profits a third party.
• Data pertinent to **mineral exploration** retrieved from UAS test-site activities and contained in an application for an oil and gas lease submitted to the General Land Office shall remain private or confidential, except as provided by law;
• Data retrieved from UAS test-site activities and received by the Texas Natural Resources Commission regarding the **discharge of water pollutants**, except as provided by Water Code Sec. 5.175, or other applicable law, shall remain private or confidential.

Contact Information

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(817) 272-5852
mcnairmk@uta.edu
# sUAS NPRM Overview

## Current Options

<table>
<thead>
<tr>
<th>Organization Type</th>
<th>Options Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public / Government Entity</td>
<td>Certificate of Authorization (COA)</td>
</tr>
<tr>
<td>- Local / State Government</td>
<td></td>
</tr>
<tr>
<td>- Local Law Enforcement</td>
<td></td>
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<tr>
<td>- First Responder</td>
<td></td>
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<tr>
<td>- Public University</td>
<td></td>
</tr>
<tr>
<td>Civil / Non-Government Entity</td>
<td>Flying for Fun ...</td>
</tr>
<tr>
<td>- Individual / Hobbyist</td>
<td>... be safe</td>
</tr>
<tr>
<td>- Company / Business / Non-Profit</td>
<td>Fly for commercial profit or for your business ...</td>
</tr>
<tr>
<td>- Private University</td>
<td>... Section 333 Exemption</td>
</tr>
<tr>
<td>- Entrepreneur flying for business</td>
<td></td>
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<tr>
<td>- pursued</td>
<td></td>
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<tr>
<td>UAS Manufacturer</td>
<td>Activity is for R&amp;D, crew training, market surveys ...</td>
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<tr>
<td></td>
<td>... Experimental Airworthiness Certificate (see UAS Test Site or FAA HQ)</td>
</tr>
<tr>
<td></td>
<td>Otherwise ...</td>
</tr>
<tr>
<td></td>
<td>... to sell an aircraft for others to fly: Type Certificate</td>
</tr>
<tr>
<td></td>
<td>... to fly the aircraft yourself: Section 333 Exemption</td>
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</tbody>
</table>
## sUAS NPRM Overview

### NPRM Summary

<table>
<thead>
<tr>
<th>Category</th>
<th>Highlights</th>
</tr>
</thead>
</table>
| **Operational Limitations**     | * Unmanned aircraft must weigh less than 55 lbs. (25 kg).  
* Visual line-of-sight (VLOS) only; the unmanned aircraft must remain within VLOS of the operator or visual observer.  
* At all times the small unmanned aircraft must remain close enough to the operator for the operator to be capable of seeing the aircraft with vision unaided by any device other than corrective lenses.  
* Small unmanned aircraft may not operate over any persons not directly involved in the operation.  
* Daylight-only operations (official sunrise to official sunset, local time).  
* Must yield right-of-way to other aircraft, manned or unmanned.  
* May use visual observer (VO) but not required.  
* First-person view camera cannot satisfy “see-and-avoid” requirement but can be used as long as requirement is satisfied in other ways.  
* Maximum airspeed of 100 mph (87 knots).  
* Maximum altitude of 500 feet above ground level.  
* Minimum weather visibility of 3 miles from control station.  
* No operations are allowed in Class A (18,000 feet & above) airspace.  
* Operations in Class B, C, D and E airspace are allowed with the required ATC permission.  
* Operations in Class G airspace are allowed without ATC permission.  
* No person may act as an operator or VO for more than one unmanned aircraft operation at one time.  
* No careless or reckless operations.  
* Requires preflight inspection by the operator.  
* A person may not operate a small unmanned aircraft if he or she knows or has reason to know of any physical or mental condition that would interfere with the safe operation of a small UAS.  
* Proposes a microUAS option that would allow operations in Class G airspace, over people not involved in the operation, provided the operator certifies he or she has the requisite aeronautical knowledge to perform the operation. |
## sUAS NPRM Overview

### NPRM Summary

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</table>
| **Operator Certification and Responsibilities** | * Pilots of a small UAS would be considered “operators”.  
* Operators would be required to:  
  o Pass an initial aeronautical knowledge test at an FAA-approved knowledge testing center.  
  o Be vetted by the Transportation Security Administration.  
  o Obtain an unmanned aircraft operator certificate with a small UAS rating (like existing pilot airman certificates, never expires).  
  o Pass a recurrent aeronautical knowledge test every 24 months.  
  o Be at least 17 years old.  
  o Make available to the FAA, upon request, the small UAS for inspection or testing, and any associated documents/records required to be kept under the proposed rule.  
  o Report an accident to the FAA within 10 days of any operation that results in injury or property damage.  
  o Conduct a preflight inspection, to include specific aircraft and control station systems checks, to ensure the small UAS is safe for operation. |
| **Aircraft Requirements**                     | * FAA airworthiness certification not required. However, operator must maintain a small UAS in condition for safe operation and prior to flight must inspect the UAS to ensure that it is in a condition for safe operation. Aircraft Registration required (same requirements that apply to all other aircraft).  
* Aircraft markings required (same requirements that apply to all other aircraft). If aircraft is too small to display markings in standard size, then the aircraft simply needs to display markings in the largest practicable manner. |
| **Model Aircraft**                            | * Proposed rule would not apply to model aircraft that satisfy all of the Model Aircraft criteria specified in Section 336 of Public Law 112-95.  
* The proposed rule would codify the FAA’s enforcement authority in part 101 by prohibiting model aircraft operators from endangering the safety of the NAS. |