NJDOT Research ShowCase

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NJDOT Division of MultiModal, Bureau of Aeronautics
“Delivered by a stork? Don’t be silly, sweetie.
A drone brought you.”
The Problem

- How do you start a brand new and innovative NJDOT Drone program that has never been done before?
The Key Components are Personnel and Funding

**Personnel** – A “UAS Coordinator” position was created within the Division of MultiModal, Bureau of Aeronautics to lead NJDOT’s UAS initiatives:

- Provide leadership, guidance, and coordination for flight operations to Divisions
- Ensure compliance with State and Federal Aviation Regulations
- Ensure flight operations are based on the most current best practices
- Coordinate FAA Airspace Waivers and ATC Authorizations
- Develop Implementation and Staff Training Plans
- Assist with the drafting of RFP’s (Request for Proposal) for consultants
- Keep NJDOT informed of public perception and liability
**Funding** – We researched and applied for grant funding assistance through:

- FHWA Tech Transfer Deployment Funds for a UAS Peer Exchange on Best Practices.
- FHWA State Transportation Innovation Council (STIC) Incentive program for equipment & training.
Potential Uses for Transportation

- Traffic Incident Management
- Aerial 3D Corridor Mapping
- Structural Inspection
- Traffic Congestion Assessment
- Emergency Response Assessment
- Real-time Construction Project Monitoring
- Landfill Volume Calculations
- Inspection of Confined or Hazardous Spaces
Advantages of UAS over Traditional Methods

- Inexpensive
- Rapid deployment
- Easy to use
- Easily transportable
- Very low carbon footprint
- Can operate in areas that are risky or dangerous to humans
The goals of our Peer Exchange were to discuss and share:

- Best practices
- Policies
- Procedures
- Current projects
- Research studies
- Funding sources
- State UAS legislation
- Our common challenges
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<th>Peer Exchange Presenters</th>
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<tbody>
<tr>
<td>FAA (Northeast Region)</td>
<td>Skip Weigand</td>
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<tr>
<td>Delaware DOT</td>
<td>Joshua Thomas</td>
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<tr>
<td>Kansas DOT</td>
<td>Merrill Atwater</td>
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<tr>
<td>Massachusetts DOT</td>
<td>Andrew Mihaley</td>
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<td>New Jersey DOT</td>
<td>Glenn Stott (Host)</td>
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<td>North Carolina DOT</td>
<td>Basil Yap</td>
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<td>Pennsylvania DOT</td>
<td>John Melville</td>
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<td>New Jersey State Police</td>
<td>Sgt Ron Leach</td>
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<td>New Jersey Forest Fire Service</td>
<td>Robert Gill</td>
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Key Takeaways

- Additional safety training is required to supplement FAA certification
- Insurance companies are leading risk management efforts
- Data management and privacy are important issues
- The responsibility for regulating airspace below 400 feet may soon be delegated to the state and local level
- DOT’s must share best practices and research to maximize resources
- Standardized state training will help to coordinate a national response to disasters
- Educational Outreach efforts are needed to teach the general public how to safely and responsibly operate UAS
- States should encourage drone friendly areas to promote an acceptable culture for drone use
FHWA STIC Grant

Purchase, use, and evaluate Unmanned Aircraft Systems for Structural Inspections and Traffic Incident Monitoring

- Purchase UAS equipment
- Train initial cadre of FAA certified UAS pilots
- Assist with developing guidance for best practices on UAS projects
- Purchase mapping software to convert UAS data into 3D Volumetric maps and GIS data
Awarded to UTRC (University Transportation Research Center), CUNY (City Univ. of NY), NUAIR, and Texas A&M

To incorporate NJDOT Risk Management concerns and best practices

To recommend comprehensive New Jersey UAS Regulations

To create New Jersey UAS Policy

To create an NJDOT UAS Operations Manual
How does NJDOT select UAS Projects?

The Bureau of Aeronautics leads the department’s UAS initiatives.

Projects must have the potential to meet one or more of the following criteria to be considered for Aeronautics support;

- Increased Safety
- Increased Efficiency
- Save Time
- Save Money
Current UAS Initiatives at NJDOT

- Traffic Incident Management
- Structural Inspections
- Aerial 3D Corridor Mapping
- Emergency Response Assessment
- Real-time Construction Project Monitoring
- 3D Reality Modeling
- Landfill Volume Calculations
High Mast Light Pole Inspection Project

- NJDOT owns and operates 250 HMLP near NJ roadways
- Traditionally inspected with binoculars or bucket trucks
- UAS are less disruptive to traffic, more efficient, and costs less
- UAS allow an inspector to view the entire pole in high definition
- Provides a photo record of potential problem areas for review
- NJDOT was the first UAS operator granted an FAA Authorization Letter to fly in Newark’s Class Bravo airspace
241 out of 250 HMLP inspections were completed with UAS

The nine HMLP sites that could not be completed had the following issues:

- Five due to airspace issues
- Two due to dense vegetation
- One was too close to the roadway
- One had poor communication with the UAS (strong RFI)
View from 95 feet
Traffic Management Center (TMC)

- Video Capture
- 2.4 GHz Radio
- Remote UAS Operation
- 4G/L TE
- Portable Communication

Remote UAS Operation
3D “Reality Modeling” with Photogrammetry

Gull Island Dredging Project
3D “Reality Modeling” with Photogrammetry

- Provides precise real-world models for conceptual design, construction, and operational decisions.
- 3D models created from simple photographs, not expensive LIDAR.
- Provides fine details, sharp edges, and geometric accuracy.
- Can access and share in CAD or GIS on desktop and mobile devices.
- 3D CAD drawings can be inserted inside the 3D model
Keansburg CDF (Combined Disposal Field)
Click on the model to select a new position.

Position: 40.4506935N  
74.1443547W  
-52.74m

Spatial reference system: WGS 84, orthometric height (EGM96)
Click on the model to define a 3D segment.

Distance: 1.05 m
Height difference: 3.55 cm
Click on the model to define the base surface.

*Double click to close the polygon. Backspace to delete the last point.*

**Method:** Mean plane

**Sampling distance:** 6.57773 meters

- **Perimeter:** 558.10 m
- **Area:** 16184.51 m²
- **Cut volume:** 1539.33 m³
- **Fill volume:** 24006.17 m³
Phase II & III Taxiway Construction
Eagles Nest Airport
Challenges for Public Sector Use

- Slowly evolving FAA Regulations and Standards.
- The “Cool vs Creepy” factor of public perception.
- Local “Drone Bans” creating a confusing patchwork of regulations.
- Privacy and data security concerns.
- Compliance with Federal Airspace Regulations in congested airspace.
- Risk Management concerns operating near roadways and critical infrastructure.
Questions?