Expanding Use of Drones in the Railroad Environment

Community of Interest Webinar for Railroad-DOT Mitigation Strategies (R16)

August 8, 2018
Purpose of Today’s Webinar

- **Learn more** about the SHRP2 R16 Railroad-DOT Mitigations Strategies Community of Interest and its Innovation Library.
- **Hear presentations** from Utah DOT and BNSF regarding the increasing uses and value of Unmanned Aircraft Systems (Drones) to promote safety and efficiency in the Railroad Environment.
- **Discuss and ask questions** in a robust exchange with presenters and participants.
Agenda

- Welcome
- Presentations:
  - Unmanned Aerial Systems, Utah DOT
  - BNSF Railway UAS Program, BNSF
- Discussion and Comments
A Few Housekeeping Details

• **Tell us what you think.** We want to hear from all of you on the call during the discussion segment.

• **Please add your comments to the chat box provided.**
Welcome

**Presenters**
- Paul Wheeler, Lead UAS Coordinator, Utah DOT
- Todd Graetz, Director of Technology Services, BNSF

**Moderators/Participants**
- Kate Kurgan, Moderator/ R16 Product Lead, AASHTO
- Pam Hutton, SHRP2 Implementation Manager, AASHTO
- David Solow, R16 Subject Matter Expert

Transcript of the presentation will be posted on the AASHTO SHRP2 website: [http://shrp2.transportation.org/Pages/R16_RailroadDOTMitigationStrategies.aspx](http://shrp2.transportation.org/Pages/R16_RailroadDOTMitigationStrategies.aspx)
Focus Areas

**Safety**: fostering safer driving through analysis of driver, roadway, and vehicle factors in crashes, near crashes, and ordinary driving

**Reliability**: reducing congestion and creating more predictable travel times through better operations

**Capacity**: planning and designing a highway system that offers minimum disruption and meets the environmental and economic needs of the community

**Renewal**: rapid maintenance and repair of the deteriorating infrastructure using already-available resources, innovations, and technologies
SHRP2 Implementation: INNOVATE. IMPLEMENT. IMPROVE

$155 million

FUNDING ASSISTANCE

63

SHRP2 SOLUTIONS

430+

PROJECTS IMPLEMENTED

DOT
52 Recipients

MPO/LOCAL
30 Recipients

UNIVERSITY
12 Recipients

FEDERAL/TRIBAL
7 Recipients

- RENEWAL
  230+

- CAPACITY
  100+

- RELIABILITY
  90+

- SAFETY
  11
SHRP2 Implementation:
INNOVATE. IMPLEMENT. IMPROVE

RESULTS
Save lives, money, and time
- Bridges being built more quickly
- Smoother traffic flows and less congestion
- Reduced construction costs
- Safer roadways
- Smarter environmental reviews
What is SHRP2 R16?

• Active Strategic Community of Interest (COI)
• Strategies to Improve Railroad-DOT Cooperation and Accelerate Project Delivery
• Innovation Library
  http://shrp2.transportation.org/Pages/R16_InnovationLibrary.Topic.aspx
• AASHTO Web Page Resources:
  http://shrp2.transportation.org/Pages/R16_RailroadDOTMitigationStrategies.aspx
Unmanned Aerial Systems (UAS) Program
2010 Testing in coordination with Utah State University
- Southern Parkway Construction Monitoring
- Wetland Plant Species Classification

Implementation Stages

• January 2016 Started Section 333 Process
• Purchased 3 Aircraft June 2016
• Policy and Procedures Approved March 2017
• 2018 - 9 Remote Pilots
UAS Platform Utilization

Structure Inspection

- Delamination (Thermal)
- Mapping
- Inspection

- Increase Frequency
- Improved Documentation
- Supplement
Site Monitoring

- Live Streaming Capabilities
- Monitor Area
- Bird’s Eye View at Low Cost

- Route Management
- Quick Response vs. Traditional Aircraft
Land Surveying

- Highly Detailed Mapping Model
- Safety
- Speed of Collection
- High Resolution Aerial Imagery with Point Cloud
Verification Report

- Required on all Pre-Construction Surveys
  - Softscape Surfaces
  - Hardscape Surfaces

- Hybrid Model

| 71 | 1151 | 3748.06 | 113741.25 | 579386.58 | 3788.06 | 0.60 |
| 72 | 1152 | 3787.84 | 113741.41 | 579375.89 | 3787.90 | 0.05 |
| 73 | 1154 | 3787.57 | 113720.26 | 572355.68 | 3787.70 | 0.13 |
| 74 | 1155 | 3787.33 | 113708.19 | 572340.25 | 3787.34 | 0.00 |
| 75 | 1156 | 3787.29 | 113700.01 | 572336.63 | 3787.26 | -0.03 |
| 76 | 1164 | 3786.48 | 113648.18 | 572278.96 | 3786.47 | -0.02 |
| 77 | 1165 | 3786.46 | 113648.67 | 572264.49 | 3786.44 | -0.03 |
| 78 | 1166 | 3786.36 | 113632.86 | 572253.64 | 3786.29 | -0.07 |
| 79 | 1167 | 3786.24 | 113621.83 | 572236.72 | 3786.23 | -0.01 |
| 80 | 1174 | 3785.55 | 113559.50 | 572107.23 | 3785.65 | 0.10 |
| 81 | 1175 | 3785.56 | 113563.69 | 572154.37 | 3785.62 | 0.05 |
| 82 | 1176 | 3785.51 | 113552.82 | 572149.52 | 3785.48 | -0.03 |
| 83 | 1177 | 3785.42 | 113559.87 | 572140.59 | 3785.37 | -0.05 |
| 84 | 1179 | 3785.37 | 113519.68 | 572114.83 | 3785.27 | 0.01 |
| 85 | 1180 | 3785.30 | 113519.12 | 572105.96 | 3785.29 | 0.09 |
| 86 | 1181 | 3785.15 | 113525.44 | 572099.48 | 3785.24 | 0.09 |

- Number Chk Pts: 81
- Mean Error (US): 0.03
- Standard Deviation (US): 0.04
- FNME (US): 0.04
- H ASK (US): Combined Horizontal FNME
- V ASK (US): 0.08
Construction – SR20

- First Project for 3D Model as Legal Document
- Attribute based Model
- Phasing/Changes Over Time
- Used by Construction & Inspection

- Compared against original design
- Hybrid Data
  - GPS, UAS, LiDAR, Design
  - As-Built Model
SR20 – Project Outcomes

- Overall savings for this project was $82,672 (2.58%)
- Workforce was 45% more productive
- Completed 25 days ahead of schedule
Environmental

- Google Earth High Resolution Imagery
- Wetland Mitigation – Jordan River
- Galena Canal – Hot Spring
- Monitor Noxious Weed Removal
UAS Platform Utilization

Incident Management

- UAS for IMT Vehicles
- Accident Reconstruction
- Monitoring Alternative Routes
- Real Time Broadcasting
- Detour management
- Search and Rescue
Airport Inspection

- Pavement Condition
- Automated Crack Detection
- Obstacle Clearance
Landslides

Moki Dugway
Landslides

Moki Dugway
UAS Platform Utilization

Asset Management

- Detailed Aerial Imagery
- Automated Detection
Data & Storage

- Plan for large data sets
- Keep all flight logs, files, and processed data.
- GIS database for all Ortho Imagery.
  - https://uplan.maps.arcgis.com/home/webmap/viewer.html?webmap=dc81b7cbd5ce4f8fba086e05d723fff
Lessons Learned

- Understand radio link characteristics in multiple environments
- Battery life and endurance
- Plan for the worst, hope for the best
- Looks can be deceiving
- Initial test flight to scout for obstacles and heights prior to autonomous flight mapping.
- Use aviation radio to monitor traffic
- Establish good relationships with other entities and public.
- Use visual observers for operations
- Sterile environment for Pilot
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Questions?
## For More Information

### Product Leads:
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- **Hal Lindsey**  
  R16 Project Manager, CH2M/Jacobs  
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### Additional Resources:
- **GoSHRP2**  
  Website:  
  fhwa.dot.gov/GoSHRP2
- **AASHTO SHRP2**  
  Website:  
  http://shrp2.transportation.org
- **R16 Product Pages**  
  http://shrp2.transportation.org/Pages/R16_RailroadDOTMitigationStrategies.aspx
- **Innovation Library**  
  http://shrp2.transportation.org/Pages/R16_InnovationLibrary.aspx
Thank You for Joining Us!