

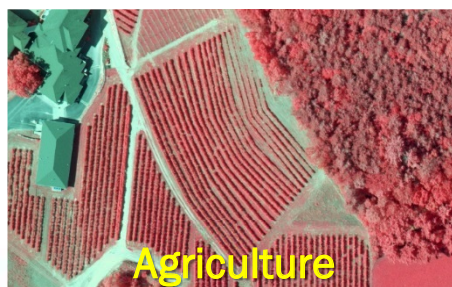
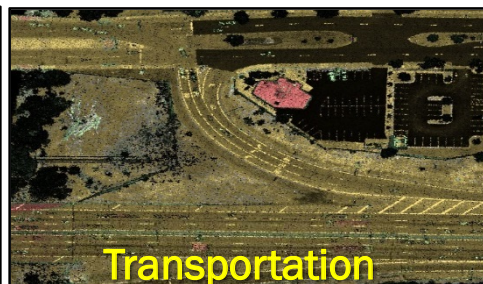
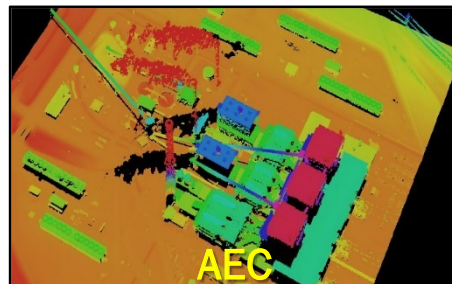
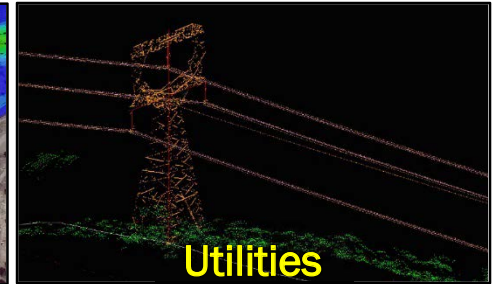
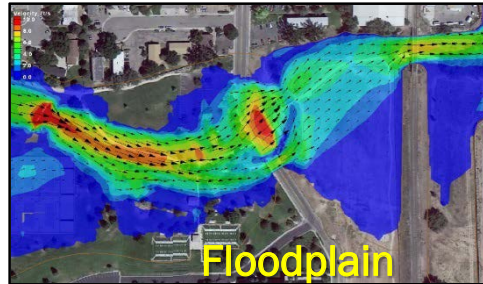


# Applying Drones on Transportation Projects

2016 ITS Forum - September 28, 2016  
Kirk Contrucci, Ayres Associates



# Applications for Drones





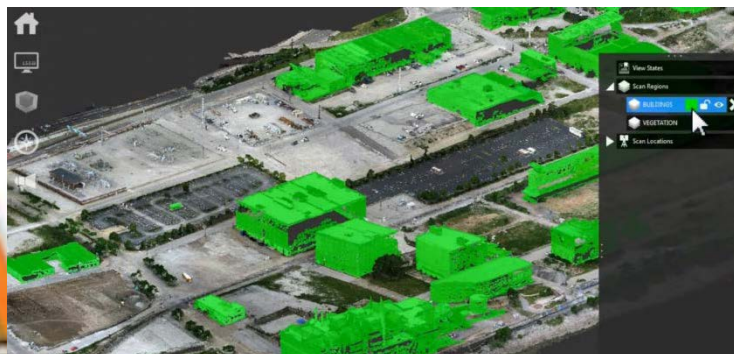
# Applying Drones on Transportation Projects

- building stock condition survey and inspection
- structural health monitoring and precision survey in civil engineering
- inspection and survey for cartography, orthophotography, topography, cadastral mapping, environmental impact assessment & land development
- surveying and monitoring of infrastructure
- surveying and monitoring of routes like roads, motorways, railways and track systems
- object surveying and monitoring of constructions, buildings, structures and facades
- inspection and survey of bridges, tunnels, level crossings, viaducts, subways etc.
- inspection and survey of cathedrals, monasteries, castles, ruins etc
- inspection and survey of surfaces, embankments, dams, reservoirs, protective and retaining walls etc
- surveying and measurements of objects and facilities to create point clouds, topographic data, digital terrain modelling, 3D modelling, reconstruction and volumetric analysis
- construction site surveys and monitoring for documentation of construction progress
- remote sensing and surveying for archeological geo-referencing, reconstruction and excavation monitoring
- precision inspection and surveying of heritage monuments



# Applying Drones on Transportation Projects

- Design
  - Perspective views
  - Site Planning
    - 3D Models of site and surrounding buildings
    - Base for concept models, renderings, 3D printing, etc.



# Applying Drones on Transportation Projects

- Construction
  - Progress imagery and videos
  - Lifting and placement of construction elements
  - Inspection
  - Change Detection





# Applying Drones on Transportation Projects

- Completion and Marketing
  - Highlight various building features
  - Explain size, shape, materiality, circulation (i.e. general intro to the building or)



# Site Construction and Engineering

- Smaller projects are cost prohibitive to carry out with full scale aircrafts
- UAV's are ideal for smaller project areas





# Applying Drones in Inspection and Monitoring







# Applying Drones in Inspection and Monitoring

- Primarily used for visual inspection
- Equipped with high resolution cameras
- Close up, accurate view of a structure or site
  - Applications
    - Oil and gas pipeline inspections
    - Power line inspections
    - Wind turbine inspections
    - Photovoltaic system inspections
    - Roadwork, ramp, bridge and canal inspections
    - Railroad infrastructure inspections
    - Safety assessments
    - Flooding change detection
    - Erosion monitoring

# Structural Inspection





# Pipeline inspection



# Transmission line inspection

- Can be outfitted with thermal sensors
- Provides virtual access to towers
- A safer way of inspecting lines



Xinhau 2013



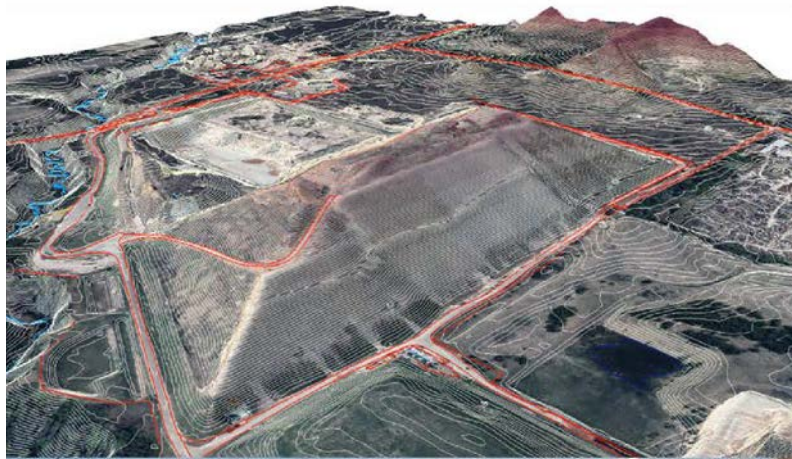


# Hazardous Environments





# Hazardous Environments







# State DOTs and Drones

- State transportation departments are increasingly studying the use of drones for everything from inspecting bridges to clearing car accidents.
- Michigan transportation officials are set to begin a two-year study. Minnesota has tested a drone to help conduct safety inspections of bridges. Vermont is using federal grant dollars to study the use of drones to monitor river flooding and figure out how much material is needed to fix roads.
- In Massachusetts, a group has also been looking at the pros and cons of drone use, from potential threats to their possible use surveying construction projects.
- The states are among 33 that have studied or used drones, helped develop drone policies, or aided in drone research.
- That's according to a new survey by the American Association of State Highway and Transportation Officials, which represents departments of transportation in all 50 states, Washington, D.C., and Puerto Rico.

# Federal Drone Rules and Regulations

## Current FAA Position



- FAA Part 107 – new regulations for commercial small unmanned aerial system (sUAS) went into effect in late August 2016
  - Caveat: I am NOT a lawyer!
- Pilot issues simplified: PIC certification
- No visual observer necessary
- Momentary loss of visibility is allowed
- Can operate from moving land (and water) vehicle (as long as you are not carrying packages)
- Twilight operation allowed
- Ceiling of 400' (vs 500' that was desired) – HOWEVER there is some liberalization of this for structures
  - Allowed within 400' boundary of structure and 400' above structure





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