massDOT
Massachusetts Department of Transportation
Aeronautics Division

Board Report:
LiDAR for Airport Obstruction Analysis & 3D Ortho-mosaic Imagery

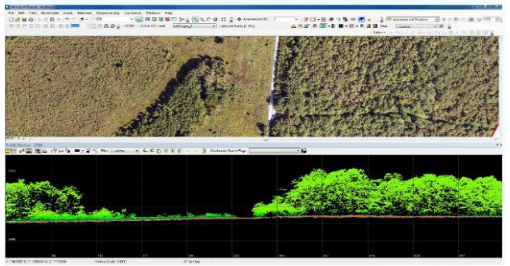
Monday October 28, 2019

Presented to:
Board of Directors

Presented by:
Aeronautics Division
- Dr. Jeff DeCarlo

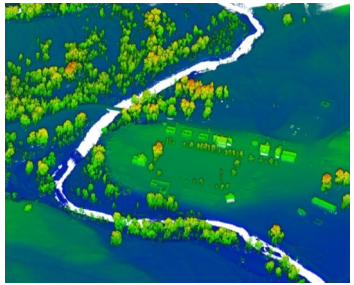
Light Detection And Ranging (LiDAR)

- LiDAR measures distance to a target by illuminating it with a pulsed laser light
- The reflection of that pulse is then used to detect and record the precise time of the LiDAR event
- The data collected can be used to make digital 3D-images of the target, referred to as a 3D Point Cloud
- LiDAR/UAS is increasingly used in transportation infrastructure projects and provides many tangible benefits
- These benefits include reduced inspection and survey times, improved inspection effectiveness, increased safety and lower operating costs
- The Aeronautics Division's Drone Pilot Program (DPP) is developing a LiDAR/UAS initiative to survey airport airspace (approach surfaces) to identify existing or potential hazards to air navigation



Light Detection And Ranging (LiDAR) Continued

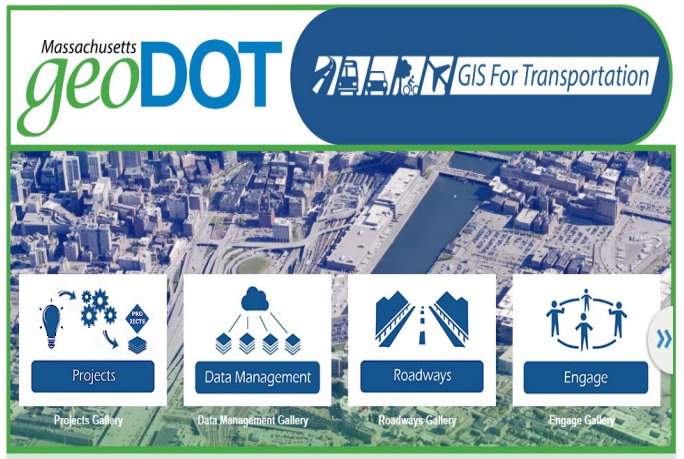
- LiDAR vs. Photogrammetry - Both can create 3D scans
- LiDAR uses lasers to make measurements, while photogrammetry is based on captured images that can be processed and combined to enable measurements

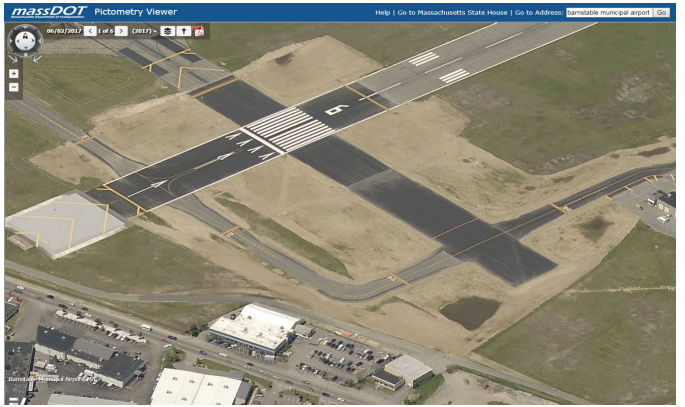


Type	Pros	Cons
LiDAR	• High Vertical resolution/accuracy • High point density on vertical targets • Penetrates through high canopy • High accuracy surveying large areas • Less flight time • Works both day/night • Corridor/vertical mapping	• Higher technical requirements (cost) • Does not work on water surfaces • Images can be distorted (fuzzy) due to multi-passes of UAS. • Higher weight and power consumption
Traditional Photogrammetry	• Lower costs • Time-tagged images • Geo-Tagged • High horizontal accuracy • Low-Power • Supports for multi-spectral sensors	• Low point density within area with low texture • Low vertical accuracy • Low point density on vertical features/foliage • Low accuracy on large area • More flight time required • Long (data) processing time

3D Ortho-mosaic Imagery

- Ortho-mosaics are aerial images composed of multiple photographs stitched together using photogrammetry that have been geographically corrected for accuracy
- 3D Ortho-mosaics provide extreme detail to support real- time decision making for key infrastructure improvements
- MassDOT's enterprise license with ESRI (external software vendor) provides access to base maps, layers and imagery that serve as a tool for data management and data analytics
- GeoDOT's Pictometry Viewer offers oblique and aerial photogrammetry of each airport including historical imagery for airport applications
- Imagery is updated annually for both ESRI and Pictometry





3D Ortho-mosaic Imagery Continued

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- Aeronautics yearly pavement maintenance as-built drawings are completed in Google Earth which can be layered into GeoDOT
- Aeronautics is currently working with APTech (engineering consultant) to provide the required tri-annual analysis of our airport pavement condition
- The shape files from the pavement analysis can be incorporated into GeoDOT along with metadata to provide dashboards on pavement metrics