Integrated Remote Sensing & Visualization (IRSV) -Applications for Bridge Management

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PRESENTED TO:
SOUTHEAST BRIDGE PRESERVATION PARTNERSHIP

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Research Team

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Outline of Presentation

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- Commercial Remote Sensing (CRS) as Bridge Health Sensors
- IRSV Project Overview
- Focus on Automation and Simplicity

Commercial Remote Sensing (CRS) for Bridge Health Monitoring

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- CRS refers to imaging from a distance using nonintrusive sensors such as aerial or terrestrial photography, LiDAR, RADAR , Passive Infrared, etc.
- For bridge health monitoring, CRS is proposed as a periodic inspection tool that is rapid and cost-effective.
- Commercial satellites, airborne large format and medium format optical photos do not have the resolution (< 6 inch) or cost-effectiveness for bridge Health Monitoring

Overview of CRS/IRSV Project

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- **Project Goals:**
  - **1) to introduce Commercial Remote Sensing technology applications to bridge management and preservation**
  - **2) to develop quantifiable method for measuring bridge sustainability**
  - **3) to demonstrate applications to industry-wide audience**
- **Research objective: to develop an Integrated Remote Sensing and Visualization (IRSV) system that uses CRS for bridge monitoring and assessment**
- **Output – cost-effective decision tool for application by bridge managers in determining structural health**

Commercial Remote Sensing (CRS)

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Focus on Two Technologies:

- **Three-dimensional LiDAR Scans of Bridge Superstructure**
- **Spatially Integrated, Small Format Aerial Photography (SI-SFAP) of Decks**

3D Terrestrial LiDAR

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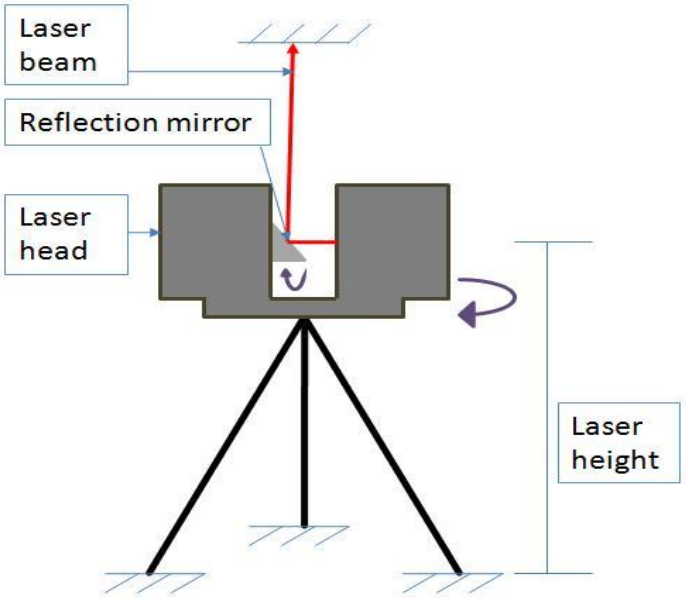
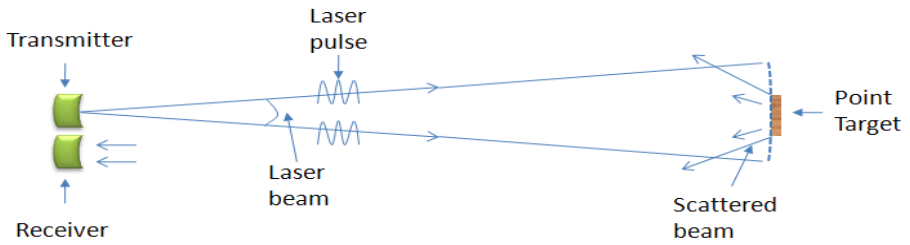
- **LiDAR - Light Detection and Ranging System.**
- **Laser scan images obtained before and after (temporal) - used to detect damages or displacements.**





LiDAR-Based Bridge Evaluation Applications

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- Bridge Clearance Determination
- Bridge Surface Defect Quantification
- Bridge Displacement Measurement / Joint movement
- Blast Impact Monitoring
- Static Load Tests / Deflection Measurements

Static Bridge Load Tests using LiDAR

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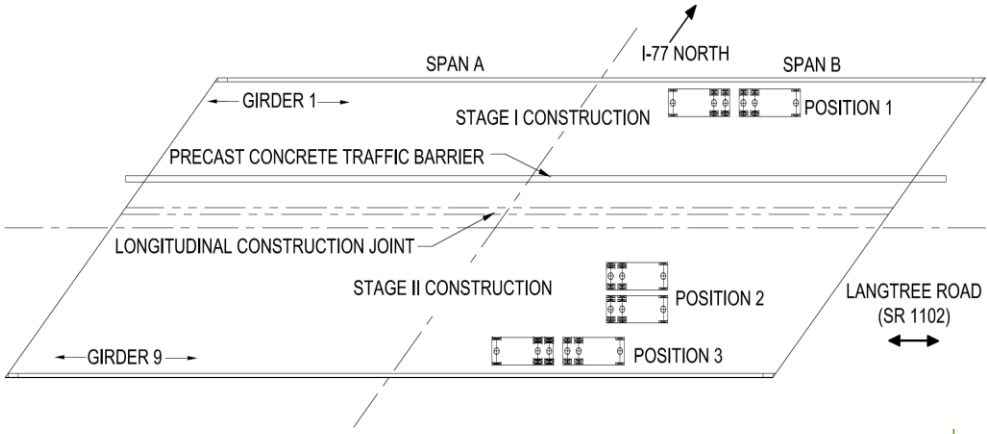

Spatially-Integrated Small Format Aerial Photography

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- Cessna C210L
- Cannon 5D DSLR camera
- Approx. 1000ft altitude at approx. 100 MPH
- Orthogonal rectification not needed

Large Format vs. Small Format Aerial Photography

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Large Format (9 in. camera aperture)

Small Format (35 mm camera)

SFAP Bridge Evaluation Applications

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- Construction Documentation
- Bridge Deck Crack Monitoring
- Bridge Deck Joint Movement Monitoring
- Bridge Environmental hardware/ “Furniture”
- Bridge Inventory

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Questions

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Thank you!

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