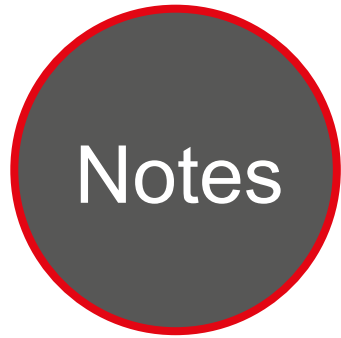




Caltrans Division of Research,
Innovation and System Information

Research



Notes



Maintenance

JULY 2020

Project Title:
Traffic Disruption-Free Bridge
Inspection Initiative with Robotic
Systems

Task Number: 3611

Start Date: August 1, 2019

Completion Date: July 31, 2024

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Traffic Disruption-Free Bridge Inspection Initiative with Robotic Systems

Inspecting and preserving infrastructure through robotic exploration.

WHAT IS THE NEED?

Currently, bridges and tunnels are visually inspected and manually maintained under traffic control with the aid of heavy lifting and access equipment. If access to the work area must be made from bridge decks, the indirect cost associated with road closure multiplies.

In such a case, travelers are frustrated with traffic congestion, and both the travelers and inspectors are subjected to a safety concern on high volume highways.

WHAT ARE WE DOING?

The Missouri Department of Transportation (MoDOT) is the lead state for the pooled fund study TPF-5(395) to engage closely with several state Departments of Transportation (DOTs) in the bridge inspection technology development at the INSPIRE University Transportation Center (UTC).

The INSPIRE UTC (<https://inspire-utc.mst.edu>) at Missouri University of Science and Technology was awarded in December of 2016 by the U.S. DOT. The UTC center was created for the development and technology transfer aimed at infrastructure inspection and preservation solutions. The center is focused on the development of advanced technologies to aid in bridge inspection and maintenance.



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California's transportation system

WHAT IS OUR GOAL?

The goals of this pooled-fund initiative are to engage closely with several DOTs in the early stage of technology development at the INSPIRE UTC, and leverage the center resources to develop case studies, protocols, and guidelines that can be adopted by state DOTs for bridge inspection without adversely impacting traffic.

The national study will use structural crawlers and unmanned aerial vehicles (UAVs) as a mobile platform for in-depth inspection of elevated bridges.

WHAT IS THE BENEFIT?

The study will demonstrate the benefit of automated bridge inspection and preservation of bridges with sensors, nondestructive evaluation devices, multi-modal robots, and data analytics. The study will provide cost-effective, consistent, and reliable solutions in bridge condition assessment and maintenance. It will provide training to a diverse transportation workforce so they can master the advanced technologies.

WHAT IS THE PROGRESS TO DATE?

In the last quarter, the following activities took place:

- Task 1. Bridge selection for manual and automated inspections:
 - The states of New York, Virginia, and Wisconsin were grouped for the study of steel girder bridges while the states of California, Georgia, and Texas were grouped for the study of prestressed concrete girder bridges.
 - In each participating state, nine bridges in the same material group will be tested.
 - In the lead state of Missouri, however, both steel girder and prestressed concrete girder bridges will be

investigated, having nine bridges in both materials for a total of 18 bridges to be tested.

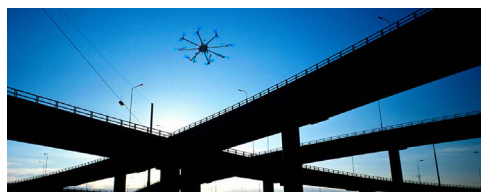
- Specific bridges selected will be submitted to the participating states for final selection and approval after they have been reviewed by Federal Highway Administration.
- Task 2. The fabrication of the second prototype of a BIRDS for combined flying and traversing capabilities began.
 - A model of the hybrid unmanned vehicle was established to optimize the structural design of the vehicle and understand the aerodynamic stability as the vehicle approaches a bridge girder. This can develop an effective navigation strategy of the BIRDS in operational training.

Next step: Field test team is being put together for bridge inspection/maintenance, and robotics system integration for UAVs.

- Task 1. Participating DOTs will be contacted to finalize the representative bridges to be tested.
- Task 2. The second prototype of a BIRDS for combined flying and traversing capabilities will continue to be built and tested for improved operability. A recreational vehicle will be designed and procured as a field test station at bridge sites.

For further information, please check the progress report at this link: <https://www.pooledfund.org/Details/Study/648>.

IMAGE



Picture 1: Unmanned aerial vehicle inspecting infrastructure