



## **POST-DISASTER DAMAGE ASSESSMENT BY UNMANNED AIRCRAFT SYSTEMS (UAS) PROJECT**

The Pacific Northwest Economic Region (PNWER) and its Center for Regional Disaster Resilience (CRDR) in partnership with Northeastern University's Global Resilience Institute (GRI) have been awarded a 2017 National Infrastructure Protection Plan (NIPP) Security and Resilience Challenge grant for critical infrastructure. The project seeks to develop technologies for UAS (drone) employment to technically inspect critical infrastructure in post disaster scenarios.

### **The Gap**

There is a need for rapid damage assessment of critical infrastructure immediately following a disaster. Emerging UAS technology is allowing for an expedited and detailed damage assessment of infrastructure such as bridges and other steel and concrete structures within the built environment.

### **Project Scope**

Our goal in this project is to enhance the efficiency, fidelity, speed and safety of current critical infrastructure inspection methods by using machine intelligence. Specifically, this project seeks the development of a Small Unmanned Aerial System (sUAS), using lidar technology. This applied research will focus on 1) human-supervised sUAS control, 2) human-sUAS interaction, 3) data analysis for damage detection capabilities, and 4) leveraging sUAS in support of incident management processes during times of emergencies and to support the rapid recovery of critical infrastructure in the aftermath of catastrophic events. The project will focus on the metro-Seattle area while leveraging applied research on post-disaster infrastructure resilience in the metro-Boston area. This bi-coastal sharing of knowledge facilitates the national-level adoption of key findings and recommendations.

### **Project Team**

The Pacific Northwest Economic Region (PNWER) in cooperation with Northeastern University's Global Resilience Institute (GRI) will execute this project. NEU/GRI will provide the technical expertise to execute the engineering aspects of the project and provide documentation on their research, specific applications and implementation guidelines. PNWER in conjunction with NEU/GRI will establish and coordinate an advisory team, hereafter referred to as the Critical Infrastructure Task Force made up of public and private sector organizations. This Task Force will review the results of the engineering effort and look for direct applications of the technologies for the rapid damage assessment of critical infrastructures by infrastructure providers and the broader emergency management and Homeland Security community.

Stakeholders will include personnel from ports, rail roads, pipelines, water systems, ferry systems, state and local transportation agencies and emergency managers, energy providers, and other public

and private sector organizations who own and operate critical infrastructures, or upon whom these infrastructures are dependent.

## **Project Deliverables**

The steps we are planning are as follows:

- 1) Develop a thorough stakeholder engagement and host an initial workshop (January – April)
- 2) Develop a regional inventory of existing UAS assets that could be appropriately deployed for post disaster assessment (January – April)
- 3) Develop cost effective tools for post disaster damage assessment of infrastructures to include details on: a) controlling the sUAS and creating a 3D information-rich point cloud map; b) transforming the robot-perception data into a semantic model; and, c) visually analyzing the model to identify defects (July 23<sup>rd</sup> in Spokane, Washington as part of the Disaster Resilience Symposium)
- 4) Produce a technical report to include overview of the developed algorithms (August)
- 5) Host a final workshop to evaluate tools and discuss foundation for public/private sector drone deployment protocols (September)

## **Stakeholder Commitment**

Stakeholders are asked to commit to providing personnel to assist this effort. We expect it will require a minimal obligation of time for reviewing draft findings, attending workshops, and providing feedback for the duration of the contract. Contact Eric Holdeman if you wish to be involved in the Project Steering Committee at [eric.holdeman@pnwer.org](mailto:eric.holdeman@pnwer.org)

## **Project Timeline**

Work began in December 2017. All contract deliverables must be accomplished by September 30, 2018.

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