

Quarterly Progress Report:

Project Number and Title: 1.12, Improved UAV-Based Structural Inspection Techniques and Technologies for Northeast Bridges

Research Area:

PI: Eric Landis, University of Maine

Co-PI(s): Alex Friess, Ali Shirazi, University of Maine

Reporting Period: 4/1/21 – 6/30/21

Submission Date: 6/30/21

Overview: (Please answer each question individually)

- Completed preliminary literature review of current state-of-practice of drone utilization for bridge inspections among state DOTs. Formal presentation and discussion session with industry scheduled.
- Weekly meetings between two PhD students and advisors (Landis & Friess) have been focused on matching mission needs with different options for UAV hardware.
- Periodic meetings with collaborators at consulting firm (VHB) and DOT.
- Team of student engineers completed prototype hexacopter drone capable carrying synthetic aperture radar module for under-bridge inspections, contact with structure.

Table 1: Task Progress			
Task Number	Start Date	End Date	% Complete
Task 1: Review of Current Regional Practice	10/1/20	12/31/20 / 3/31/21	100%
Task 2: Survey of Commercially Available UAVs appropriate for Applications	10/1/20	12/31/20 / 4/30/21	100%
Task 3: Prototype Development	10/1/20	5/31/21	100%
Task 4: Image array packages	1/1/21	9/30/22	10%
Task 5: Adv. Data interp.	1/1/21	9/30/22	5%
Task 6: Laboratory trials	3/1/21	9/30/22	0%
Task 7: Field trials	6/1/21	9/30/22	0%
Task 8: Field validation	TBD	TBD	0%
Overall Project:	10/1/20	9/30/22 (phase I)	
		9/30/23 (phase II)	

Table 2: Budget Progress		
Project Budget	Spend – Project to Date	% Project to Date*
\$566,743	(Vu?)	

*Include the date the budget is current to.

Describe any opportunities for training/professional development that have been provided

A large student team has been assembled, including two PhD students (one supported by project), and a Mechanical Engineering senior capstone design team, who developed custom drone for carrying different sensor packages.

Describe any activities involving the dissemination of research results

Met with industrial collaborator and MDOT 4/8/21 to discuss results of Tasks 1, get feedback on Task 2. Plans in progress for field collaborations in July/August, as soon as VHB finalizes contract with MDOT

Table 3: Presentations at Conferences, Workshops, Seminars, and Other Events				
Title	Event	Type	Location	Date(s)

Table 4: Publications and Submitted Papers and Reports				
Type	Title	Citation	Date	Status



Prototype Inspection Drone During Flight Testing

Participants and Collaborators:

Use the table below to list all individuals who have worked on the project.

Table 5: Active Principal Investigators, faculty, administrators, and Management Team Members			
Individual Name	Email Address	Department	Role in Research
Eric Landis	landis@maine.edu	CIE	PI
Alex Friess	Wilhelm.friess@maine.edu	MEE	Co-PI, Capstone Design Leader
Ali Shirazi	shirazi@maine.edu	CIE	Co-PI, Data science, AI

Use the table below to list all students who have participated in the project during the reporting. (This includes all paid, unpaid, intern, independent study, or any other student that participated in this project.)

Table 6: Student Participants during the reporting period					
Student Name	Email Address		Class	Major	Role in research
Zahra Ameli	PhD	Civil Eng.	Grad. Research Asst.		

Yugandhar Aremanda		PhD	Mech Eng.	Grad. Research Asst.
Drew Bennett		Sr	Mech Eng.	Capstone Design Team
Dominic Dangelo		Sr	Mech Eng.	Capstone Design Team
Nathan Godbout		Sr	Mech Eng.	Capstone Design Team
Jack Leopold		Sr	Mech Eng.	Capstone Design Team
Nicolas Michaud		Sr	Mech Eng.	Capstone Design Team
Peter Rohrbacher		Sr	Mech Eng.	Capstone Design Team

Use the table below to list any students who worked on this project and graduated during this reporting period.

Table 7: Student Graduates			
Student Name	Role in Research	Degree	Graduation Date
Drew Bennett	Prototype Drone Development	BS, Mech. Eng.	May 2021
Dominic Dangelo	Prototype Drone Development	BS, Mech. Eng.	May 2021
Nathan Godbout	Prototype Drone Development	BS, Mech. Eng.	May 2021
Jack Leopold	Prototype Drone Development	BS, Mech. Eng.	May 2021
Nicolas Michaud	Prototype Drone Development	BS, Mech. Eng.	May 2021
Peter Rohrbacher	Prototype Drone Development	BS, Mech. Eng.	May 2021

Use the table below to list organizations have been involved as partners on this project and their contribution to the project.

Table 8: Research Project Collaborators during the reporting period						
Organization	Location	Contribution to the Project				
		Financial Support	In-Kind Support	Facilities	Collaborative Research	Personnel Exchanges
VHB	Augusta, ME (and others)		x		x	

List all other outputs, outcomes, and impacts here (i.e. patent applications, technologies, techniques, licenses issued, and/or website addresses used to disseminate research findings). Please be sure to provide detailed information about each item as with the tables above.

Have other collaborators or contacts been involved? If so, who and how? (This would include collaborations with others within the lead or partner universities; especially interdepartmental or interdisciplinary collaborations.)

Table 9: Other Collaborators			
Collaborator Name and Title	Contact Information	Organization and Department	Contribution to Research
Dale Peabody, Director, Research & Innovation	dale.peabody@maine.gov	Maine DOT	Technical champion

Who is the Technical Champion for this project?

Name: Dale Peabody

Title: Director, Research & Innovation

Organization: Maine Department of Transportation

Location (City & State): Augusta, ME

Email Address: dale.peabody@maine.gov

Changes:

Based on discussions with industrial collaborators, we are putting off purchase of commercial drone until we can make better use in laboratory and field trials. Drone technology is changing rapidly, and it does not make sense to purchase unit that will not be immediately used.

Planned Activities:

Participate in UAV-based inspections with industrial partners, test prototype drone in field, continue to work on optimizing appropriate sensor array packages, automated data analysis systems.