# TRANSPORTATION POOLED FUND PROGRAM
# QUARTERLY PROGRESS REPORT

Date: June 30, 2021

Lead Agency (FHWA or State DOT): Indiana DOT

**INSTRUCTIONS:**
*Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.*

| **Transportation Pooled Fund Program Project #**<br>*(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)*<br>***TPF 5-387*** | **Transportation Pooled Fund Program - Report Period:**<br>☐Quarter 1 (January 1 – March 31)<br>X Quarter 2 (April 1 – June 30)<br>☐Quarter 3 (July 1 – September 30)<br>☐Quarter 4 (October 1 – December 31) |
|---|---|

| **Project Title:**<br>**Development of an Integrated Unmanned Aerial Systems (UAS) Validation Center** | | |
|---|---|---|
| **Name of Project Manager(s):**<br>**Tommy E. Nantung** | **Phone Number:**<br>**(765) 463-1521 ext. 248** | **E-Mail**<br>tnantung@indot.in.gov |
| **Lead Agency Project ID:** | **Other Project ID (i.e., contract #):** | **Project Start Date:**<br>1/1/2019 |
| **Original Project End Date:**<br>**12/31/2022** | **Current Project End Date:**<br>**12/31/2022** | **Number of Extensions:**<br>None |

Project schedule status:

☐On schedule ☐ On revised schedule ☐ Ahead of schedule X Behind schedule

Overall Project Statistics:

| Total Project Budget | Total Cost to Date for Project | Percentage of Work Completed to Date** |
|---|---|---|
| **$650,000** | **$309,800** | **65%** |

***Quarterly*** Project Statistics:

| Total Project Expenses and Percentage This Quarter | Total Amount of Funds Expended This Quarter | Total Percentage of Time Used to Date** |
|---|---|---|
| **$34,802** | **5.3%** | **83%** |

**Since end date has been extended, project percentages have been updated (estimates)

**Project Description**:
This study proposes to develop the basic standards, protocols, and testing requirements that a given UAS must meet and demonstrate for a particular application.

**Progress this quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

- The development of the UAS Evaluation Chamber for Bridge Inspection has been completed (See Figure 1). As discussed in previous reports, the chamber presents a GPS denied environment that can be used to evaluate UAS in a controlled and repeatable environment. A scoring rubric for UAS is currently being developed.
- A standardized "cold weather" evaluation test is nearly completed. This test will be used to provide a relative indication of the effect of cold weather (in the range of 20F to 30F) as compared to "warm" weather (<60F) operation times of a UAV.
- The development of a "pilot check list" is nearly completed. The check list is to be completed prior to flights in the context of bridge inspections.
- The development of a standardized "turbulence test" is well underway. This test will be used to evaluate the performance of the UAS in turbulent wind conditions to determine the effect of turbulence on the quality of the data collected.
- Continued work in developing camera and image quality evaluation criteria.

**Anticipated work next quarter**:

- It is planned to bring various bridge inspectors to the S-BRITE center to get real-world feedback on the test.
- Develop draft scoring and test procedures for evaluating the performance of UAS within the UAS Evaluation Chamber.
- Finalize the cold weather and turbulence tests along with the pilot check list.
- Schedule Project Panel meeting for some time in the 3rd Quarter of 2021. It has been decided to push the meeting to the 3rd quarter to allow a more comprehensive project update. Further, it is hoped that project partners can travel to Purdue for an in-person meeting.
- Submit a short report summarizing the work completed to date for review by the project partners.

**Significant Results:**

1. The development of the UAS Evaluation Chamber for Bridge Inspection has been completed. A scoring metric is currently being developed. It is planned to bring various bridge inspectors to the S-BRITE center to get real-world feedback on the test during the 3rd quarter of 2021.

**Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the Agreement, along with recommended solutions to those problems).**

1. The COVID-19 restrictions resulted in Purdue University shutting down entirely in Mid-march 2020. All access to laboratory facilities were halted effectively bringing all research to a standstill. In mid-June 2020, standard Operating Procedures were being developed for review by the University to begin safe operations. Bowen Laboratory and the S-BRITE Center were cleared to allow research to re-start in mid-July of 2020. Clearly, COVID has been a major impact on this and other research projects. The Research Team continues to try and work hard to try and make up for lost time due to the laboratory shut downs while still working as safely as possible and within the confines of Purdue's COVID-19 operation procedures.

**Potential Implementation:**
None to date


**Figure 1 - Photographs showing interior UAV Evaluation Chamber**