FINAL REPORT

For the Period:

April 1, 2009 – August 31, 2009

Prepared for:

Transportation Research Center
University of Nevada, Las Vegas

Prepared by:
Daniel Lowe
Robert O'Brien

UNLV Account # 2397-254-687Y

Drag Reduction Proof of Principal Research

Oct 14, 2009

For Submittal to:

Nevada Urban Transportation Center
University of Nevada, Las Vegas
Attn: Dr. Ken Peck

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1.0 GENERAL INFORMATION

1.1 Introduction and Purpose

This report describes the technical advancements made on the Drag Reduction Proof of Principal project from April 1, 2009 through August 31, 2009.

Project description

The dust suppression project that was funded last year through the UTC discovered that the feasibility of drag reduction for large vehicles is feasible through extensive wind tunnel testing. Although the project was not able to test the full scale version on a trailer due to time and financial restraints, valuable data and insight was gained for future large scale testing. This project will utilize the knowledge gained from the dust suppression research and try to validate their findings on a full scale trailer. If time and money permits, flaps will be attached to the trailer to try to quantify the amount of fuel savings on a vehicle of that size.

1.2 NUTC Account Number/Name of Recipient

UNLV Account # 2397-254-687Y

Recipient: UNLV College of Engineering

Las Vegas, NV 89154

1.3 Project Title/Name of Project and Principal Investigator

Project Title: Drag Reduction Proof of Principal Research

Principal Investigators: Daniel Lowe, Robert O'Brien

1.4 Date of Report/Period Covered by Report

Report Date: October 14, 2009

Period Covered by Report: April 1, 2009 – August 31, 2009

2.0 PROGRESS TOWARDS GOALS

2.1 Accomplishments and Major Activities

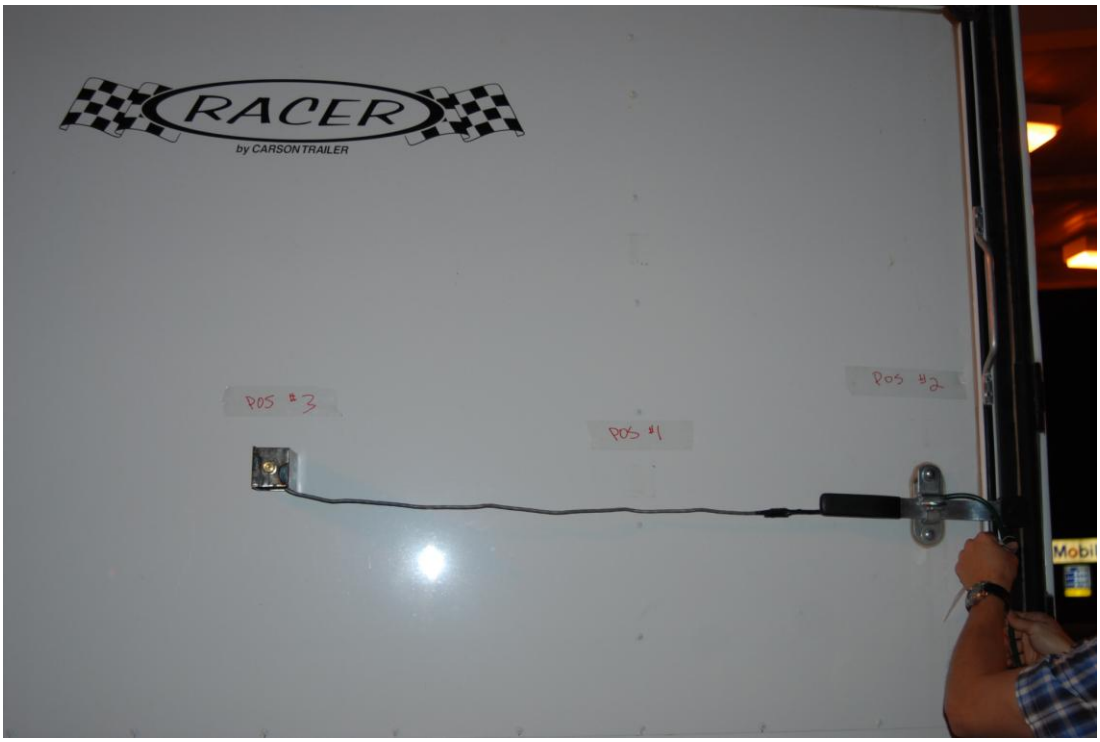
This project's main goal was to further investigate the feasibility of drag reduction through active surface control; more specifically to test the DAQ system on a full scale truck and trailer system that was developed for the wind tunnel.

3.0 SCHEDULE STATUS

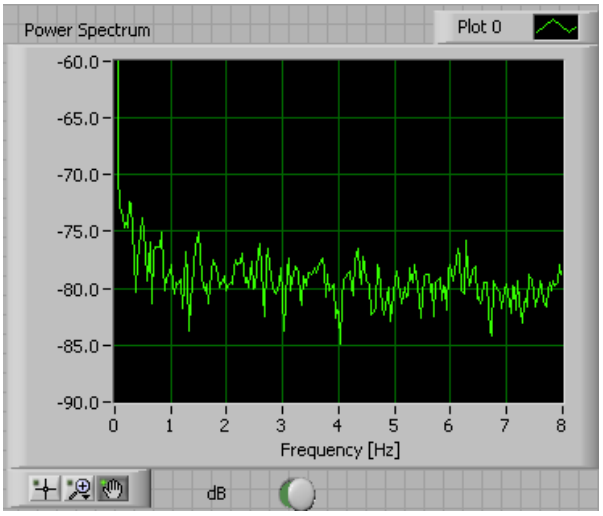
The project was on schedule and has now ended.

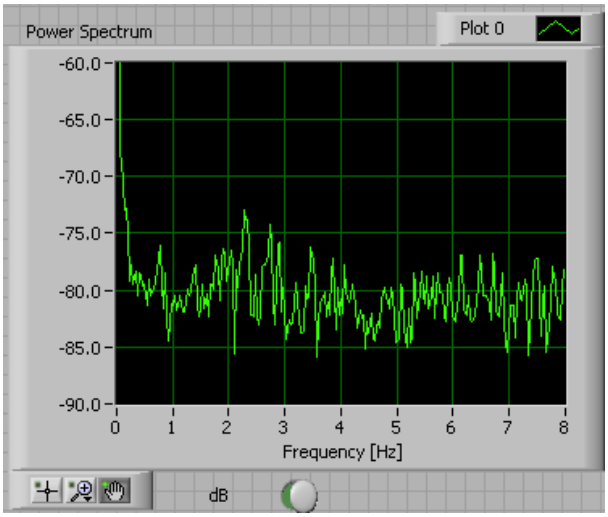
3.1 Milestones

- Instrumented truck and trailer system with various pressure sensors that are able to detect the pressure variations that would be found on a moving vehicle of that size, shown below. Various positions of the pressure sensor were tested to identify the best location for the sensor.

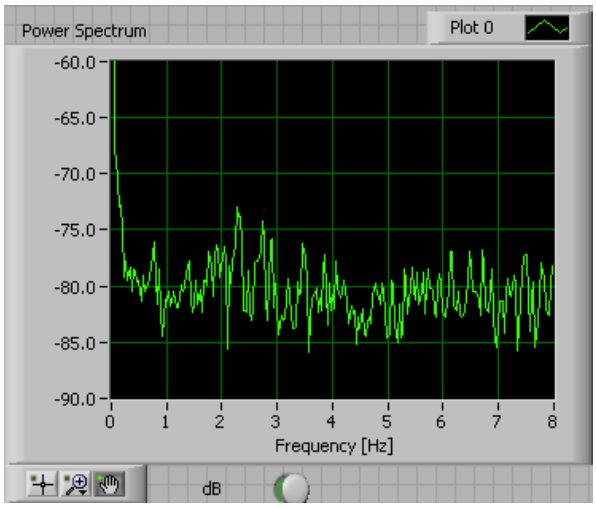


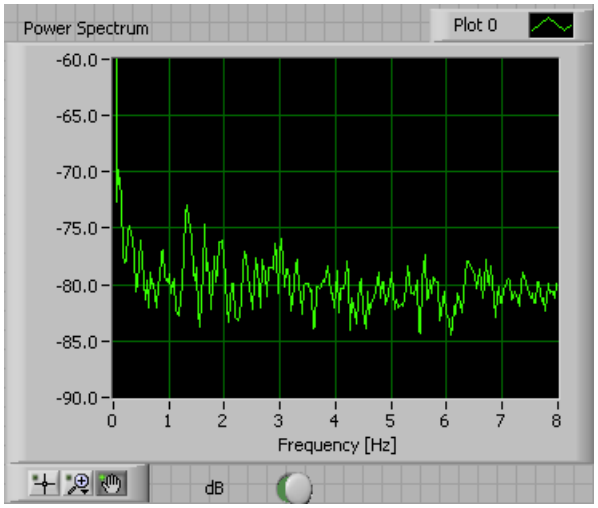
- The FFT results from the various sensor locations are show below. The left graph shows the strouhal frequency being hidden by trailer vibration (this sensors was in the middle of the rear panel, causing road vibrations to be transferred into the pressure sensor) while the right graph shows the correct strouhal frequency for a trailer going 65 MPH





- The figure below shows the effects of wind speed and direction on the vehicle. In the wind tunnel, there are no environment variables that are quickly changing whereas driving a trailer you encounter head, tail and side winds constantly. An effort was made to quantify these effects. The figure on the left shows the strouhal frequency measured for no noticeable wind while the right graph shows the effect of a 20 MPH tail wind. Notice the expected reduction in strouhal frequency from 2.2 Hz to 1.4 Hz.





- The Labview control system was then tested with the pressure sensor in the best pre determined location. This test was to verify a) the pressure DAQ system was working with the full program b) the filtering system could find the correct bandwidth to apply to the pressure signal and c) apply the logic routines to the said filtered data stream. This test was conducted multiple times and it was determined that the laptop was too slow to do the real time processing required for the system to work. In response to this find, a newer high end Dell M6400 was purchased to eliminate this problem. Testing on the newer system, however, has been delayed (See section 5.0 for details)

4.0 CHANGES IN APPROACH/SCOPE

None

5.0 PROBLEMS OR DELAYS

The scheduling of the COE truck became a noticeable problem as other research projects were utilizing the truck in a configuration that rendered the truck inoperable for our task. This problem lingered for the last half of this project and to date has not been resolved. A scheduling meeting is being held on Oct 15, 2009 to discuss the scheduling rights each project will have with the truck to try and correct this problem.

6.0 KEY PERSONNEL

Principal Investigators

Daniel Lowe

Robert O'Brien

Researchers

none

Graduate Students

none

6.1 Changes in Key Personnel

Principal Investigators

None

Researchers

None

Graduate Students

None

7.0 TECHNICAL ADVISORY COMMITTEE MEETINGS

Meeting Date:

Attendees:

Location:

Summary of Meeting:

Meeting Date:

Attendees:

Location:

Summary of Meeting:

8.0 PRODUCTS PRODUCED/TECHNOLOGY TRANSFER ACTIVITIES

None

9.0 COST STATUS

9.1 Actual Costs Incurred

Figure 1: Original Project Schedule

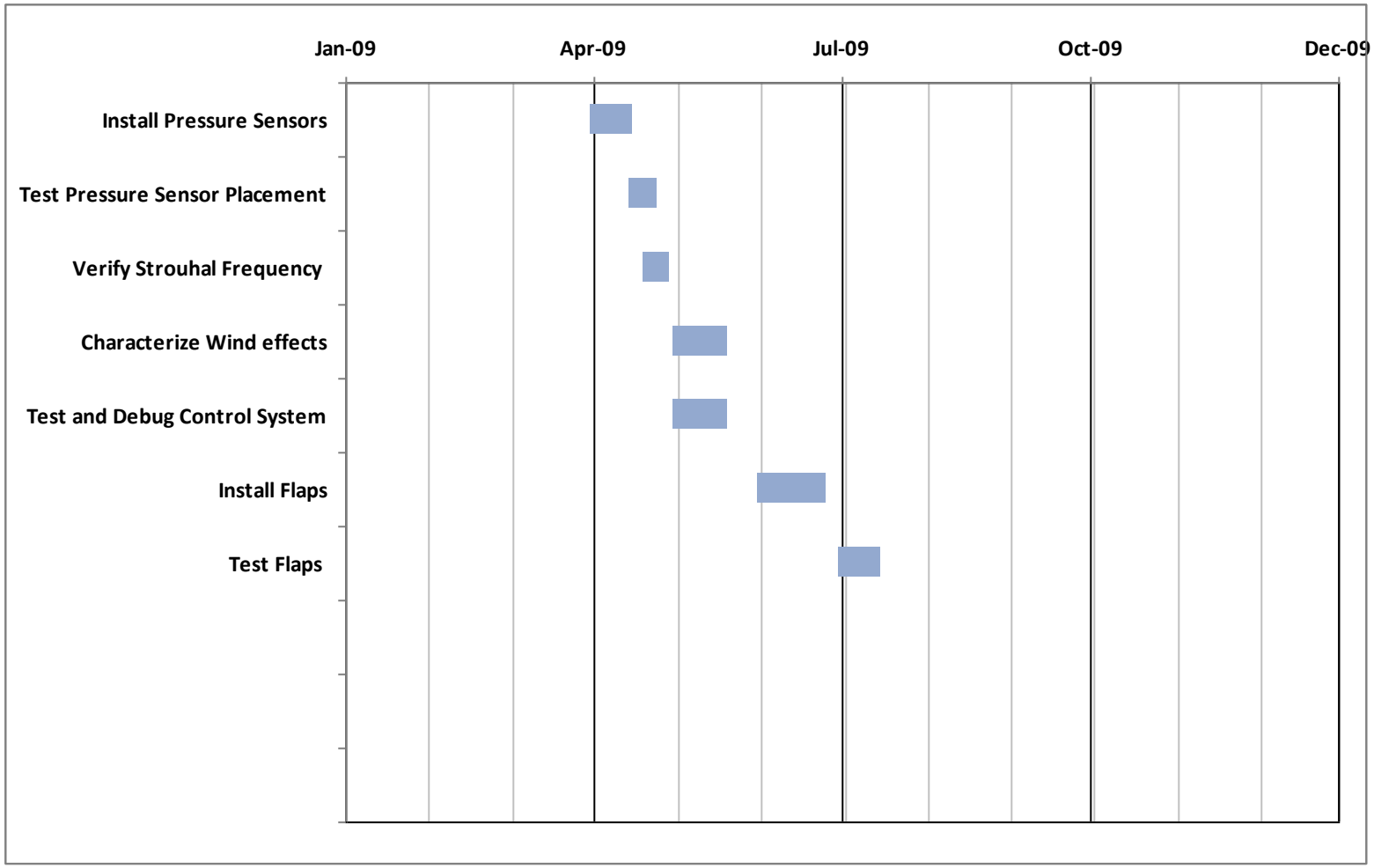


Table 1: Budget Summary

	Project Title:	**Drag Reduction Proof Of Principal Research**					
	Account #	**2397-254-687Y**		Reporting Quarter: FINAL			
	PI:	**Daniel Lowe / Robert O'Brien**		Date of submission: 10/14/2009			
Obj. Code	**Item**	**Prior Expenses**	**Q1**	**Q2**	**Q3**	**Q4**	**Cumulative**
	Personnel						
11	Researchers		$ 12,500.00	$ 302.47			$ 12,802.47
12	Graduate Students						$ -
15	Undergrad Students						$ -
16	Fringe		$ 3,350.00				$ 3,350.00
	Total Personnel	$ -	$ 12,500.00	$ 302.47	$ -	$ -	$ 16,152.47
44	Tuition						$ -
30	Supplies						$ -
23	Travel						$ -
65	Equipments						$ -
44	Sub-contracts						$ -
30	Operations		$ 1,093.21	$ 3,265.08			$ 4,358.29
	Total	**$ -**	**$ 13,593.21**	**$ 3,567.55**	**$ -**	**$ -**	**$ 20,510.76**