State of California
AIR RESOURCES BOARD

Resolution 09-26

February 26, 2009

Agenda Item No.: 09-2-7

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, a proposal entitled “Fuel-Efficient Active Flow Control for Tractor-Trailers” has been submitted by Advanced Transit Dynamics, Inc. in response to the 2008 Innovative Clean Air Technologies (ICAT) Program solicitation;

WHEREAS, the proposal has been independently reviewed for technical and business merit by highly qualified individuals; and

WHEREAS, the Research Division staff and the Executive Officer and Deputy Executive Officers have reviewed and recommend for funding:

> Proposal entitled “Fuel-Efficient Active Flow Control for Tractor-Trailers,” submitted by Advanced Transit Dynamics, Inc., for a total amount not to exceed $249,194.

NOW, THEREFORE BE IT RESOLVED that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39703, hereby approves the following:

> Proposal entitled “Fuel-Efficient Active Flow Control for Tractor-Trailers,” submitted by Advanced Transit Dynamics, Inc., for a total amount not to exceed $249,194.

BE IT FURTHER RESOLVED that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and agreements for the efforts proposed herein, and as described in Attachment A, in an amount not to exceed $249,194.

I hereby certify that the above is a true and correct copy of Resolution 09-26, as adopted by the Air Resources Board.

/s/

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Monica Vejar, Clerk of the Board

ATTACHMENT A

Innovative Clean Air Technologies (ICAT) Grant Proposal:

"Fuel-Efficient Active Flow Control for Tractor-Trailers"

Background

Advanced Transit Dynamics (ATD) seeks to commercialize active flow control (AFC) technology to improve the fuel economy of Class 8 tractor-trailers by 6-10%. A well established technology in aeronautical and astronautical engineering, AFC uses localized energy injection to alter ambient airflow in a manner that decreases aerodynamic drag. At highway speeds, aerodynamic drag accounts for two-thirds of the fuel consumed by tractor-trailers. ATD's patented AFC technology (the technology) is installed at the rear of a tractor-trailer, around the perimeter of the trailer's doors. The technology works by pressurizing the low-pressure vortex, or vacuum, that develops behind a box-shaped trailer as it moves forward; in aerodynamic terms, the technology delays boundary layer separation, reducing the intensity with which the vacuum inhibits the trailer's forward motion.

Objective

The purpose of the project is to optimize the technology for application to the rear edge of box trailers, and to demonstrate the fuel efficiency and operational performance of the technology through industry-favored SAE Type II fuel economy track testing and Type IV fuel economy on-road testing.

Methods

The year-long project is made up of six discrete tasks, each culminating in a deliverable or quantifiable milestone. All of the tasks – including installation and fabrication – will be conducted in California, in whole or in part. The demonstration will involve vehicles from three California trucking fleets seeking early adoption of a next-generation aerodynamic device.

Expected Results

It is expected that the objective of the project will be met, and the effectiveness of the technology in improving truck-trailer fuel economy will be demonstrated to a reasonable degree of satisfaction. Upon successfully meeting the objectives, ATD will have the data for use in further optimizing the system and to apply to the initial stages of verification by the USEPA SmartWay program and is expected to obtain SmartWay certification on its path to commercialization of the technology.

Significance to the Board

The technology is an emission-preventing aerodynamic device. It decreases fuel consumption of tractor-trailers by 6-10%, corresponding to a proportional reduction in greenhouse gas (GHG) emissions. Emissions from tractor-trailers are mobile source emissions attributable to the IPCC category addressing 1A3biii – Heavy-Duty Trucks and Buses.

ARB projects that by 2020, the target year for 20% reduction of Green House Gas (GHG) emissions established by the Global Warming Solutions Act of 2006 (AB 32), 1.2 million trailers will travel across California highways (excluding trailers with a short operating radius and non-"box" trailers whose geometries would not accommodate the technology in its current form). Operators of these trailers in California have economic and regulatory reasons to consider the adoption of aerodynamic devices. With the help of ICAT, demonstration of the technology in 2009 will draw the attention of fleet operators toward a product that reduces fuel costs, and moves toward a least-cost compliance with prospective California regulations.

Commercial trucking is a saturated, low-margin industry in which winning bids come down to pennies per mile. Fleets operating in California are faced with the Heavy-Duty Vehicle Greenhouse Gas Emissions Reduction Measure, an AB 32 "early action item" that was adopted by the Board in December 2008. That regulation mandates the phased adoption of fuel efficiency improvements, including aerodynamic devices, on tractors and trailers. The technology would meet the performance standards of the regulation without need of additional devices, and therefore represents a "low-hassle," low-cost compliance tool.

According to the California Greenhouse Gas Emission Inventory, heavy-duty trucks and buses statewide emit nearly 36 MMTCO2e per year. As a subcategory of those emissions, emissions specifically from tractor-trailers are uncertain. However, ARB's estimate of 1.2 million nonlocal "box" trailers traveling on California highways provides a reasonable basis for estimating the emissions reductions achievable by the technology. Assuming that these trailers travel 50,000 miles per year while hitched to tractors that average 6 miles per gallon; that the technology's generates fuel-efficiency gains of 6-10%; and that amount of CO2e per gallon of diesel is 22.38 pounds; then under an ideal scenario of universal adoption, the technology would reduce emissions by 6 to 10 MMTCO2e.

Reducing power consumption is likely to provide co-benefit of reducing non-GHG emissions. Researchers at the U.S. Environmental Protection Agency (U.S. EPA) have found that aerodynamic devices on tractor-trailers may cause decreases in nitrous oxide (NOx) emissions that are twice as large as the concomitant decreases in GHG emissions (Bachman et al. 2006). As the EPA researchers themselves stated, this intriguing conclusion should be tested further before serving as a basis for projected benefits of aerodynamic devices.

Applicant: Advanced Transit Dynamics, Inc.

Project Period: March, 2009 to March, 2010

Principal Investigator: Geoffrey Johnson

ICAT Funding: $ 249,194

Co-funding: $280,567

Past Experience with This Principal Investigator:

None.

Prior ICAT Funding to 2008

Year	2007	2006	2005
Funding	0	0	0

B U D G E T S U M M A R Y

Advanced Transit Dynamics, Inc.

"Fuel-Efficient Active Flow Control for Tractor-Trailers"

Direct Costs and Benefits	**ICAT**	**Total**
1. Labor	$167,804	$210,918
2. Employee Fringe Benefits	$ 47,380	$ 63,275
3. Subcontractors	$ 0	$ 0
4. Equipment	$ 0	$ 0
5. Travel and Subsistence	$ 3,410	$ 10,334
6. Materials and Supplies	$ 30,600	$ 76,500
7. Other Direct Costs	$ 0	$ 0
Total	$249,194	$361,027
Indirect Costs		
1. Overhead	$ 0	$168,734
2. Other Indirect Costs	$ 0	$ 0
Total	$ 0	$168,734
Total Project Costs	**$249,194**	**$529,761**