Volpe Center Office of Research and Technology Applications (ORTA)

FY 2013 Annual Report

December 2013

DOT-VNTSC-14-03

U.S. Department of Transportation
John A. Volpe National Transportation Systems Center

Volpe

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	December 2013	Annual Report – Fiscal Year 2013

4. TITLE AND SUBTITLE	5a. FUNDING NUMBERS
Volpe Center Office of Research and Technology Applications (ORTA) FY 2013 Annual Report	51YL29/G9001
6. AUTHOR(S)	5b. CONTRACT NUMBER
Aviva Brecher and Gary Ritter	N/A
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) John A. Volpe National Transportation Systems Center 55 Broadway Cambridge, MA 02142	8. PERFORMING ORGANIZATION REPORT NUMBER DOT-VNTSC-14-03
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) John A. Volpe National Transportation Systems Center 55 Broadway Cambridge, MA 02142	10. SPONSORING/MONITORING AGENCY REPORT NUMBER
11. SUPPLEMENTARY NOTES	
12a. DISTRIBUTION/AVAILABILITY STATEMENT This document is publically available.	12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

Technology transfer activities performed by the Volpe National Transportation Systems Center during fiscal year 2013 in fulfillment of statutory Office of Research and Technology Applications (ORTA) responsibilities are summarized in this report. During the fiscal year, efforts to share research and development findings and results reached nearly 1,500 people and organizations involved in transportation.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Technology Transfer, ORTA, State government, Local government, Research, Development, Federal Laboratories, Technical assistance, Information dissemination	10
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Unclassified Unlimited

SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1000 L shall be shown in m^3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
oz	ounces	28.35	grams	g
		TEMPERATURE (exact degrees)		
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
mL	milliliters	0.034	fluid ounces	fl oz
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
g	grams	0.035	ounces	oz
		TEMPERATURE (exact degrees)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	$candela/m^2$	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	Kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

Contents

List of Abbreviations **5**

1. Background **6**

2. Volpe ORTA Activities and Achievements **7**

2.1 Roles and Responsibilities 7

2.2 FY13 ORTA Activities and Accomplishments 8

2.2.1 Prepare application assessments for selected laboratory R & D projects which may have potential commercial applications: 9

2.2.2 Provide and disseminate information on federally owned or originated products, processes, and services having potential application to State and local governments and to private industry 9

2.2.3 Cooperate with, and assist the National Technical Information Service (NTIS), the Federal Laboratory Consortium for Technology Transfer (FLC) and other organizations which link the R&D resources of that laboratory, and the federal government as a whole to potential users in state and local government and private industry 11

2.2.4 Provide technical assistance to State and local government (SLG) officials 12

2.2.5 Participate in regional, State, and local programs designed to facilitate or stimulate the transfer of technology for the benefit of the region, State, or local jurisdiction in which the Federal laboratory is located. 12

List of Abbreviations

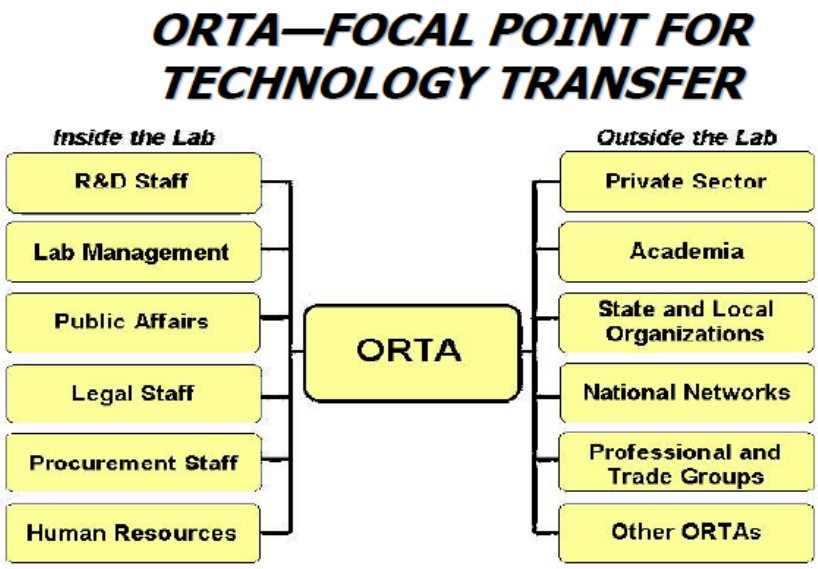
Abbreviation	Term
AEDT	Aviation Environmental Design Tool
AASHTO	American Association of State Highway and Transportation Officials
ATCA	Annual Meeting, and the Air Traffic Control Association
CRADA	Cooperative Research and Development Agreement
DOE	Department of Energy
DOT	Department of Transportation
FLC	Federal Laboratory Consortium
FLC-NE	Federal Laboratory Consortium – Northeast Region
FY	Fiscal Year
IAA	Inter-Agency Agreement
IP	Intellectual Property
IPAC	Industry Professional Advisory Council
ITS	Intelligent Transportation Systems
ITS America	Intelligent Transportation Society of America
MassDOT	Massachusetts Department of Transportation
MPO	Metropolitan Planning Organization
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institutes of Standards and Technology
NTIS	National Technical Information Service
NTL	National Transportation Library
OMB	Office of Management and Budget
ORTA	Office of Research and Technology Applications
RITA	Research and Innovative Technology Administration
R&D	Research and Development
SBA	Small Business Administration
SIPCC	State-wide ITS Planning and Coordination Committee
SLG	State and Local Government
STAMP	Systems-Theoretic Accident Model and Processes
T2	Technology Transfer
TRB	Transportation Research Board
TRIS	Transportation Research Information Services

1. Background

The 1980 Stevenson-Wydler Act, as amended (15 USC 3710) requires that federal labs with 200 or more technical staff, and/or with more than a $20M annual budget establish an Office of Research and Technology Applications (ORTA). As a federal U.S. DOT national laboratory, the Volpe must fulfill the five ORTA functional requirements defined in the Act, namely:

> (1) Prepare application assessments for selected laboratory Research and Development (R & D) projects which may have potential commercial applications;
>
> (2) Provide and disseminate information on federally owned or originated products, processes, and services having potential application to state and local governments and to private industry;
>
> (3) Cooperate with, and assist the National Technical Information Service (NTIS), the Federal Laboratory Consortium for Technology Transfer (FLC) at www.federallabs.org and other organizations which link the research and development resources of that laboratory and the federal government as a whole to potential users in state and local government and private industry;
>
> (4) Provide technical assistance to state and local government (SLG) officials; and
>
> (5) Participate, where feasible, in regional, state, and local programs designed to facilitate or to stimulate the transfer of technology for the benefit of the region, state, or local jurisdiction in which the federal laboratory is located.

The ORTA role as a focal point for technology transfer (T2) activities is depicted below:



2. Volpe ORTA Activities and Achievements

Volpe, The National Transportation Systems Center is a fee-for-service organization that does not have appropriated budget authority beyond that derived from project sponsors. Thus, Volpe has evolved a distinct approach to fulfilling the ORTA mission requirements that works in conjunction with agencies that sponsor the research conducted by Volpe—in recognition that the agency that funds the research has a primary role in determining the disposition of results.

2.1 Roles and Responsibilities

Volpe fulfills its ORTA responsibilities through a distributed, cross-organizational, approach, which overall amounts to the required minimum of 1 full-time equivalent (FTE) staff level of effort. Key contributions come from the following:

- Director of the Advanced Transportation Technologies Technical Center, Director of Strategic Initiatives for Research and Innovation, and Volpe's FLC representative and T2 liaison to the U.S. DOT Research and Innovative Technology Administration (RITA) and the modal agencies (0.4 FTE)
- Director, Communication and Knowledge Management, and staff in Volpe's technical library (0.3 FTE)
- Office of Legal Services (0.2 FTE)
- U.S. DOT SBIR program office (0.1 FTE)
- Multiple technical staff who fulfill requests from state DOTs, local and authorities, universities and professional associations, as further described below (0.1 – 0.2 FTE)

ORTA activities are conducted under the overall coordination of the Director of the Center for Advanced Transportation Technologies, and include:

- Initiatives on the part of technical staff, in consultation with their research sponsors, to identify technology transfer opportunities and work with legal staff to share project-related information and knowledge and transfer technology when appropriate, as an integral and explicit part of sponsored research.
    - ❖ Typically, Volpe research products (technical reports, software, technologies, integrated devices, test protocols) are owned by sponsoring agencies, which have the primary responsibilities for technology applications, deployment and transfer.
    - ❖ Consistent with the Stevenson-Wydler Technology Innovation Act and the Bayh-Doyle Act, intellectual property (IP) rights are assigned to contractors involved in

performing the work, subject to a non-exclusive right for federal government use.

- Contributions of Volpe legal staff in reviewing IP contract clauses and rights to technology use, and related technology transfer terms and conditions in inter-agency agreements (IAAs) and reimbursable agreements (RAs) that fund Volpe research and innovation activities, and assist, as necessary, in patent applications and IP licensing, and Cooperative Research and Development Agreements (CRADAs).

- Efforts by the Director of Communication and Knowledge Management to promote awareness of Volpe research and innovation results through the Volpe library, Volpe websites, and a monthly newsletter (http://www.volpe.dot.gov/noteworthy/index.html) that is emailed to over 5,000 subscribers, and disseminated indirectly via research organizations and trade associations to over 40,000 people worldwide.

- Activities of the U.S. DOT Small Business Innovation Research (SBIR) program office to promote widespread adoption and commercialization of SBIR research results. The U.S. DOT SBIR program is administered within the Volpe Center Technology, Innovation, and Policy Division, in association with the U.S. DOT modal operating administrations.

- Activities of the Director of Strategic Initiatives for Research and Innovation, who:
  - ❖ Provides a technical liaison to interact with the Federal Laboratory Consortium, the RITA technology transfer program manager, and other U.S. DOT modal administration technology transfer staff.
  - ❖ Conducts thought leadership and outreach activities to share knowledge with transportation stakeholders via webinars, conferences, symposia, and seminars, as part of a three-tiered technical information exchange initiative
    - Participation in the FY13 technical outreach events increased since 2011 to over 1,500 stakeholders across international, federal, state, regional, local, academia and industry sectors.

2.2 FY13 ORTA Activities and Accomplishments

ORTA activities in FY13 were funded both directly as part of sponsored research activities and by overhead funding to support the technical liaison to the FLC, participation in U.S. DOT Research Innovative and Technology Administration (RITA) accelerated tech transfer activities, U.S. DOT SBIR program administration, and annual contributions to U.S. DOT T2 reports to the Office of Management and Budget (OMB), the National Institutes of Standards and Technology (NIST), and the Small Business Administration (SBA). Highlights of Volpe activities and accomplishments in fulfillment of statutory ORTA responsibilities are outlined in the following five subsections.

2.2.1 Prepare application assessments for selected laboratory R & D projects which may have potential commercial applications:

Several Volpe projects were identified as having the potential for widespread or commercial application and/or intellectual property (IP) patenting and licensing activities. Recent examples, and related CRADA activities, that have potential for future commercial applications, include:

- SaferCar – a web-based mobile data application for consumers described at http://www.volpe.dot.gov/noteworthy/2013/safercar-app.html
- A safety hazard analysis software tool applying Systems-Theoretic Accident Model and Processes (STAMP) methods to complex, safety-critical, transportation control systems
- A multi-year CRADA with the MIT Center for Transportation and Logistics for joint R&D on human-machine interactions in various transportation system design and operations.
- A CRADA with Rockwell Collins, Inc. to analyze and quantify sensor imagery in low visibility systems, in order to promote low visibility technology applications to aviation operations.
- Ongoing refinements to the Aviation Environmental Design Tool (AEDT) that is used to model dynamic aircraft fuel consumption and emission performance—publically available at a modest cost via the Federal Aviation Administration.

In addition, several research results in FY13 have the potential for widespread impacts on transportation throughout the nation. Examples include:

- Innovative uses of highway right-of-way for renewable energy using solar and/or wind power technologies: http://www.volpe.dot.gov/news/rights-way-increasingly-being-considered-innovative-uses
- Wake turbulence research findings that allow aircraft operations to be increased significantly at congested airports: http://www.volpe.dot.gov/news/wake-turbulence-research-esoteric-field-study-pays-big-dividends

2.2.2 Provide and disseminate information on federally owned or originated products, processes, and services having potential application to State and local governments and to private industry

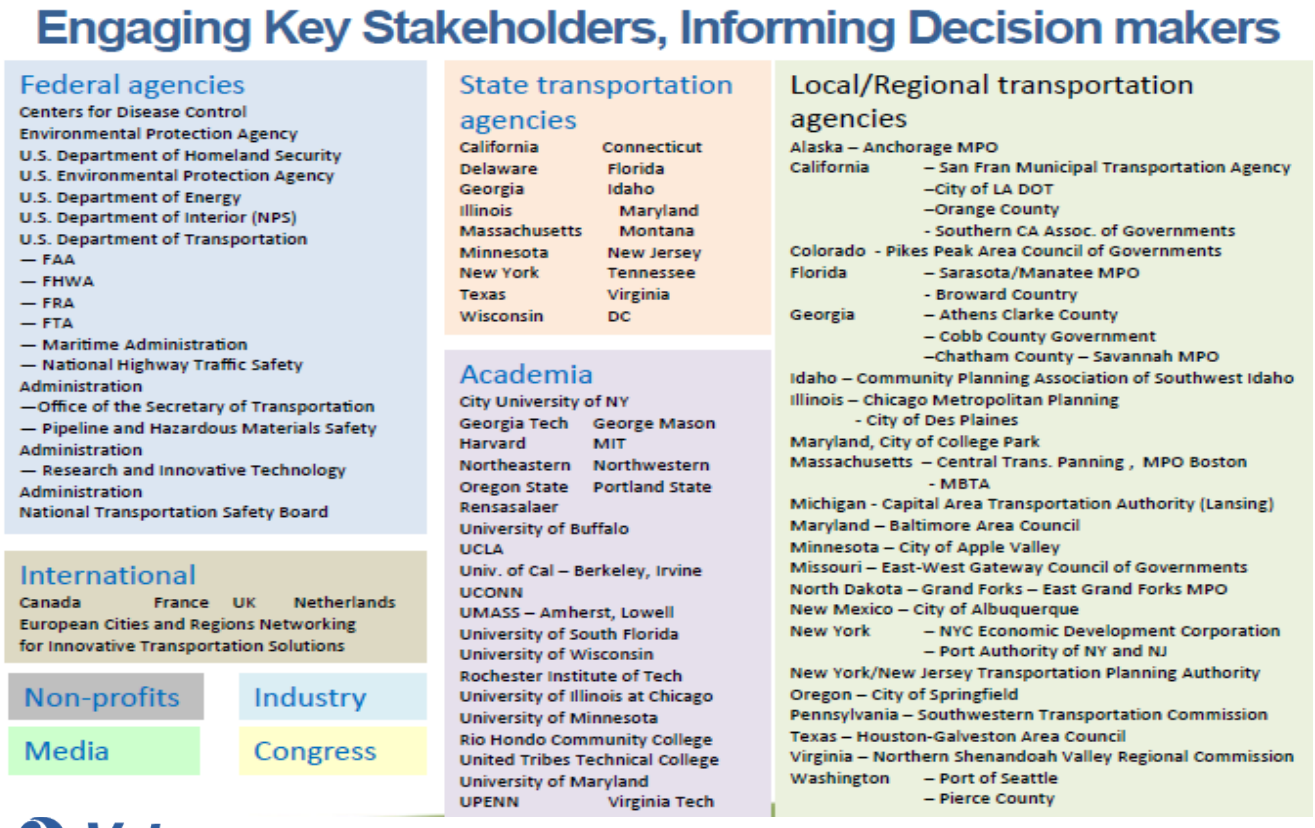
Technology transfer is accomplished through outreach and communication of Volpe Center research and technology products, and knowledge sharing with transportation stakeholders via technical publications, and conference presentations—mostly in conjunction with sponsored research activities. Volpe technical staff serve on more than fifty Transportation Research Board (TRB) committees, and chair and/or present findings at roughly a dozen or so national

and international conferences in any given year. Volpe also showcases its research activities as an exhibitor at conferences, including the TRB Annual Meeting that draws nearly 12,000 transportation professionals from around the world, the InnovTech 2013 Summit, the Intelligent Transportation Society of America (ITS America) Annual Meeting, and the Air Traffic Control Association (ATCA) annual conference that attracts over 3,000 participants from more than 40 countries. In addition the Volpe Center website includes a dedicated technology transfer web page at: http://www.volpe.dot.gov/ourwork/techtrns.html.

Broad dissemination of technical findings is assured by publication of reports on applications of advanced technologies and operational improvements, new transportation data and modeling products, and outreach to stakeholders through technical information exchange mechanisms supporting the ORTA mission, including:

- Updates and technical project work and news postings on the Volpe Center website
- Volpe news at http://www.volpe.dot.gov/noteworthy/index.html
- Descriptions of Volpe project work at http://www.volpe.dot.gov/featured-work
- Published technical reports at http://www.volpe.dot.gov/library/about-library
- Outreach to transportation stakeholders via webinars, conferences, symposia, and seminars at Volpe Events.

The reach and impact of these strategic outreach activities is illustrated below. Annually, between two and three dozen events reach some 1,500 participants in person or via webcast.



2.2.3 Cooperate with, and assist the National Technical Information Service (NTIS), the Federal Laboratory Consortium for Technology Transfer (FLC) and other organizations which link the R&D resources of that laboratory, and the federal government as a whole to potential users in state and local government and private industry

During FY13, the Volpe FLC representative attended regional and national FLC conferences, and Volpe legal staff attended technology transfer and IP legislation training events at FLC conferences. Eight Volpe multi-modal projects that resulted in successful tech transfer to states and local agencies were published in the 2013 **Federal Laboratories & State and Local Governments (SLG)** publication, available at http://www.federallabs.org/flc/store/sandlg-2013/, was disseminated in September 2013 to Congress and to state and local tech transfer officials. In addition, over a twelve stories on Volpe technology transfer successes were featured on the FLC NewsLink at http://newslink.federallabs.org/ and in the quarterly FLC-NE newsletters at http://www.flcnortheast.org/news.html. The Volpe Center lab profile in the FLC Directory also was updated, see http://www.federallabs.org/labs/profile/?id=1674.

Volpe assisted the RITA technology transfer manager by selecting and contributing Volpe T2 success stories for inclusion in the U.S. DOT annual report input to NIST, which collects and communicates to Congress and the White House / OMB annually information on how federal labs implement ORTA technology transfer requirements. In addition, Volpe participated in U.S. DOT lab webinars organized by the RITA technology transfer manager, and conducted a human factors research webinar in May for other U.S. DOT labs.

Volpe also contributed to the U.S. DOT Technology Transfer Plan developed in response to the Presidential Memorandum, *Accelerating Technology Transfer and Commercialization of Federal Research in Support of High-Growth Businesses*.

In FY13, over 60 technical reports were made available to the public through the National Transportation Library (NTL). Volpe staff produced more than 90 reports and conference papers in FY13. Volpe technical reports frequently are available through the National Technical Information Service (NTIS), as well as the Volpe Library, research sponsor websites, the National Transportation Library (NTL), and referenced in the Transportation Research Board (TRB) Transportation Research Information Services (TRIS) database of some 650,000 documents covering all transportation modes and disciplines.

Volpe technical experts also responded to requests from federal agencies in need of specialized expertise to evaluate research opportunities. These included:

- A Department of Energy (DOE) request relative to its May 2013 Merit Review and Peer Evaluation Meeting—seeking technical review and recommendations on R&D project awards related to advanced vehicle technologies for improved fuel efficiency and reduced emissions.
- A July 2013, National Institute for Occupational Safety and Health (NIOSH) request for a Volpe expert to consult with NIOSH on the effectiveness of vehicle safety technologies

as related to a new NIOSH program on evaluation of commercial vehicle active safety systems, and effects on truck driver behavior.

2.2.4 Provide technical assistance to State and local government (SLG) officials

Throughout FY13, Volpe responded to requests for information from various professional associations (ITS America, AASHTO), state DOTs, Metropolitan Planning Organizations (MPOs) and local agencies. In addition, Volpe technical staff provided specialized technical assistance to SLGs as outlined below:

- Volpe staff conducted a TRB Workshop on risk analysis and management best practices for transportation decision-making and participated in the workshop on human factors impacts on safety.
- In November 2012, Volpe staff that conducted the ***Study & Report to Congress: Applicability of Maximum Axle Weight Limitations to Over-the-Road and Public Transit Buses*** shared their knowledge and expertise with the California Transit Association during a plenary panel session entitled "Innovative Compliance: Bus Weight Limits and You – an Interactive Roundtable" that explored issues relating to California bus weight limits in light of the State's recently enacted temporary exemption as well as the need for a longer term solution.

2.2.5 Participate in regional, State, and local programs designed to facilitate or stimulate the transfer of technology for the benefit of the region, State, or local jurisdiction in which the Federal laboratory is located.

In addition to Volpe support to state DOTs and local requests as listed above, technology transfer activities included:

- Responding to a request from Mass DOT to participate in and present at the November 28-29, 2012 ITS Symposium by providing a summary overview of national efforts to advance connected transportation concepts.
- Providing expert technical advisors to the MassDOT State-wide ITS Planning and Coordination Committee (SIPCC) during the development of an ITS statewide strategic plan.
- Participating on the Civil Engineering Technology Industrial Professional Advisory Committee (IPAC) at the Wentworth Institute of Technology to provide input on trends and corresponding needs for curriculum development and/or professional capacity building initiatives.

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Volpe Report Number: DOT-VNTSC-14-03