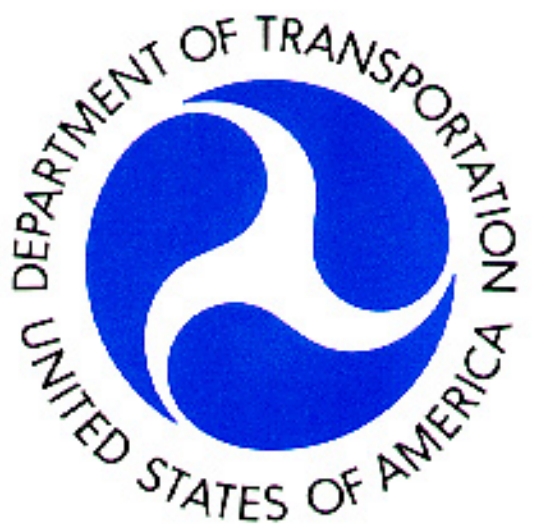
Office of Inspector General

Audit Report

Management and Oversight of University-Based Research

Department of Transportation

Report Number: MA-1999-130
Date Issued: September 24, 1999



Memorandum

U.S. Department of Transportation
Office of the Secretary of Transportation
Office of Inspector General

Subject: ACTION: Department of Transportation Management and Oversight of University-Based Research MA-1999-130

Date: September 24, 1999

From: Alexis M. Stefani
Assistant Inspector General for Auditing

Reply to Attn. of: JA-40

To: The Deputy Secretary

This report presents the results of our review of the Department of the Transportation's (DOT) management and oversight of university-based research. We conducted this review at the request of the Ranking Member, House Committee on Transportation and Infrastructure. DOT relies on universities to conduct research, education, and technology transfer needed to ensure a safe, efficient, accessible and convenient transportation system that meets vital national interests and enhances the quality of life for the American people, today and into the 21st century. In fiscal years (FY) 1996 through 1998, DOT awarded between $60 million and $70 million annually to educational institutions for university-based research, education, and technology transfer. This amounts to 7 percent of DOT's appropriations for research and development during that period.

DOT awards for university-based research vary widely in cost and scope. For example, one university received a $5,000 award to prepare cement paste specimens for studying freeze-thaw damage to concrete; another received about $500,000 to develop and present courses on the application of a newly developed welding process for construction and repair of highway bridges; and a third received nearly $20,000,000 to provide services and technical support for the Intelligent Transportation System.

The objectives of our review were to:

- Identify all direct DOT awards for university-based research in FYs 1996 through 1998, including awards pursuant to congressional direction.

- Review the effectiveness of DOT processes for awarding and monitoring university-based research and determine whether the processes differ for awards made pursuant to congressional direction.

- Identify deliverables from university-based research and determine whether they relate to DOT's strategic goals.

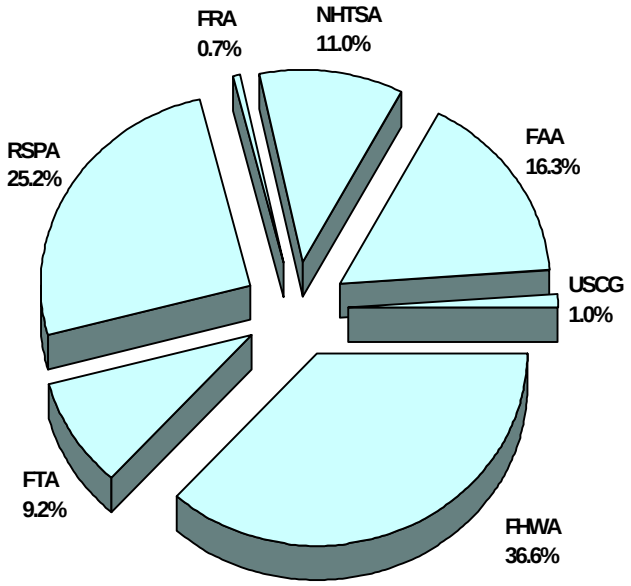
- Evaluate DOT oversight of university-based research programs, including the use of expert review to evaluate program results.

To answer the objectives we evaluated policies and procedures for awarding and monitoring university-based research and assessed whether they were applied uniformly to both congressionally directed and non-directed awards. We reviewed applicable legislation, strategic and performance plans for DOT, and strategies and plans developed by the National Science and Technology Council. We evaluated data bases kept by the Office of the Secretary and the Operating Administrations (OA), and selected a random sample of 33 awards during FYs 1996 through 1998 from 3 OAs – Federal Highway Administration (FHWA), Federal Transit Administration (FTA) and Research and Special Programs Administration (RSPA) -- for detailed review. During this period, these 33 awards had obligations totaling about $56 million. We focused on the three OAs because they accounted for 71 percent of DOT's obligations for university-based research and because they were of interest to the Ranking Member. Our audit was performed according to Government Auditing Standards prescribed by the Comptroller General of the United States. Exhibit 2 describes our Scope and Methodology for this review.

Results-in-Brief

Seven DOT Operating Administrations made 343 awards, including 24 Congressionally directed awards, directly to universities in FYs 1996 through 1998. Funding for these awards totaled $192 million for the 3-year period. The chart on the following page compares the percentage of DOT funding for university-based research for FYs 1996 through 1998 by OA.

Percentage of DOT Funds for University-Based Research by Operating Administration Fiscal Years 1996 through 1998



FHWA	Federal Highway Administration
FTA	Federal Transit Administration
RSPA	Research and Special Programs Administration
FRA	Federal Railroad Administration
NHTSA	National Highway Traffic Safety Administration
FAA	Federal Aviation Administration
USCG	United States Coast Guard

We reviewed 33 awards totaling $56 million, of which 10 awards totaling $26 million were congressionally directed. For the 23 awards that were not congressionally directed, FHWA, FTA, and RSPA followed their controls and processes for selecting recipients. For example, we found adequate justification for the recipient selected, the extent of competition, and the type of award. For the remaining 10 awards, FHWA, FTA, and RSPA did not follow all the controls and processes for selection and award because they were congressionally directed. However, the reasons for the deviations, which were based on the congressional direction and included limited or no competition, were documented in the award files. Although DOT needs to make greater use of expert review to assess the overall effectiveness of its university-based research program, program managers were actively involved in project oversight by reviewing progress reports and when necessary conducting site visits to assess progress or resolve problems. The controls and processes for monitoring university-based research projects did not differ for congressionally directed awards.

All of the university-based research awards that we reviewed in detail produced, or are expected to produce, one or more deliverables related to DOT strategic goals. These include products intended to improve safety, enhance mobility, and help the environment. For example, one university provided a report to FHWA on the visibility of road signs from vehicle headlamps. FHWA intends to use this information to promote safety legislation requiring car manufacturers to change

automobile headlamps for additional sign visibility. Another university provided a report to FTA on ways of increasing comfort and safety for bus riders. The report was provided to the designated repository for distribution.

We found however, that DOT can improve its oversight of university-based research. Specifically,

- DOT was criticized as early as 1994 by the General Accounting Office (GAO) for not having a comprehensive database to manage and coordinate university-based research. Although we were able to identify the awards for university-based research, the task was complicated and time-consuming. DOT recently initiated an effort to develop a pilot system for a DOT-wide database. However, full implementation will take several years and is contingent on the success of the pilot. Also, DOT has not yet decided which OA will administer and maintain the database.

- DOT does not have a plan that aligns its university-based research program with the strategic goals as called for in its Performance Plan for FY 1999. However, on August 26, 1999, officials from the OAs met to begin development of a DOT-wide plan. The plan is intended to increase the effectiveness of DOT's total university-based research effort. DOT expects a final plan to be completed in January 2000.

- DOT is not using experts to assess the quality and relevance of its university-based research program. Expert review is considered the most effective means available to evaluate Federally funded research, including university-based research. Peer review, a form of expert review, includes an independent assessment of the technical or scientific merit of research by peers who are scientists with knowledge and expertise equal to that of the researchers whose work they review. While DOT officials acknowledge that expert review can be useful in assessing results, plans for DOT-wide implementation of an expert review program have not been developed.

To improve its oversight of university-based research, DOT needs to develop and implement a plan for using expert review to assess the quality and relevance of university-based research. A milestone date for completing this action needs to be established and progress should be monitored to ensure completion. Further, DOT needs to complete two ongoing actions**.** These actions include (1) developing and implementing a comprehensive DOT-wide database to track university-based research and ensuring that a database administrator is appointed, and (2) completing the development of its university-based research plan as called for in the FY 1999 Performance Plan.

Findings

Identifying Awards to Universities Was Difficult Because DOT-wide Data Were Not Maintained

Data on DOT's university-based research are fragmented among, and compartmentalized within, each OA. Therefore, the process of identifying the universe of awards required extensive work and coordination with both the Office of the Secretary (OST) and each OA. Using award data maintained separately by OST and the OAs, we determined that DOT made 343 awards totaling $192 million to universities for university-based research during FYs 1996 through 1998. This included 24 awards totaling $48 million that were congressionally directed.

The lack of a comprehensive DOT database of all awards is a long-standing problem. In February 1999, DOT awarded an interagency agreement to the Department of Energy to develop a pilot system for a DOT-wide database. Full implementation of the database, if approved, will take several years. Further, a database administrator will need to be selected.

The number and value of university-based research awards we identified are shown in the following table:

AWARDS FOR UNIVERSITY-BASED RESEARCH
FISCAL YEARS 1996 – 1998
(Value in Millions)

	Total		Congressionally Directed	
Administration	Number	Value	Number	Value
FHWA	177	$70.3	8	$8.4
FTA	11	17.7	4	16.7
RSPA	25	48.4	9	21.6
FAA	62	31.2	0	0.0
FRA	5	1.4	2	0.9
NHTSA	60	21.2	1	0.2
USCG	3	1.9	0	0.0
TOTAL	343	$192.1	24	$47.8

Prior Recommendation to Develop Database Was Not Implemented

In May 1994, GAO issued a report criticizing DOT for not adequately tracking its university-based research.[1] GAO noted that the numerous systems used to track spending on university awards did not provide DOT with complete or accurate information on the number or purpose of awards. GAO recommended DOT develop a comprehensive database to track the purpose and costs associated with each university-based research award and determine how best to maintain and operate the database.

The following year, RSPA commissioned the Volpe National Transportation Systems Center's Transportation Strategic Planning and Analysis Office to conduct a one-time inventory of the Department's investment in university activities. RSPA issued the resultant report titled "An Inventory of 1995 U.S. Department of Transportation Investment in University Activities" in November 1997. This report noted that DOT organizations maintained various databases containing university information, including information that might not be reflected in headquarters data for the organizations. Further, the report noted that conflicting data on the same program often compounded the difficulty in quantifying DOT's investment in universities.

Pilot Consolidated Database to be Developed

The 1997 DOT Strategic Plan identified the need for a consolidated DOT database of research and development awards, and called for its completion in FY 1998. This milestone was not met and has not been revised. On February 12, 1999, DOT awarded a $200,000 interagency agreement to the Department of Energy for the development and delivery of an operational pilot system covering FHWA by February 12, 2000. Subsequent funding is contingent on the success of the pilot system. At best, the consolidated database will not be operational for several years.

Furthermore, RSPA's Project Manager for Systems Development advised us that DOT has not yet decided which office will administer and maintain the consolidated database. This decision is essential to ensuring the database is developed in such a way that it provides the information needed to identify DOT-wide investment in university-based research.

[1] GAO/RCED-94-175, Research Activities Need Greater Oversight, May 1994.

Operating Administrations Are Following Their Processes for Awarding and Monitoring Individual Projects

We reviewed 33 awards made for transportation research under contracts, grants, cooperative agreements, and purchase orders with universities, of which 10 were congressionally directed.

Awards Reviewed by Administration

	Award Instruments					
OA	*Grants*	*Cooperative Agreements*	*Contracts*	*Purchase Orders*	*Total Awards*	*Funding (Millions)*
FHWA	1	8	9	3	21	$29.5
FTA	1	3	0	0	4	$11.5
RSPA	8	0	0	0	8	$15.0
Total	**10**	**11**	**9**	**3**	**33**	**$56.0**

For the 23 awards that were not congressionally directed, FHWA, FTA, and RSPA followed their controls and processes for selecting recipients. We found justification for the type of award used (grant, cooperative agreement, contract, or purchase order); substantiation for sole-source awards or lack of competition, if applicable; eligibility determinations; and support for the recipient selected (e.g., technical qualifications, price). In addition, RSPA, which administers the University Transportation Center (UTC) Program, obtained and reviewed work programs and ensured that the proposed scope of each university's effort was consistent with its approved UTC theme. For the remaining 10 awards, FHWA, FTA, and RSPA did not follow all the controls and processes for selection and award because they were congressionally directed. However, the reasons for the deviations, which were based on the congressional direction and included limited or no competition, were documented in the award files.

Each of the three OAs monitored ongoing projects by obtaining periodic progress reports, and, when necessary, conducting onsite visits to assess progress or resolve problems. For example:

- The University of South Florida was awarded $60,000 to develop training courses in travel demand management techniques and conduct a series of training classes. Quarterly reports were required and submitted to the Project Manager during the first year of the project while the courses were being developed. Thereafter, a copy of the class roster, evaluation forms, and a summary of scores were substituted for the formal quarterly progress reporting. All course materials were submitted as required by the contract. The Project Manager also attended both of the class pilot presentations given by the contractor.

- The Pennsylvania State University was awarded an $83,000 project to develop design guidelines for bus interiors that will increase rider comfort, safety, and vehicle utility levels. Quarterly progress reports for the 18-month period of the project were provided to FTA. A draft report was submitted for review and the Project Manager provided comments. The final report was also reviewed and provided to a designated repository for distribution.

RSPA also actively monitored the UTC program to ensure participating universities developed and complied with annual plans. RSPA managers were involved substantively in reviewing and commenting on goals and objectives identified in annual plans. RSPA managers also required universities to revise their annual plans to better conform with UTC goals related to education, human resources, diversity, research selection and performance, and technology transfer. For example:

- The New Jersey Institute of Technology was awarded $2.5 million by RSPA for the development and operation of the Center for Transportation and Industrial Productivity under the UTC Program. RSPA was actively involved in monitoring the award. RSPA directed that the Institute's initial operations plan be revised before it was ultimately approved. From the initial award in May 1993 to the most recently completed reporting period (ended June 30, 1998), all required progress reports were submitted. In addition, RSPA conducted site visits on November 30, 1995, November 21, 1996, and April 29, 1997.

Our review of the 10 congressionally directed awards showed that the controls and processes used for monitoring university-based research were the same and were followed. We also found that congressional direction does not guarantee continued funding if a university does not comply with program requirements. For example, one university with a congressionally directed 6-year grant failed to submit an annual report of accomplishments for the first year and strategic plans for the second and third years. As a result, RSPA withheld funding until corrective action was taken.

Deliverables Were Required and Related to DOT's Strategic Goals

We concluded that the 33 awards produced, or are intended to produce, deliverables that support one or more of DOT's strategic goals. These include projects intended to improve safety, enhance mobility, and improve the environment. The following examples illustrate the kinds of deliverables derived from university-based research and their relevance to DOT's strategic goals (Exhibit 1 identifies the deliverables for all 33 awards and DOT's strategic goals.)

- Based on a congressional mandate, FHWA provided nearly $1.6 million to the University of North Carolina to study and improve pedestrian and bicycle safety. To date, 15 specific task orders had been issued to the university to analyze and review specific technical and existing program documents and develop a revised research program on pedestrian and bicycle safety. Three task orders had been completed, and the deliverables included databases, software packages, interactive CDs, and information brochures. These deliverables were disseminated through a website and directly to state and local agencies, health organizations, and international organizations interested in pedestrian and bicycle safety. Hardcopy reports on study topics such as methodologies for deriving a bicycle compatibility index of use to bicycle coordinators, traffic engineers and others that need to evaluate the capability of specific roadways to accommodate both motorist and bicyclists have been published.

- FTA provided Georgetown University $11.2 million for its program to conduct a program to develop U.S. produced fuel cell systems in transit buses. Deliverables include preliminary engineering and development of two commercially produced, fuel-cell powered, full-size transit buses. The FTA Project Manager received quarterly progress reports for the period from January 1997 through September 1998, as required by the university's contract with FTA. The first of the buses was delivered in March 1999. The bus was scheduled for emission tests and was available for demonstrations and shows.

- The University of Washington educated students, completed research, and facilitated technology transfer under RSPA's UTC theme "Operations Management and Planning." This award covered FYs 1993 through 1995, during which time the Center enrolled 85 students and published reports on at least 30 research projects related to the Center's theme. For example, one project evaluated design and implementation of a public transit system for a rural area; another developed a model for predicting future high occupancy vehicle (HOV) and facility usage. Current guidelines require UTC participants such as the University of Washington to publish their reports on a website, transmit each report electronically to DOT's Bureau of Transportation Statistics, and distribute printed copies to RSPA and other offices such as the Transportation Research Board Library. In addition to strategic goals for safety, mobility, and human and natural environment, this UTC's research can be related to the economic growth and trade goal, which is to "advance America's economic growth and competitiveness domestically and internationally through efficient and flexible transportation."

DOT Does Not Have a Plan or Expert Review Process for Overseeing its University-Based Research Program

Although DOT recognizes the need for a plan to align university-based research with its goals, it has not yet developed such a plan. Also, while expert review has been used to assess the relevance and value of selected projects, DOT has not used it to assess its entire university-based research program.

DOT is Developing a Plan for Its University-Based Research

DOT's Performance Plan for FY 1999 called for the development of a draft multi-modal university-based research and education plan. According to the RSPA's Associate Administrator for Research, Technology and Analysis, this plan will provide an opportunity to look at how the individual research initiatives of the operating administrations can be made "even more effective and synergistic."

On August 26, 1999, key officials from DOT operating administrations met to begin the development of a DOT-wide plan. The Associate Administrator advised us that participants discussed ongoing university-based research and education programs as well as ways to improve their integration and focus on the long-term research and education needs of transportation. The participants developed a rough draft outline for a multi-modal university-based research and education plan. A more refined draft outline is expected to be available for comment in October 1999, and a final plan is expected in January 2000.

Independent Studies Endorse the Use of Expert Review

Expert review is widely considered the most effective means available to evaluate federally funded research, including university-based research. Although there is no universal definition of expert review in the Federal Government,[2] the Committee on Science, Engineering, and Public Policy concluded in a 1999 study[3] that the most effective means of evaluating Federally funded research programs is expert review.

Two forms of expert review discussed by the Committee are:

Peer review can be effectively used to evaluate the quality of proposed, current and past research that has DOT-wide implications, such as the program to develop a national intelligent transportation infrastructure. The peer review process includes an independent assessment of the technical or scientific merit of research by peers who are scientists with knowledge and expertise equal to that of the researchers whose work they review. Peer review is effective for answering questions such as "How

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[2] Federal Research - Peer Review Practices at Federal Science Agencies Vary, GAO/RCED-99-99, March 1999.

[3] Evaluating Federal Research Programs - Research and the Government Performance and Results Act, Committee on Science, Engineering, and Public Policy, National Academy of Sciences, National Academy of Engineering, Institute of Medicine, 1999.

good is current research work compared with other work being conducted in the field?" Although not specifically included in our detailed review, GAO, in March 1999 reported that FAA was subjecting its proposed research projects to peer review. In addition, FAA was conducting program-level peer reviews of planned, ongoing, and completed research for their usefulness to FAA and industry.

Relevance review occurs when potential users join with experts in related fields to evaluate the relevance of research to agency goals, answering questions such as "Is the research on subjects in which new understanding could be important in fulfilling the agency's mission?" Collectively, a panel assesses the appropriateness of the direction of the research to the agency mission and its potential value to intended users.

The report concludes that research programs can be evaluated meaningfully on a regular basis, and should be described in strategic and performance plans, and evaluated in performance reports. Further, the report concludes that "expert" review is the most effective means of evaluating federally funded research programs. According to the report, expert review is helpful in answering three questions that are particularly relevant to the Government Performance and Results Act of 1993 as follows:

- What is the quality of the research program?

- Is the research program focused on the subjects most relevant to the agency mission?

- Is the research being performed at the forefront of scientific and technological knowledge?

In March 1999, GAO issued a report on its study of peer review practices at 12 Federal agencies that conduct scientific research and development, including DOT's Federal Aviation Administration. The report concluded that, while there is no uniform Federal policy for conducting peer reviews, each of the 12 agencies used peer review to varying degrees to evaluate their programs.

DOT Has Made Limited Use of Experts to Assess the Quality and Relevance of University-Based Research

The only expert reviews conducted for the 33 awards we reviewed in detail, were on the 8 UTC projects being administered by RSPA. For example, at the University of Washington, FY 1996 proposals were subjected to expert review to assist in selecting research based on technical merit, regional and national priorities, researcher capabilities and resources, and scope. Further, the draft and final research reports for

the University of Washington were being peer reviewed by another university and the results were incorporated in the final report.

As a part of the FY 1998 UTC awards, the expert review process was formalized and requires a peer review of the proposed university-based research activities at an institution and a review of any articles, publications, etc. that are being published as a part of the assisted research. RSPA intends to review these activities during upcoming site reviews at university-based research institutions.

DOT officials acknowledge that expert review can be useful in assessing the quality of research they support, the relevance of that research to their mission, and the leadership demonstrated by the research. To illustrate, FHWA is considering a proposal for using experts to review research at three levels: project, program, and organization. At the project level, FHWA peer review teams (individuals with a stake in the outcome) would answer the question "Are we doing things right?" At the program level, an independent review (individuals with little or no stake in the outcome) would answer "Are we doing the right things?" At the organizational level, the review would seek to answer the question "How well are we doing as an research organization?"

Recommendations

In order to improve DOT-wide oversight of university-based research, we recommend the Secretary of Transportation:

- Develop and implement a plan for using expert review to assess the quality and relevance of university-based research. A milestone date for completing this action needs to be established and progress should be monitored to ensure completion.

- Complete the ongoing development and ensure implementation of a comprehensive DOT-wide database for university-based research, and appoint an administer for the system.

- Complete the ongoing initiative to develop a DOT-wide plan for university-based research.

Management Comments

A draft copy of this report was provided to the Associate Administrator for Research Technology and Analysis for review and comment. He provided clarifying comments

on a number of points which have been incorporated into this report, and indicated general agreement with the findings and recommendations.

Action Required

Please provide milestone dates and proposed implementing action plans for each of the recommendations included in this report. We would appreciate receiving your reply within 15 days. We appreciate the courtesies and assistance extended to our staff during this audit. If I can answer any questions or be of further assistance, please feel free to contact me at (202) 366-1992, or Tom Howard, Deputy Assistant Inspector General for Maritime and Departmental Programs, at (202) 366-5630.

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Exhibit 1

	OA	Obligated FYs 96-98	University/Institution/ Award Number	Strategic Goal(s)	Congres-sionally Directed	Deliverables
1	FHWA	$1,551,530	University of North Carolina Award No. 92-C-00138	Safety	No[4]	Project resulted from an ISTEA mandate to study and improve pedestrian and bicycle safety. To date, 15 specific task orders have been issued to the contractor to analyze and review specific technical and existing program documents and develop a revised research program in pedestrian and bicycle safety. Three task orders have been completed, and the deliverables include data bases, software packages, interactive CDs, information brochures, and website data disseminated to state and local agencies, health organizations, and international organizations interested in pedestrian and bicycle safety. Hardcopy reports have been published on study topics such as methodologies for deriving a bicycle compatibility index, that will be of use to state and local government bicycle coordinators, traffic engineers and others that need to evaluate the capability of specific roadways to accommodate both motorist and bicyclists.
2	FHWA	$550,000	Texas A&M Research Foundation Award No. 95-C-00084	Safety	No	FHWA is developing the Interactive Highway Safety Design Model (IHSDM) to consolidate available knowledge about safety into a more useful form for highway planners and designers. IHSDM will be a suite of evaluation tools for assessing the safety impacts of geometric design decisions. It will help planners and designers maximize the safety benefits of highway projects within the constraints of cost and environment. Deliverables include a detailed technical report, up to five oral presentations of the project scope and results, analysis software development and documentation, and a database of design consistency rating methods at two test tracks in different geographic locations. The final report was completed in June 1999.
3	FHWA	$44,592	Kansas State University Award No. 94-C-00126	Safety	No	Completed in November 1998, this project tested and evaluated the visibility of road signs from vehicular headlamps. FHWA received the final report in July 1999 after the university corrected errors in the draft report. FHWA intends to use this and other information to promote legislation requiring car manufacturers to change automobile headlamps for additional sign visibility.
4	FHWA	$175,000	Texas Transportation Institute Award No. 97-C-00048	Safety	No	The university made six crash tests of Connecticut's Narrow Impact Attenuation System. Deliverables include (1) crash test data such as videocassettes, disks, and film; and (2) a final report and technical summary. FHWA is reviewing a draft copy of the final report it received in May 1999. Also, FHWA will provide the results of this project to the National Crash Analysis Center for dissemination to the public.

[4] The award to North Carolina was not Congressionally directed. However, ISTEA legislation directed a study be done on pedestrian and bicycle safety.

Exhibit 1
(continued)

	OA	Obligated FYs 96-98	University/Institution/ Award Number	Strategic Goal(s)	Congres-sionally Directed	Deliverables
5	FHWA	$99,356	University of Iowa Award No. 97-X-00011	Safety	No	The University is updating and refining the current model used to simulate the interaction of a vehicle impacting into a roadside structure, the resulting motions of the vehicle, and the subsequent failures of the structure. Deliverables include (1) a research paper to be published in a National Journal describing the research; (2) a data tape of the model being updated; and (3) conducting a three-week training class in using the model.
6	FHWA	$750,000	Drexel University Award No. 97-X-00023	Safety Mobility	Yes	Fiscal Year 1997 Congressional appropriations specified FHWA would establish an Urban Transportation Safety Systems Center in the Philadelphia metropolitan area to collect, synthesize, integrate, and disseminate the results and implementation of the state-of-practice integrated intelligent transportation systems information and management with particular emphasis on highway safety. Among other tasks, this project will (1) develop ITS design and integrated management plan; (2) design instrumentation system; (3) install bridge and weather correction technology; (4) install video camera technology; (5) link video and sensor response information; (6) conduct operational experiments; (7) conduct driver-profile studies; and (8) develop and test hypotheses. A final report is due by July 2000.
7	FHWA	$50,000	University of Cincinnati Award No. 97-X-00027	Safety	No	The University is refining the DYNA3D model for use in analyzing simulated vehicle collisions into roadside safety structures.
8	FHWA	$1,000,000	University of New Mexico – ATR Award No. 98-X-00099	Safety & Mobility	Yes	The award is to determine the viability of establishing an Intelligent Transportation System Center to evaluate the ways in which ITS products such as transponders, identification tags, transmitters, receivers, readers, can, or should, communicate with each other in practical use in order to accomplish improved efficiency and safety in commercial vehicle operation process. The study determined that it was not viable to establish a center because the industry was not sufficiently developed to use this degree of sophistication. The final report is due to be submitted in January 2000.
9	FHWA	$60,000	University of South Florida Award No. 94-C-00136	Human & Natural Environment	No	The University developed and is presenting courses to industry on telecommuting and travel demand management. Courses were based on prior research conducted by FHWA and other organizations. To date, 4 pilot and 5 of the 32 regular course presentations have been completed.

Exhibit 1
(continued)

	OA	Obligated FYs 96-98	University/Institution/ Award Number	Strategic Goal(s)	Congres-sionally Directed	Deliverables
10	FHWA	$600,000	Montana State University Award No. 93-X-00002	Safety & Mobility	No[5]	This award established one of four American Indian Tribal government technology transfer centers provided for under ISTEA. The centers provide training and assistance in transportation planning and development, recreational travel and tourism, and related economic development. FHWA funded this center through February 1999, and is currently reviewing the center's final evaluation plan. While TEA-21 extended the program, the transfer center was competitively awarded to another university.
11	FHWA	$1,778,000	Calspan/University of Buffalo Research Center Award No. 98-X-00103	Safety & Mobility	Yes	This project provides funding for the Center to establish and maintain a facility for transportation injury research as required by TEA-21. This 5-year project began in October 1998. It is intended to identify and develop innovative technologies that will reduce crash-related fatalities, injuries, and their associated costs; leading to improved procedures for responding to highway accident scenes. The project is expected to consider all areas of transportation injury prevention, mitigation, and treatment. Promising technology will be evaluated in a real-world test bed in western New York.
12	FHWA	$8,000	Brigham Young University Award No. 97-P-00109	Safety	No	The contract requires a report on static load tests on rigidly capped piles that were conducted by the University. The report was received by FHWA.
13	FHWA	$5,000	University of New Hampshire Award No. 97-P-00542	Safety Mobility	No	The university prepared twenty cement paste specimens to support FHWA studies of freeze-thaw damage to concrete. This research uses an innovative method based on neutron scattering, which requires cement paste specimens less than 1 mm thickness. Currently, a nuclear reactor facility is measuring the specimens. FHWA expects to use the results in scientific papers.
14	FHWA	$288,621	Texas Transportation Institute Award No. 98-C-00056	Safety	No	The university has conducted 9 crash tests on bridge railing and transition structures for the State of New York, under the State's Federal-aid highway apportionment. Three tests remain to be conducted. New York plans to use this research to implement acceptable design standards of bridge rails, and will provide the results to the National Crash Analysis Center for dissemination to the public.

[5] The award to Montana State was not Congressionally directed. However, ISTEA legislation directed the establishment of four technology centers around the U.S. for American Indian Tribal governments.

Exhibit 1
(continued)

	OA	Obligated FYs 96-98	University/Institution/ Award Number	Strategic Goal(s)	Congres-sionally Directed	Deliverables
15	FHWA	$19,711,823	Johns Hopkins University Award No. 95-C-00098	Safety & Mobility	No	The university is providing services and technical support for ITS programs. Project tasks cover a wide array of work. To illustrate, one task requires services in support of the design, development, and deployment of the Commercial Vehicle Information Systems and Network (CVISN) in the states of Maryland and Virginia; another covers microwave thermoreflectometry for the detection of rebar corrosion in concrete bridge structures. As of August 1999, 7 of 14 tasks are complete and closed; the remaining tasks are scheduled for completion on various dates through September 2002.
16	FHWA	$292,906	Texas Transportation Institute Award No. 97-C-00039	Safety	No	The university is conducting crash tests on roadside traffic barriers. Eight tests are complete and the results have been delivered to FHWA; the three remaining tests are planned for completion before April 2000. Deliverables include (1) crash test data such as videocassettes, disks, and film; and (2) reports documenting the events. FHWA is providing the results to state Highway Safety Offices for use in improving design standards for roadside safety structures, and to the National Crash Analysis Center for dissemination to the public.
17	FHWA	$400,000	George Washington University Award No. 95-X-00030	Safety	No	The university operates the National Crash Analysis Center (NCAC) and, therefore, was awarded this project to develop standard commercial crash codes for use in analyzing the performance and design of roadside structures. Deliverables include (1) a validation test plan; (2) status of parallel codes; (3) results of supercomputer validation; and (4) a final report. The university is now developing a final report for the project, which is scheduled for completion by October 1999. FHWA will use this information to conduct additional work at the NCAC and promote the use of computer crash simulation to the government and automobile industry.
18	FHWA	$40,228	University of Colorado at Denver Award No. 97-P-00703	Human & Natural Environment	No	EPA requires the use of oxygenated fuels to reduce emissions of air pollutants from automobile engines. With this project, the university is conducting a study on watershed modeling of gasoline oxygenates used in transportation. The objective of this research is to develop a model that links: (1) traffic flow along roadways within a regional watershed; (2) air emissions of MTBE resulting from traffic; (3) wet and dry disposition of air-borne MTBE into surface waters and soil; and (4) infiltration of MTBE into groundwater. The project is scheduled for completion by October 1999.

Exhibit 1
(continued)

	OA	Obligated FYs 96-98	University/Institution/ Award Number	Strategic Goal(s)	Congres-sionally Directed	Deliverables
19	FHWA	$458,057	Oregon Graduate Institute of Science & Technology Award No. 97-C-00030	Safety & Mobility	No	Scheduled for completion in March 2000, this project requires the university to develop and present two-day courses based on prior FHWA sponsored research in the application of a newly developed welding process. Through April 1999, the contractor had completed two pilot workshops; with 18 additional demonstrations planned around the country through project completion.
20	FHWA	$750,000	George Mason University Award No. 98-X-00100	Safety Mobility	Yes	Project calls for the university to establish and operate an ITS Policy, Operations, and Systems Research Center. Tasks required by the contract (1) continuing work on the development of an approach to forecasting the state of ITS in Virginia in the year 2020; (2) continuing the development of transportation/land use planning models; and (3) developing a program to analyze how other states are promoting the diffusion and implementation of ITS technologies. At the conclusion of the project, a report will be required detailing the University's findings. The project is schedule for completion by October 1999.
21	FHWA	$891,000	New Jersey Institute of Technology Award No. 98-X-00104	Human and Natural Environment	Yes	This 6-year project is scheduled for completion in October 2004. The university is developing and deploying the Transportation Economic and Land Use System (TELUS) for about 340 metropolitan planning organizations throughout the United States. TELUS provides detailed and easily accessible information on transportation projects in the region as well as their interrelationships and impacts, and is expected to enable public sector agencies to more effectively meet organizational, TEA-21, state, and other mandates. Deliverables include: (1) a comprehensive computer system that can be used by any region in the United States; (2) detailed documentation and a training course on the system; (3) implementation of an automated Transportation Improvement Program (TIP) in geographically different portions of the United States; (4) enhanced and consistent approaches for assessing the regional economic impact, land use, and freight impacts of transportation projects; and (5) consolidating TIPs from all states and MPOs throughout the United States.
22	FTA	$0[6]	Pennsylvania State University Award No. PA-26-0005	Safety Mobility	No[7]	Research is to develop design guidelines for bus interiors that would increase rider comfort, safety, and vehicle utility levels by specifying the requirements that will allow a rider to maintain a maximum sense of balance and spatial orientation. FTA received an executive summary and a final report on bus design guidelines as required by the contract.

[6] $83,000 obligated prior to FY 96-98.

[7] The award to Penn State University was not Congressionally directed. However, ISTEA legislation directed a program be established to develop design guidelines for bus interiors.

Exhibit 1
(continued)

	OA	Obligated FYs 96-98	University/Institution/ Award Number	Strategic Goal(s)	Congres-sionally Directed	Deliverables
23	FTA	$11,232,000	Georgetown University Award No. DC-26-7002	Economic Growth & Trade Human & Natural Environment	Yes	The university is conducting a program to develop U.S. produced fuel cell systems in transit buses. This award funds preliminary engineering and development for domestic, commercial production of fuel cell powered, full sized transit buses. The first of two fuel cell buses has been delivered. The bus was scheduled for emission tests and will be available for demonstrations and shows. The university received $3.6 million for Fiscal Year 1999 to support ongoing development of fuel-cell technology.
24	FTA	$144,000	Texas Southern University Award No. TX-26-7004	Mobility	No	This project was designed to provide mobility and accessibility to individuals living in the inner City of Houston, Texas; particularly transit dependent groups such as the physically disabled, low income, and elderly. Further, the project was intended to link public transit and the community; provide strategies to provide mass transit for central-city residents; and provide for continuation of a vanpool project for low to moderate income groups. Although the university pursued several alternatives, none of the options for continuing vanpool service after this project ended in August 1998 was viable.
25	FTA	$200,000	Bridgewater State Award No. MA-26-7020	Mobility	No	The university completed the acquisition, input, and verification of attribute and location data for the fixed bus route and fixed guideway databases of the National Transit Geographic Information System. This system allows operators to track buses and other transit vehicles. The databases are available on the internet.

Exhibit 1
(continued)

	OA	Obligated FYs 96-98	University/Institution/ Award Number	Strategic Goal(s)	Congres-sionally Directed	Deliverables
26	RSPA	$0[8]	University of Washington Award No. 92-G-0010	The UTC Program[9] covers all the Strategic Goals: Safety & Mobility Economic Growth & Trade Human & Natural Environment National Security	No	These awards were made under DOT's University Transportation Center (UTC) Program. The mission of the UTC program is to advance U.S. technology and expertise in the many disciplines comprising transportation through the mechanisms of education, research, and technology transfer at university-based centers of excellence. Each UTC specializes in a theme to support local and national transportation issues. For example, the University of Washington was provided a grant under the theme of "Operations Management and Planning" for Fiscal Years 1993-1995. During a June 1999 site visit, we confirmed the Center enrolled 16 students during the 92/93 school year, 31 in 93/94, and 38 in 94/95. Also, the Center conducted and published reports on at least 30 research projects related to its theme. To disseminate research, participants in the UTC program publish their reports on a website; transmit each report electronically to the Bureau of Transportation statistics, and distribute printed copies to RSPA and other offices such as the Transportation Research Board Library. In another example, Iowa State University was provided a grant under the theme "Intelligent Transportation Systems and Geographic Information Systems" for Fiscal Years 1993-1995. We reviewed documents obtained directly from the university indicating the Center supported 163 graduate students and 58 undergraduate students. In addition, the Center conducted and published reports on at least 22 research projects related to its theme. Based on our review of RSPA program files for the six remaining UTCs, we concluded the Center's operated consistent with their theme and UTC's mission.
27	RSPA	$0[10]	Iowa State University Award No. 92-G-0007		No	
28	RSPA	$1,359,576	University of South Florida Award No. 93-G-0019		Yes	
29	RSPA	$497,000	San Jose State University Award No. 93-G-0015		Yes	
30	RSPA	$2,500,000	New Jersey Institute of Technology Award No. 95-G-0011		Yes	
31	RSPA	$5,593,729	Northwestern University Award No. 95-G-0014		Yes	
32	RSPA	$2,500,000	University of California Award No. 95-G-0009		No	
33	RSPA	$2,500,000	City University of New York Award No. 95-G-0002		No	
	Total	$56,030,418				

[8] $2,973,756 obligated prior to FYs 1996-1998.

[9] Samples 28-31 were awarded under the University Research Institutes (URI) Program, predecessor to the UTC Program. The URI program was similar to the UTC program, but provided a greater focus on research, rather than education and required a lower contribution from the university.

[10] $3,000,000 obligated prior to FYs 1996-1998.

Scope and Methodology

In December 1998, the Ranking Member, House Committee on Transportation and Infrastructure, expressed concern about Department of Transportation (DOT) management and oversight of university-based research and development. He was particularly interested in awards made to universities by the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), and the Research and Special Programs Administration (RSPA). The 3 administrations covered by our review accounted for 213 (62 percent) of the total awards and $136.4 million (71 percent) of the total obligations.

We worked with the Office of the Secretary and each of DOT's operating administrations to profile awards made directly to universities for transportation research during FYs 1996 through 1998. We selected 30 of the 213 awards for review randomly. To more thoroughly cover closed awards, we supplemented our sample with three awards closed during the 3-year period, but funded in prior years. During FYs 1996 through 1998, obligations for the 33 awards totaled $56 million. Ten of the 33 awards were Congressionally directed.

We examined files maintained by project and contract managers for the 33 awards. During this review, we assessed whether managers and contracting officials: established timeframes and deliverables for university-based research projects; monitored the projects through mechanisms such as progress reports and site visits; and determined whether deliverables met project goals and provided useful information for DOT research programs. Although did not use experts to evaluate the quality of research performed by universities, we compared research topics and deliverables with goals identified in DOT's Strategic Plan to determine if funded research supported these goals. Further, we did not evaluate the propriety of costs claimed by universities.

We reviewed DOT processes established for planning, coordinating, and evaluating research. Also, we reviewed legislation for Congressionally directed awards; Office of Management and Budget circulars governing the oversight of awards to universities by Federal agencies; and an array of other documents and publications influencing transportation research. To illustrate, we reviewed DOT's (i) Strategic Plan for 1997-2002, (ii) Performance Plan for Fiscal Year 2000, and (iii) Research and Development Plan. We also reviewed the National Science and Technology Council's (i) Transportation Science and Technology Strategy, (ii) Transportation Technology Plan, and (iii) Transportation Strategic Research Plan. Further, we reviewed Transportation Equity Act for the 21st Century (TEA-21) requirements for surface transportation research strategic planning and university transportation research.

Scope and Methodology

We discussed individual awards with project and contract managers. Also, we discussed DOT research with officials such as RSPA's Associate Administrator for Research, Technology, and Analysis and FHWA's Director of Resource Management. Finally, we visited 2 universities - Northwestern University and the University of Washington - having awards covered by our review.

Our audit was performed according to Generally Accepted Auditing Standards prescribed by the Comptroller General and our field work was conducted during the period from October 1998 through March 1999. Data pertaining to the receipt of deliverables required under the terms of the awards was expanded and updated in June through August 1999.

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