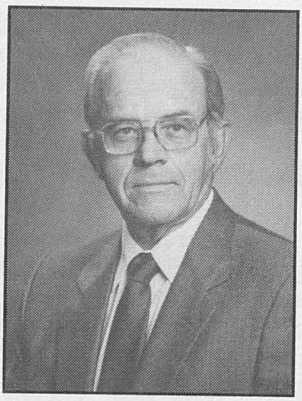

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GENERAL SESSION
Friday, September 6, 1991

Dr. Charley V. Wootan, Director
Texas Transportation Institute

# UNIVERSITY TRANSPORTATION CENTERS: PARTNERS FOR THE '90S

## *Introduction*

Good morning. It is a real pleasure for me to be with you this morning and to be a part of this 28th Forum. It not only gives me a chance to visit one of our nation's most beautiful states, but also lets me talk about something that I truly support—the University-based transportation research center.

I am a director of such an agency at Texas A&M University—the Texas Transportation Institute. Since most of us know more about our own operation than anyone else's I'll tell you about TTI and cite our experience when discussing the roles of transportation centers.

For those of you familiar with TTI, we are one of the oldest university-based transportation research centers in the United States. In fact, we are celebrating our 40th birthday this year. Many of our current practices and relationships have developed over these past four decades. They've evolved in response to a set of sociopolitical conventions and state government practices that are probably unique to Texas. Let me emphasize that I'm not proposing our operation as a model that anyone else should follow; rather, TTI is an example of one way that a state transportation agency and a university have organized to maximize their resources

to the great benefit of both. Before I tell you about this research partnership, let me start by describing the state of transportation research in this country, how it is funded, and how and why a partnership between a state DOT and university-based research center works.

### *Transportation Research Funding*

Research in general, and transportation research specifically, is grossly underfunded in the United States. Total public funding for highway transportation research amounts to only 0.2 of one percent of our combined highway budgets compared to an average two percent investment rate by other industrialized countries. For a segment of the economy, that generates in excess of 20 percent of this nation's gross national product, to reinvest less than 0.2 of one percent of its expenditures in research and development is economic and technologic starvation.

Our private sector is aware of the relationship between innovation and research. Our low-tech industries, such as those in building materials, spend about 2.5 percent of their gross sales on research. Medium-tech firms, such as those producing automobiles and appliances, spend about four percent, while high-tech firms that make products like semiconductors, computers, and drugs spend six percent or more. Private industry ***is*** making the investment. We haven't learned that yet in the public sector and, in my opinion, that's the primary reason we are falling so far behind in the maintenance and preservation of our whole physical infrastructure. We are using old technology to address current prcblems. We need to develop new transportation technology through publicly funded research. Currently, the federal government funds most of the transportation research in the United States. At the federal level, practically all transportation research is conducted through one of the modal agencies of the Department of Transportation. Some are contracted directly by the Federal Highway Administration (FHWA) or Urban Mass Transit Administration (UMTA) from administrative funds. However, most of the federal support for research comes from the programs utilizing the Highway and Transit Trust Funds. Special programs such as the Strategic Highway Research Program (SHRP) and the University Transportation Centers Program, are funded directly from the trust funds, but administered centrally in Washington.

The largest single source of research funding comes from the Highway Planning and Research (HPR) Program. In this program, from each state's allotment from the Highway Trust Fund, one and one-half percent, amounting in the aggregate to over $200 million, must be spent on research or planning. Many states use all their allocated funds for planning purposes. Some states like Texas, dedicate theirs for research.

### *Research in Texas*

The Texas State Department of Highways and Public Transportation, which on Monday of this week became TxDOT, has a long history of supporting research. Not only, as I mentioned, do they use all their HP & R funds for research, they add to these funds with state dollars directed at solving local transportation problems.

Our more than 40-year relationship with the Department started on an informal basis when they first contracted with individual faculty at Texas A&M. Several years later, in 1950, the TAMUS Board of Regents created the Texas Transportation Institute specifically to focus and administer the University's transportation research effort. Our relationship with the Department was soon formalized in 1951 through the creation of the Cooperative Research Program.

### *The Cooperative Research Program*

The Cooperative Research Program is a joint effort—jointly planned and jointly supported. We work through four research area committees, made up of select members of the Department's technical personnel. Each committee meets twice a year—once to review research progress in each functional area and a second time to develop the content of next year's research program. TTI researchers, along with their Department advisors, develop problem statements based on their area of expertise and assessment of the state's needs. These are submitted and reviewed by the respective area committees. Selections are made and researchers are invited to submit full proposals. The proposals are then ranked for funding based on merit and potential return. The budget is approved, the contracts are awarded and the work begins. Today our share of the Department's research program totals about $13 million, including $6.5 million contracted through the Cooperative Research Program and another $6.5 million in matching interagency research agreements with the Department's districts and divisions.

### *Texas Transportation Institute*

As I described, we develop this program together, each of us contributing toward a research partnership that serves us both. Being a state agency and, at the same time, part of the Texas A&M University system gives us flexibility that is beneficial to the University, the Highway Department, and especially the state of Texas.

As our financial contribution to this cooperative arrangement, we forgive nearly 84 percent of our federally audited 43-percent indirect cost rate on HP&R research. This allows the Highway Department to buy more research for its dollar. We can do this for several reasons. First,

because we contract for nearly two-thirds of the Department's research budget, we receive a significant amount of dollars, if not a significant percent of indirect costs. As a state agency, we also receive a small general revenue appropriation from the Texas legislature that helps to offset the loss of these overhead dollars. Third, since we are both state agencies, TTI can contract directly with SDHPT. This is a distinct advantage because we can retain all of the overhead instead of sharing one third of it with the Texas A&M Research Foundation as we do on federal and private contracts.

As its part, the Highway Department pledges TTI (through a gentleman's agreement) a stable level of funding from year to year. This provides program continuity, which is absolutely essential to both the Institute and the Department.

Through this cooperative arrangement, the Department has access to expert faculty and graduate students to perform its research. That access is at a fraction of the cost that it would take to recruit, house, and maintain a professional in-house research staff. But like an in-house staff, there is continuity over time as the same Department personnel and researchers are involved in the program year after year. Also the Department enjoys greater flexibility as its research needs change, because TTI draws upon the University's many disciplines to form individual research teams.

The University benefits from this relationship too. Through the Institute, faculty apply their knowledge to help solve transportation problems. Currently there are 52 university faculty who hold joint appointments with our institute. By this, I mean that we pay part of their annual salary from TTI funds. They transfer their research findings through reports, papers, presentation, and teaching. This professional involvement keeps the academic transportation program up-to-date with the latest technology developments.

Many of their students also are directly involved in the research program. We currently have 148 graduate students and 126 undergraduates employed on our research projects. These students get hands-on experience that provides relevance to what they study in the classroom. Encouraged through early exposure, some go on for terminal degrees and continue in academic teaching and research. Others become interested in the profession and enter the practicing side of transportation. The Department has early access to these graduates and therefore a clear recruiting advantage.

Because there are funded research opportunities, the University can recruit and support two to three times the number of high-quality faculty and graduate students than would otherwise be possible. With a bigger faculty, the University can offer transportation students a larger number

of specialized and challenging courses. Also, with more personnel, the University can develop short courses and tailor an advanced continuing education curricula for the Department.

### *Benefits of the Cooperative Research Program*

As you can see, the Department and the A&M both benefit greatly from this arrangement. The Department secures a low-cost source of research support to guide it in solving complex policy and technical problems. They also have access to well-trained transportation professionals to staff their organization, as well as continuing education opportunities to keep their existing personnel up-to-date with rapidly changing technologies. TTI and the University, on the other hand, have a stable base of funding that enables them to recruit top faculty and students, upgrade research facilities, and strengthen the academic and transportation research programs. But even more than the benefits derived by the partners in this unique relationship, the citizens of Texas realize the greatest gains. They have at their disposal one of the finest and safest highway systems in the world, built at one of the lowest costs per mile.

For every ***general revenue*** dollar we received from the legislature last year, we contracted $8.80 of sponsored research. The Department estimated that for every dollar they invested in research, they realized an average $22 return in measurable benefits. If you use the Department's own value of research figures, that translates to nearly $200 worth of benefits per dollar of public investment. Not bad when you consider that industry averages only a 10-percent return on plant and equipment.

In addition to these tangible benefits, Texans realize direct economic impact because TTI leverages the state's investment by attracting additional non-state research dollars to Texas. We also stimulate the states economy by aiding the private sector in the commercialization process of many of our research findings.

So this partnership works well for the state of Texas. We achieve synergy by pooling and leveraging our public resources. And this increased efficiency is important because as I described earlier, research is severely underfunded to begin with.

### *A Case for Increased Research Funding*

Recently I heard budget testimony before the U.S. Congress on the need for increased research funding. I thought the speaker, Director of the President's Office of Science and Technology Policy, Dr. Allan Bromley, stated a strong case for supporting research and development.

He offered several compelling reasons why research was essential to our national agenda.

First, he talked about investing for the long-term. Funded research, he said, would pay off in the future and conversely, the lack of research investment now would jeopardize the future. Second, he pointed out that research met basic national needs: economic, military, and social. And, he concluded that research, or inquiry in its simplest form, was the nature of man, the driving force behind innovation and the essence of a progressive society.

In his congressional testimony, Dr. Bromley emphasized the Administration's position that the United States has grossly underinvested in research despite the fact that research has historically provided strong returns. Economists estimate that almost half of all the post depression economic growth was due to "new knowledge" obtained through research. Further, they estimate rates of return from all R&D expenditures, basic and applied, at between 20 and 200 percent. These high returns build a strong case for continued research investment for two reasons. First, in strict terms of return on investment, research far outperformed the market. In addition, these high returns suggest we have only just "skimmed the surface" and we should continue to fund research to the point that competing investment opportunities offer comparable or better returns.

In addition to fostering economic growth, research improves our quality of life, not only by enhancing and protecting our physical existence but by feeding our natural quest for knowledge. That drive for innovation supported by excellence in education has fueled the growth of this country since its inception and holds the key to regaining our national competitiveness in the future.

The National Governor's Association recently released a report from its Task Force on Research and Technology, entitled "America in Transition." This report documented the decline in the United State's international competitiveness in high technology goods. It also assessed the role of our weakened national commitment to research and development in that decline.

They found that the U.S. share of the world market in high technology goods has dropped dramatically from more than a $27-billion surplus in 1980 to a deficit in 1986. There are a number of factors creating our current trade deficits. Compared to other industrialized nations, our government is spending less on research in general and a disproportionate amount of what it does spend is on classified defense R&D, leaving even less for the civilian sector. Most of the research in this country is conducted at universities, so with smaller budgets for basic and applied non-defense research, less commercialization occurred. As a

consequence, between 1985 and 1987, the share of U.S. patents granted to foreign companies rose from 35 percent to 46 percent. (General Electric, which had been the leading recipient of U.S. patents for each of the past 25 years, slipped to number four, surpassed by Canon, Hitachi, and Toshiba.) The report made clear that the United States must expand its research and development efforts and stimulate the commercialization of new technological developments if we are to remain a major player in international markets.

The Administration is supporting a renewed commitment to research, including transportation research, in this year's budget. Through the re-authorization of the 1992 Surface Transportation Act, a significant increase in highway planning and research has been requested along with increased or continued funding for existing programs such as the University Centers Program. Also, creation and funding for new innovative programs such as the Intelligent Vehicle Highway System program are included in the proposed Act. Both the Senate and House have reported out their versions of the new Act and I'm sure Dr. Ruane can give you a much clearer update on where that stands than I can, but both have included sizable commitments to IVHS.

### *Research Partnership for the Future*

*IVHS America*, the Intelligent Vehicle Highway System interest group, has followed the team model. Government, universities, and private industry have formed a consortium to develop, implement, and deliver a transportation system for the future. And this will be the model for other emerging transportation technologies such as magnetic levitation. Dr. Bromley publicly supports this partnership approach to conducting research. He suggests the most effective way for the government (federal and state) to support applied research and development is through collaborative cost-shared efforts with universities and private industry. Together, he says, *"These organizational arrangements are designed to foster a new, more results-oriented approach to technology development. They have the effect of building technology transfer into the process from the outset rather than attempting to weld it on at the tail end."*

Research partnerships are results-oriented because they combine strengths, share resources, solve problems from different perspectives, and guide the process from inception to implementation. Partnerships between state transportation agencies and universities work for these same reasons. Because they work toward the common goals of providing a high-quality transportation system at a reasonable cost and a strong higher education system and stimulate the state's economy through technology transfer, public partnerships between state DOT's and university-based research programs are a model that must be exploited more completely in the future.