## Luncheon Speech

## APTS and Transit in the San Francisco Bay Area



Frank J. Wilson General Manager, San Francisco Bay Area Rapid Transit District

It is a pleasure to have the opportunity to participate in this conference. I would like to thank the Co-Chairs, Bill Loudon and Patricia McLaughlin, and all the members of the Program Steering Committee for inviting me and for the excellent job they did in organizing the conference. I also want to offer special accolades to Bob Reilly of the Transportation Research Board and Brian Clymer of the Federal Transit Administration for their deep commitments to the research and development effort in our industry. Their leadership and inspiration is critical to the success of our efforts.

I am pleased to welcome all of you to the Bay Area. Some say we have our faults, but in my book, the West Coast does not leave much to be desired. I intend to keep my remarks relatively short so that you can wrap up lunch early, and get out into the San Francisco sun and support our local economy. For every dollar you spend, one-half cent of the sales tax goes to the Bay Area Rapid Transit District (BART); so I encourage you to support public transit by buying something.

You may ask what is wrong with the transit industry today. I would suggest that transit faces the same problem as other parts of American industry. The major problem in all areas is that research has been dormant. Not enough resources are currently being focused on research and development activities.

I recently read an article by a respected business leader, Stephen Wolfe, the Chairman of United Airlines. His assessment is that the American economy is stressed due to unemployment, government deficits, wavering consumer confidence, a deteriorating infrastructure, stifling regulations, and global competition.

Currently, America spends some 1.9 percent of its gross national product (GNP) on commercial R&D. In comparison, Germany, Japan, and much of the European Community spends approximately 3 percent of their GNP on R&D. This provides a critical bellwether on the economic health and stability of our country. According to Business Week magazine, the return on R&D investment is tremendous, running as high as 60 percent a year in the U.S., including indirect benefits to the economy. Only spending 1.9 percent of our GNP for non-defense-related R&D does not provide much of a return. What must happen to get us back on a fast economic track in the 1990s? I think we must target key areas such as R&D, public infrastructure investment, technical assistance, exports, taxes, health care, and education.

Stephen Wolfe also suggests that global competitive advantages in the 1990s will depend more on knowledge and information than on industrial base and natural resources. This will require greater investment and long-term commitment to R&D. This could be considered pretty radical stuff for an American business leader trained to seek short-term sizzle and tormented by stockholders to push the stock price at any and all cost.

I thought Mr. Wolfe might represent a minority opinion on the importance of R&D in industry today, so I continued my search for corroborating or conflicting opinions in the general business arena. To my surprise, I found a raging debate being conducted in the pages of the *Harvard Business Review* on this topic.

For example, the March/April issue focused on the need for a technology policy in America. The May/June issue included an impressive lineup of experts from diverse parts of the business world who examined the appropriate track for America's technology policy. The debate was not over, however. The July/August issue included a provocative discussion of a more enlightened way to carry out research in all industries.

This new approach, called technology fusion, is characterized by cross-industry research directed at solving problems, not just developing hardware. This approach is expected to create whole new products, services, and industries. It should also shorten the commercialization cycle and get solutions to the market quicker. Unfortunately, we do not have the time this afternoon to explore the basic arguments and the subtle theories that dance around the core findings. However, I strongly urge you to take the time to read these articles. As professionals in the R&D business, I think you will find the dialogue fascinating.

I do, however, want to summarize in a general way the essential items covered in the *Harvard Business Review* commentary. First, the new approach represents a shift from single industry research to cross-industry R&D activities. Thus, technology fusion will result in new products and new industries. Second, focus is being redirected from new technology break-through products to a more efficient R&D process. The importance of commercialization of

R&D programs is also being stressed, with rapid delivery of technology advances to the market.

The new approach also stresses the need to understand and support expanded information technologies and data sharing across industries and political boundaries. This will include public/private partnerships that function over the long-term, foster collaboration among companies and between industries, and embrace governmental and university research facilities. Government support for the establishment of open technology platforms that aid private industries in development of specific products will also be needed. Further, removing institutional, regulatory, and tax disincentives to private industry will help advance R&D programs.

The transit industry reflects many of the problems I described earlier related to American industry in general. I think the transit industry is stressed right now. Part of this stress relates to the pressures being placed on transit to meet national objectives related to clean air, alternative fuels, the Americans with Disabilities Act, and service equity. At the same time we are trying to meet these objectives, we are faced with the inability to adequately maintain an infrastructure, the evaporation of funding levels, pressures to hold down fares, an anemic supply market, and a dwindling talent pool. Thus, we are concerned not only with long-term growth, but also with long-term survival.

I think R&D can help us to balance the score in the transit industry. A brief review of the development of the transit R&D policy and program back to the 1970s helps to indicate the important role R&D can play in our industry. An excellent report, Special Report 213 — Research for Public Transit: New Directions, prepared by TRB with assistance from UMTA and transit operators, outlines the importance of R&D. Once again, I recommend this as mandatory reading if you are a serious student of the subject of R&D in transit. This document extends the investigation of the changing tides and fortunes of the federally-sponsored R&D program over the last 20 years. The parallels be-

tween what happened in the broader economy and transit over this time are remarkable.

At least four different periods can be identified in the evolution of the federal R&D program. First, the period from 1962 to 1969 stressed large systems planning studies. This was followed by the development of large-scale new technologies from 1970 to 1974. Then, from 1975 to 1979, the emphasis changed to improvements of existing technology. Finally, from 1980 to the present, the focus has been on the support of public transit as a business and taking a problem-solving approach. I am sure many of you remember the major emphasis on technologies in the early days of the R&D program. These included the Morgantown Personal Rapid Transit System, the Advanced Concept Train, the Urban Tracked Air-Cushion Vehicle, dial-aride systems, the state-of-the-art car, and Transbus.

Like the general industry preoccupation with new technological breakthroughs, we spent considerable time and money chasing our rainbows. This period was followed by a growing disenchantment and disillusionment among transit operators regarding the relevance and merit of R&D investments. There did not appear to be any real-world, short-term benefits for the front-line warriors from these efforts. As a result of complaints, UMTA went through years of changing policies and redirection. At the same time, funding levels started to fluctuate wildly, mostly in a downward direction.

George Pastor, UMTA Associate Administrator for Technology Development & Deployment at the time, defended his program against criticism by pointing out the changing priorities of various administrators and industry leaders, the loss of American technological leadership, a national tendency toward excessive self-criticism, and congressional insistence that UMTA use spare capacity in the aerospace and defense industry. His assessment was not far from the mark, as each of those influences has provided instability over the long run.

The transit industry's dissatisfaction with R&D grew from the lack of the transition of demonstrated results in the use of new technologies to daily operations, and the growing costs, shrinking revenue base, loss of productivity, and growing regulatory demands being placed on operators. Given other pressing concerns, R&D efforts took a low priority. As the Harvard Business Review articles indicate, R&D is considered a key to long-term economic stability and competitiveness. However, spending on R&D is currently at inadequate levels. In addition, the excessive time it takes to commercialize technological advances further adds to the problem. Both government policy and business users are out of sync regarding R&D strategy, methods, priorities, and objectives. We need to improve our information base, our approach to information dissemination and data sharing, and provide greater reliance on technology transfer and inter-industry coordination.

Currently, there is renewed interest in R&D initiatives in the transit industry. These initiatives are supported by the Intermodal Surface Transportation Efficiency Act (ISTEA). Further, FTA is taking the lead to reposition itself and the industry regarding R&D activities. The ISTEA provides the potential for growth in federal R&D funding. It includes a 3 percent takedown on authorized or appropriated funding levels, which results in some \$924 million over six years. At the national level, R&D funding has changed from an average of \$25 million a year in the early 1980s, to \$13 million a year in late 1980s, to \$45 million a year in the 1990s. The total resources available for R&D in the 1980s averaged about \$50 million a year, compared to \$150 million a year included in the ISTEA. This is essentially a change from a 1percent to a 3-percent set-aside.

The framework for decisions on the R&D program definition, elements, and funding allocation is also improving. Instead of making policy and funding decisions in a vacuum, FTA is integrating government, the R&D community, suppliers, and transit agencies in this process. This is an obvious attempt to bring R&D to bear where it is needed most in the business environment to solve near-term problems. As a result, the policy and program is becoming more relevant to end-users.

At the same time, funding levels are increasing. Establishing public/private partnerships is critical to the long-term program. These relationships are being cemented. We are also migrating to information sharing, technology transfer, and rapid commercialization, rather than just a fixation on new technology breakthroughs. Finally, the integration of technology developments from multiple industries is becoming commonplace. This technology fusion is coming into vogue.

I have highlighted the current state of the American industry in broad terms and the past and present trends in the transit industry. Now I would like to identify what I think a transit property can offer the R&D campaign. BART has made a commitment to its version of R&D. This effort is focused on near-term results, low investments, high-return projects, cultivating partnerships with the private sector, actively participating in TRB and FTA programs, and investing our own resources. BART is the only transit property I know of with an R&D department. It is a modest, but growing effort. Currently we have three people and a budget of some \$700,000 in the R&D program.

I would like to highlight a few of the projects on the BART Research Agenda. Research is currently underway on superconducting magnetic energy storage. This effort, which focuses in boosting voltage from one DC power grid, is being conducted in conjunction with PG&E and Superconductivity, Inc. A neural networks study is also being conducted. This focuses on developing a computing system that uses imperfect information to teach itself to diagnose printed circuit board failures and more quickly troubleshoot a solution. This reduces maintenance time and makes more equipment available through the use of artificial intelligence. We are also exploring advanced automatic train control systems. This involves moving-block train control systems using technologies from the defense industry and offers the potential for significant cost and time savings. The electric vehicle applied research project is a demonstration with EPRI and PG&E to field test electric-powered automobiles and test recharge technologies at rail stations. Finally, Calstart, which some of you may have heard of, is a consortium to commercialize a California-made electric car for rail station access.

I think the Calstart project represents the prototypical R&D enterprise of the future. It is comprised of representatives from the defense industry, the automotive industry, public transit systems, and universities. The Calstart objective is to reposition R&D know-how from the defense and automotive industries to the domestic front to solve urban mobility problems, create jobs, advance export potential, and achieve environmental objectives. All of these groups are assisting with funding for Calstart. BART's objective is to oversee the potential commercialization of a multi-use electric car to access rail stations. We are also interested in changing basic travel behavior of consumers in a niche market.

Sometimes in spite of our sophistication we still practice the accidental discovery of R&D possibilities. While some may call this serendipity, I think it is more often just luck. A current project at BART provides a perfect example of this. BART was moving ahead with a \$37 million new communication system. At the same time we were approached by PacTel, which needed access to our tunnel to perfect a new technology to support mobile portable phones. We worked at the technical and business levels to develop a system we can both benefit from. The use of PacTel technology on our property permits us to graft our communications system onto theirs. BART can offer new services-ontrain portable phone and computer service with data transmission-and obtain the needed communication system at a reduced \$12 million.

I would like to conclude by repeating my opening comments. I do not think there is anything wrong with the transit industry or American industry that cannot be solved by a sound R&D policy. There are a number of basic concepts needed to support a sound R&D policy. First, government should encourage growth by spending more on commercial R&D. Second, government support of training for new scientists and engineers is needed. Third, creating tax laws that make private investment in R&D and new equipment cheaper should be a priority. Fourth, the government should sponsor free and fair trade policies. Fifth, businesses should make growth, higher productivity, and job creation top priorities. Sixth, businesses must have the discipline to take a long-term view. Seventh, business should join government in broad-based industry partnerships to focus on the process, not products, of technological advance. Finally, transit operators must get involved and make a commitment to lobbying for R&D as a special interest.

Transit R&D activities must be relevant and responsive to mainstream needs of the user, unencumbered by debilitating regulatory obstacles, consistent, efficient, and skillfully practiced. We must focus on long-term benefits, while providing early useful results. Establishing strong public/private partnerships is important and we must stress the flow and exchange of information. Further, we need to encourage a growing cadre of capable, well-trained scientists, engineers, planners, and business leaders.

Above all we must have advocates. Champions and heros are desperately needed. We have tasted the promises offered in the ISTEA, but I think it's time that this group of professionals got a shot of champagne! Thank your for your hard work, your invitation, and attention.