Research Community's View

Dean Wise, *Mercer Management Consulting*
Bernard J. La Londe, *Ohio State University*

The purpose of this paper is to highlight several important internal and external trends that will affect the future position of railroads and to identify research issues that must be addressed to develop additional, ongoing insights on rail industry initiatives, customer requirements, and the outlook for rail industry market share and financial performance.

Two perspectives are presented: Rail Vision 2000 and Seven Propositions about Transportation and Logistics Change. Rail Vision 2000, an analysis conducted by Mercer Management Consulting for the Association of American Railroads (AAR), examines how changes in railroads' cost and service position could affect shippers' total logistics costs. Seven Propositions about Transportation and Logistics Change uses findings from a recent Ohio State University (OSU) survey to identify several logistics relationships with the customers of railroads.

Rail Vision 2000

The purpose of Rail Vision 2000 was to develop a realistic vision for the U.S. rail freight industry that reflects emerging and potential innovations in technology and management practices, the influence of these innovations on the railroads' "product" (transportation service), and the ways in which the enhanced product would benefit existing rail customers and potential new rail customers. AAR was interested in comparing the shipper benefits from Rail Vision 2000 to the potential shipper benefits from longer combination vehicles (LCVs)—primarily twin 48-ft and triple 28-ft trailer combinations—if they were allowed nationwide.

To develop Rail Vision 2000, Mercer needed to answer four questions:

- What are the key innovations emerging, spreading, or envisioned in the rail industry?
- How will the innovations change the rail "product"?
- How will shippers respond to the new product and how will they benefit?
- How do the benefits compare with benefits from LCVs?

Analyzing these questions involved a variety of techniques, starting with qualitative reviews to identify and categorize a wide range of industry initiatives, then translating them into

quantitative impacts using several cost models, a market share model, and the AAR's mode volume data base.

Data from 1990 were used as a base to show how 1990 rail costs, market share, and shipper logistics costs would have changed if the emerging innovations could have been realized in 1990. This approach focuses on and isolates the impact of innovations driven by the railroad industry and their motor carrier competitors, without the complications of cost inflation, overall economic growth, and changes in traffic mix. In this way, the approach reflects what railroads could reasonably accomplish on their own before consideration of the impact of external forces, many of which railroads cannot control.

Key Initiatives and Their Impact on Railroad Productivity

More than 25 key initiatives were identified that will have a significant impact on the railroad industry's productivity and service in the 1990s. These initiatives were grouped into six major categories and quantified in terms of their impact on 1990 costs. The results, shown in Figure 1, indicate total savings of nearly $5.5 billion, or approximately 20 percent of total 1990 costs. The six categories are discussed in the following paragraphs.

- *Door-to-door service management.* Savings of $1.4 billion will result from industry-wide service management (both single line and interline), more sophisticated equipment management systems supported by automated equipment identification (AEI), and the evolution of advanced train control systems (ATCS). As a result, the industry will save 7 percent in fuel costs, achieve 15 percent better use of equipment, achieve 6 percent better use of locomotives, and improve train crew productivity by reducing overtime and arbitrary payments.
- *Track of the future.* Savings of $0.5 billion will result from wider use of concrete ties, widespread rail grinding, improved locomotive and car technologies that will reduce track wear, and better maintenance-of-way (MOW) scheduling.
- *Locomotive of the future.* Savings of $2.2 billion will result from use of larger horsepower units, expansion of alternating current (AC) traction, use of liquefied natural gas fuel (which is 30 percent cheaper than diesel), and use of in-cab electronics to monitor locomotive health.
- *Carload system of the future.* Savings of $0.2 billion will result from use of larger bulk cars, steerable trucks, widespread flange lubrication to reduce wheel wear, and electronic braking systems.

Major Element	Key Initiatives	Savings vs. 1990 ($MM)
Door-to-Door Service Management	Interline service management (ISM), equipment management, AEI, work order automation	$1,390
Track of the Future	Concrete ties, rail grinding, loco/car technologies, MOW scheduling	498
Locomotive of the Future	4,000-5,000 HP superunits, AC traction, LNG fuel, train crew consist, in-cab electronics (ICE)	2,165
Carload System of the Future	Larger bulk cars, steerable trucks, flange lubrication, electronic braking systems	160
Intermodal System of the Future	Double-stack, RoadRailer, equipment management, drayage management	488
Customer Relations and Administration	Centralized rating and billing, Rate EDI Network (REN), G&A process reengineering	782
	Total Savings	$5,483 20.3%

FIGURE 1 Key initiatives of Rail Vision 2000.

- *Intermodal system of the future.* Savings of $0.5 billion will result from further expansion of the double-stack network and RoadRailer; better management of trailers, containers, and chassis; and better coordination to improve the interface with drayage companies and reduce terminal land requirements.
- *Customer relations and administration.* Savings of $0.8 billion will result from continued centralization of rating and billing activities, introduction of the Rate Electronic Data Interchange (EDI) Network, and reengineering and automation of general and administrative processes.

Impact on Other Shipper Logistics Costs (Existing Rail Users)

The Rail Vision 2000 initiatives will not only improve the productivity and costs of railroads, but will also improve service in several ways. With faster, more reliable transit times, improved billing accuracy, increased use of EDI, and better multimodal coordination, the railroads will generate other savings for shippers in inventory, record keeping, private railcar fleets, and the nonrail portion of intermodal (local drayage costs and third party fees). These improvements in product quality translate into an additional $2.3 billion in savings to existing (1990) rail users, as shown in Figure 2.

Impact on Rail Market Share and Volume

Improvements in the cost and service position of railroads will also attract new business. Assuming that half of the productivity savings of railroads are passed to shippers and that the speed, reliability, and administrative ease of service are improved, railroads could increase volume by more than 30 percent through market share gains. For example, as shown in Figure 3, the increase in share of medium hauls from 33 to 44 percent represents a 33 percent increase in volume. Overall market share (all mileages) would increase from 40 to 53 percent, a 32.5 percent increase in volume. About two-thirds of the increase would be intermodal; one-third would be carload. The increases would occur at all lengths of haul, as shown in Figure 3.

Service Element	Vision Assumptions	Savings for Current Shippers ($MM 1990)
Door-to-Door Transit Time	One day off intermodal and non-unit train carload moves	$828 inventory
Door-to-Door Reliability	Intermodal from 80% to 95% Carload from 60% to 90%	792 inventory
Billing Accuracy	Intermodal from 90% to 95% Carload from 85% to 95%	150 clerical
Shipper Ordering Costs	Reduced from $25/CL to $20/CL	91 clerical
Private Equipment	Larger bulk cars, better utilization	220 equipment
Intermodal Drayage/Third Parties	Improved service management and automation	225 purchased services
	Total Savings	$2,306

FIGURE 2 Service improvements and logistics cost reductions expected from Rail Vision 2000 initiatives (CL = carload).

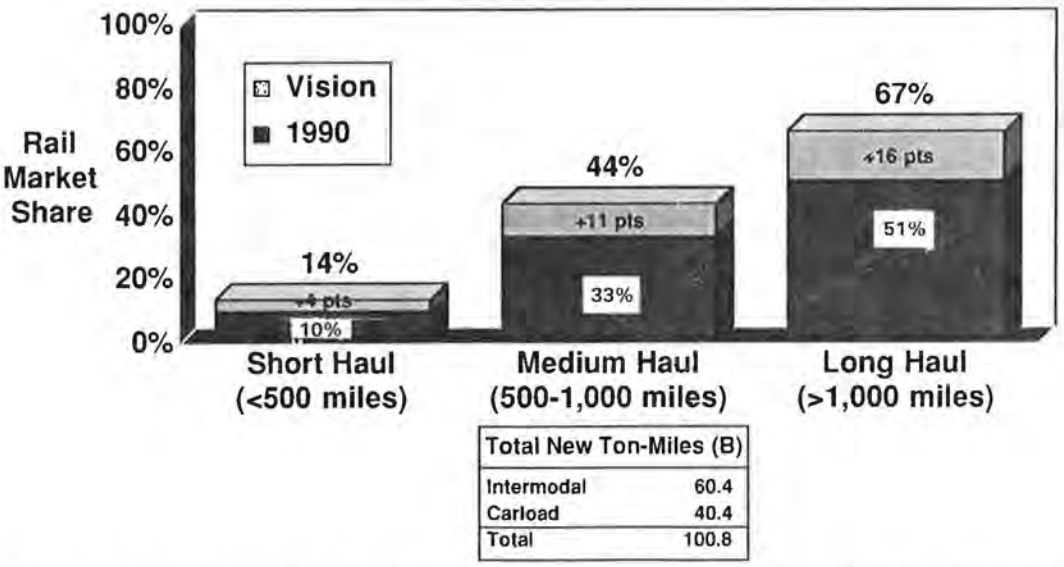

FIGURE 3 Increased market share expected from improvements in cost and service position of railroads (rail market share of 1990 intercity nonbulk rail and rail competitive truck ton-miles).

Summary of Benefits to Shippers

The benefits to railroads and to existing and new rail users if Rail Vision 2000 is achieved are shown in Figure 4. The railroad and shipper cost savings for existing rail traffic would be nearly $8 billion, and nearly half of the savings realized by current shippers would come from "cost of quality" improvements (inventory, clerical, etc.). New rail traffic that converts from truck would actually pay a penalty for these cost of quality items, but these penalties would be more than offset by savings in direct transportation expense, netting to a total savings of $2.3 billion.

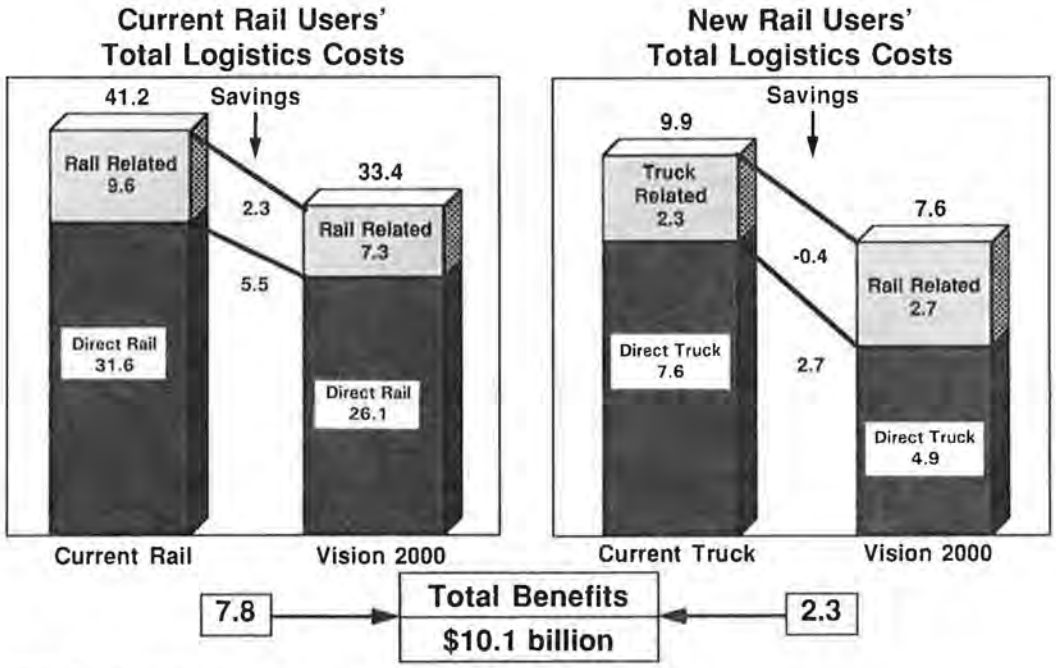

FIGURE 4 Value of benefits [1990 $ (billions)].

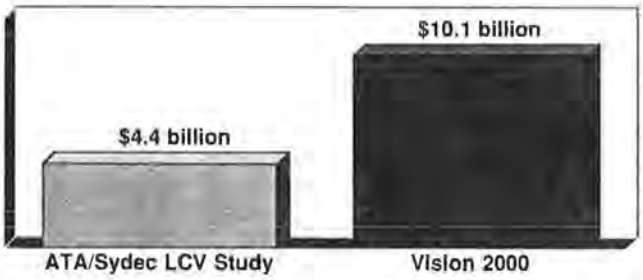

FIGURE 5 Estimated benefits of Rail Vision 2000 compared with estimated benefits from LCVs (*1*).

The combined value of shipper and rail benefits is $10.1 billion, which exceeds the American Trucking Associations' (ATA) estimated shipper benefits for LCVs, as shown in Figure 5.

In conclusion, the railroad industry appears to have a lot of upside potential for productivity, growth, and enhanced customer benefit in the 1990s. Achieving all the elements of Rail Vision 2000 will be challenging, but all of the initiatives are in various stages of implementation today. Other innovations will certainly emerge before the end of the decade; these innovations will include new applications of telecommunications technology, artificial intelligence, and the Iron Highway intermodal technology, which is expected to be in commercial service in 1994. Perhaps the greatest challenge will be for railroads to implement these changes consistently and thoroughly across the entire rail system so the benefits may be realized uniformly by the railroads, their customers, and the public.

Seven Propositions about Transportation and Logistics Change

The seven propositions discussed in the following paragraphs are based on findings from the OSU annual Career Patterns in Logistics survey, conducted in late summer 1992. The survey respondents were the chief logistics executives of 197 U.S. companies, most of them Fortune 1000 companies. All are members of the Council of Logistics Management. This group of companies should be viewed as a "leading edge" sample; chemicals, food products, and consumer products are the largest industry segments represented.

- *Relationships in the logistics channel will shift from a transactional to a contractual basis.* Shippers expect their percentage of inbound freight moved under contract rates to increase from approximately 52 percent in 1990 to about 70 percent in the late 1990s (Figure 6). The growth of contracts parallels the growth of deeper relationships between carriers and shippers

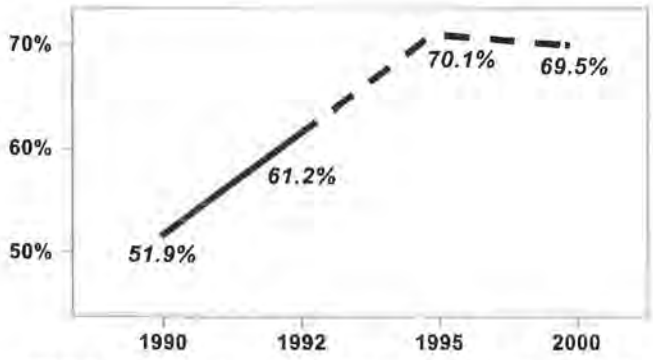

FIGURE 6 Percentage of total inbound freight shipped under contract rates (source: OSU Career Patterns in Logistics survey, 1992).

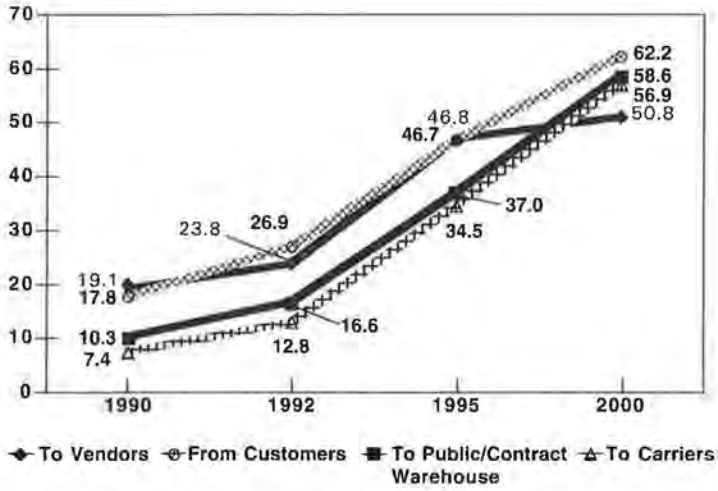

FIGURE 7 EDI patterns and profiles (source: OSU Career Patterns in Logistics survey, 1992).

seeking to identify and execute "win-win" solutions to reduce total logistics costs for both parties. Railroads will increasingly need to develop contract terms that cover a wide range of service, equipment, and administrative features, as well as price.

- *Efficient and effective communications within the logistics channel will be an important driver for positive change in the buyer–seller–third party triad.* Shippers expect EDI use to increase dramatically during the 1990s (Figure 7). Expansion of EDI will reduce clerical requirements for both carriers and shippers, improve accuracy of orders and bills, and lead to better short-term forecasting of shipment and equipment requirements. In several ways, railroads are leading the way in this area and must continue to take advantage of their significant information systems resources.
- *"Technology matching" will be a key element of the buyer–seller–third party productivity mix.* As an example, warehouse automation will increase dramatically during the 1990s (Figure 8). Warehouse automation is one of the developments that will allow true seamlessness in service—not only for door-to-door transportation, but for the whole sequence of activities in a complex distribution pipeline from raw material to consumer—involving several carriers, modes, and inventory points. With greater information about what is in the pipeline, carriers and third parties will have more opportunity to provide more responsive, and more efficient, services.
- *The ability to support "global reach" will be an increasingly important element of third party value added in the 1990s.* Shippers are globalizing both their material sourcing and finished product markets (Figure 9). Logistics providers who can respond to both the broader

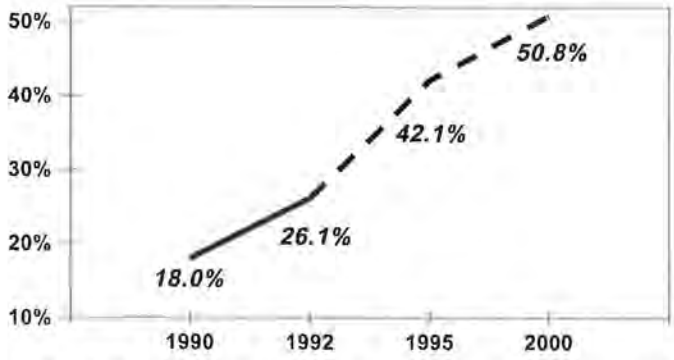

FIGURE 8 Current and projected levels of warehouse automation (source: OSU Career Patterns in Logistics survey, 1992).

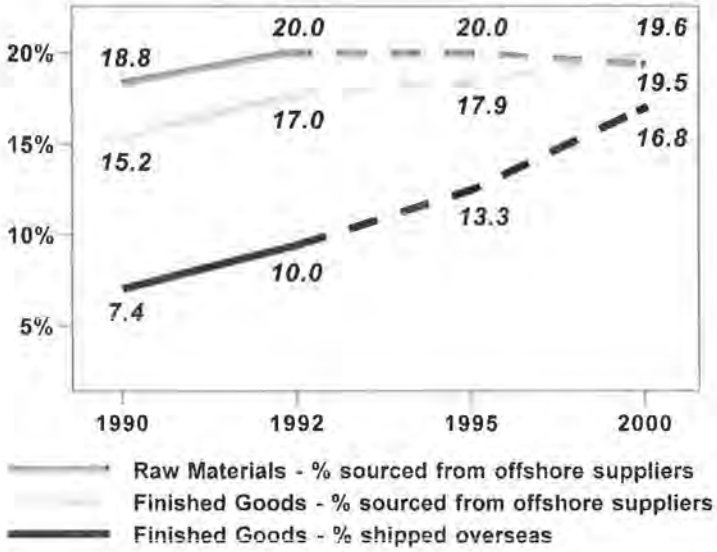

FIGURE 9 Import and export patterns and profiles (source: OSU Career Patterns in Logistics survey, 1992).

reach (within North America and across continents) and the pace of change as patterns shift will be valuable partners for manufacturers, distributors, and retailers. Although many North American railroads may not formally extend their reach overseas, they can be sensitive to the globalization trends and respond proactively to the shifts in patterns, instead of just reacting.

- *Quality, or "do it right the first time," will be the performance norm in the 1990s.* The percent of orders without errors is expected to increase from mid-90 percent to more than 98 percent by the end of the decade (Figure 10). Shippers expectations are increasing—last year's level of satisfactory performance will not be adequate in future years—and carriers that are not striving for perfection in their own quality management efforts will not be viewed favorably as performance standards continue to tighten.
- *Improved asset productivity will be a central driver for individual and joint management action in the 1990s.* Inventory turns are expected to increase from 6 to 8 per year to 9 to 10 per year by the end of the decade (Figure 11). The railroads can support this trend if they can achieve significant improvements in transit time consistency through interline service management, AEI, and ATCS. The more consistent the transportation delivery time, the smaller the

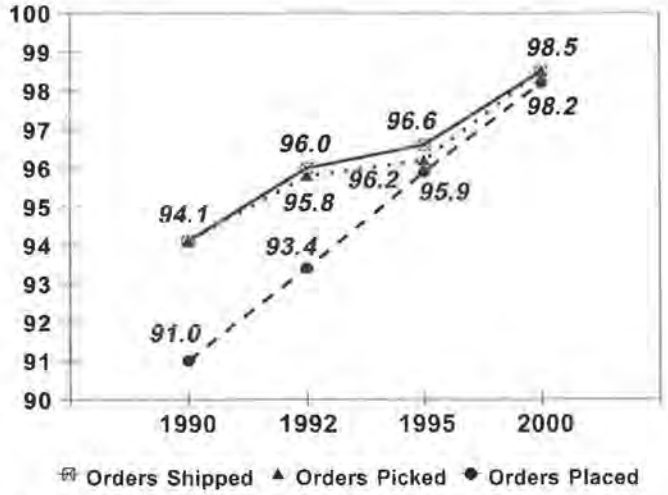

FIGURE 10 Percentage of orders without errors (source: Warehouse Education and Research Council/OSU study, 1993).

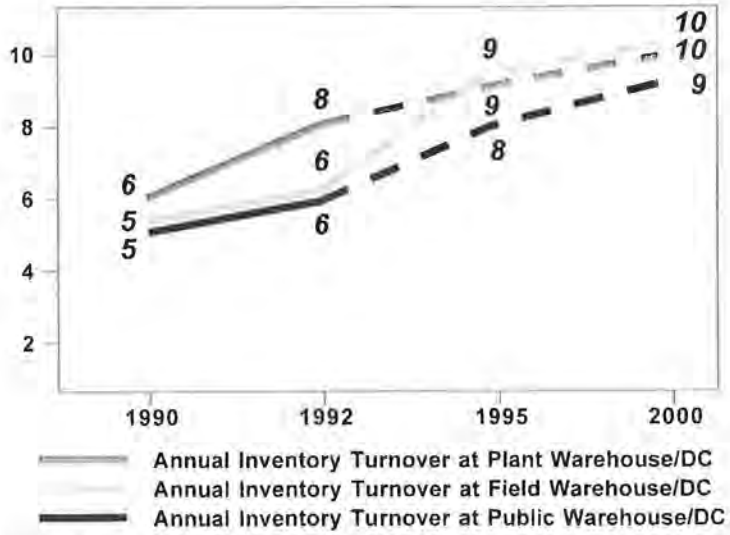

FIGURE 11 Annual inventory turnover patterns and profiles (source: OSU Career Patterns in Logistics survey, 1992).

inventory safety stock shippers need to ensure product availability and the less capital they need to tie up in inventories.

- *Improved competitiveness will be the name of the game for the 1990s.* As Joseph Schumpeter said, "Profit is the payment you get when you take advantage of change." Railroads must be prepared for some dramatic changes in the way shippers do business. If they can respond to their customers with better cost and service offerings that meet the changing requirements, they will prosper in the 1990s.

Research Questions and Requirements

Questions

On the basis of the Rail Vision 2000 analysis and the trends highlighted in the Ohio State survey, the following research questions have been identified:

- What are shippers' future requirements by industry sector?
- How will rail innovations change the rail cost and service profile?
- How will modal competitors' cost and service profiles change?
- How will shippers respond to these changes by industry sector?
- How will rail network economics and service change with increased volume?

Requirements

The research questions are challenging and not easily answered by the rail industry or any one railroad. Full exploration of these issues will require a number of analytical tools, data bases, and ongoing research efforts, including the following:

- Accurate modal volume and share data by lane, commodity, and equipment type;
- Price and service elasticity estimates by lane, commodity, and equipment type;
- Analytical tools to measure (a) total logistics costs and (b) links among physical change, service, cost, and capacity (activity-based costing);

- Real-time best practice data bases for (a) shipper logistics innovations, (b) rail industry innovations, and (c) truck and barge industry innovations.

These research efforts are in various stages of development today. Some are already in place and available (e.g., commercially available modal data bases). Others are being implemented by individual companies (e.g., total logistics cost models). Still others require either ad hoc confidential efforts (e.g., lane- or market-specific elasticity studies) or broad industry-wide participation (e.g., best practice data bases). All should be pursued vigorously—better knowledge about customers, markets, competitors, and high leverage innovations can help the rail industry achieve substantial gains in the 1990s.

Reference

1. SYDEC, Inc. and Jack Faucett Associates. *Productivity and Consumer Benefits of Longer Combination Vehicles*. Trucking Research Institute, ATA Foundation, American Trucking Associations, Alexandria, Va., 1990.