The Role of the National Highway System Connectors:

Industry Context and Issues

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Federal Highway Administration

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I. INTRODUCTION – MATCHING PUBLIC AND PRIVATE SECTOR PRIORITIES

Global economic and security trends are putting increasing emphasis on reliability and speed of freight transportation services. These trends have significant implications for the types of infrastructure and government supported transportation programs that should be emphasized in the future to increase the competitiveness of America's business enterprises. Intermodal connectors, or the links that facilitate the transfer between modes, have been identified as one of the types of investments that have the potential to result in improved reliability and service levels. This paper explores changing freight transportation demand and shipper requirements and the resultant role and importance of freight intermodal connectors in the National Transportation System.

Transportation is often discussed by governmental agencies in physical terms – roads, rail track, airports and seaports. Investments in infrastructure and operation of facilities are important and necessary, but they are not the starting point for decisions regarding the movement of freight. Rather, the question increasingly asked by companies today is: " Will the goods arrive when specified?" It is not the mode that is important; rather it is reliability, transit time, efficiency and cost.

Once these key freight transportation characteristics and their role in ensuring American business competitiveness and supporting national security are understood, the priorities for the U.S. transportation system become more apparent. Within this context, the role and growing importance of intermodal connectors becomes evident.

Intermodal connectors tie the transportation system together. They are the means for moving cargo to and from ports. They keep time sensitive air cargo moving expeditiously. They tie the rail yards to the end users. When they are efficient, intermodal connectors can facilitate the "highest and best" use of each transportation mode. Conversely, when they are inadequate or congested, the connectors can be an obstacle to the seamless movement of cargo needed to support US businesses and national security.

This report:

- Provides an understanding of the evolving role of freight transportation in maintaining a competitive business environment and effective national security;
- Articulates the importance of intermodal connectors in providing an efficient, flexible transportation system that meets the expectations of businesses and national priorities; and
- Identifies both the opportunities and barriers to improving intermodal connections.

The report begins with defining key terms and the legislative context for intermodal connectors. The changing practices and priorities in freight transportation are then summarized to provide a context and understanding of the new demands placed that must be met by the nation's transportation system. The implications for the U.S. transportation system and public investment are discussed in the final section. Opportunities for and barriers to achieving intermodal connector goals are also discussed within this section.

As part of the development of this report, an executive dialogue was held with key individuals representing shippers and freight carriers. The executive dialogue, which focused on the changing needs and priorities for the US freight system, served two purposes – it provided a private sector review of a draft version of this report and an opportunity for executive staff from the modal administrations to discuss firsthand the changing needs and priorities. Comments from the executive dialogue participants have been incorporated into this report. A summary of the executive dialogue is provided in Appendix A.

II. BACKGROUND AND DEFINITIONS – WHAT IS AN INTERMODAL CONNECTOR?

A Short Legislative History

The Intermodal Transportation Efficiency Act of 1991 (ISTEA) created a new framework for addressing the nation's infrastructure into the 21st century. For the first time, an intermodal policy was established by law as a cornerstone of the Nation's federal surface transportation programs. ISTEA made it a national policy "to encourage and promote development of a national intermodal transportation system in the United States to move goods and people in an energy efficient manner, provide the foundation for improved productivity growth , strengthen the nation's ability to compete in the global economy and obtain the optimum yield from the nation's transportation resources."

ISTEA also called for the establishment of the National Highway System (NHS). In defining the NHS, the US Department of Transportation (USDOT) and the Federal Highway Administration (FHWA) recognized the crucial role played by intermodal connectors – those public highways which link the Nation's ports, rail and truck terminals airports and passenger transit terminals to the NHS. With active support from stakeholder organization such as the Intermodal Freight Transportation Coalition, the American Public Transit Association, the American Association of State Highway and Transportation Officials and the National Passenger Railroad Corporation, more than 2,000 miles of intermodal connector roadways were identified. The NHS Designation Act of 1995 directed the Secretary of Transportation to submit this list of intermodal connectors to Congress, and this list was subsequently presented in May of 1996.

In 1997, the NHS consisted of 156,986 miles, amounting to 4 percent of the total highway mileage. More significant than the number of miles is the fact that the designated NHS miles carry 1 trillion or 45 percent of the vehicle miles traveled (VMT). The roads in the NHS, therefore, represent the key arteries in the nation's transportation system.

Congress enacted a second landmark Surface Transportation bill in May 1998 – the Transportation Equity Act for the 21st Century (TEA-21). Section 1106 (subsection d) of TEA-21 directed the Federal Highway Administration to conduct an intermodal freight connectors study. That subsection states:

(1) Report – not later than two years after the enactment of this Act, the Secretary shall-

(A) review the conditions and improvement made since the designation of the NHS connectors to the system that serve seaports, airports and other intermodal freight transportation facilities; and

(B) report to Congress the results of such review.

(2) Review – in preparing the Report, the Secretary shall review the connectors and identify projects carried out on those connectors that were

intended to provide and improve service to an intermodal facility as referred to in the paragraph above and to facilitate the efficient movement of freight, including movement of freight between modes.

(3) Identification of Impediments – if the Secretary determines that on the basis of the review that there are impediments to improving the connectors serving intermodal facilities, the Secretary shall identify such impediments and make any appropriate recommendations as part of the Secretary's report to Congress under this subsection.

This TEA-21 reporting requirement provides a formal mechanism for USDOT to monitor intermodal connector performance and needs and to make recommendations to Congress regarding appropriate initiatives to assure adequate maintenance or expansion of connectors.

Defining an Intermodal Connector

The term "intermodal" refers to a transfer of a shipment from one transportation mode to another as the shipment moves from origin to destination. Defining an intermodal connector requires some additional elaboration due to the varying nature on type and capacity of intermodal connectors.

In April of 1995, FHWA issued *Guidelines for Identifying National Highway System Connectors to Major Intermodal Terminals* (HEP-12 from Thomas Ptak). This document indicated that NHS connectors must be public roads leading to major intermodal terminals and that those roads must have a critical bearing on the efficient operation of that facility. Intermodal terminals were defined as facilities which provide for the transfer of freight or passengers from one mode to another.

The primary criteria established by this document for defining an intermodal connector are based on annual passenger volumes or freight volumes or daily vehicular traffic on one or more of the principal routes which serve the facility. A secondary set of requirements include factors which underscore the importance of an intermodal facility within a specific state. The secondary criteria are specifically related to intermodal terminals that handle more than 20 percent of freight or passengers by mode within that state and also have significant highway interface. The subject intermodal terminals were anticipated to have been already identified by the state or metropolitan planning organization (MPO) as a major facility and targeted for major investments to handle expanded traffic.

Within the NHS, over 1,400 freight and passenger intermodal connectors were identified, including:

Connector Type	Number
Public Transit Stations	389
Maritime Facilities	247
Airports	228
Truck/Rail Terminals	211
Intercity Bus Stations	99
Amtrak Stations	71
Pipeline/Truck Terminals	61
Ferry Terminals	59
Multi-modal Passenger Sites	42

This report focuses primarily on freight intermodal connectors. However, the performance benchmarks of transportation most often sought by freight users – reliability, transit time, efficiency and cost – are also the same characteristics sought by passengers. These performance factors also define many of the national security-related transportation needs.

III. CHANGING PRACTICES AND PRIORITIES IN FREIGHT TRANSPORTATION DEMAND

Changing Business Practices

In the past few decades, the US economy has undergone changes as dramatic as the industrial revolution. These changing business practices are a reflection of major evolutions in key economic sectors, such as manufacturing and trade.

The nature of transportation demand has also changed to meet the new needs of businesses and consumers. In addition, recently, US businesses now recognize that innovative distribution systems can be a key competitive factor. Accordingly, transportation is now viewed as one of the crucial components of doing business. Performance is measured in terms of reliability, transit time, efficiency and quality of service. Translated into infrastructure requirements, these trends heighten the need for effective intermodal connectors.

Changing business practices include:

The restructuring of traditional manufacturing. To regain their competitiveness, during the past decade American companies have modernized their manufacturing and distribution systems, as well as downsizing and restructuring their operations. Traditional manufacturing industries have also become more technology intensive. The end result is that the manufacturing sector of the U.S. economy is far more efficient today than in the recent past.

Manufacturers are continually searching for opportunities to restructure their operations, consolidate production at fewer, lower cost locations closer to major consumer markets, etc. Manufacturing industries increasingly also rely on multinational production.

In the new global economy, American manufacturers must be able to efficiently move raw materials, partially assembled products and finished goods to and from all areas of the world to remain competitive. Their logistics systems must be able to rapidly adjust to changing demand and inventories during the various stages of the production and distribution cycle around the globe.

Decentralization of manufacturing processes additionally leads to an increase in the total number of freight movements required for production. Domestically, as trucking accounts for a large share of intercity and metropolitan transport, this trend puts immense pressures on the roadway system.

Product shifts. Another important trend in manufacturing is the shift from heavier, lower value, manufacturing products towards higher value, less bulky, lighter products, typically associated with the use of new materials and new production technologies. The physical inputs of goods produced also tend to be smaller, although many are highly valuable. Even the older, traditional manufacturing of durable goods now produces smaller and less bulky products through greater use of plastic and other less bulky and lighter materials. These

developments have important implications for transportation demand and the relative use of transportation modes in the future. For example, lower volume, higher value goods increase demand for fast transportation of small quantities, thereby increasing demand for air freight and truck services relative to water and rail services.

Production runs and JIT. An important cost element of traditional manufacturing has been the need for large volume production runs of the same product. Frequently, the uncertainty as to demand levels results in larger or smaller-than-required inventory levels at certain times in the economic cycle. As the value of products have increased, many manufacturers have adopted techniques that permit rapid adaptation to changes in demand. Manufacturing now involves smaller, shorter production runs, in many cases aimed at specialized, differentiated market segments responding to different consumer preferences and tastes. Companies have adopted techniques that permit the production of various goods with the same production line. These new production processes often require the ability to receive inputs just-in-time (JIT).

JIT is one of the most important trends in manufacturing over the past two decades. The JIT inventory control system was developed in response to the high interest rates of the 1970's and the high inventory carrying costs it generated. However, it continues to be increasingly used as a means of reducing inventory requirements and manufacturing costs. The use of JIT is especially important in some industries, e.g. electronics and automobiles. More and more manufacturers are carefully scheduling deliveries so that parts arrive when needed - not a day before or a day after. Through careful management of the transportation pipeline to the assembly plant, the inventory costs in storage and transit are kept to a minimum, thereby reducing warehouse and carrying costs. JIT requires more frequent, smaller shipments, emphasizing reliability.

The emphasis on reduced inventory levels, JIT delivery, quality, and quick response, means a significant change in the nature of transportation demand. First, it requires more frequent, smaller shipments. Secondly, it means that the transportation infrastructure must be able to function with sufficient reliability, so that businesses can count on their deliveries being on-time, without being affected by congestion at airports, highways, intermodal terminals, or ports. The sequential impacts of designing transportation infrastructure that responds to JIT is further discussed in the next section.

Reducing the length of product cycles. Transportation and distribution requirements are also evolving as companies place greater importance on reducing "cycle time," i.e., the time that it takes for a company to respond to changes in the market. For example in the garment industry, seasons and changing fashions demand quick turnaround if a company is to remain competitive. Cycle times are increasingly important as they provide a competitive advantage.

Competition to reduce the time necessary for producing or distributing goods is as significant as price or style competition. Products that do not move quickly through the distribution system can become obsolete, due to lower priced new products or changes in style. For several industries, including auto parts, electrical components and apparel, the need for a reduction in time for products to move from concept to manufacturing to the selling floor requires more frequent, and smaller size shipments, even if transport costs are higher.

"Lean manufacturing." The essence of "lean manufacturing" is low work-in-process supported by multi-disciplinary teams. Low work-in-process is expected to result in quality improvement, since work-around options are limited, and low work-in-process forces shorter cycle times, because fewer items are worked in parallel. The lean manufacturing model is based on many of the underlying principles of JIT production. A critical distinction, however, is in the focus on low work-in-process rather than JIT delivery as a strategic factor, so the intent is not only to have parts or intermediate products delivered just in time for final production, but producing those intermediate products just in time. A highly reliable, cost efficient transportation system is a prerequisite for these types of operations.

The emergence of high technology and knowledge-based industries. The composition of the U.S. manufacturing sector has changed significantly. Basic industries have declined, as new industries have emerged. These new industries are characterized by the "knowledge-intensity" and the "technological innovation" of their products. The physical inputs and outputs of these new industries are particularly small, light, but highly valuable.

These “high-technology” industries, e.g. drugs, medical equipment and supplies, electronic products, office and computer equipment, have been growing and are anticipated to continue growing at a faster rate than other manufacturing industries. From 1977 to 1992, the share of technology-based and information-intensive manufacturing industries has increased from 35% to 42% of total manufacturing. This development is particularly interesting, considering that the contribution to GDP of the manufacturing sector has been decreasing during this period.

One characteristic of the newer manufacturing industries is that they are typically composed of a large number of smaller firms, with less concentration in the larger firms than is the case in the older industries. These industries have a smaller production scale, smaller volumes of inbound materials, and are particularly dependent on the latest technology and research. As new, smaller firms, they also typically depend on other firms for supplies and basic services and are not as integrated in their manufacturing and distribution processes.

E-commerce. The development of new computer, communications and related technologies have also created new specialized information, entertainment, trade and business service industries. These new technologies,

culminating in what is now referred as internet-based electronic commerce, have huge implications for transportation demand. They facilitate complex multi-location and multinational production and distribution, and will likely affect retail distribution patterns and the transportation needs of the retail industry. For example, the *1998/1999 Boeing World Air Cargo Forecast* noted that "consumers are increasingly using the Internet for home and business purchases, fueling growth in air/truck logistic networks."[1]

Demanufacturing/Remanufacturing. Demanufacturing and remanufacturing are two new elements in product life cycles. Accordingly, they are also new elements in the logistics chain. Demanufacturing involves the disassembling of such products as electronics, automobiles, and household appliances after the end of their useful life. The disassembled parts are then recycled. In remanufacturing, the disassembled or retrieved parts are reused.

Demanufacturing and remanufacturing is increasingly used in the US and globally. From an environmental perspective, companies are being asked to take fuller responsibility for their products – from their creation to their ultimate disposal. From a cost perspective, remanufacturing offers an opportunity for companies to save money. As a result, laserjet toner cartridges can be sent back, free of charge, to the manufacturer. "Disposal camera" flash units, retrieved when the cameras are sent for photo processing, are reused in new disposal cameras.

Demanufacturing and remanufacturing processes also require freight handling – reverse logistics. Similar to the supply chains and distribution channels which have become increasingly specialized for industry/commodity clusters, reverse logistics is similarly customized to individual firms and businesses. Nevertheless, the processes add freight flows and considerations to the transportation system.

The globalization of the economy. With more multinational production and foreign trade, the economies of all countries are increasingly intertwined. In many industries, the trend has been towards one global market. For many firms, transportation costs can define the economical reach of their products in the global marketplace. An efficient transportation, logistics and distribution system can increase the market for a product or a service, thereby achieving economies of scale that result in increased competitiveness and profitability. There are also fewer products today that can be easily categorized as being only foreign or domestic. The best example is the automobile industry, where it is no longer possible to neatly categorize American versus import cars. A large percentage of the parts used in vehicles assembled by foreign and domestic manufacturers in the U.S originate in foreign countries. Many of the foreign manufacturers also export the U.S. assembled cars to other countries.

[1] *1998/1999 Boeing World Air Cargo Forecast*, p. 17.

The U.S. has led in the growth in international trade over the last 20 years, and the impact of foreign trade on the American economy has increased significantly. The share of trade (imports and exports) as a percentage of GDP (in constant 1987 dollars) increased from 12.4% in 1970 to around 25 % in the mid-1990's. Although there has been a persistent trade deficit in the US trade balance since the 1970's, the international service trade balance has been consistently positive and growing.

World trade trends are also setting the stage for further integration of the economies of individual countries into several economic blocks. In North America, Canada and the United States signed a Free Trade Agreement in January 1989 covering trade between the world's largest trading partners. The U.S., Canada and Mexico signed NAFTA in December 1992, which was approved in 1993, and became effective January 1994. Many countries in Central and South America are emulating the example set by their northern neighbors. Countries in the Central American Common Market, the Caribbean Common Market, along with the Andean Pact countries (Peru, Bolivia, Ecuador, Colombia, and Venezuela), and the Mercosur countries (Argentina, Uruguay, Paraguay, and Brazil) have all been lifting trade barriers and strengthening economic ties among themselves. A Free Trade Area of the Americas covering the entire American continent is also under discussion, with specific goals set by the leaders of all the countries to achieve steps towards integration by 2005.

In Europe, a single economic market was established in accordance with previous agreements in January, 1993. Europe is proceeding towards economic and monetary union (EMU), including a single currency. Although there are still many obstacles to be overcome, the major economies in the European continent are beginning to function to a large extent as a single market.

Finally, the Asia-Pacific Economic Cooperation (APEC) group of countries in November 1994 adopted the Bogor Declaration, a statement of common resolve by APEC economic leaders aimed at achieving free and open trade and investments by 2020 (2010 for industrialized economies).

The pattern of U.S. foreign trade is likely to change as efforts to create multinational trade blocks evolve. For the U.S., over the past decade, the fastest growing area in foreign trade has been with the Far East, which became the U.S. largest foreign trade area during the 1980's. Coupled with the significant trade volume with Europe, the double stack rail system in the US and major world trade lanes have grown mostly along east-west corridors. With the potential for free trade extending "from Alaska to Tierra del Fuego", new transportation corridors and trade lanes are emerging with a north-south orientation.

Focusing on core competencies within a firm. As businesses continue to pursue strategies to improve their competitiveness in world markets, they have simultaneously focused in their core competencies. As a result, increasingly businesses are outsourcing many functions (including accounting, payroll,

engineering, information, computer, legal, travel and other business services) in order to reallocate their resources toward their core business. One of the functions being outsourced is freight distribution. In this manner, significant cost cuts can be achieved, redeploying capital (by not financing truck fleets and buildings for warehousing and distribution purposes).

Third-party logistics companies (3PL) have emerged to fulfill a range of distribution and logistics functions including trucking, warehousing, billing, inventory management, and fleet maintenance. Some rail, truckload and less-than-truckload (LTL) firms, in particular, have diversified to provide such services; newly created logistics firms have also formed to serve a market niche or tailor a service to a firm's specific needs. These third parties have increasing control over the flow of goods – the modes used and the routes taken.

Focusing on Transportation Characteristics Rather than Modes and Routes

The increasingly competitive environment in which firms must operate has fundamentally altered the use of freight transportation services and infrastructure. Businesses view freight transportation as a means for better serving customers, for better supporting their operations, and for reducing costs. Businesses view freight transportation in terms of what it achieves for their firms, rather than as trucks, trains, vessels and aircraft. In fact, the actual physical movement and routing of cargo are increasingly likely to be handled by a 3PL on behalf of the firm.

Firms now seek five qualities in their freight transportation service – reliability, transit time, efficiency, cost and damage minimization.

Reliability is defined as consistently ensuring that goods are delivered on the specified date at the specified time in the specified amount in the specified condition. Reliability is often written into contracts with transportation providers with exacting specifications – often requiring meeting delivery targets close to 100 percent of the time. The penalties can be severe, ranging from monetary fines to loss of the work.

Transit Time is also a consideration. With JIT, the movement of goods replaced inventory and, often, had to be moved quickly. However, overnight shipment is expensive. Accordingly, with more advanced planning, an emphasis on reliability, and better communications and information technology, the objective of JIT has matured and is now to simultaneously reduce inventory and transportation costs. As long as shipments arrive when specified, they do not have to travel overnight. The *1996/1997 Boeing World Air Cargo Forecast* found that “growth in ‘deferred’ air cargo shipments (next afternoon or later) has been faster in recent years than the growth in ‘overnight’ shipments.” Continuing this trend, the *1998/1999 Boeing World Air Cargo Forecast* also found strong growth and noted, “Deferred services, which are less expensive than traditional overnight

express shipments, appeal to shippers who need to reduce their shipping cost but still require time-definite transport."[2]

Reliability combined with a known transit time is sometimes referred to as "time definite service." The interviews with shippers have found that use of time definite service now extends from the highest priced commodity to the lowest priced bulk commodity. It is a common element in inventory management for businesses. For example, a major shipper recently noted, "In all cases, meeting arrival dates is important. We put a premium on consistency as opposed to pure speed." For transportation providers, meeting time definite service requirements can impact the modes and routes used. The availability of effective intermodal connectors can also influence these choices.

Efficiency refers to optimally using transportation equipment so as to minimize costs. Efficiency is often left to the transportation providers to achieve. However, efficiency objectives can impact a shipper's purchase and use of transportation services, including modes and routes. Companies want to see their transportation equipment in constant motion, rather than sitting in traffic. For example, with a mandatory ten hour workday, congested roadways can significantly reduce the number of trips that a vehicle can make. Congestion on intermodal connectors can significantly affect the productivity of all the modes involved and can affect routing decisions. For example, port selection criteria equally consider the availability and ease of waterside access; the efficiency of the maritime terminals and labor; and the ease and availability of inland connections.

The efficiency of all modes tends to be dependent on efficient roadway access. Roadways handle the end moves of an intermodal movement. Roadways also link freight facilities. For example, roadways link maritime terminals to rail yards that are not "on-dock."

In addition, many shippers, especially those who use a third party logistics firm to handle their outbound goods movement to customers, also ask the 3PL to work with their suppliers to fill what would have been an empty back haul truck movement with inbound commodities to the firm. This ultimately reduces the transportation cost for the firm since they can negotiate a "back haul allowance" with the supplier rather than pay the cost associated with moving that freight to their firm. Efficiency considerations can, therefore, affect routing (in that trucks may be routed differently to service supplier locations in addition to customer locations) and modal choice (since the objective is to fill a truck in both directions). Back haul considerations extend throughout the modes, with trucking firms, railroads, shipping lines and air cargo carriers all seeking to "balance" their loads. No company wants to move equipment that is empty.

Cost has always been a consideration in freight movement, that is, obtaining the lowest possible cost for moving goods. Central to business' efforts

[2] *Air Cargo Forecast,* op. cit., p. 16.

to better manage transportation and distribution and their acceptance of outsourcing of services has been a drive toward greater productivity and closer examination of the entire production and supply chain, as well as the administrative functions. As companies face growing competition domestically and globally, efforts have increased to get total freight logistics cost down and achieve better returns on assets.

However, there are new considerations regarding cost. For example, shippers focus on the overall cost of moving a shipment from origin to destination, regardless of the number of modes involved. As discussed previously, the overall cost often now encompasses both the supply chain to a firm and the distribution channel to its customers. In addition, shippers now consider cost within the framework of reliability, transit time and efficiency. Within this framework, reliability and quality service can be more important that obtaining the lowest cost.

Damage Minimization and Safety are also a "given" in freight movement. It is no use to a company if the goods arrive damaged. Different modes and equipment types have different "ride" characteristics. Accordingly, companies may select certain modes to minimize damage to shipments, as well as minimize delays. Similarly, shippers and transportation providers have become more cognizant of safety considerations in freight movement, leading to improved driver training, new handling procedures, and changes in equipment designs.

Expecting More from Transportation Providers. Total Quality Management (TQM) principles in American business culture have encouraged businesses to expect and demand more from the freight transport provider. Shippers are seeking to diminish the number of carriers in favor of long-term agreements with single suppliers or a limited number of such providers, demanding global coverage from their transportation providers. Carrier firms are willing to make a commitment to greater reliability and on-time performance in exchange for the shipper's commitment to concentrate its business. Shippers are also demanding customized information on a real-time basis. Shippers want to have real-time access to shipment location and status; the ability to enter bookings by computer directly from their many production, warehousing and office locations; access to billing, payment and other information. Electronic Data Interchange (EDI) with carriers and agents is an increasingly essential requirement for many companies. The minimization of damage or loss, along with the safe transport of goods through communities and to customers – proven by past and on-going performance – is a basic requirement for transportation providers to obtain business from shippers.

A Reduced Focus on Modes and Routes by Shippers. As shippers set these new parameters for freight service, they may also outsource all or part of their distribution and logistics operations to a third party, thereby distancing themselves from modal and routing decisions, as previously noted. The old paradigm was for the company to select the mode, the transportation providers, and the routes. Under the new paradigm, the purchase and management of

transportation and distribution shifts to a third party tasked with delivering the exacting specifications in reliability, transit time, efficiency and cost established by the shipper. In many respects, this trend builds on the model set by Federal Express, United Parcel Service and others in offering to deliver packages by a specified time and date without the customer having the hassle of selecting the mode or route.

The new paradigm also creates a new class of stakeholders for the nation's transportation system – the 3PLs. With their multimodal, door-to-door focus, these new stakeholders have a greater interest in the availability and effectiveness of intermodal connectors.

The Responses of the Transportation Industry

As shippers have demanded higher quality transportation and value added services, the transportation industry has responded with an increasing number of innovative services. Deregulation of the industry has made it possible for carriers to become more responsive to their customer needs, to tailor special services for individual customers, and to merge or forge alliances and partnerships. Transportation carriers and other service providers in the transportation industry are responding to the changing needs of businesses by broadening their service offerings, so that one company can be held accountable for the overall service and cost.

Cost and Service Requirements. Today's shipper needs emphasize reliable, fast freight transportation service, but cost remains an important component. As the US economy becomes more integrated into the global economy, and as manufacturing processes are increasingly decentralized at multinational locations, business requirements have then become more complex. A greater need exists for simplified, door-to-door transportation to and from a more diverse list of origins and destinations, frequently beyond the shores of the continental United States. Furthermore, businesses now require a greater variety of transportation-related services to meet these more specific needs than the historical emphasis on large volume moves between the smaller number of origins and destinations.

Competition. Transportation providers have responded with more aggressive competition, as well as mergers and alliances. For example, domestic doublestack rail service competes with over-the-road trucking. Trucking firms are competing with traditional air cargo carriers to provide "deferred, time definite" deliveries. Intermodal connectors facilitate competition among modes and provide additional choices for shippers.

In addition, as shippers demand lower cost and fast service from vendors offering door-to-door service, carriers have developed agreements and procedures to be able to offer "seamless" intermodal door-to-door transportation service from origin to destination. The shipper deals with one vendor only, who

guarantees delivery, sets the price for the entire move, manages and monitors the intermodal transfers, interfaces electronically with the shipper, and administers the paperwork. However, the actual physical move can involve a railroad, a steamship line, a trucking firm, and/or an agent. It can involve two, three and even four modes, and several intermodal transfers, again, highlighting the growing significance of intermodal connectors.

Mergers and alliances. Transportation companies are merging or establishing partnerships and alliances as means to reduce costs, rationalize capacity, achieve greater equipment utilization and enhance service offerings. Railroads, airlines, trucking firms and steamship lines have merged or expanded to create larger, more competitive companies, both within the US and internationally. Major US railroads have merged – most recently with the Conrail restructuring – and some have expanded into Mexico, Europe, New Zealand, and other countries. Airlines have merged, established code-sharing agreements, and entered into marketing partnerships. Steamship lines have merged or entered into vessel-sharing agreements, and they operate double-stack rail, trucking services, and joint terminals with other steamship companies. Trucking firms have also merged and emphasized different market segments, such as overnight, express, less-than-truckload (LTL), or truckload services

Similar to 3PLs, some companies and alliances have chosen to specialize as asset based companies relying on others to market and put together integrated multimodal services. Other companies have chosen to specialize in marketing, customer service, brokerage, and value added services. For example, the role of third parties or shipping agents, that traditionally have handled a major share of rail intermodal sales, drayage and customer service functions has been redefined.

Some companies have also established logistics subsidiaries or expanded the scope of their business to internally broaden their service offerings. In other cases, to be able to compete and meet shipper demands, carriers are setting up agreements and alliances with other modal carriers or through third parties that provide the shipper with better service options, in effect resulting in increased frequency of service, more integrated offerings, more efficient services, or broader geographic coverage. Even those companies that continue to view themselves as single modal carriers are entering into agreements with other modal carriers to be able to broaden the services that they can offer shippers.

Innovation and standardization. Carriers, in addition, continue to innovate, introducing more efficient equipment and new technology, improving asset management, and expanding service and operating patterns to reduce costs. Each carrier will be continually searching for ways to increase productivity that can be reflected in its rate and service package.

One of the major opportunities for future cost savings and service improvement is through new technology. The container revolution, the development of doublestack technology and the new information handling and

interchange systems are the most significant technological breakthroughs in freight transportation over the past few decades. Further innovations in equipment and line-haul modal systems have the potential to increase the speed, reliability, capacity and productivity of the existing transportation system. For example, intelligent transportation systems (ITS); greater automation; larger capacity vehicles; modern intermodal facilities with improved methods of cargo handling or equipment interchange; simpler, expedited information exchange and billing systems; and new vehicle technologies (ship, rail car, truck and aircraft) with greater speed and/or increased size can all help achieve significant increases in productivity and capacity.

Standardization of equipment and creation of large interchangeable equipment pools also offers opportunities to improve equipment utilization and eliminate empty back hauls, as discussed previously. For example, rather than return an empty container to a port, carriers have been increasingly filling it with domestic cargo. The integration of international and domestic equipment pools offers further opportunities to balance export/import moves with domestic cargo, and minimize any imbalances in various trade routes and domestic lanes.

The demand by manufacturers and shippers to achieve greater integration of their core processes with the logistics and distribution functions is creating opportunities for transportation companies to offer a broader, more complete service package. An integrated logistics/distribution service package can include:

- Warehousing
- Consolidation
- Tagging and hanging of merchandise
- Packaging,
- Minor assembly,
- Order tracking,
- Cost management, and even
- Installation and Customer Service.

In-transit visibility and flexibility. Manufacturing and distribution processes are evolving into more efficient integrated systems. Stores can reorder electronically and manufacturers can schedule production based on the latest demand information from retail sales. Purchase orders go directly from store computers to the suppliers, in many cases directly to the manufacturing facility. These “point-of-sale” based systems, made possible by the use of bar code scanning, allow firms to respond to real-time demand. However, because the demand is in the present, rather than projected, the ability to control inventory while it is in-transit becomes paramount. Reliability and transit time become critical considerations in freight movement – if the product is not there when the customer wants it, then it is a lost sale.

In-transit visibility refers to firms knowing where their inventory is at all times although they may not actually have it physically on their premises. Bar codes, radio frequency systems, transponders on vehicles, and advanced information and telecommunications equipment allow in-transit visibility to occur. In-transit flexibility occurs when these systems allow firms to quickly respond to changes in real-time demand. For example, if a product is moving very quickly at one store, stock can quickly be repositioned to be available to meet customer demand.

Using the best combinations of modes. As previously discussed, shippers typically do not care how cargo is routed or what mode is used, as long as delivery is timely and reliable. Carriers also want to move the cargo using the best combination of modes to provide the service sought by the shipper at the lowest cost.

As a result of deregulation, modal distinctions have been disappearing. Many of the services provided by all transportation companies now include multimodal movements and/or intermodal connections that cannot be identified separately or disaggregated by mode. For example, the air cargo industry includes both trucking firms and air carriers, as well as integrated carriers that operate both trucks and aircraft. It has been noted that as much as 20 percent of the integrated carrier activity that takes place at an airport never enters a plane. Rather, the entire movement is handled by trucks. However, this is not important to the end user – they are paying to have a product delivered when and where specified, not for the mode and route used.

Doublestack trains represent another example of using the best of each mode. Originally developed by American Presidents Line, doublestack trains (where containers are stacked two high on a platform) provided a most cost effective means for transporting goods between the Far East and the US East Cost. Rather than use an all-water route to the East Coast, steamship lines found that they could save time and cost by “landbridging” their cargo. Further, with door-to-door movement arrangements, such multimodal use would be invisible to the end user.

Doublestack use now extends beyond the movement of maritime containers. Shippers now view intermodal rail as an economical alternative to over-the-road trucking, providing that the intermodal move can meet similar reliability, transit time and cost parameters. Rail is used for the long distance move, where it is considered the most efficient mode, and trucks are used for the short-haul moves at either end, which are considered the most efficient mode for picking up and distributing freight.

In all these cases, the intermodal connectors play a key role in facilitating the move. They allow the efficient combination of modes.

The “amodal” transportation company. It is becoming increasingly difficult to characterize transportation companies as modal carriers. Multimodal

companies are now operating that include combinations of rail and truck service, steamship line and rail service. Most important, many single mode operating companies offer their services through many third parties or through logistics firms that package them as part of integrated services offerings. Shippers are then able to buy a seamless service that utilizes the most effective combination of modes that meets his needs. The emphasis is on the cost and service level offered, not on the technology or mode used.

It is within this context that third party logistics firms have emerged. The role of 3PLs has been previously discussed. In structure, the third party firms generally fall into two categories – asset based and non-asset based. Asset based 3PLs have their own transportation equipment and facilities. Non-asset based 3PLs, in contrast, do not own their equipment but rather contract with or assemble transportation providers to meet customer needs. Approximately 1,000 companies are now providing 3PL services, generating $34 billion in gross revenues in 1997.[3]

New National Security Requirements

Private sector freight customers are not the only ones seeking reliability, transit time, efficiency and cost. In an era of downsizing and budget constraints, the US Department of Defense (DOD) is seeking similar improved performance in its movement of freight and personnel.

The military is increasingly a customer of the commercial transportation system and has requirements that could potentially overwhelm the existing system. DOD is already a major user of commercial services, spending $2 billion annually on freight services alone. Further, the military anticipates, in the current "do more with less" environment, that it will rely on commercial providers for 90 percent of its peacetime movements and 85 percent of its wartime movements.[4] Looking into the near future, DOD recently enacted a new requirement that by 2001, the military must be able to respond to two geographically divergent major regional contingencies, each the size of Desert Storm, at nearly the same time. Even optimized, these surges could overwhelm the U.S. commercial transportation system with the need to ship 7,000 containers a week, along with troop and rolling stock movements.

Case Study : Desert Shield and Desert Storm. Over 3.5 million tons were moved to southwest Asia as part of Desert Storm/Desert Shield. This is roughly the equivalent of moving the entire city of Atlanta (the people, their belongings and their cars) half way around the world. However, as documented by Transcom's own analysis, the US had plenty of time to prepare, and the lift was

[3] Statistics developed by Richard D. Armstrong as noted in the ninth annual *State of Logistics Report* issued by Cass Logistics in 1998.

[4] *National Conference on Setting an Intermodal Transportation Research Framework*, Transportation Research Board, Conference Proceedings 12, 1997.

conducted under favorable conditions. The military had unopposed transits, host nation support, superior port facilities, and ample use of foreign flag shipping vessels. Even under these somewhat ideal circumstances, the military classified the move as inefficient. Innumerable things were lost somewhere in the supply chain. When they could not be located, the items were sent again and again.

Similar Needs. Accordingly, similar to the private sector, the military is seeking in-transit visibility and flexibility. DOD needs the same reliability, transit time, efficiency and cost sought by the private sector. However, the DOD movements are potentially much larger, with greater surges, and with even greater consequences if real-time demand is not met.

Unlike the private sector freight customers, the military's greatest intermodal demand will occur during an unscheduled crisis and will require immediate capacity to move men and materiel from the continental United States overseas to a conflict area, possibly even in two diverse regions of the world at the same time. DOD needs a reliable, rapid, safe, efficient, and cost-effective commercial transportation system to meet these national security requirements. The challenge of the military's needs for rapid deployment are measured in human terms and the more quickly the equipment and material arrive in the conflict site, the lower the loss of U.S. lives.

Since the last major mobilization of Desert Storm/Desert Shield in the 1980's, the DOD has taken measures to address the inefficiencies evident in moving the over 3.5 million tons of materiel required for that conflict. These have included the Voluntary Intermodal Sealift Agreement (VISA) which establishes conditions and terms, including payment considerations, for the use of U.S. commercial ships and intermodal equipment during national emergencies. This pre-planning for sealift, airlift, and surface capacity requirements along with agreed upon terms among the private sector, labor, and military, will lessen the burden on the overall transportation system as surge and sustainment requirements occur. Using advanced simulation technologies, it is relatively simple to theoretically plan for deployments; but in actuality, successful deployment will depend upon the immediate availability of infrastructure and support services. With joint public/private/military planning, the transportation system's capability to handle the military's requirements with minimum disruption to the commercial freight system will be there when needed.

Current projections made by TRANSCOM suggest that out of a $259 billion military budget, about 34%, or $88 billion, is expended on the logistics function. Ongoing budget cuts and re-engineering requirements are moving the DOD to reduce their transportation costs by following several of the operational and organizational tactics of the private sector. When the military consolidates functions, locates manufacturing and storage at transportation sites, and jointly invests their capital expenditures in transportation infrastructure, they are reflecting industry's recent efforts to maximize the opportunities for partnering, streamlining, and minimizing costs. Investment in applying commercial

technologies to improving DOD's power projection system will assure that its "just-in-time" system delivers the goods.

Seeking Solutions. The military has recognized the unique set of transportation challenges that it faces. At a 1997 DOD sponsored "Power Projection Symposium", three objectives were cited:

- Educate industry and government on deployment process and challenges;
- Identify commercial technologies of interest to the Army in improving power projection; and
- Enhance defense and commercial research and development partnerships.

During this meeting, DOD noted its projected freight needs. Specifically, it was projected that between 1996 and 2002 there would be a notable increase in military lift: Military airlift will move up from 48.9 ton miles/day to 49.4 ton miles/day in 2002. More significantly, the increase in Sealift is projected to move from 4.1 million square feet in 1996 up to 9.3 million square feet in 2002.

Learning from the private sector. DOD has expressed an increased level of interest in fostering an exchange of information and developing partnerships that address the common needs of the commercial and military freight movement. Just as the commercial sector was able to reduce the cost of distribution and logistics from a high of nearly 17 percent of the Gross Domestic Product (GDP) in the early 1980s to below 11 percent in the 1990s, the military has the same need to streamline. Timely information and accuracy of that information is what the military refers to as "strategic agility." The commercial sector has also streamlined its organizations, mapped its processes, and re-engineered to drive out costs. The military realizes that they must move down the same avenues as the commercial sector, and is carefully transplanting the best practices which accommodate surge and security requirements.

Military organizations outside of the US have also reached the same conclusion and are seeking to use the best logistics practices from the private sector. For example, in September, 1998, Emery Worldwide was awarded a two-year contract to provide third party logistics services for the Royal Australian Air Force.[5] Emery will provide consolidation, warehouse, inventory control and ocean container loading under the contract.

[5] American Shipper Wire Service, September 21, 1998.

Passenger Movements

Reliability, transit time, efficiency and cost are also often the parameters sought by passengers in their use of transportation infrastructure and services. But use of multiple modes is not as invisible for the end user, and information systems are generally set up to provide only single-mode data. For example, if a passenger wants information on an airline trip, that information is readily available. However, if the passenger also wants to obtain information on either connecting rail service or local transportation options, this data is not as readily obtainable. As the passenger industry moves towards integrating modes and facilities, the best practices and lessons learned from the intermodal experiences of the freight industry could be instructive.

In addition, in many instances, passenger and freight operations share transportation corridors, particularly highways and rail track. This can result in potential conflicts, such as the need to move freight trains at off-peak times to avoid commuter windows or balancing automobile and truck use of roadway capacity. There are also safety considerations – freight and passenger vehicles have different operating characteristics yet often must share the same transportation corridors. However, the overarching objective remains the same – to put each mode to its highest and best use.

IV. IMPLICATIONS FOR THE TRANSPORTATION SYSTEM

Orange juice must be there for breakfast. Products must be available when we go to stores to purchase them. Factories must have the materials they need to keep production lines going. Critical documents must be delivered to offices. Supplies and personnel must be where the military needs them. These are needs that are easily understood by the general population. However, how goods move and what is required is generally invisible to the public.

The distribution and logistics required to meet these needs are less visible to the general public and, therefore, less understood. Accordingly, translating reliability, transit time, efficiency and cost parameters into the implications for the nation's transportation system would seem an even more difficult task. However, that is not the case.

The overall demand for freight can be estimated based on economic trends such as the demand for certain industries' product. Reliability and transit time are based on capacity and congestion considerations. For example, congestion can cause unpredictable transit times and affects reliability. Congestion can also affect the efficiency and cost of operations.

Existing and future transportation infrastructure must consider and accommodate the dimensions of equipment moving into use. As noted previously, transportation providers are continuously introducing new equipment as a means for increasing efficiency and reducing their costs. Older elements of the transportation system may not be able to accommodate the 53 foot long, 102 inch wide, 13 foot six inch high trailers that have become the industry standard in the U.S. Railroads are similarly dealing with providing adequate clearances for taller doublestack trains. U.S. ports are also wrestling with providing adequate channel depth for the new class of mega container vessels.

Greater Demand and Greater Stress

All of the trends described previously ultimately increase the volume and frequency of freight movements that must be accommodated by the US transportation system and simultaneously increase the amount of stress placed on the system, particularly at intermodal connectors.

Growing demand even with optimization. Freight is derived demand. Freight moves in response to the needs of its customers. In a period of economic expansion, more goods need to be moved to support production lines, construction, and consumer activity. Shippers and transportation providers must also respond to customers who increasingly require more frequent and precise delivery of smaller quantities.

Shippers are making a concerted effort to optimize the use of transportation equipment (for example, through initiating back haul programs). Together with transportation providers, they are also shifting as much freight movement as possible to off-peak periods (when travel times tend to be more

consistent and roadways less congested). New types of equipment is being introduced to increase efficiency. Nevertheless, a healthy economy both generates and requires a freight transportation system that can support it.

Increased stress on the transportation system. The increased emphasis on meeting delivery windows and reducing the amount of inventory maintained on site heightens the need for a transportation system that provides the reliability, transit time, efficiency, cost and damage minimization sought. When the transportation system cannot meet these parameters, then the cost to the economic well-being of the country can be tremendous. Estimates of the economic impact of the UPS strike and congestion on the UP/SP have ranged into the hundreds of millions. In reporting problems with imports from Asia, the *Wall Street Journal* noted as a example:

> "Getting on a ship isn't even the end of the problem for some companies. Totes Isotoner Corp. got a shipment of 50,000 pairs of gloves squeezed onto a vessel to the U.S. from Asia on time, only to have them get stranded in a Chicago rail yard for a week, awaiting delivery to the company's base in Cincinnati. With so much cargo coming in, there aren't enough truck-trailer chassis to handle cargo boxes."[6]

The additional surges that could be generated by the military could further stress the system, affecting both military and commercial traffic.

Modal Integration – Striving for Connectivity in the Supply Chain

With shippers becoming both more demanding in their freight needs and less involved in the actual physical process, it is increasingly the transportation providers and third parties that must arrange and manage the entire trip from origin to destination. As discussed previously, the "door-to-door" move sought by shippers may involve several different modes of transportation. The overall objectives are to make the door-to-door move as seamless and invisible to the shipper; to meet the overall reliability, transit time, efficiency and cost parameters set by the shipper; and to carry out the move as effectively as possible so that it can generate revenue for the transportation provider.

Within this context, the ability to integrate the various modes in the transportation system – air, water, truck and rail – becomes crucial. Such integration must occur at two levels:

- Physical integration whereby the appropriate facilities and infrastructure exist to physically conduct the transfer of cargo between modes in an efficient manner; and

[6] Anna Wilde Mathews, "Holiday Imports from Asia Jam Shipping Lanes," *The Wall Street Journal*, September 22, 1998, page B1.

- Information and technology integration which provides the "backbone" that ties the modes together by expediting the movement of documents, payments, and tracking information. Information integration facilitates the exchange of documentation, orders and payments and provides critical tracking information. This tracking information allows the in-transit visibility and flexibility sought by shippers in a seamless move.

From an infrastructure standpoint, freight facilities become more of a meeting and integration of the modes. For example, ports are more than facilities that load and unload vessels – they are intermodal hubs where cargo is moved among modes to speed it to and from customers. Truck and rail access are as key to a port's success as waterside access. As one 3PL recently noted, "You can get a great ship rate and then have that go away real quick if the customer can't get in and out of the port." Similarly, truck access is critical to successful cargo operations at airports.

The Role of Intermodal Connectors

Accordingly, the intermodal connectors increasingly play an essential role in ensuring the reliability, transit time, efficiency and cost sought by shippers. Intermodal connectors allow transportation providers to use the best of each mode and to provide seamless door-to-door movements. Because shippers are further removed from the physical elements of freight movement and the general population rarely sees actual cargo operations today, the key role played by intermodal connectors may not be fully realized. However, the consequences of not having effective intermodal connectors has been made abundantly clear.

Opportunities and Barriers to Facilitating Intermodal Connectors

The importance of intermodal connectors would seemingly make them a priority for both the public and private sectors. Indeed, the need for system efficiency alone is an objective sought by both sectors. However, a number of issues remain for optimizing and investing in intermodal connectors. These include:

- Infrastructure Considerations – Coordination among the modes has advanced among transportation providers and pubic sector infrastructure providers. The public and private sectors need to continue to work together to optimally plan access for multiple modes at facilities. This may be complicated in many urban settings by an insufficient availability of land and older transportation system segments that cannot accommodate the newer equipment and vehicles being used today.

  Planning and investment in passenger facilities and connections also compounds the infrastructure issues for freight movement. For example, full service airports that are land constrained may place a priority on passenger service considerations.

- Operational Considerations – As freight traffic increases in general and surges become larger and more pronounced, operational issues will need to be resolved. For example, steamship lines are seeking to load and unload the new mega-class of container vessels in the same time as the previous, smaller class of vessels. To accomplish this, more cranes and labor are necessary to work the vessels. More equipment must be used to quickly move containers to and from on-dock rail facilities, and more capacity is needed for the additional truck and rail traffic generated. Information systems among the entities involved in the movement of goods are also still being woven together to expedite the flow of data and documents and to provide the detailed tracking data sought by shippers.

  In addition, reliability and transit time are often not based on freight movement throughout the day, but rather the demand for freight movement that must be met during certain portions of the day. Inbound traffic attempts to arrive by early in the morning or at the start of the business day. Outbound traffic generally leaves in the afternoon or evening.

  Many businesses and transportation providers have, where possible and cost effective, already adjusted their distribution channels and shifted to off-peak periods (generally at night) to obtain more consistent travel times. However, it should be noted that night time is increasingly the time allocated by departments of transportation for road work and maintenance. In addition, some communities are imposing delivery curfews in order to reduce noise, forcing trucks back into peak periods. Further, there are companies and operations that must continue to receive and ship freight during peak traffic periods. Peak period congestion at intermodal connectors to airports, rail

terminals, and port facilities is one of the key situations that requires investment and results in delay, increased costs, lower efficiency and unpredictable travel and delivery times.

- Regulatory Considerations – The range of regulatory issues that must be resolved include size and weight considerations. For example, many ocean containers are considered overweight for highways. To use the roadways, the products within the containers must be reloaded into trailers that comply with regulatory requirements. Environmental, noise, and hazardous materials handling regulations must also be reviewed within the context of facilitating intermodal connections.
- Financial Considerations – The shared goals of the public and private sectors would appear to make intermodal connectors an ideal forum for joint ventures. Indeed, several such ventures are under consideration or in the planning stages, including the "Portway" project linking the maritime facilities in New Jersey with rail terminals in the area via a dedicated truck road. As another example, the Seagirt Intermodal Container Transfer Facility (ICTF) in Maryland involved financial commitments by the railroads, the Port, nearby businesses and governmental agencies. The innovative financing elements of the TEA-21 legislation also provide a mechanism for facilitating such joint ventures.

  However, it is equally important to note that private sector entities tend to move much faster than the public sector in their business planning and investment and seek shorter pay back periods. These divergent time lines can impact the effective use and development of intermodal connectors.
- Competitive Issues – While coordination among the modes is increasing, competition among the modes and among transportation providers for customers will remain. Balancing the need to work together and the need to expand customer bases can be difficult. For example, it was recently noted that rail intermodal volumes have grown at less than one percent in 1998 in comparison with an average growth rate of seven percent over the previous four years.[7] Cost and service issues have been noted as traffic has converted back to over-the-road trucking. In an increasingly competitive and low profit margin environment, such issues will most likely continue.

  Competition is not limited to the private sector; geographical regions also compete for commerce. Under the new freight transportation parameters, the least expensive route that can meet transit time and reliability needs will be used, regardless of the actual distance or modes involved. Accordingly, federal investment can affect routing and modal decisions.
- Institutional Considerations – Freight movement remains one of the least understood elements of transportation. There is a continuing need to educate

[7] Rip Watson, "Intermodal sector warned it's flirting with flat-line growth," *Journal of Commerce*, September 25, 1998.

public sector agencies, elected officials and the general public on the role of freight movement in the economic well being of the country. Efforts to involve citizens in the general transportation planning process have been successful. Similar efforts are needed to fully and productively engage companies and freight transportation providers in public sector planning processes.

- Meeting Other Public Goals – In enabling the highest and best use of each mode, intermodal connectors can help achieve safety, environmental, economic development, land use, and other public objectives. However, explaining and illustrating the value of intermodal connectors relevant to these objectives is still needed for the general public, state agencies and MPOs. Without an understanding of that value, intermodal connectors, similar to freight movement in general, may not receive the appropriate level of prioritization in regional and local planning and investment.

In conclusion, the growing importance of increased reliability and efficiency, combined with reduced transit time and cost, points to the vital need to provide adequate capacity for access to major intermodal terminals that serve international, national, and regional commerce. Congested, inadequate, or functionally obsolete intermodal connectors can be an obstacle to the seamless, reliable cargo movement that US businesses and security requirements demand now. Meeting the more stringent requirements anticipated in the next century may be far harder to achieve. Efficient intermodal connectors promote the best use of each mode and support the performance standards of goods movement necessary as the country moves forward into the new century.

APPENDIX A:
EXECUTIVE DIALOGUE DISCUSSION SUMMARY

APPENDIX A:
Executive Dialogue Discussion Summary

On December 10, 1998, a set of individuals representing shippers and freight carriers gathered in Washington, DC to discuss changing needs and priorities for the US freight transportation system as the country moves into the 21st century. The executive dialogue was designed to be a tightly focused working session that would provide guidance to USDOT as part of a congressionally mandated assessment of NHS connectors. The key points that emerged from the discussion included:

- ***The efficiency of all modes is dependent on efficient roadway access.*** Roadways handle the end moves of an intermodal movement. They also link freight facilities. For example, roadways link maritime terminals to rail yards that are not on-dock. In terms of providing the high degree of reliability needed today, the highways provide the best dollar value.
- ***Transit time, reliability, cost and damage minimization are the key considerations in modal selection.*** It was noted that shippers are looking for a "perfect world" in terms of the speed and reliability they expect from their transportation providers. From a carrier perspective, the customers' expectations are: " We are going to be there; we're going to make the commitment; we'll get it there on time. They don't care how we do it." In addition, speed can matter. For example, in deciding between routing cargo by truck-rail-truck or by truck only, transit time may be the decision point. The mode can also matter to shippers in terms of limiting the potential damage to cargo shipped and delays. In today's just-in-time work environment, delays can significantly hurt firms.
- ***Shippers want flexibility, that is the use more than one mode or route to move their cargo.*** Shippers worry about breakdowns in service (for example, from carriers or from unexpected weather). They do not want "all their service eggs in one basket." Accordingly, access to a variety of options for moving goods is highly desired.
- ***The railroads have a tremendous opportunity to grow their cargo market. This growth depends on the railroads improving their reliability and may be hampered by cost savings efforts.*** Participants noted that consistency in railroad service was essential to bring customers back. The market for intermodal rail service is there because of the railroads' ability to move freight long distances economically and because of the truck driver shortage. However, it was also noted that the railroads continue to focus on using their existing yards, which were originally developed for box car traffic that did not require highway connections. Highway access is crucial to intermodal rail service.

- ***Congestion directly impacts productivity***. Participants noted that truck drivers need to arrive an hour early to ensure they make their appointment with a receiver because of the uncertainty in travel time caused by congestion. This seriously impacts the use of driver hours and productivity levels. It was also pointed out that trucks do not necessarily have the luxury of waiting for off-peak periods to deliver their shipments. Accordingly, participants noted that "peak period pricing" would not necessarily work to redistribute truck movements.
- ***Safety is a major concern***. Safety issues arise in a number of circumstances, including the difference in operating characteristics of freight and passenger vehicles that must use the same roadway; the movement of hazardous materials (which also raises liability and preparedness issues); and having to travel through construction zones while enroute.
- ***Industrial sprawl, similar to suburban sprawl, has complicated modal decisions and operations.*** Industrial production and distribution centers have moved away from urban cores to more suburban and exurban locations. This outward movement places the facilities further away from existing intermodal rail yards. It was noted that railroads will continue to focus on maximizing the use of existing yards because of cost considerations. For example, modern intermodal yards require much more capital expenditures that previous types of yards – there are more equipment and information system requirements.
- ***The military has freight movement requirements that are similar to the private sector.*** For the military, time is of the essence. Their concerns include supporting emergency deployments using the commercial freight system, as well as the impacts of congestion and construction zones on crucial cargo movements.
- ***Solutions to intermodal connector problems should be considered on a case-by-case basis. Some problems may require a relatively minimal expenditure to resolve.*** Solutions can consist of a new turnpike exit, the designation of a local road as a federal route, or development of a dedicated truck lane. Participants noted that "value toll pricing" is the fad of the moment but is not the answer to nationwide problems. Similarly, building new capacity simply cannot be done in some urban settings. Participants suggested that the federal government become more focused on finding specific solutions to specific problems.
- ***Separating trucks from passenger vehicles, along with separating long distance movements from local traffic could substantially help.*** The participants noted that one of the biggest headaches is freight and passenger vehicles having to use the same roadways. Similarly, long distance truck moves must pass through local "peak period" congestion zones, hampering their speed and reliability. Dedicated truck routes or lanes can expedite traffic

and cargo flows. A similar situation exists with the railroads who must share rights-of-way and track with passenger operations.

- ***Technology can help. However, standards are still needed, and technologies must provide an easily identifiable benefit (particularly financial) to the users.*** Information is crucial, particularly to manage and react quickly to unexpected problems and needs. Participants noted that a convergence of standards is needed in technology applications that cut across modes. It was noted that there were too many individual "stove pipes" for the flow of information currently in existence. Further, the financial savings of new technology applications must be readily apparent. One carrier related that it notified the owner operators that the company works with about the EZPass electronic toll system as a time saver. However, the owner operators apparently focused primarily on the need to place $500 upfront into an EZPass account rather than pay as they used toll facilities. None signed up for the program.
- ***With the increased passenger load factors on aircraft, shippers are moving towards more use of all-cargo aircraft and investigating options such as using trucks on some routes.*** The Postal Service noted that it is leasing a number of aircraft on a long term basis in response to passengers and their baggage reducing the amount of "belly cargo" space available to move the mail, as well as to ensure adequate air capacity on needed routes.
- ***Freight carriers are willing to pay to reduce the congestion they encounter. However, the improvements must work and save them money. Further, because of the low margin nature of the business, increased costs will be passed on to customers.*** Participants noted that "most of the fat" has been removed from the freight system. Accordingly, increased costs of operations have to passed on to customers. One way that congestion relief can generate cost savings is if a driver can handle an additional cargo movement each day as a result of the improvement.
- ***The MPOs need to have a better understanding of freight movement and the concerns of freight industry. Similarly, the freight industry needs a better understanding of the MPOs and the role they play. The involvement of the federal government could help.*** Participants noted that the MPOs have done a good job of involving citizens in their planning; however, the MPOs also need the active participation of the freight community. It was conversely noted that it is often hard to get private sector freight firms involved with MPOs; that companies only go when there is an item that specifically affects them. One participant noted that MPOs were the "ultimate in uncharted waters." Further, for larger corporations, interaction with MPOs is particularly difficult – they must interact with several MPOs, each with its own personality. It was suggested that FHWA working with the MPOs:

- develop project measurements that make sense to the general public (such as jobs, economic impact, competition) rather than focusing on the goods movement nature of some initiatives.
- document best practices with regard to freight movement and intermodal connectors.

Participants also suggested that the federal government ask more questions of the MPOs regarding freight movement and intermodal connectors. The participants felt that the federal government could take a greater role in advancing freight movement objectives and considerations with the MPOs, along with increasing the meaningful involvement of freight users and providers in the MPO processes.

The dialogue agenda and participants are attached.

The Role of the National Highway System Connectors in the Development of a North American Intermodal Transport Network: Practices, Priorities, and Policies

Executive Dialogue Agenda

December 10, 1998

Washington, DC, KPMG Building, 2001 M Street, NW on the 9th floor

9:00 - 9:30 AM	**Continental Breakfast**
9:30 - 10:45 AM	**Welcome and Introductions** – Madeleine Bloom, Harry Caldwell and George Schoener, Federal Highway Administration **Discussion**: • What are the key characteristics sought in freight movement today? • How are the various modes – rail, truck, maritime and air – being used? • What is the role of the intermodal connectors?
10:45 - 11:00 AM	**Coffee Break**
11:00 - 12:30 PM	**Discussion**: • How can the federal government facilitate development of an efficient freight transportation system? • What are the appropriate roles and priorities for the federal government in improving intermodal connectors? • How can USDOT better organize its programs and functions to better serve businesses?
12:30 - 1:30 PM	**Informal Lunch**

Executive Dialogue Participants

Mr. Walter Curran
Holt Cargo Systems, Inc.

William Goetz
CSX Intermodal

Mr. Edward Bridges
H&M Trucking

Mr. James Hertwig
Landstar Logistics

Mr. Richard Fallica
US Postal Service Headquarters

Mr. Arthur C. Kelly, Jr.
The Terminal Corporation

Mr. Robert Utz, Jr.
McCormick & Company

Mr. Bob Franz
MTMCTEA, MTTE-SA

Public Sector Participants

Madeleine Bloom
FHWA Policy

Harry Caldwell
FHWA Policy

George Schoener
FHWA Program Development

Lee Chimini
FHWA Program Development

Steve Natzke
FHWA Program Development

Mike Onder
ITS JPO

Richard Walker
Marad Intermodal

Evie Chitwood
Marad Intermodal

Rob Martin
FRA Policy

Chip Wood
USDOT Intermodal

Consultant Team

Anne Strauss-Wieder
A. Strauss-Wieder, Inc.
(dialogue facilitator)

Christina Casgar
A. Strauss-Wieder, Inc.

Ray Ellis
KPMG Peat Marwick

Amy Orringer
KPMG Peat Marwick

Jennifer Clinger
Louis Berger & Associates

Joan Yim
Parsons Brinkerhoff