TRANSPORTATION

ABSTRACT: The United States has the largest, most advanced transportation system in the world. It efficiently serves 284 million people and six million businesses scattered about the country. The transportation system plays a critical role in national and international affairs. It is the heart of the nation's economy and a major part of the global economy as well. It empowers America's political, informational and social influence in the global community. America's transportation system is also a critical element of national power. It enables the swift mobilization of the military and supports the sustainment of the armed forces during long-term conflict. The importance of the US transportation system makes it essential that leaders in industry and government act to advance its capabilities. National leaders must address the security, infrastructure, labor, capacity and environmental issues facing the transportation system. Most importantly, federal, state and local governments must collaborate with industry to provide the significant capital investment needed to maintain and expand the infrastructure necessary to support the robust system demanded by the American people.

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Domestic:
Alameda Corridor Transportation Authority, Long Beach, CA
American Airlines, Fort Worth, TX
American President Lines, Los Angeles, CA
Burlington Northern Santa Fe Railway, Fort Worth, TX
Burlington Northern Santa Fe Railyard, Alliance, TX
CSX Rail Terminal, Baltimore, MD
Federal Express World Hub, Memphis, TN
Liberty Ship, *John W. Brown*, Baltimore, MD
Louisiana Steamship Association, New Orleans, LA
Long Beach Port Authority, Long Beach, CA
Port of New Orleans, New Orleans, LA
Regional Planning Commission, New Orleans, LA
Union Pacific Railroad, Long Beach, CA
USNS Fisher, Military Sealift Command, Baltimore, MD

International:
598th Transportation Group, Military Traffic Management Command-Europe and Southwest Asia, Rotterdam, Netherlands
Aalsmeer Flower Auction, Amsterdam, Netherlands
British Airports Authority, Heathrow Airport, London, United Kingdom
British Airways, London, United Kingdom
Bureau Voorlichting Binnenvaart, Rotterdam, Netherlands
Betuweroute Visitors Center, Rotterdam, Netherlands
Caterpillar Logistics Services, Brussels, Belgium
EuroTunnel Development Ltd, Folkestone, United Kingdom
GE SeaCo, London, United Kingdom
Maersk Sealand Europort, Rotterdam, Netherlands
Rotterdam Port Authority, Rotterdam, Netherlands
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INTRODUCTION: Transportation touches every American's life, every day. It provides the means for delivering the fuel that provides energy, carrying the food that feeds the nation's people and moving the material that builds and sustains the nation. It takes us to work and to play, to school and to worship. All citizens are dependent on safe, reliable transportation. Further, transportation is vital to America's national security. During peace, the US military relies on a robust transportation system to carry out its responsibilities to organize, equip and train military forces. And, transportation mobilizes and sustains those same forces in the event of war or other military operations. The transportation system fuels the US economy, which, in turn, finances a strong national defense.

Approximately 11% of US gross domestic product is transportation related goods and services.[1] One out of eight civilian jobs is transportation-related. The transportation system also plays a vital role in today's expanding global market. The transportation system moves over 20% of the world's goods and services. It empowers America's political, economic, informational and social influence in the global community.

Although it can be simply defined as a service that moves people and goods, America's transportation industry is anything but simple. It efficiently serves 284 million people and six million businesses scattered about the country. The transportation industry is made up of a variety of key industries – air, maritime, motor carrier, pipeline and rail. It is comprised of a fleet of more than 20 million commercial trucks and buses, 190 million private automobiles, 1.5 million railroad freight and passenger cars and 7,600 certified air carrier aircraft. America's transportation system includes over 300 ports supporting 3,700 marine terminals and 5,000 berths that serve thousands of ships and barges. Gas and oil are transported in over 1.5 million miles of pipeline within the United States. US transportation platforms operate on 192,000 miles of rail, four million miles of public roads and interstate highways and 25,000 miles of waterways and harbor channels. All together, the US transportation industry distributes 4 trillion ton-miles of products and allows people to travel 4.6 trillion passenger miles each year.

The demands upon the transportation industry increase every year. America's prosperity has created a population that is both mobile and the largest consumer country in the world. International trade tripled in the last thirty years and is expected to double in the next ten years. E-commerce has placed a greater demand on the transportation sector by generating more volume and higher public expectations for on-time, on-demand delivery direct to customers. Amidst these many constant challenges, the transportation system is also now facing several new, serious issues that threaten its stability and current capabilities. The events of 11 September 2001 confirmed how critical transportation is to the nation and revealed how vulnerable it is to attack.

Despite the challenges, the US transportation industry is robust and highly capable. It continues to enable both economic strength and military mobility. The industry's future is bright, but it must tackle significant challenges in security, capacity and condition of its supporting infrastructure. Security and infrastructure advances will be costly so the industry must take advantage of technologies that deliver cost-effective solutions.

The transportation industry is also now characterized by value-added logistics services. Frequently, a transportation firm is more a logistics service firm than purely a

transportation firm. For example, Caterpillar Logistics views transportation as a homogeneous commodity. Its core competence lies not in transportation, but in delivering the parts a customer needs wherever and whenever the customer needs them. To do so, Caterpillar orchestrates multiple modes and providers of transportation to provide its customers a successful, integrated logistics service.

CURRENT STATE: Two significant circumstances had recent dramatic effect on the US economy as a whole and deeply resonated throughout the transportation industry. The first is the recession that commenced in March 2001; the second is the 11 September terrorist attacks. These events enormously impacted the transportation industry. Many of the key transportation indicators showed negative trends when comparing October 2001 to October 2000, with dramatic drops in the immediate aftermath of 11 September. Clearly, patterns of passenger travel changed due to the attacks, with an immediate and dramatic drop in air travel.

Economic indicators show the US has turned the corner on the recession and are in what has been termed "guarded" recovery. The transportation industry is a leading indicator of the health of the US economy. An economic downturn brings reduced capital investment and slows consumer spending, so reduced demand results in fewer products being transported. It is too soon to tell if the underlying trends have significantly changed, or if there is any lasting shift among transportation modes in the longer run.

Air: The aviation sector remains in a depressed condition from the after effects of 11 September and a US economy that had been slowing since early in 2001. Airlines were hard hit by loss of business travelers during the recession and hit again by the public's reluctance to fly after 11 September. It is worth noting that airlines often gain more than half their revenue from business travel. British Airways (BA), for example, gains 80% of revenue from 16% of its passenger volume.[2] BA caters to the business traveler, so these figures probably represent one end of the airline revenue spectrum, but the case is still illustrative of the importance of business travel to the financial well being of the airline industry. Congress approved special loans to maintain a vital industry facing, according to the Federal Aviation Administration (FAA), estimated losses of $9.75B in 2001. Further, the FAA reported that passenger traffic for US airlines fell 6.9% in 2001 and predicts a further 4.7% decline in 2002. Reverting to the industry's dismal profit picture of 1990-1994, only Southwest Airlines among scheduled carriers is likely to be profitable in 2001 or 2002. The FAA is currently forecasting depressed passenger numbers through 2002, though the industry expects growth to resume in 2003.[3]

The big three, United, American and Delta, dominate the market and supply some 50.7% of total revenue passenger miles.[4] Seeking economies of scale and access to larger markets, US passenger carriers will continue to aggressively pursue alliance arrangements, both internationally and domestically. Many in the industry expect airline consolidation in the near term as a reaction to the sharp industry losses in 2001.

The air cargo sector continues to offer expanded services with a full range of logistical support and management for its customers. For example, Federal Express secured a

contract to deliver mail for the US Postal Service. Package express services, like UPS and FedEx, and cargo carriers, like Polar Air Cargo, provide customers in-transit visibility so customers can utilize just-in-time systems and decrease inventory costs.

Maritime: The US continues to be the world's largest maritime trading nation. Ninety-five percent of US international trade travels by water. The US Marine Transportation System (MTS) of coastal, inland, Great Lakes waterways and ports is critical to the US economy and national security. The MTS efficiently moves over 2.4 billion short tons of foreign and domestic trade, and is growing to accommodate projected future demand.[5] Petroleum and petroleum products, crude materials and coal comprise most of the cargo moving in US domestic waterborne trade.[6] Domestic waterborne ton-miles in the coastal trade have declined slightly in recent years. In 2000, there was a 0.69% decrease from the previous year to 302.6 billion short-ton miles.[7]

Inland waterways constitute an important segment of US waterborne transport but a significantly larger segment of transportation in Europe. For example, throughput at the five ports in New Orleans is currently some 270-300 thousand containers annually and is expected to grow to 360 thousand with the opening of an additional container terminal currently under construction. More significantly, total tonnage put through New Orleans ports was 253 million short tons in 2001. Comparatively, Rotterdam in the Netherlands, has an annual throughput of 320 million tons in 2000. Rotterdam, also the world's largest port, is vital to Europe's inland waterway transportation.

US-flag merchant ships conduct only 3% of US international maritime trade.[8] Due to the higher crew wages, as well as other costs associated with US-flag requirements, the US merchant fleet had difficulty competing in the international market and has steadily declined over the past 50 years. In May 2001, the US-flag deep-sea commercial fleet consisted of approximately 212 vessels.[9] To help support and maintain the US-flag merchant fleet, the government has provided limited direct assistance in the form of the Maritime Security Program, Voluntary Intermodal Sealift Agreement (VISA) Program, the Jones Act and the Title XI shipbuilding loan guarantee program.

The continuing decline of the US maritime industry and the decreasing mariner population has serious implications for meeting strategic mobility requirements. In early 2002, an analysis conducted within the US Navy determined that an additional 2,150 seagoing personnel, including a minimum of 663 licensed mariners, would be required to fully crew Ready Reserve Force (RRF) and Surge Sealift Force (SSF) vessels. The six state maritime schools graduated 397 licensed mariners in 2000.[10] Another 180-200 licensed mariners graduate annually from the US Merchant Marine Academy. It is becoming more difficult to recruit young people into the merchant marines. This could make it more difficult to meet mobility requirements in the future.

Pipelines: The nation's extensive pipeline system is a critical segment of the transportation industry. It moves vast quantities of petroleum products, water and chemicals. Pipelines transport 67% of US petroleum commodities and oil pipelines transport 17% of all US freight at only 2% of the nation's freight expense.[11] Thirty-eight

million barrels per day of crude oil, intermediaries and finished petroleum products are transported by pipeline. Pipeline flow velocity is between 3-8 mph, with an East-to-West, coast-to-coast transit time of 2-4 weeks.

The US natural gas pipeline network continues to grow to meet increasing domestic and import/export demands. US natural gas consumption increased by 17% from 1991 to 2000 and natural gas demand is expected to grow even more rapidly over the next 20 years.[12] The natural gas pipeline network has grown 27% since 1990.[13] The existing US natural gas pipeline grid consists of over 254,000 miles of mainline transmission lines with an estimated daily delivery capacity of 119 billion cubic feet (almost twice the amount of US daily consumption in 2000).[14]

Rail: America's freight railroad industry is dominated by four companies, with Union Pacific and Burlington Northern/Sante Fe (BNSF) operating to the west of the Mississippi River and CSX and Norfolk Southern operating in the east. The freight railroad sector meets the nation's current demands for rail service and has the capacity to accommodate future economic growth.

In 2000 the US railroads accounted for more than 40% of all freight transportation. US freight railroads directly contributed $14.7B to the economy in wages and benefits to 191,808 employees. America's freight railroads carry more than 25% of the nation's intercity freight tonnage and 41% of its ton-miles; 70% of vehicles from domestic manufacturers; 65% of the nation's coal and 30% of the nation's grain. US railroads hauled nearly 33 million carloads of freight in 2000, totaling 2.14 billion tons and 1.53 trillion ton-miles. Expected rapid growth of throughput (doubling between now and 2020) at the Ports of Long Beach and Los Angeles means that freight rail needs to keep up with growing demands. The Alameda Corridor rail project which opened in April 2002, is a big step in the right direction. More investment in dedicated freight rail lines like Alameda and the Betuweroute project in the Netherlands will be necessary in the US as demand for efficient freight movement inland from key ports continues to grow.

Amtrak, the country's long distance passenger rail company, is not financially solvent. In December 1997, Congress passed the Amtrak Reform and Accountability Act (ARAA) that established a deadline of 2 December 2002 for Amtrak to sufficiently improve operations to eliminate need for further federal operating subsidies. ARAA gave Amtrak the latitude to drop routes but they have not done so due to political pressure. According to its 2000 annual report, Amtrak reported a net loss of $768 million compared to a net loss of $702 million in 1999. If Amtrak cannot become operationally self-sufficient by the deadline, the Amtrak Reform Council recommends it liquidate. The local commuter rail systems, however, are widely used and support relief of automobile congestion.

The events of 11 September forced a greater degree of cooperation between Amtrak and the four major freight railroad companies. All are actively engaged with industry task forces and government agencies to address increased rail security measures. As with other industries, security is a top priority for the rail industry. Continued success is contingent upon its ability to safeguard its rail system from attack.

Motor Carrier: The motor carrier sector continues to be the dominant mode of freight

transportation in America and has been since the early 1960s. The trucking sector transported 68% of the nation's domestic freight in 1960. By 1997, the total tonnage of commercial freight hauled by trucking had increased to 80%.[15] There are over 450,000 interstate motor carriers registered with the Department of Transportation (DOT), employing approximately three million drivers who log 428 billion miles annually. The motor carrier sector saw its fortunes decline sharply over the past year with industry profits declining. Particularly hard hit were independent owner operators and interstate motor carriers that operate fewer trucks. Over 3,650 trucking companies went out of business in 2000. Not surprisingly, surviving companies purchased relatively new repossessed trucks instead of buying new ones. As a result, sales of new trucks were down 30% from November 1999 to November 2000. This downturn rippled throughout the truck manufacturing sector, where firms like Freightliner and Peterbilt laid off thousands of workers as production of heavy rigs plummeted from a record 262,000 in 1999 to an estimated 120,000 for 2001. As highway congestion and pavement condition worsen it will constrain motor carrier traffic and require new ways of managing traffic and diversion of freight off the roads onto rail and, where practical, inland water.

CHALLENGES: The attacks of 11 September present new challenges for the industry. The transportation systems move huge amounts of goods with great efficiency thanks in part to the nation's openness; an openness in which the citizens have taken for granted the security of its transportation systems. Accordingly, security costs and related delays were minimal prior to 11 September. The newly recognized threat will demand investment in new equipment, information technology (IT) and operating procedures. Security, however, is only one of the challenges the transportation industry must address. Keeping infrastructure up to the demands placed on it is a significant challenge. Labor concerns are common throughout the industry. Fluctuating fuel costs significantly impact corporate profits and financial stability. The outcomes of the expanding transportation system must be balanced against their environmental impact. Safety remains an industry-wide challenge. Finally, technology must be leveraged to maintain the competitive advantage in the global market. We already use many automated systems in the transportation industry but the real goal is a highly integrated system of systems. Specific security issues affecting the transportation industry are addressed in the "Essays on Major Issues" section.

Infrastructure Expansion and Modernization: America's public and private sectors demand an extensive and modernized infrastructure to support the nation's transportation industry. This infrastructure modernization investment must have security and capacity as primary concerns. Highways, railroads and bridges require continuous maintenance and upkeep. Harbors, intracoastal and inland waterways need continuous dredging to sustain their channel depths. The antiquated air traffic management system must be modernized to support increasing demands on the air transportation system.

The industry and the nation face the significant challenge of reinvesting in core transportation resources: 59% of US roadways are in fair, mediocre or poor condition; 31% of the nation's 582,862 bridges are either deficient or functionally obsolete; waterways and ports require modernization to cope with increased commercial volume

and larger ships; 44% of inland waterway locks and 23,000 dams are over 50 years old and are considered significant hazards; and 21% of US railroad track requires significant improvement. The American Society of Civil Engineers estimates the nation must invest $700B to repair and improve the transportation infrastructure.[16] Innovative engineering solutions will be necessary to extend the life of the infrastructure. Additionally, the transportation infrastructure must be revolutionized by applying applicable information technologies, like Intelligent Transportation Systems.

Since the end of Cold War, no significant infrastructure change has occurred. The government has added money to fix, rebuild and extend the infrastructure but it has not kept pace with growth. The most critical aspect of the transportation infrastructure problem is congestion. Motor vehicle overcrowding is a major problem in 39 of the 70 largest US cities. Overcrowding is also a problem at 22 of the nation's busiest airports.[17] The combination of expanding trade and increased travel will only worsen the congestion problem. National, state and local governments and private industries joined forces in addressing this critical issue. In the Los Angeles/Long Beach port region, the Union Pacific Intermodal Container Transfer Facility and the Alameda Corridor Rail project provide examples of congestion-relief efforts that increase distribution efficiencies. Air traffic congestion at many of the nation's major airports has reached unprecedented levels, placing extraordinary burdens on the nation's air travelers and air traffic controllers. Recent figures from the Bureau of Transportation Statistics concerning the air passenger sector reflect the highest percentage of delayed, diverted and canceled air passenger flights in history.

The main growth area for global trade is in container shipping where the leading trend is the deployment of larger container vessels. These gigantic vessels require deeper and wider channels and deeper and longer berths. According to a September 2000 report by the US Army Corps of Engineers (ACOE), container ports around the world are deepening navigation channels to between 49 and 53 feet. Since channel depths at most US ports typically range from 35 to 45 feet, the ports and harbors will require extensive deepening to accommodate this global fleet of ultra-large container ships.

Labor: The single largest expense item for the transportation industry is employee wages and benefits. Changes in labor costs directly affect the price of transportation services, profit margins and the competitiveness of the industry.

A common theme throughout the transportation industry is the lack of qualified labor. A shortage of truck drivers as well as their constant turnover continues to impact the motor carrier segment. It is also becoming increasingly hard to recruit young men and women into the merchant marines. The lack of experienced merchant mariners within the US has raised concerns about adequate manning for the RRF.

All sectors of the industry must deal with the consequences of a labor force that is heavily unionized. Particularly vulnerable is the air transportation sector. Recent labor disputes threatened to impact United Airlines. However, negotiating with multiple unions is a time consuming task. For instance, BNSF management must negotiate

contracts with 13 different labor organizations.[18] Industry managers view the increasing demands of unionized labor as one of the greatest threats to the financial stability of the air transportation and rail passenger service sectors.

Fluctuating Fuel Prices: Another challenge to the financial stability of the transportation industry is fluctuating fuel prices. Fuel prices are still susceptible to volatile price swings. The Air Transport Association reports each one-cent increase in the price of jet fuel adds $200 million to annual airline industry costs.[19]

Environment: As the demands upon transportation increase, the demands for an environmentally safe transportation industry increases. Engine emissions, dredging and ballast water present serious challenges for global industry. External agencies continue to press for increased emphasis on environmental awareness. In response, transportation companies have invested in fuel-efficient engines, noise reduction and the proper disposal of contaminated material. In addition to protecting the environment, the companies have reduced their fuel cost and avoided costly litigation. New technology introduced to avoid road traffic congestion minimizes the effects of vehicle emissions by reducing the amount of time spent idling on the road.

Shipping companies have joined the environmental battle by agreeing to implement new standards for ballast water management. Unknown species and organisms carried into the US in ballast water poses a significant threat to the local marine eco-systems.

Safety: Safety programs instituted across the industry have resulted in continued improvement in accident statistics. The total number of people killed in highway crashes in 2001 was estimated to be 41,730, compared to 41,821 in 2000. The total number of people injured dropped by 200,000 to 3.0 million in 2001. Fatalities involving large truck crashes dropped from 5,211 in 2000 to 5,192 in 2001. American Trucking Association's (ATA) Road Team members - most of whom have one to two million miles of accident free driving in their careers – travel the country and speak on behalf of the ATA to the media and to the public. These drivers address transportation issues and answer questions about the trucking industry's commitment to highway safety. Most importantly, they provide safe driving tips and offer motorists advice for safely sharing of the road with tractor-trailers.

In 2001, there were 36 US scheduled airline accidents, including the four crashes of 11 September. The remaining 32 accidents in 2001 result in an accident rate of .317 per 100,000 departures. These numbers represent a decrease from 2000, when 51 accidents were reported for a rate of .463 accidents per 100,000 departures. The 531 fatalities associated with crashes involving US scheduled airliners last year is the highest total since 1977. Half of last year's fatalities - 265 - occurred aboard the four hijacked airliners on 11 September. Other than a ground worker who was struck by a propeller at an airport in August, the remaining fatalities (265) occurred when American Airlines flight 587 crashed in New York on 12 November.

Work-related injury compensation decreased across the rail industry, but was

somewhat offset by higher insurance costs. Total accidents fell, but the rate per million train miles increased because fewer miles were traveled in 2001.

TRANSPORTATION AND NATIONAL SECURITY: The ability to project large numbers of forces quickly is a distinctive feature of the US military and is critical to maintaining the nation's status as a superpower. Since the end of the Cold War, the US armed forces participation in deployments in support of small-scale contingencies and humanitarian efforts has steadily increased. At the same time, national security leadership has reduced the number of US troops permanently stationed overseas. To meet the demands of the future, the Department of Defense (DoD) maintains strategic airlift and sealift to move its forces as well as to position abroad critical assets in strategic locations. To maintain flexibility, DoD relies heavily on commercial planes and ships to assist in its power projection.

Force projection relies on three components: airlift, sealift and ground transportation. The nation's highway and rail systems play critical roles in the movement of military equipment and personnel during peacetime and particularly in wartime. When a contingency arises, huge amounts of military equipment and personnel are moved expeditiously from their home station to various seaports and airports.

DoD's current fleet of strategic aircraft includes three types of cargo planes: the C-141, C-5 and C-17 and two varieties of tanker aircraft, the KC-10 and KC-135. A significant part of the nation's mobility resource is in the Civil Reserve Air Fleet (CRAF). The CRAF has three main segments: international airlift, national airlift and aeromedical evacuation. Commercial US air carriers sign a contract to belong to CRAF and make available a certain number of planes and crews to DoD in the event of a crisis in return for preference in bidding on the government's air transportation business. If fully mobilized, the combined fleet would have a total theoretical airlift capacity of almost 50 million-ton miles per day.[20] Nearly two-thirds of that amount comes from the military's own planes, with the rest contributed by CRAF. During a major contingency, CRAF will provide about 90% of passenger and 40% of cargo airlift capacity.[21]

In order for the US to respond unilaterally to military emergencies, it requires an adequate US-controlled maritime shipping capacity. Sealift's role in future contingencies is one of both surge and sustainment. DoD's SSF includes approximately 95 ships and has the capacity to carry more than 7 million square feet of cargo.[22] These ships include government owned Fast Sealift Ships (FSS), Large Medium Speed Roll-on/Roll-off (RORO) and container ships. Only ships that can be ready for deployment in less than 20 days are considered part of DoD's SSF. Many of these are part of the RRF, a fleet of cargo ships maintained by the DOT's Maritime Administration. There are several programs and acts that help the US maintain a US-flag merchant fleet. They include the Maritime Security Program (MSP), the Jones Act and the VISA, which provides annual funding to private operators in exchange for emergency sealift and related services to DoD.

Prepositioning combines the speed of airlift with the volume of cargo that sealift can

provide. The afloat prepositioning program plays a significant part in the US strategic mobility strategy. DoD maintains approximately 35 strategically positioned ships to provide quick response capability. These ships support the Army, Marine Corps, Air Force and the DLA and carry ammunition, fuel, equipment and supplies.

DoD must have the agility necessary to deploy large and small forces rapidly to a wide range of contingency operations around the globe. Speed is essential when projecting military force, so the US military is currently leasing high-speed vessels (HSVs) to test their potential for providing strategic mobility. HSVs refer to ocean-going cargo vessels with speed capabilities of approximately 40 knots or greater. They typically use water jet propulsion systems and have high technology hulls (aluminum). HSV technology has matured and may significantly enhance operational maneuver of brigade-sized units (5,000 – 7,000 personnel) from the sea at high speed and long range.

Changes in the international security environment, technology and strategy will require the DoD to continually reexamine its resources and method of doing business. Power projection depends on effectively maintaining a balanced mix of both government-owned and commercial transportation resources. A strong, professional partnership between the transportation industry and DoD will ensure the US maintains its ability to project forces quickly and keeps its superpower status.

OUTLOOK: The US transportation system will remain a critical element of national power, both for its contribution to the nation's economic strength through the efficient distribution of goods, and for its ability to deploy and sustain military forces. While the US transportation system is functioning well today, it is essential that the transportation industry address capacity, infrastructure and labor issues especially in the face of projected significant increases in freight volume.

General Industry Forecast: The US transportation industry is primarily privately owned. To date the focus of transportation firms has been on obtaining competitive advantage through greater velocity and throughput, frequently using the existing infrastructure. Companies will continue using advances in IT to maximize velocity and throughput, as well as provide greater reliability and enhanced services for customers. The predicted 28% increase in freight volume over the next 20 years will require expansion of America's transportation system. Adding capacity in the form of additional railways, roads and ports is capital intensive and requires significant lead-time to complete. Rail companies, for example, will likely wait until they recover from recent mergers and consolidations before embarking on any major capital investment in additional railways. In the interim, the focus will be on maximizing efficiencies with existing capital resources. Intelligent transportation systems will become more prevalent, allowing increased efficiencies through smarter operations in lieu of adding capacity.

The standard container is currently the most efficient way of transporting finished products because it is easy to handle and to move intermodally, allowing great flexibility. In fact, the container is so efficient it allows opportunities for new ways of manufacturing and distributing products. For example, there is a trend toward establishing wholesale

distribution parks for products at or near debarkation ports to allow the maximum cost savings available through the use of containers. There is also a trend by some heavy equipment manufacturers to ship equipment subassemblies in containers to third party logistics providers who perform final assembly of the equipment.

The most significant concern facing transportation companies is security. The 11 September terrorist attacks disrupted the backbone of the American economy. These attacks brought transportation's vulnerability to the news forefront and at the same time highlighted transportation's critical role in effective crisis response. The need to improve security will compete against the emphasis on efficiency, speed and reliability. The second most pressing concern is that demand for transportation is straining the capacity of the US transportation system. Population growth and an increased number of trips have increased congestion and frustration. Congestion imposes a total annual cost on travelers (road, air and rail) of $75B annually attributed to lost time and wasted fuel. New intelligent transportation systems and system management procedures for all modes of transportation are needed.

GOVERNMENT: GOALS AND ROLES: The US transportation system evolved to facilitate an open society and a global market economy. The events of 11 September have highlighted the need for more effective and stringent security requirements in the transportation industry. The government's challenge is to maintain an efficient global transportation system conducive to an expanding economy, while at the same time ensuring that the various modes of transportation are safe and secure. As there are limited federal resources, the Government must promote public/private partnerships to sufficiently resource identified needs.

As the focal point for federal transportation policy, the DOT should establish and measure performance against strategic goals to ensure the US maintains and expands its global competitive advantage in transportation systems. These strategic goals should emphasize strengthening the capability of the transportation system to safely move people and goods in support of US economic, military, political and informational interests. These goals should also address critical safety and environmental issues.

To be effective, the nation's transportation system must be international in reach – linking people and markets across the globe; intermodal in operation – leveraging the individual economies and efficiencies of each transportation mode; intelligent in character – marshalling the extraordinary power of IT; and innovative – seeking faster, cheaper, safer and environmentally responsible solutions to transportation challenges. To meet these goals, the federal government must partner with industry to focus on the following critical areas:

Airline and Maritime Security: In November 2001, the DOT assumed control of airport security and established the Transportation Security Administration (TSA). The TSA must focus funding and program priorities to: improve baggage inspection technology; establish smart card program for airline employees; improve passenger flow and decrease wait times to maintain convenience of air travel.

In addition, the DOT, US Customs, Homeland Defense, Coast Guard and DoD – under the leadership of the TSA - must coordinate security of domestic ports/waterways and maritime shipping. Cargo container security must be improved so that US Customs is fully aware of container contents shipped into the US. The overarching challenge of government is to provide adequate security while maintaining efficient movement of cargo. The ability of government to execute these security measures efficiently will have a direct impact on the health of the transportation industries.

Infrastructure: The government must continue to partner with industry to assess vulnerabilities in the critical transportation infrastructure network and take remedial action where needed. The federal government must continue to modernize the air traffic control system. Federal, state and local governments must modernize and build new airport facilities to ease air traffic congestion and maintain high safety and reliability standards. In addition, it must aggressively fund quality improvements to highways, bridges, waterways, rail and mass transit systems that were initiated by the Transportation Equity Act for the 21st Century (TEA-21).

The government should expand efforts aimed at integrated Intelligent Transportation Systems (ITS). These systems use state-of-the-art electronic information and communications technology to extend the capacity of the existing infrastructure system, improving traffic flow and reducing bottlenecks. Industry will have to pay some part of this big bill.

Research and Development: The federal government should provide tax incentives to encourage the development of fuel cells, more efficient and cleaner burning internal combustion engines and IT advancements related to the flow of people and goods through transportation networks. In addition, the federal government should support industry efforts to develop high-speed, heavy-lift approaches such as high-speed rail and fast sealift. The government should also fund research and development in improved materials for pipeline performance and improved models of corrosion assessment and corrective action. These collective actions will greatly enhance the nation's ability to project force anywhere its interests are threatened.

ESSAYS ON MAJOR ISSUES: The following three topical areas highlight critical transportation issues in greater detail: **Security, CRAF and the Defense Distribution Center (DDC).** The first area highlights security issues of particular concern since 9/11 in the areas of airports, seaports, containers (intermodal) and information technology. The second area examines issues in the CRAF. The final area discusses a variety of issues faced by the DDC in today's changing environment.

Security:

Airports: The terrorist hijackings on 11 September 2001 shattered the widely held assumption that air travel was safe and secure. Taking advantage of the security and

communication shortfalls, the terrorists were able to board airplanes with weapons, seize control and turn them into cruise missiles. To restore confidence in the airline industry significant security changes have to be implemented. Prior to 9/11, the airlines were responsible for passenger and baggage screening and used a variety of commercial firms to perform this function. With greater concern for cost-cutting and customer service the airport security became "security on the cheap" and was characterized by high personnel turnover, inadequate luggage screening, unauthorized access to high-risk areas and inadequate training of x-ray operators.

The government responded quickly after 9/11 as the airline industry spiraled into the largest annual loss in its history by passing the Air Transportation Safety and System Stabilization Act. The decision to create the TSA, a new federal agency in charge of airport security, presents the potential for improved security as a result of better-trained personnel and broader use of advanced technology. The primary concerns for the airlines revolve around customer service and whether the TSA will maintain the increased staffing level instituted following the attacks, to avoid longer waits in security screening lines. As airlines return to their pre-11 September schedules, the number and duration of delays are likely to increase. Delays cost the United States an estimated $6.4B in 2000, with 50% directly absorbed by the airline industry.[23] The airlines also worry about the transition period before the TSA is fully operational. During this period the airlines will be asked to help supervise contract security personnel but will not have any authority over them. This creates the potential for serious problems.

Providing an adequate level of air traffic safety will involve commercial losses and passenger inconvenience. In response to industry concerns about potential losses caused by delays and passenger inconvenience, the TSA is weighing many options to improve the process starting with bread-and-butter security measures, such as better-trained security personnel and progressing to air marshals, smart cards with biometric technology and new screening technologies. The outlook for security is promising, if taxpayers are willing to pay the bill.

With passengers fleeing to other modes of transportation, predominantly rail, and the expanded use of advanced telecommunications, airlines were forced to cut costs in response to the dramatic decrease in demand for airline seats. The increased financial strains made it less likely that the airlines could afford to pay for the security increase, which some industry officials say will cost around $9B annually. The cost for this new airline security is estimated to be less than $20 per passenger, which exceeds the current proposed surcharge will be a maximum of $10, and begs the question, "who will pay the rest?" It is currently unclear if the TSA will receive government funds to cover the rest or if consumers and airlines will have to make up the difference.

What America needs for security at airports are well trained, appropriately compensated airport security employees and comprehensive screening of all airline and contractor personnel who have access to the airport ramps. Screeners need to ask more appropriate questions to help weed out security threats. Americans need a new mind-set - security is important and worth the time, inconvenience and cost.

Seaports: The tragic events of 11 September also served as a wake-up call regarding major seaport security gaps. The seaport security net has been wide open for years. "The MTS moves 95% of the nation's overseas trade and 90% of the warfighting materials during a major military contingency,"[24] making it a lucrative target. Seaport security must address not only ports, but also vessels, cargo and passengers and must integrate security for all of these items to provide an overarching security net. "Indeed, the whole inspection culture must be overhauled to catch terrorist threats that were never before on the radar."[25]

One of the primary challenges to improved seaport security is developing security enforcement oversight. Historically, no single federal agency had oversight of seaport security at some 361 facilities. This responsibility is now under the leadership of the new TSA. Successful enforcement oversight is dependent upon effective coordination, cooperation and communication between federal, state and local agencies, foreign governments and private industry.

Another major challenge is increasing container inspections without unduly interrupting cargo flow. "The security environment must allow for the differentiation between the movements of lawful and unlawful cargo without unreasonably disrupting the free flow of commerce or movement of warfighting materials to overseas theaters."[26]

Container Security: Each Day approximately 35,000 containers arrive in the US from all over the world.[27] On an annual basis, the US receives approximately $750B worth of cargo at 361 seaports throughout the US.[28] Container trade is vital to the US and global economy.

Unfortunately there is no clear understanding of what is in the containers that arrive at US ports. A bomb or weapon of mass destruction (WMD) detonated in a container bound for the US would likely cause the container ports to be shut down for some period of time which would have a devastating impact on the US and global economy. If a terrorist's intent is to disrupt, the payoff from this cause and effect relationship makes the ports extremely attractive targets. US Customs was initially established to collect tariffs on trade and was not designed to be an anti-terrorism agency. US Customs is now on the frontlines of the container security issue. The agency has 7,500 inspectors to cover 361 seaports and 3700 passenger and cargo terminals. Of the $20B in funding for the 11 September response, the Customs received $300M to hire more people and buy more equipment[29]. Since 1997, cargo volume has doubled with no increase in inspection force. In addition, trade is expected to continue to grow annually at a rate of 8-10%.[30] Intrusive inspection of all containers is not economically prudent, as it would grind the flow of containers to a halt.

US Customs now inspects approximately 2% of the containers utilizing intelligence information and other clues to determine which containers are at high risk. Customs receives cargo manifest information 48 hours before cargo arrival at port. Nevertheless, shipping information is often incomplete and inaccurate. In fact, a US Customs audit

found in an inspection of 181 ships, that 96 of them had more or fewer containers on board.[31] In addition, many container manifests specify "Freight All Kinds" which does not provide any specificity as to the contents. Relying on established exporters is problematic as well in that there are over 500,000 exporters and 40,000 freight forwarders in the world.[32] Additionally, the containers arrive in the US before they are inspected. In the case of WMD, inspecting at the arrival port may be too late.

Legislation passed by the Senate and under consideration in the House mandates cargo security requirements and adds funding. The act proposes requirements in six main areas:

1. *Personnel Credentialing*- People with access to the container, ship or cargo areas should be have an approved background check and issued appropriate identification such as a "smart card". The unions are resisting this provision.
2. *Container seals*- Containers should be sealed and that the seal number be placed on the cargo manifest. The container will not be loaded without a seal.
3. *Cargo Documentation* - Export shippers must provide complete cargo manifest documentation no later than 24 hours after tendering cargo to the marine terminal. Containers cannot be loaded without appropriate documentation.
4. *Container Inspection*- The act promotes research and technology for new container inspection technologies.
5. *Container Technologies*- The act promotes new research and technology to develop electronic container seals.
6. *Information Technology* – The act requires a robust, scalable information system that specifies what information is required, from whom and when.

The 11 September attacks exposed some harsh realities about our open global economy. It is in the best interest in all of the economies of the world to tighten security associated with shipping containers. If trade is halted in the US or any other trading partner for any period of time, the economies of the globe will be severely injured. There are many recommendations proposed, but the US must develop a single coordinated strategy to deal with this security issue and ensure that the strategy is implemented with its trading partners.

Information Technology: The role that IT does and can play in all modes of transportation became headlines in the aftermath of 9/11. While some facets of the industries incorporate IT into daily businesses, others have limited support. All modes of transportation, however, identified IT methods they can use to step up their security. A brief look at the major methods of transportation and measures to improve IT use is below.

Container shipments use various modes of transportation and this adds to their inherent vulnerability and the difficulty of inspecting them. Most initially enter US ports as imports from our trading partners before the container is placed on either a train or truck. The mandatory shipping documents vary according to the mode of transportation and lack a centralized authority to verify all paperwork reports the same information. Customs officials rely on anomaly detection to determine the 2% of shipments to check but they are hindered by fragmented, often disparate IT systems. Already understaffed

before 9/11, customs officials could get a well-needed boost from an integrated system that reaches across all modes of transportation.

The trucking industry enjoys robust and mature IT system support. It actively pursued GPS tracking and navigation tools to track shipments and ensure timeliness of delivery. Additionally, the DOT fielded a system of systems called the Intelligent Transportation Systems (ITS) that monitors traffic and provides emergency services notification. Although these IT systems were originally primarily designed for other functions, they go a long way towards stepping up security on the roads by allowing better communication and surveillance to a central location.

The aviation industry focuses on use of information technology to develop sophisticated yield-management programs to effectively segment pricing for both business and pleasure passengers while maintaining high aircraft load utilization. Unfortunately, since 9/11 the media has exposed its IT vulnerabilities that while they have good stand-alone systems they, unfortunately have poor integration. As the TSA stands up, they need to make the supporting IT systems a priority. Efforts must address a comprehensive system that integrates all the systems from the time the passenger books a reservation, provides his or her government identification, checks in baggage and passes through security checks up until to the time they finally board the aircraft.

Railroads have good automated systems for controlling the locomotives and tracking cargo but until 9/11, passenger security was almost non-existent. Amtrak now has federal agents working with them to scan passenger lists but the process is largely manual. Passenger screening largely consists of providing identification and passing through a metal detector. The same comprehensive system defined for aviation is applicable to passenger rail service.

Improvement in IT is not the end-all answer to the security vulnerabilities in the transportation system. However, it can go a long way in assisting a dedicated workforce in detecting anomalies and protecting the nation's vital infrastructure.

Civil Reserve Air Fleet: International airline alliances have become a permanent feature of air travel since Northwest Airlines and KLM started their partnership in 1993.[33] As the US DOT reports, international alliances provide "a way for carriers to mitigate the limitations of bilateral agreements, ownership restrictions, and licensing and control regulation."[34] Competition in the aviation industry will intensify due to severe financial losses in 2001. In planning for use of the CRAF to supplement military airlift capacity, policymakers will need to consider issues posed by US air carriers entering into long-term alliances with foreign carriers. It may well be time to consider allowing foreign carriers to participate in CRAF.

Aviation Industry Under Pressure: The FAA reported recent severe losses for passenger carriers. While the FAA predicts a recovery in air traffic in 2003, it also projects that average fares will decline in real terms over its 10-year forecast period. If the FAA is correct, carriers will face mounting debt loads in a time when marginal revenue is

shrinking.[35] Countries limit foreign ownership of the carriers that they regulate. US carriers, for example, may not have more than 25% foreign ownership. Regulations also require that management control reside with US citizens. European Union ownership and management restrictions are functionally equivalent to US requirements.

Northwest and KLM pioneered international alliances, confirming the effectiveness of alliances when they agreed to a 10-year global joint venture in 1997.[36] US transportation officials supported liberalization and the alliance approach by issuing its 'open skies' policy in 1992 and the *United States International Air Transportation Policy Statement* in 1995. According to academic studies,[37] alliance partners receiving antitrust immunity and code-share authority are able to reduce ticket prices.[38] The US DOT has come to a similar conclusion: "Data for 1999 show continued strong traffic growth and greater fare reductions than occurred through 1998."[39]

Alliance partners generate greater traffic and lower fares through: a) shared reservation systems and ticketing; b) joint marketing and advertising; c) code sharing; and d) expanded destinations. The first two innovations offer obvious cost savings as the carriers can spread costs over a larger group of customers. Code sharing is when carriers place their flight "code," e.g., 'NWA' for Northwest, on another carrier's flight. Code sharing can range from arm's-length transactions between independent carriers to joint decisions on offering travel services. Alliance partners can offer a vastly expanded network of destinations around the world. The key ingredient for the alliances is a waiver from antitrust regulations that allows alliance carriers to act as a single company in setting prices and capacity.

US and foreign carriers moved quickly to emulate NWA/KLM. United Airlines developed the Star Alliance and its immunized partnership with Lufthansa. Delta obtained immunized links with Swissair, Austrian Air and Belgium's Sabena Air, which began to dissolve toward the end of 1999 and Delta is now developing a code-share alliance with Air France.[40] American Airlines has been seeking an immunized partnership with British Airways for many years.[41]

Partners in international airline alliances have a great deal at stake and great incentives to want a say in the use of their partner's assets. This level of partner interdependence raises national security issues because the US relies on civilian carriers for strategic airlift in time of need.

Civil Reserve Air Fleet: CRAF traces its roots to 1951.[42] Formed as a cost-effective source of emergency airlift capacity, the CRAF program is a voluntary arrangement where US civilian air carriers contract with the DoD to provide airlift capacity and crews.

In a state of full mobilization, CRAF would provide about 90% of US international passenger capacity, 98% of strategic aeromedical evacuation and 40% of long-range air-cargo capacity. US Transportation Command estimates that it would incur an additional $50B in capital costs and $1-3B in annual operating costs to buy and maintain an equivalent airlift capacity.[43] Long-range aircraft are particularly desirable for the CRAF

program because US forces are generally responding to contingencies abroad. This means that the aircraft, such as B747s, B767s and A340s, used by US carriers in their international alliances, are the ones most likely to be activated in CRAF.

DoD activated CRAF for the first time in the Gulf War. CRAF aircraft and crews flew 20% of the total strategic airlift missions, carrying 62% of the total passengers on deployment and 84% of them on redeployment. Similarly, CRAF cargo carriers handled 27% of the cargo on deployment and 40% on redeployment.[44] Following the 11 September attacks, carriers had substantial unused capacity and provided their aircraft and crews in support of the conflict in Afghanistan.

CRAF Incentives: Even though CRAF participants are paid market prices for use of the aircraft and crews, they stand to lose market share when activated aircraft are unavailable for scheduled service. In response, the US Government has enhanced existing programs that provide a portion of Government peacetime business to CRAF participants. US Government travel and small package delivery contracts are now limited to CRAF participants, providing a protected pool of well over $1 billion in potential business.[45] CRAF participants also have exclusive access to operate from military airfields and to designate military airfields as alternative landing sites. The modified CRAF has successfully attracted US carriers back to the program.

Recommendation: Immunized international alliances have become an enduring fixture of the aviation industry. Originally encouraged by the US Government as a tool to foster greater competition in international aviation, airlines have come to depend on alliances in today's globalized transportation industry. Alliance membership will undoubtedly continue to shift as carriers seek optimum competitive positions, but we will be dealing with alliances of networked carriers for the foreseeable future. Immunized alliance members, linked as they are in setting price and capacity, and sharing liability, will want full input into the use of alliance assets. If US partners need to divert planes for CRAF, foreign alliance partners are likely to be adversely affected.

Foreign carriers already seek participation in US Government travel contracts and chafe under the linkage to CRAF participation. In light of immunized relationships the US has authorized, it is appropriate to begin considering means to permit selected foreign carriers to participate in government travel in exchange for contractual commitments to support their immunized partners in CRAF activations.

The Defense Distribution Center: The Defense Distribution Center (DDC) is the DLA component responsible for the distribution, storage and management of materiel in support of the combatant commanders, military services and other agencies during war and peace. DDC performs this mission using IT and a seamless, tailored, worldwide DoD distribution network comprised of two strategic distribution platforms (DDC San Joaquin, CA (DDJC) and DDC Susquehanna, PA (DDSP)), collocated distribution sites and a premium service site (Memphis, TN).

To increase readiness and efficiency, enhance scheduled and synchronized time

definite delivery (TDD) and provide scheduled replenishment, DDC has recently begun exploring the use of Joint Theater Distribution Platforms (JTDP) in Japan (Yokosuka), Hawaii and Europe (Germany). This is part of DDC's initiative to achieve more optimal materiel positioning in the United States and Europe. With efforts in Germany well under way, DDC is now focusing efforts in the Pacific Rim.

The Pacific Rim Challenge: Managing materiel in the Pacific is unique for several reasons. As in Europe, all the Services are represented in the Pacific Rim. However, their missions in this region raises readiness issues to a higher level of urgency than either Europe or CONUS—the nature of the threat is different. In addition, the geography of the Pacific is unique with the bases widely distributed and separated by water. The local transportation infrastructure limits distribution options and flexibility. Under these circumstances, what items, if any, should be forward positioned and what items should be centrally stored and transported upon requisition?

DDC's stock positioning dilemma is the trade-off between maximizing individual customer satisfaction and maximizing system efficiency. What is best for the customer? What is the most cost effective business decision? These questions at times yield contradictory answers. Hence, finding the proper balance is at the heart of DDC's challenge.

DDC has identified the following five goals as key to success in JTDPs:

1. Improve overall readiness
2. Reduce customer wait time
3. Reduce inventory
4. Reduce transportation costs
5. Reduce stress on strategic airlift during contingency

Based on facts regarding customer locations, transit times and customer wait times we examined a number of potential solutions and arrived at the conclusion that the optimum solution was to create a JTDP in the Pacific (specifically in the DDC Yokosuka (DDYJ)). Determining the items to position at that site should be based on the following logic tool.

A Tiered Approach: The tool (attached) utilizes a three-tiered approach to provide an initial indication of stock positioning. Each tier presents criteria that must be considered in making a positioning decision. The first tier seeks to determine whether the item should be positioned in San Joaquin or in the Pacific somewhere (not differentiating between Yokosuka or more forward locations). The second tier takes the location question one step further by examining "where" in the Pacific (DDYJ or positioned forward of DDYJ). The final tier is more subjective and simply identifies issues that must be considered in order to determine "how much" to place in the determined location. This matrix provides an initial stock positioning location suggestion and is not intended as a substitute for more detailed quantitative analysis.

Conclusion: We propose DDYJ as an interim step to be followed by the consideration of satellite centers in Okinawa and/or Korea. A phased approach in the Pacific will allow

scheduled transportation to mature prior to the determining if traffic will support satellite centers.

CONCLUSION: America's transportation system not only plays a critical role in national and international affairs, it also enables the swift mobilization of the military during contingencies and supports the sustainment of the armed forces during long-term conflict. It is for this reason that DoD must be concerned with the health and vitality of the transportation industry. Future military readiness depends on effectively utilizing a balanced mix of both commercial and government owned transportation. The DoD maintains organic airlift and sealift to provide flexibility and power projection capabilities quickly when needed. It relies on the commercial sector to supplement this organic capability. While the commercial industry portion of the equation is functioning well today, it is essential that several industry wide challenges be addressed.

The 11 September terrorist attacks caused major changes nation wide and it is arguable that the transportation industry experienced the greatest negative impact. In reaction, each segment of the industry is making adjustments and striving to rebound. Security is now a top priority in all transportation segments. There are many other challenges that traverse the industry. Labor concerns are common. As the single largest expense item in transportation, it is troubling when positions are hard to fill with qualified workers. The need for infrastructure expansion and modernization is another common theme. America must reinvest in core transportation infrastructure resources if the industry is to remain healthy and grow.

One of the biggest difficulties for the government in addressing industry challenges is establishing policies that both foster innovative flexible solutions and at the same time promote security. These two goals are at times contradictory. It is imperative that the Federal Government partner with private industry to determine how to best implement security improvements, upgrade infrastructure, react to mobilizations and encourage research and development. It is quite possible that the recent economic slowdown should be seen as an opportunity to examine industry challenges and formulate plans to accommodate growth that is sure to occur in the future. Government and industry must embrace this opportunity together to move toward an even more successful future. The challenges the industry faces are not insurmountable, but demand thoughtful attention.

Endnotes

[1] US Department of Transportation (USDOT), Transportation Statistics Annual Report 2000, Bureau of Transportation Statistics (BTS), Washington D.C., p.6.
[2] Edwards, Tony, British Airways, Presentation to ICAF Students, 15 May 2002, London, England.
[3] Bond, David, "Optimism on Surface, Skepticism Beneath," *Aviation Week & Space Technology*, McGraw Hill, March 18, 2002, pp. 44-46. Note: The FAA held its annual Commercial Aviation Forecast conference March 12-13, 2002. According to data from the Air transport Association, this nearly $10 billion loss by the industry compares to some $13 billion lost over the five-year period from 1990 – 1994.
[4] Air Transport Association, http://www.air-transport.org.
[5] "Waterborne Commerce of the United States – 2000", US Army Corps of Engineers, Waterborne Statistics Center, Part 5, Table 1-1, Internet, http://www.iwr.usace.army.mil/ndc/wcusnatl00.pdf.
[6] "Transportation Indicators – March 2002", US Department of Transportation, Bureau of Transportation Statistics, Internet, http://www.bts.gov/transtu/indicators/.
[7] *Ibid.*
[8] "SeaPower/Maritime", Jan 2002, *Sea Power*, Washington, D.C.; Vol. 45, Iss. 1; pg. 274.
[9] Pouch, Robert H., "The US Merchant Marine and Maritime Industry in Review", May 2001, *Proceedings*, United States Naval Institute. Data interpreted from this and other sources. The 212 figure includes 47 MSP ships in commercial service.
[10] The Catalog of Federal Domestic Assistance http://www.cfda.gov/static/p20806.htm.
[11] Exxon-Mobile Corp, Internet, http://www2.exxonmobil.com/files/corporate/000601.pdf , accessed 01 May 2002.
[12] James Tobin, "Natural Gas Transportation – Infrastructure Issues and Operational Trends", Energy Information Administration / Natural Gas Division October 2001, Internet.,http://www.eia.doe.gov/oiaf/servicerpt/naturalgas/index.htm.
[13] "US Natural Gas Markets: Recent Trends and Prospects for the Future", Energy Information Agency, US Department of Energy, Internet, http://www.eia.doe.gov/oiaf/servicerpt/naturalgas/index.htm, accessed 02 May 2002.
[14] James Tobin, "Natural Gas Transportation – Infrastructure Issues and Operational Trends", Energy Information Administration / Natural Gas Division, US Department of Energy, October 2001.
[15] "Inside ATA: The Future of Transportation," remarks of Paul T. Stalknecht, Senior Vice-President, Federation Relations, American Trucking Associations, Inc. before the Military Traffic Management Command Training Symposium, April 4, 2000, Atlanta, Georgia. Reprinted in Truckline, http://truckline.com/insideata/speeches.
[16] 1998 Report Card for American Infrastructure, American Society of Civil Engineers.
[17] USDOT, Transportation Statistics Annual Report, 1999, p. 5.
[18] 2001 Annual Report to Shareholders, Burlington Northern Santa Fe Corporation, p.21.
[19] 2001 Annual Report, Air Transport Association, www.airlines.org.
[20] The Congress of the United States, "Moving US Forces: Options for Strategic Mobility", Congressional Budget Office, February 1997.
[21] *Ibid.*
[22] *Ibid.*
[23]" State of the U.S. Airline Industry" produced by the Air Transportation Association of America (www.airlines.org).
[24] Testimony of Admiral James M. Loy on Port and Maritime Security Strategy, before the Subcommittee on the Coast Guard and Maritime Transportation, 6 December 2001.
[25] CDR Stephen Flynn, USCG, senior fellow at the US Council on Foreign Relations.
[26] Testimony of Admiral James M. Loy on Port and Maritime Security Strategy, before the Subcommittee on the Coast Guard and Maritime Transportation, 6 December 2001.
[27] US Department of Transportation (USDOT), Transportation Statistics Annual Report 2000, Bureau of Transportation Statistics (BTS), Washington D.C., p. 121.
[28] Gribbin, August, The Washington Times, 22 January 2002.
[29] Brosnan, James, The Commercial Appeal, 17 January 2002.

[30] Bonner, Robert, Speech by US Customs Commissioner before Center for Strategic and International Studies 17 January 2002.
[31] Bartleme, Tony, The Post and Courier, 17 February 2002.
[32] Brosnan, James, The Commercial Appeal, 17 January 2002.
[33] Northwest Airlines Press Release, "Northwest Begins Code-Share With KLM," 20 December 1999. Northwest and KLM started joint operations even earlier with twice-weekly flights between Minneapolis/St. Paul and Amsterdam in 1991.
[34] US Department of Transportation, "International Aviation Developments: Global Deregulation Takes Off" *(First Report)*, December 1999, p. 2.
[35] *Ibid.*
[36] *CQ Outlook*, "Will global alliances hurt consumers?," 16 October 1999.
[37] *M2 Presswire*, "Northwest Airlines: New study finds Northwest/KLM alliance saves travelers millions," Coventry, 7 May 1999.
[38] Brueckner, Jan K., "The Benefits of Antitrust Immunity and Code sharing for InterlinePassengers: The Case of American Airlines and British Airways," Department of Economics and Institute of Government and Public Affairs, University of Illinois at Urbana-Champaign, November 2001.
[39] US Department of Transportation, "International Aviation Developments: Transatlantic Deregulation: The Alliance Network Effect" *(Second Report)*, October 2000, pp.1 & 2.
[40] *Ibid*, p 2.
[41] American Airlines-British Airways websites, http://www.american-britishairways.com/history/.
[42] Daly, John D. and Needham, Paul M., "Air Transportation: Elements of a Changing Environment And What it means to the Civil Reserve Air Fleet," Industrial College of the Armed Forces, National Defense University, Washington, D.C., p. 4.
[43] CINCTRANS: *Statement of Gen Charles T. Robertson, Jr.*, USAF, Commander in Chief, US Transportation Command Before the Senate Armed Services Seapower Subcommittee on Strategic Airlift and Sealift Imperatives for the 21st. Century, 26 April 2001, p. 14.
[44] Air Mobility Command, http://www.hqamc.af.mil.
[45] *Ibid.*, p. 7.

Bibliography

1998 Report Card for American Infrastructure, American Society of Engineers, Washington, D.C., 1998.

2001 Annual Report to Shareholders, Burlington Northern Santa Fe Corporation.

Air Mobility Command, http://www.hqamc.af.mil.

Air Transport Association, Internet, http://www.air-transport.org.

American Airlines-British Airways websites, http://www.american-britishairways.com/history/.

Congressional Budget Office, "Moving U.S. Forces: Options for Strategic Mobility," February 1997.

CQ Outlook, "Will global alliances hurt consumers?" 16 October 1999.

Department of Energy, Energy Information Agency, "US Natural Gas Markets: Recent Trends and Prospects For The Future," http://www.eia.doe.gov/oiaf/servicerpt/naturalgas/index.htm.

Exxon-Mobile Corporation, Internet, http://www2.exxonmobil.com/files/corporate/000601.pdf.

M2 Presswire, "Northwest Airlines: New study finds Northwest/KLM alliance saves travelers millions," Coventry, 7 May 1999.

Northwest Airlines Press Release, *Northwest Begins Code-Share With KLM*, 20 December 1999.
Sea Power, "Seapower/Maritime," January 2002, , Washington, D.C., Vol. 45, Issue 1.

The Catalog of Federal Domestic Assistance, Internet, http://www.cfda.gov.static/p20806.htm.

"Transportation Indicators- March 2002," U.S. Department of Transportation, Bureau of Transportation Statistics, Internet, http://www.bts.gov/transtu/indicators.

U.S. Department of Transportation, "Transportation Statistics Annual Report 1999," Bureau of Transportation Statistics, Washington, D.C.

U.S. Department of Transportation, "Transportation Statistics Annual Report 2000," Bureau of Transportation Statistics, Washington, D.C.

U.S. Department of Transportation, *International Aviation Developments: Global Deregulation Takes Off (First Report)*, December 1999.

U.S. Department of Transportation, *International Aviation Developments: Transatlantic Deregulation: The Alliance Network Effect (Second Report)*, October 2000.

"Waterborne Commerce of the United States – 2000," US Army Corps of Engineers, Waterborne Statistics Center, Part 5, Table 1-1, Internet, http://www.iwr.usace.army.mil/ndc/wcusnatl100.pdf.

Bartleme, Tony, *The Post and Courier*, 17 February 2002.

Bond, David, "Optimism on Surface, Skepticism Beneath," *Aviation Week & Space Technology*, McGraw Hill, 18 March 2002.

Bonner, Robert, Speech by U.S. Customs Commissioner before Center for Strategic and International Studies 17 January 2002

Brosnan, James, *The Commercial Appeal*, 17 January 2002.

Brueckner, Jan K., *The Benefits of Antitrust Immunity and Code sharing for InterlinePassengers: The Case of American Airlines and British Airways*, Department of Economics and Institute of Government and Public Affairs, University of Illinois at Urbana-Champaign, November 2001.

Daly, John D. and Needham, Paul M., *Air Transportation: Elements of a Changing Environment And What it means to the Civil Reserve Air Fleet*, Industrial College of the Armed Forces, National Defense University, Washington, D.C.

Edwards, Tony, British Airways, Presentation to ICAF Students, 15 May 2002, London, England.

Flynn, CDR Stephen, USCG, Senior Fellow at the U.S. Council on Foreign Relations.

Gribbin, August, *The Washington Times*, 22 January 2002.

Loy, Admiral James M., "Testimony on Port and Maritime Security Strategy," before the Subcommittee on the Coast Guard and Maritime Transportation, 6 December 2001.

Pouch, Robert H. "The U.S. Merchant Marine and Maritime Industry in Review," May 2001, *Proceedings*, United States Naval Institute.

Robertson, Gen *Charles T., Jr.*, USAF, Commander in Chief, U.S. Transportation Command Before the Senate Armed Services Seapower Subcommittee on Strategic Airlift and Sealift Imperatives for the 21st. Century, 26 April 2001.

Stalknecht, Paul T., American Trucking Associations, Remarks before the MTMC Training Symposium, "Inside ATA: The Future of Transportation, 4 April 2000, Atlanta, GA, http://truckline.com/insideata/speeches.

Tobin, James, "Natural Gas Transportation – Infrastructure Issues and Operational Trends," Energy Information Administration/Natural Gas Division, October 2001, Internet, http://www.eia.doe.gov/oiaf/servicerpt/naturalgas/index.htm.