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**Final Report
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TRANSPORTATION

ABSTRACT: Transportation is the key to this nation's strength. Within this industry, the movement of freight is critical—an aspect made even more significant in a global economy. Effective management of freight movement requires a robust infrastructure and the implementation of an integrated, intermodal approach to transportation. The government must address the immediate needs of upgrading and expanding the infrastructure associated with all modes of transportation from both a requirements and financial perspective. Effectively addressing freight movement also requires the Department of Transportation to develop a strategy to implement an intermodal vision to overseeing the transportation industry.

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TRANSPORTATION: A CONFLICT OF INTERESTS

“...there is a looming threat to our economic prosperity in the form of transportation congestion. Goods stalled at overwhelmed seaports, airplanes circling crowded airports, and delivery trucks stuck in traffic cost America an estimated \$200 billion each year. Traffic jams alone waste 2.3 billion gallons of gasoline and 3.5 billion hours...”

The Honorable Norman Y. Mineta, Secretary of Transportation
May 23, 2006¹

Introduction

Transportation is an essential enabler of the United States’ economic power, providing the means by which its goods and services are delivered throughout the nation and the mobility of its inhabitants as travelers. The viability, efficiency, and protection of the nation’s transportation systems are of strategic significance, and Secretary Mineta’s statement identifies a clear challenge to the vitality of our nation. The Transportation Industry Study of the Industrial College of the Armed Forces presents this final report as a collective assessment of the industry.

Demand for goods and services and the transport modes involved in meeting those demands provide the basis for assessing transportation. A basic transportation demand is to move people and/or goods from one location to another. Transportation services add value by moving people/goods where they need to be for use. The modes include air, land, and sea and include the requisite assets to execute the move (planes, trucks, trains, ships, and pipelines) as well as supporting infrastructure, facilities and systems (airports, terminals, and ports).

This report focuses on freight movement, primarily examining the demand for goods movement and the modes generally associated with freight, but also considering passenger transport insofar as it places competing demands on the overall transportation system. Viewed from an integrated, multi-modal perspective, America’s transportation industry is not yet postured to meet America’s 21st century freight transportation demands.

The Industry Defined and Current Condition

Freight Movement Overview

America’s well-developed infrastructure and efficient transport modes helped produce an unrivaled economy throughout the 20th century.² Entering the 21st century, world trade liberalization and supply chain globalization fostered further expansion in the United States’ overall freight transportation industry and economy. From 1993 to 2002, the value of U.S. freight activity rose by 44 percent, while the number of ton-miles rose by 30 percent.³ This trend will likely continue, with the transport industry forecast to grow 23 percent from 2006-2011.⁴

Despite the opportunities afforded by this environment, the U.S. experiences freight congestion and capacity limitations that impede productivity gains and reduce the full economic benefit to both the industry and economy as a whole.⁵ These difficulties stem from two overall causes. The first is that public financing mechanisms for transportation infrastructure across the freight modes feature a number of inequities and inefficiencies.⁶ The second is that while the U.S. benefits strongly from its system of state and local transportation planning to enhance and integrate freight movement, it lacks coherent federal policies at the national level. The U.S. Department of Transportation (DOT), which oversees this industry, operates a “stovepipe”

collection of agencies, each focusing on a single transportation mode.⁷ This framework hampers inter- and multi-modal planning efforts that could overcome freight bottlenecks, which precludes effective prioritization and financing of infrastructure improvements.

Air. The air component of America's transportation industry is comprised of two sectors: air freight/package delivery and passenger travel. In 2006, domestic air freight generated \$41.3 billion as compared to U.S. passenger travel, which generated \$147.3 billion in total revenue. Researchers expect this trend to continue with air freight sector value forecasted to reach \$61.6 billion in 2011, and passenger travel to achieve a market value of \$207.8 billion.^{8,9} The air movement of goods is only a fraction of the total freight moved as compared to the other transportation modes, though it is critical for high-value, time-sensitive cargo. Although projections have air freight volume growing by 34.7 percent by 2011, the volume will remain far less than shipped by other modes.¹⁰

The air package delivery service operates worldwide, mainly to large metropolitan areas and business centers. The package delivery market, both air and surface means, generates over \$70 billion annually in domestic and international business. The industry leaders are UPS, FedEx, and DHL, commanding nearly 98 percent market share. They compete for business by providing increasing quality service and continually increasing efficiencies to hold down cost or lose market share to existing or emerging competitors.

With the movement of freight by air comes the problem of congestion. The increase in passenger travel adds to the crowded skies, thus compounding movement of freight by air. The FAA projects that air traffic expansion will be equivalent to two major hubs per year through 2020.¹¹ The FAA is also working implementation of new tools, which will more effectively manage the National Airspace System. Essentially these tools will more effectively control airborne aircraft, thereby using airspace more efficiently.¹² This increased efficiency puts more planes in the air, which translates into higher volume in- and outbound for airports.

Ports. While not a mode themselves, seaports play a critical role in the transportation industry as the intermodal connections through which freight transitions between seaport and other key modes, such as rail, trucking, and inland barges. The U.S. boasts over 360 seaports owing to its extensive coastlines and a vibrant economy.¹³ Within the last 20 years, container traffic passing through U.S. ports has grown 6-fold, with annual figures of more than 1.5 billion tons (approximately \$1 trillion worth) of cargo shipped in and out of U.S. ports,¹⁴ including 11 million cargo containers.¹⁵ As trade flourishes, so do the profits of the port industry. A potential U.S. recession and/or global slowdown reduce import and export volumes, ultimately affecting overall port revenues and profits.

Port authorities, while established as public agencies, generally run ports as business enterprises and strive to maximize revenue. As with the transport modes, congestion is a significant concern in this industry. Though most U.S. ports can raise funds for expansion, planned projects will not keep pace with projected growth in trade. To sustain expected growth, the U.S. must expand its overall port capacity by 10 percent annually -- equivalent to adding the capacity equal to the Port of Oakland every year.¹⁶ Other challenges include supply chain inefficiencies, environmental restrictions and competition for land from developers.

Intermodal ports handling containerized cargo are the fastest growing in the industry, with many at or near capacity. The ten largest U.S. intermodal ports for 2006 are Los Angeles, Long Beach, New York, Savannah, Charleston SC, Norfolk, Oakland, Houston, Seattle, and

Tacoma.¹⁷ Even at capacity, these ports compete in terms of cost, services provided, and efficiency trying to attract, grow, and keep the highest revenue customers.

Rail. There are over 500 rail companies operating in the United States, but the industry is concentrated with the top 50 capturing nearly 100 percent of the business.¹⁸ The rail industry is broken into three classes where the Class I rail companies each have revenues in excess of \$346.8 million.¹⁹ Class II and Class III lines are typically more limited in operating area with some Class III short lines operating over very small distances. The railroads not only own the track but the land and right of ways involved. Protected from anti-trust challenges, railroads operate as an integrated network.²⁰

The Staggers Act deregulated the industry in 1980. While revenue has decreased 21%, (adjusted for inflation), ton-miles per mile of track has tripled in that time.²¹ This increase reflects the magnitude of the rail industry, which generates \$50 billion-plus in revenues annually.²² Currently there are approximately 1.5 million freight cars in service, which moved nearly 1.3 million carloads of materials in February 2008 alone.²³ The fact that rail transported over 80 percent of all the coal, which in turn created 51 percent of the electricity used in the U.S., further demonstrates the significance of this transportation mode. The Association of American Railroad projects between a 58% and 76% growth in freight tonnage between now and 2020.²⁴ When extrapolated to 2035, most rail corridors are either at or above capacity without the introduction of improvements.²⁵

Shipping. The shipping industry has undergone rapid expansion to support the continued growth and globalization of the world's economy since the end of World War II. Shipping lines continue to build larger ships capable of carrying as many as 14,000 containers between major ports, in addition to smaller vessels and commodity specific ships. With this ongoing expansion come challenges such as the potential obsolescence of many narrow waterways. Panama is planning a new set of locks for its canal, as is the Suez in Egypt. These decisions based on high demand and larger ships that cannot pass through the current locks. Another challenge for the shipping industry is the environmental impact from ships' engines and handling equipment.

The U.S. segment of the freight shipping industry consists of over-ocean and short-sea shipping. Short-sea shipping works in three areas of what is known as the 'Marine Highway': coastal, intercoastal, and inland waterways. Smaller roll on/roll-off (Ro/Ro) ships and ferries along with some barge traffic dominate coastal short-sea shipping. Intercoastal and inland waterways are predominantly barge traffic. Most barge traffic, especially on inland waterways, consists of bulk agricultural products such as grain or bulk energy products such as coal. There is a small but growing segment of barge operations known as container-on barge shipping. The freight shipping industry accounted for about \$30B in revenues for 2006 with an annual growth of 3.2% for the years 2002-2006. Growth is expected to decline to 1.8% through 2011. Although the vast majority of goods are transported by over-ocean shipping, the U.S. industry revenue is relatively light because most of this segment is dominated by foreign flag carriers.

With a requirement that a significant amount of domestic business be carried by U.S. flagged, built, and crewed ships, government regulation and defense policy heavily subsidize the domestic shipping industry. This often occurs at a significantly higher cost, in order to protect the domestic shipping industry in the interest of maintaining a surge capable domestic shipping capacity for the deployment of U.S. forces abroad. The inland waterways -- consisting of 11,000 miles of navigable channel and 186 sets of locks -- are an irreplaceable means for high-volume,

low-cost movement of bulk commodities like chemicals, grain, and ore.²⁶ Marine fuel taxes partially fund construction of locks and dams with all other costs coming from general government funds. The average age of locks on the inland waterway system exceeds 50 years, and many are undersized compared to current vessel sizes.²⁷ The Inland Waterway Trust Fund suffers the opposite problem from the Federal Highway Trust Fund; political pressures to reduce the apparent Federal budget deficit have limited the amount of expenditures.²⁸

Trucking. Trucking operates on a public network of highways with privately-owned terminals. The National Highway System comprises 162,000 route miles of which 47,000 are interstates.²⁹ The system is almost entirely government owned and supported by a combination of user fees and taxes, and monies from the federal, state, and local governments. The trucking industry is critically dependent on highways, and therefore on federal, state, and local investment decisions regarding essential industry infrastructure. Those investments however, are funneled through political system that has become ineffective at supporting infrastructure improvements.³⁰

Trucks carry 80 percent of all surface freight tonnage and three quarters of trucking vehicle miles move along the National Highway Systems network.³¹ Moreover, most road freight movement occurs within urban areas and over half of all freight tons are shipped less than 50 miles.³² The trucking industry comprises over 700,000 local, regional, and national carriers that exhibit increasing horizontal (i.e. multi-modal) integration with broader geographic coverage. Deregulation has squeezed excess capacity to generate efficiency, but lowered profit margins. Because they share common physical infrastructure, trucking firms leverage capital and labor cost structures within their business strategies to capture local and regional markets in a highly competitive industry.

While trucking vehicle miles traveled (VMT) doubled between 1980 and 2005 and is expected to double again by 2035, system lane-mileage expanded only 3 percent in the past quarter century.³³ Although surface freight represents only five percent of total VMT, the industry bears 27 percent of all congestion costs.³⁴ These associated costs generate negative industry conditions including reduced investment, increased shipment delivery time, and increased driver and vehicle costs.³⁵ The Federal Highway Administration (FHWA) projects that without any additional capacity, the number of National Highway System miles on which peak-period congestion routinely occurs will increase from 10,600 in 2002 to 20,000 in 2035.³⁶

Challenges and Outlook

America is the land of commerce, and our need to ship freight continues to grow. There is widespread agreement that economic growth and globalization will leverage new requirements on freight movement across the transportation sector and the DoT projects a 92% increase in freight movement by 2035.³⁷ As globalization continues, international trade will also continue increasing. The American Association of State Highway and Transportation Officials projects the portion of GDP derived from trade to increase from 13% in 1990 to 35% in 2020. This will push the demand for shipping freight inside the U.S. from six to 11 trillion ton-miles over the 2007-2035 timeframe.³⁸ With such growth come challenges such as capacity constraints, system congestion, integrated planning, funding challenges, environmental concerns and security.

Capacity Constraints. Lack of infrastructure is driving capacity constraints in which competing solutions and funding requirements compound the issues. Although air shipments

represent a small portion of freight, a predicted 35% increase in passenger travel in the next seven years will obviously lead to inadequate capacity.³⁹ This growth translates to more traffic, which affect not only passengers but freight as well. Adding air lanes is not a possibility; thus, capacity enhancement is addressed through more efficient handling of traffic (the air infrastructure). The price tag for that fix is \$44B.⁴⁰

TVM doubled between 1980 and 2005 and is expected to double again by 2035.⁴¹ A recent report⁴² confirm the Federal Highway Trust Fund's negative balance of \$14 billion by 2012, and highway account revenues will be exhausted in 2009.⁴³ Revenue is insufficient to maintain and improve the federal highway system to meet short-term future capacity requirements much less the long-term requirements of 2035.

Of the 92% increase in freight predicted by the DOT, rail will transport nearly one-half of the total.⁴⁴ This increased capacity will require \$135B in Class I line improvements. The railroad industry is lobbying for \$39B to be funded by public-private partnerships in additive tax credits.⁴⁵ Capacity challenges in the shipping industry are directly related with capacity challenges with the nation's ports. In April 2007, a congressionally directed study confirmed a shortage of port capacity to support potential major contingencies.⁴⁶ Forecasts have trade doubling by 2020 but the U.S. has no strategic plan on how to build capacity to meet this growth.⁴⁷ The Panama Canal expansion is expected to be complete in 2014 and more Asian products will move to Atlantic and Gulf ports like Houston, Savannah, Charleston, and Norfolk rather than those on the Pacific; clearly one can expect the cost to be in the billions of dollars.

All modes of the transportation industry share the challenges of limited capacity for the predictable future. To increase capacity, infrastructure must be expanded. To fund expanded infrastructure, public capital must be provided to some extent. Obviously, there are inadequate funds in the public coffers to fund the expanded requirements described above, so the identification of priorities is essential. The DOT needs to establish a long-term national policy to address prioritizing capacity issues with a concentration on reducing congestion within the nation's transportation system.

System Congestion. Capacity and congestion are inexorably linked among all modes of domestic transportation. With the projected increases across transportation modes and limited capacity, congestion will only increase as the projected increase in freight traffic occurs. Lack of a unified plan is exacerbated by DoT's modal approach to freight transportation and its apparent satisfaction with outdated funding mechanisms.

Congestion delays that significantly constrain freight mobility could result in serious economic implications for the nation.⁴⁸ For example, congestion imposes nearly \$200 billion in costs on motorists and industry each year.⁴⁹ The FHWA projects that without any additional capacity, congestion on the National Highway System will increase from 10,600 miles in 2002 to 20,000 miles in 2035.⁵⁰ The AAR estimates that 30% of the primary rail corridors will be operating above capacity in 2035.⁵¹ The average age of locks on the inland waterway system exceeds 50 years, and many are undersized compared to current tow sizes.⁵² This causes the inland waterway system to be underutilized due to infrastructure constraints. Although air accounts for only about 7% of freight movement by value in the United States, it has some of the same congestion concerns such as overcrowded airports and saturated air routes.⁵³

Congestion requires the presence of adequate capital funding if relief is to be realized. The OMB has stated that absent any changes, the Highway Trust Fund will reach an estimated \$4 billion negative balance by fiscal year 2009.⁵⁴ The Inland Waterway Trust Fund suffers the

opposite problem; political pressures to reduce the apparent Federal budget deficit have limited the amount of expenditures.⁵⁵ Railroads, facing a decreased revenue base and lack of federal support, require \$135 billion in capital improvements between 2007 and 2035, just to keep their primary routes on pace with increasing demand.⁵⁶

Although each freight transportation mode must offer up potential solutions that fit its particular needs, this alone is inadequate. There needs to be comprehensive intermodal discussions at the local, regional, and national level to come up with creative solutions to the congestion issue. Such solutions could include regional hubs combining road, rail, air, and where practical water, is just one promising idea. In addition, short-sea shipping along the Atlantic, Gulf, and Pacific coasts has great potential to reduce congestion along the coastal interstate lanes. Reducing traffic congestion and increasing freight movement capacity must be the centerpiece of America's future transportation strategy.

Integrated Planning. The economic success of the U.S. is closely tied to the movement of people and goods. As discussed above, the U.S. has no federal policy concerning transportation infrastructure or an intermodal approach to enable the efficient movement of people and goods. Twice though in U.S. history visionary leaders had the strategic perspective to establish infrastructure goals, strategies and policies that resulted in economic expansion: the construction of the Transcontinental Railroad after the Civil War and the Interstate Highway System in the 1950's. Since then, states, regions, and companies (air, rail, shipping, and truck) have individually optimized their particular mode, which has resulted in the current system. Although initially enabling the growth of the expansion of the U.S. economy, growth driven by globalization and what had been a strong national economy have produced maintenance deficiencies and capacity shortfalls.

The current transportation modal focus optimizes individual "rice bowls" not the entire national intermodal system. The U.S. is at a point in history where visionary leadership is required to establish a Federal transportation strategy and policies that will incentivize coordinated infrastructure improvements to develop and sustain a national intermodal network to move people and goods most efficiently.

Funding Challenges. Transportation infrastructure funding is both inadequate and inefficient, which degrades mobility, distorts investment decisions, and inequitably distributes burdens. Class I railroads alone require \$135 billion in capital improvements between 2007 and 2035 just to keep their primary routes on pace with increasing demand, without increasing their modal share.⁵⁷ Fuel taxes that fund highways and waterways are neither indexed for inflation and nor sufficient to fund maintenance and modernization needs. Without legislative reform, both the Highway Trust Fund and Inland Waterway Trust Fund will be exhausted in the next four years. Even so, government at all levels fund only 40 percent of the nation's highway and bridge requirements. Similarly, airport landing fees do not cover operational and infrastructure expenses for the nation's commercial and non-commercial users.

Meanwhile, political influences also impede efforts to enhance cost-effective investment and operational efficiency. For example, the 1920 Jones Act, conceived to protect American shipping in a previous era, today stymies innovation and competition in a globalized economy. The GAO estimates that this protectionist legislation imposes "\$9.8 billion a year over what freight rates would have been without cabotage laws"⁵⁸ for residents of Hawaii, Alaska, and Guam. Actually, the transportation industry is funded through a complex array of private and

public finance that unevenly anticipates and invests in infrastructure needs and contends with entrenched interests and procedures. The industry will struggle to meet future needs without deliberate political reform and business innovation in order to ensure the capacity for economic growth.

Environmental Concerns. As worldwide concern over the environment and energy efficiency continues to escalate, the spotlight focuses on improving all modes of transportation from an energy and environmental perspective. The public interest in becoming more “green” and steadily increasing energy costs have intensified the transportation industry to focus on environmental priorities.

In the port of Los Angeles-Long Beach, which handles over 40% of all domestic container traffic,⁵⁹ pollution from trucks and trains hauling containers to and from the port became so significant that the decision was made to fund and build a dedicated, 20 mile long, triple track rail line to move containers away from the port to a rail head north of the city. The Alameda Corridor allows trains to avoid over 200 grade crossings and runs at a consistent speed of 40 miles per hour, currently moving 11,000 containers per day. The association that runs the corridor commissioned a study, which found a reduction of 92% of carbon monoxide, 44% of nitrous oxide, and 21% of the sulfur oxide over the trucks, and trains the corridor replaced.⁶⁰

The challenge of meeting increasing demand while still protecting the environment will prove daunting in the coming years, but can eventually be overcome through technological improvements in emissions scrubbers and improved fuel efficiency. While these improvements will be costly to both the transportation industry and consumers, they are a necessary and prudent expenditure if efficiencies and an improved environment are to result.

Security. Since the terrorist attacks in the U.S. on September 11, 2001, representatives from all sectors of the transportation industry have met to examine potential vulnerabilities and to identify areas that need increased protection. The country has begun to place a great deal of emphasis on detection and prevention of attacks and how to adjust to incidents to maintain the efficient flow of people and goods whether by rail, air, road, or sea.

The protection of rail and public transportation systems in our country is of vital importance. Countless thousands of railroad tank cars transport hazardous materials (hazmat) daily across the United States. There is virtually an unlimited number of ways that these shipments face risk from terrorist attack. Hazmat shipments can be attacked or exploited by terrorists and shipments that are poisonous, infectious, radioactive, flammable, or explosive can serve to harm large groups of people.

For air, the Airports Council International estimates that approximately 3,400 U.S. airports will budget \$87.4 billion dollars associated with security developments and improvements through 2011.⁶¹ Of that amount, the projection is approximately 6 percent of those expenditures will go to security for the large-scale hubs. These expenditures will come from airport funds and the FAA Airport Improvement Program.⁶² Although the U.S. has had no experiences similar to 9/11 (this is due in large part from the work of TSA) the security and protection of the nation’s commercial airports must remain a high priority.

Our nation continues to rely on the trucking industry to move goods securely, in the most cost effective way, and as quickly as possible to its final destination. The size of the transportation network makes surveillance, tracking, and control monumental tasks for law enforcement agencies and the DHS has warned of multiple suspicious incidents that heighten

concern over the potential terrorist acquisition of large trucks and commercial buses.

Government Goals and Role

Faced with strained transportation capacity and an increasingly “globalized” world, America’s transportation policy makers are challenged to shape a future transportation environment that increases the capacity, velocity, and reliability of America’s transportation system. America is at a crossroads and U.S. policy makers must reassess if current transportation incentives and regulations have outlived the conditions from which they were originally created. For example, the Merchant Marine Act of 1920 (the Jones Act) was drafted at the end of the World War I economic boom and looked to eliminate wartime controls, cut taxes, and restore high protective tariffs.⁶³ In the context of 1920, efforts to develop a merchant marine by giving preference to domestic industry made sense for both the U.S. economy and for national security. Today, the Jones Act represents how modal specific barriers constrict innovation within a single mode and across the larger transportation industry. If our nation’s transportation system is to remain the cornerstone of nation’s ability to grow economically, America’s transportation policy makers must not live in the past.

National-level entities must work with, and build partnerships “with state, local, and private sector entities to promote a safe, more secure, more efficient, and more interconnected national transportation system of roads, railways, pipelines, airways, and waterways.”⁶⁴ It is critical that congressional and executive influences (laws, appropriations, policy, regulation, disbursement of funds, *etc.*) guide an all inclusive and unifying approach to shape America’s future transportation system. America’s policy makers must embrace multimodal solutions that provide seamless transportation capability and support America’s 21st century economic growth.

Policy Considerations

Enhancing America’s transportation capacity is clearly tied to U.S. national interests. Unfortunately, America’s transportation industry -- as efficient, interconnected, and colossal as it is -- is not postured to meet America’s 21st century transportation demands. Intermodalism, technological innovation, and appropriately applied capital investment incentives all provide attractive opportunities to enhance America’s freight mobility and relieve congestion pressures on America’s highways. Bureaucratic politics must be set aside in order for policy makers to must embrace and incentivize an integrated transportation system.

When determining if and how the transportation industry should be regulated, deregulated, incentivized, or protected, U.S. policy makers must act on four central considerations:

- 1) Is the status quo progressive or antiquated?
- 2) How does globalization impact the industry?
- 3) How can cross-modal transportation opportunities be enhanced?
- 4) Regardless of mode, when should barriers fall and when should incentives be offered to expand America’s transportation capacity?

Answering the questions posed in this four-factor framework will enable America’s transportation policy makers to shape policy and apply resources in a manner that postures America to increase its transportation capacity, embrace the role of transportation infrastructure on the nation’s economy, and improve transportation safety and security.

Importance of Increasing Transportation Capacity

Continuing to address transportation problems on a modal basis produces sub-optimal government policies. Intermodal solutions provide an untapped freight movement capacity and provide attractive transportation opportunities because of their potential to enhance freight mobility and relieve the stifling congestion that is building on America's highways. Transportation policy makers must emphasize multimodal capital investment, innovation, and efficiency by minimizing trade restrictions, trade barriers and transaction costs.

Experts often analyze the competitive transportation environment by emphasizing the advantage of a single mode. "Modal equity" is an intermodal measure that can objectively evaluate the different operational environments in which air, truck, rail, ships, and barges operate. If transportation policy makers used modal equity comparisons when shaping America's future transportation industry, they would be better postured to make those tough trade-off decisions. That is, investment in one mode of transportation is at the expense of other modes.

As an example, rail is solely responsible for operating and maintaining all aspects of the rail system. This adds a significant expense to their operating costs with almost 18% of their revenues dedicated to capital assets maintenance, replacement, and improvement.⁶⁵ This is far above the normal 3-5% for most industries and has resulted in over \$400B in investment since 1980 and annual maintenance costs of roughly \$10.6B in 2006 for the four largest Class I's and capacity improvements of nearly \$2B annually.⁶⁶ Trucks and barges on the other hand are partially subsidized in the form of less than cost-accounting fuel taxes and Army Corps of Engineers maintenance of major waterways. Government imposed barriers and incentives produce modal inequity and sub-optimal transportation system performance.

The Role of Economics and Infrastructure

Improving transportation infrastructure and processes depends on the ability of U.S. policy makers to create a healthy investment climate that promotes and improves system-wide performance. Unfortunately, America lacks a business plan that addresses how this nation will accommodate ever-increasing volumes of trade. The challenge is how to make investment, incentive, and regulatory decisions in a multi-modal framework vice single mode decisions influenced by lobbies and politics.

Supporting growing trade and a global economy requires policies that shape and guide intermodal capacity increases at air, land, and sea ports. To expand its transportation capacity and effectiveness, America must develop an integrated national transportation strategy focused on meeting future trade volumes and incentivizing infrastructure investment to maximize system effectiveness. Encouraging the development of an intermodal transportation network will lead to increased capacity as opportunities and interactions between the modes are maximized.

The Role of Safety and Security

September 11, 2001 changed the way our nation approaches safety and security and the transportation industry finds itself in the middle of many security driven changes. As such, America's transportation policy makers must carefully balance a reality that while transportation

economics are best left to market forces, safety and security are often best managed at the national level.⁶⁷ Without question, the strategic benefits of effective transportation in the United States stems from the ease with which travelers and freight move throughout the transportation system. Tightening security and enhancing safety can, and often does, threaten efficiency.

Reducing America's vulnerability to terrorism will compromise personal and economic mobility and impose significant social and economic costs on the United States.⁶⁸ America's transportation policy makers must make the tough choices that will balance safe/secure delivery while minimizing the constraints placed on the "free market" network; these constraints include environmental regulations, cabotage laws, security requirements and energy costs.

National Security

Meeting the requirements as established in America's National Security Strategy requires the U.S. to remain an economic powerhouse. In this context, it becomes clear that America's transportation capability, economic strength, and national security are interconnected. Remaining a leader in the global economy requires America to provide cost efficient, effective, transparent, and time definite delivery of goods. While idealistic in concept, emerging technology can make time-definite delivery a reality only if multimodal solutions provide seamless transportation capability. U.S. policy makers must shape a transportation network able to deliver people and cargo safely, securely, and efficiently when and where needed. How well this system overcomes congestion, retains a surge transportation capacity, and maintains strategic responsiveness that provides assured response across the public and private realms are the measures of success.

Essays on Major Issues

Although the focus of the summary portion of this paper has been on freight congestion, the various modalities of transportation offered insight into where future challenges are expected. The results of these studies are included in the *Issues Papers* annexes below. Those essays include the following: 1) Trucking—A Future of Congestion?; 2) Rail—Lack of policy and guidance for the Railroad Industry; 3) Shipping—A Global Modality; 4) Ports—Prepare for the Surge; 5) Air—The Sky is Falling.

Conclusion

The future is here. The U.S. increasingly relies on a force projection strategy for rapid deployment of expeditionary military capability to support and defend vital national interests around the globe. Experience and studies conclude there is a growing risk to meeting both deployment standards and national economic growth expectations. Targeted federal funding and smart policies to improve infrastructure that directly supports national security objectives into the future is such an opportunity.

Transportation is a "network" industry where the interaction of different market segments provides a capability much greater than the sum of the parts. In very simple terms, meeting the demands of future U.S. domestic transportation requires an expanded and more efficient cross-modal approach that leverages and integrates the efficiencies of each mode.⁶⁹ America's

transportation policy makers must follow through on President Bush's intent to "break down barriers to trade so our workers can sell more goods and services."⁷⁰

¹ Mark Yonge, "Defining Short-sea Shipping Land and Water Use" briefing slide 6. Information was derived from a comprehensive brief given to the American Association of Port Authorities in Memphis, TN on November 15, 2006.

² David J. DeBoer and Lawrence H. Kaufman, *an American Transportation Story – the Obstacles, the Challenges, the Promise* (Maryland: Intermodal Association of North America, 2002), p. 2.

³ U.S Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, Census Bureau, *2002 Commodity Flow Survey: United States* (Washington, DC: December 2004), table 1a.

⁴ *Transportation Services in the United States: Industry Profile* (New York: DataMonitor USA, July 2007), p. 3.

⁵ While the value of U.S. freight activity grew as noted in the preceding paragraph, overall U.S. gross domestic product over the same 1993-2002 period grew faster (57 percent).

⁶ One problem is that prices paid by users often do not align with infrastructure costs. Another is the extent to which carriers bear the full cost of their infrastructure use varies across modes, which distorts the competitive position between them. See General Accountability Office, *National Policy and Strategies Can Help Improve Freight Mobility*, GAO-08-287, January 2008.

⁷ Per the GAO, the federal government is not well positioned to enhance freight mobility due to the lack of a clear federal strategy and role for freight transportation, an outmoded federal approach to transportation planning and funding, and the unsustainability of planned federal transportation funding. See General Accountability Office, *Restructured Federal Approach Needed for More Focused, Performance-Based, and Sustainable Programs*, GAO-08-400, March 2008.

⁸ _____, *Air Freight in the United States: Industry Profile*, DataMonitor (July 2007), p. 7.

⁹ _____, *Airlines in the United States: Industry Profile*, DataMonitor (November 2007), p.7.

¹⁰ _____, *Air Freight in the United States: Industry Profile*, DataMonitor (July 2007), p. 3.

¹¹ FAA Washington Headquarters Press Release. *FAA Forecasts Steady Growth in Air Travel Demand*. Release No. AOC-8-07 (March 2007), http://www.faa.gov/news/press_releases/news_story.cfm?newsId=8358.

¹² Briefing by M. Smiley at FAA, March 28, 2008.

¹³ 180 of which are "deep-water." A deepwater port is one that can handle a ship that can traverse the Panama Canal. The port depth is usually the driver, and is 12 meters or 39.5 feet.

¹⁴ *American Association of State Highway and Transportation Officials (AASHTO) - Transportation Invest in Our Future: America's Freight Challenge*. p. 25.

¹⁵ Chris Strohm, "Officials criticize plan to scan all cargo," Government Executive, <http://www.govexec.com/dailyfed/0707/071107tdpm1.htm>.

¹⁶ U.S. Dept. of Transportation "MARAD – A Vision for the 21st Century", (2007), p. 13

¹⁷ Intermodal Association of North America (IANA), www.intermodal.org.

¹⁸ _____, "Railroads Industry Overview" from Hoovers.com, http://www.hoovers.com/railroads/-ID__319--/free-ind-fr-profile-basic.xhtml.

¹⁹ _____, “Class I Railroad Statistics” from the Association of American Railroad, located at <http://www.aar.org/PubCommon/Documents/AboutTheIndustry/Statistics.pdf>, however this number is changed annually by Surface Transportation Board but the top 7 have consistently been there.

²⁰ As described by John Gray, the Policy and Economic Vice President from the Association of American Railroads (AAR) during the ICAF visit on 6 March 2008.

²¹ *The Challenge of Meeting Freight Infrastructure Demands*. ITC New Hill for AAR.

²² _____, “Major Freight Railroads to Invest \$8.3 Billion in Infrastructure in 2006, Record Level of Investment for Industry,” press release by the AAR, March 16, 2006.

²³ Jeff Berman, “Railroad Shipping: AAR Says February Volumes Are Mixed,” *Logistics Management*, 3/7/2008, <http://www.logisticsmgmt.com/article/CA6539072>.

²⁴ AAR’s “The Nation’s Freight Rail Challenge.”

²⁵ AAR brief to ICAF Industry Study. However, since the charts were not located on the public domain, the reference to AAR will be deleted, and changed to industry advocacy group if this is ever released publicly. Also see Ott, James and Guy Norris, “Anything Goes; Synthetic Blend Heads for USAF Certification. Research Expands to Unusual Renewable Sources” in *Aviation Week and Space Technology* (August 20, 2007).

²⁶ *Statutory Definitions of Inland and Intracoastal Fuel Taxed Waterways of the United States* (As of September 2007), U.S. Army Corps of Engineers.

<http://www.iwub.iwr.usace.army.mil/FuelTaxedWaterways.htm>

²⁷ David V. Grier, *The Declining Reliability of the U.S. Inland Waterway System*, U.S. Army Corps of Engineers, Institute for Water Resources.

<http://www.trb.org/Conferences/MTS/4A%20GrierPaper.pdf>

²⁸ Comments by the Assistant Secretary of the Army for Civil Works, 17Mar08.

²⁹ *National Rail Freight Infrastructure Capacity and Investment Study*, Cambridge Systematics for AAR, September 2007.

³⁰ *Transportation for Tomorrow: Report of the National Surface Transportation Policy and Revenue Study Commission*, 2008. http://www.transportationfortomorrow.org/final_report/.

³¹ AASHTO, p. 13.

³² Clifford Winston and Ashley Langer “The Effect of Government Highway Spending on Road Users’ Congestion Costs,” AEI-Brookings Joint Center For Regulatory Studies Working Paper 06 (11 May 2006), p. 16. Meanwhile, the American Trucking Association figure is a more modest 56 percent. While the interstate system enabled national carriers to achieve scale economies, particularly for full truckload shipping and container transport, freight remains predominantly centered in “mega-regions” emerging around the nation’s population centers.

³³ C. Wick Moorman, “Statement of Mr. C. Wick Moorman, Chairman, President and Chief Executive Officer, Norfolk Southern Corporation, before the Committee on Senate Commerce Science and Transportation Subcommittee on Surface Transportation and Merchant Marine Infrastructure, Safety and Security,” (October 23, 2007), p. 3. U.S. DOT projects a 92 percent freight demand increase from 2002 to 2035, but a disproportionate increase in rail freight demand relative to road freight due to public highway investment constraints, existing disbursement mechanisms, and project delivery times relative to the deregulated rail industry.

³⁴ Winston and Langer, p. 16. The authors estimate the magnitude of highway congestion and share of the burden borne by surface freight companies, “Summing over all origin-destination pairs, our estimate of the congestion costs for the nation’s firms in 1997 is \$7.58 billion (2000

dollars). Thus, adding this figure to the \$2.46 billion in congestion costs incurred by truckers yields roughly \$10 billion in congestion costs for the surface freight sector.” Their study assessed overall congestion costs of \$37.5 billion, which differs from the Texas Transportation Institute figure several years later using different parameters.

³⁵ Winston and Langer, p. 18. Unlike most motorists who commute to work within a single city, truckers typically travel through multiple urban areas. Moreover, the hourly delay costs are greater for truckers than for individual motorists: \$63.69 per hour for trucks versus \$9.71 per hours for individual motorists.

³⁶ Office of Freight Management and Operations *Freight Facts and Figures 2007* (Washington: Federal Highway Administration, November 2007), pp. 30-31, http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/07factsfigures/pdf/ff2007.pdf.

³⁷ The 92% was provided in the AAR report on America’s Freight Rail Challenge. However, a look at the DoT website essentially confirmed this number when it showed over 50 million tons currently and 100 million tons in 2035, http://www.rita.dot.gov/publications/transportation_vision_2030/html/freight_transportation.html.

³⁸ *America’s Freight Challenge*, AASHTO, May 2007.

³⁹ Palmeri and others, “Fear and Loathing at the Airport,” *Business Week*, September 10, 2007, 46.

⁴⁰ Palmeri and others, “Fear and Loathing at the Airport.”

⁴¹ C. Wick Moorman, “Statement of Mr. C. Wick Moorman, Chairman, President and Chief Executive Officer, Norfolk Southern Corporation, before the Committee on Senate Commerce Science and Transportation Subcommittee on Surface Transportation and Merchant Marine Infrastructure, Safety and Security,” (October 23, 2007): 3. U.S. DOT projects a 92 percent freight demand increase from 2002 to 2035, but a disproportionate increase in rail freight demand relative to road freight due to public highway investment constraints, existing disbursement mechanisms, and project delivery times relative to rail.

⁴² National Surface Transportation Infrastructure Finance and the National Surface Transportation Policy and Revenue Study Commission, 2008.

⁴³ The Office of Management and Budget estimates a negative \$200M balance in 2009. CBO estimates are similar. TRIP, “Key Facts About America’s Road and Bridge Conditions and Federal Funding.” Washington, D.C.: (March 2008): 2. Transportation Secretary Peters has requested authority to migrate Federal Transit Funds to cover highway outlays until a solution to the FHWA shortfall is secured.

⁴⁴ _____, “The Nations’s Freight Rail Challenge, An Overview of Recent Policy Studies” published by AAR, sheet 7 (pages are unnumbered).

⁴⁵ _____, “National Rail Freight Infrastructure Capacity and Investment Study Report (September 2007)” published by Cambridge Systematics, available at http://www.camsys.com/pressreleases/pr_sep07_aar_rr_capacity_study.htm.

⁴⁶ DOD Report to Congress, *Projected Requirements for Military Throughput at Strategic Seaports*, Under Secretary of Defense (Acquisition, Technology & Logistics), Apr 07.

⁴⁷ MARAD Fact Sheet, *Intermodal Development*, www.marad.dot.gov.

⁴⁸ *ibid.*

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- ⁴⁹ Vincent E. Grewatz, “Financing Infrastructure: State and Federal Reform”, Industrial College of the Armed Forces, Ft McNair, Washington D.C., April, 2008, p. 3.
- ⁵⁰ *Freight Facts and Figures 2007*, Department of Transportation, (Washington, D.C., pending).
- ⁵¹ Cambridge Systematics.
- ⁵² David V. Grier, *The Declining Reliability of the U.S. Inland Waterway System*, U.S. Army Corps of Engineers, Institute for Water Resources,
<http://www.trb.org/Conferences/MTS/4A%20GrierPaper.pdf>
- ⁵³ _____, “Transportation Services Industry in the United States,” DataMonitor (July 2007), p. 10.
- ⁵⁴ *Mid-Session Review, Budget of the U.S. Government, Fiscal Year 2008*. Office of Management and Budget, Washington, DC, July 11, 2007.
- ⁵⁵ Comments by the Assistant Secretary of the Army for Civil Works, 17 Mar 08.
- ⁵⁶ Cambridge Systematics.
- ⁵⁷ *National Rail Freight Infrastructure Capacity and Investment Study*, Cambridge Systematics for AAR, September 2007. AASHTO figures confirm this industry finance requirement, but place the overall (public and private) figure at between \$175-\$195 billion over this period in *America’s Freight Challenge*, AASHTO, May 2007.
- ⁵⁸ Stephanie Nall, “High cost of Jones Act Keeps out Competitors” in *Florida Shipper* (16 April 2007)..
- ⁵⁹ Bill Mongeluzzo, “Green Ports,” *Journal of Commerce*, (November 21, 2005), p. 1.
- ⁶⁰ *Alameda Corridor Transportation Authority*, <http://www.acta.org/>.
- ⁶¹ John Doyle, “U.S. Congress, Public Opinion Likely to Shape Airport Security Market.” *Aviation Week and Space Technology*. 168, no.1 (January 2008): pp. 50-51.
- ⁶² Bag screening costs area paid by TSA.
- ⁶³ The goal of creating a stable – U.S. – domestic maritime capability did not originate with the 1920 “Jones Act.” While the “Jones Act” is widely recognized and cited today, it largely restated America’s original cabotage protection for maritime commerce between U.S. ports that was enacted by America’s first congress in 1789. Today, of the 192 United Nations member countries, only 47 enforce cabotage laws/protections – 19 percent. Mike Murphy, *US Cabotage Laws: Transportation Industry Study* lecture (Fort McNair, Washington D.C.: Industrial College of the Armed Forces, February 2008).
- ⁶⁴ Mary E. Peters, *Fiscal Year 2009 Budget in Brief* (Washington D.C.: U.S. Department of Transportation).
- ⁶⁵ Individual looks at capital expenditures for each railroad shows large annual capital expenditures. The “almost 18%” summary is taken from a report by AAR located at http://www.aar.org/pubcommon/documents/ITC_REREG_1p.pdf.
- ⁶⁶ These data points were taken from AAR reports (Railroad Trust Fund point paper) and site visits to BNSF and Norfolk Southern.
- ⁶⁷ The Aviation market segment provides a good example where and why active government engagement is appropriate. The FAA has a history of enforcing safety standards only after a repeated number of accidents have occurred. “Virtually every major air safety advances, including ground proximity warning systems in cockpits, was preceded not by a careful weighing of evidence, but by a series of crashes, followed by political demands that something be done.”

⁶⁸ Kelley S. Coyner, “Sustainable Transportation Security”; Transportation Research Board, “Deterrence, Protection and Preparation: The New Transportation Security Imperative,” Special Report 270 (Washington: National Academy of Sciences, 2002).

⁶⁹ Rick Everyday, Editor of “Florida Shipper” magazine argues that time is money, but large quantity freight shipping is always cheaper. He notes that, “bulk and break bulk shipping has long been the soul of domestic shipping whether it is cotton and wheat down the Mississippi or coal from the Gulf to Tampa Bay. That is, the supply chain makes financial sense to the shippers who know trucks and trains cost three times as much to fuel as a tug and barge.” Rick Eyerdar, “Costal Cargo: Grassroots Grow for Maritime Highways,” in *Florida Shipper* (April, 2007), 1.

⁷⁰ Economic Report of the President, February 2007, “Message from the President of the U.S.,” p. 3, http://www.gpoaccess.gov/eop/2007/2007_erp.pdf.



ISSUE PAPERS

ANNEX A – TRUCKING: A Future of Congestion?

The health of the trucking industry depends critically not only on the other transportation modes, but the connectivity among them. Roads are the heart of America's transportation system. Trucks carry 80 percent of all surface freight tonnage and three quarters of trucking vehicle miles move along the National Highway Systems network. Moreover, most road freight movement occurs within urban areas and over half of all freight tons are shipped less than 50 miles.⁷¹ The trucking industry comprises over 700,000 local, regional, and national carriers that exhibit increasing horizontal (i.e. multi-modal) integration with broader geographic coverage. America's highways have become a "moving warehouse" due to economic expansion, adoption of just-in-time delivery, declining rail capacity, and globalized supply chains. Moreover, road connectors are the linchpins to intermodalism and connectivity among the passenger and freight mobility nodes. Unique among transportation modes, the highway network is the only one not managed as a system or collection of subsystems due in part to its complexity. Yet, highways are crucial to America's quality of life, prosperity and international competitiveness.

Government Role

Deregulation has squeezed excess capacity to generate efficiency, but lowered profit margins for all transportation modes. Because they share common physical infrastructure, trucking firms leverage capital and labor cost structures within their business strategies to capture local and regional markets in a highly competitive industry. Chief among the challenges facing the trucking industry today are safety, highway finance and congestion, which are both interrelated and critically dependent on alternative freight modes.

Safety underpins a significant share of Federal Highway Administration and Federal Motor Carrier Safety Administration activity ranging from training and education requirements for initial entry drivers,⁷² vehicle and equipment regulation (i.e. roll stability mandates), hazardous material transport, security, and speed limits. Hours of Service (HOS) regulations designed to prevent fatigue-induced mishaps and crashes stand as the top issue for truckers according to the American Transportation Research Institute (ATRI). When combined with a shortage of drivers with good driving records and skills – particularly for long haul trucking companies – HOS regulations place stress on trucking companies seeking to meet economic demand. Tort reform is a related issue demanding attention to correct the disproportionate burden placed on truckers involved in truck-automobile crashes even when the automobile driver is at fault.⁷³

Outlook

Congestion thus saps prosperity and undermines international competitiveness. The trucking industry bears a disproportionate share of congestion costs, which have skyrocketed in the past quarter century. Trucking vehicle miles traveled (VMT) doubled between 1980 and 2005 and is expected to double again by 2035.⁷⁴ Meanwhile, system lane-mileage expanded only 3 percent in the past quarter century, resulting in bottlenecks and delays that disproportionately affect the trucking industry. While surface freight represents only five percent of total VMT, the industry bears nearly 27 percent of all congestion costs⁷⁵ that include 4.2 billion hours, 2.9 billion gallons of fuel, and \$78.2 billion annually – more than the entire

Federal Highway Administration budget.⁷⁶ Congestion reduces business investment in product improvements and economic productivity; increases shipment delivery time; and increases driver and vehicle costs.⁷⁷ The recent surge in diesel fuel prices threatens the entire industry, but most acutely strains the smaller firms. Solutions to urban congestion must involve freight movement by rail, waterways, and air, as well as mass transit alternatives for passengers.

Highway finance faces a looming crisis with depletion of the Highway Account in 2009 and the entire Highway Trust Fund in 2012. The fundamental issue is the growing chasm between prices and costs of commercial and non-commercial highway usage. The average current user fee revenue per VMT is about 3 cents, while highway congestion costs average 10 to 29 cents per VMT.⁷⁸ Failure to index fuel taxes, diversion of revenues for non-highway uses, enhanced fuel efficiency, distorted tax structures that promote less fuel-efficient trucks that pollute more, burdensome environmental permitting requirements, and congestion exacerbate the funding challenges. In response, states have turned to increased tolling, public-private partnerships, and complete privatization to supplement inadequate revenues to meet the growing road and bridge maintenance and modernization needs and resulting in the "balkanization of the U.S. transportation system."

Submitted by Mr. Vince Grewatz, Department of the Army

⁷¹ Clifford Winston and Ashley Langer "The Effect of Government Highway Spending on Road Users' Congestion Costs," AEI-Brookings Joint Center For Regulatory Studies Working Paper 06 (11 May 2006): 16. Meanwhile, the American Trucking Association figure is a more modest 56 percent. While the interstate system enabled national carriers to achieve scale economies, particularly for full truckload shipping and container transport, freight remains predominantly centered in "megaregions" emerging around the nation's population centers.

⁷² Roger Morton, "What Worries Trucking?" *Logistics Today*. Vol. 49, No. 2 (Cleveland: Feb 2008): 26. ATRI anticipates new regulations detailing minimum driver training qualifications including substantial accreditation, including 120 hours of classroom and 44 hours behind the wheel.

⁷³ Roger Morton, "What Worries Trucking?" *Logistics Today*. Vol. 49, No. 2 (Cleveland: Feb 2008): 26.

⁷⁴ C. Wick Moorman, "Statement of Mr. C. Wick Moorman, Chairman, President and Chief Executive Officer, Norfolk Southern Corporation, before the Committee on Senate Commerce Science and Transportation Subcommittee on Surface Transportation and Merchant Marine Infrastructure, Safety and Security," (October 23, 2007): 3. U.S. DOT projects a 92 percent freight demand increase from 2002 to 2035, but a disproportionate increase in rail freight demand relative to road freight due to public highway investment constraints, existing disbursement mechanisms, and project delivery times relative to rail.

⁷⁵ Winston and Langer, 16.

⁷⁶ The Road Information Program. "Relieving Congestion Will Require Comprehensive Set of Transportation Strategies Aimed at Reaching measurable Goals, Says DC Group in Response to New Congestion Study." TRIP (18 September 2007). Data cited from Texas Transportation Institute, 2007 Urban Mobility Report (available at mobility.tamu.edu/).

⁷⁷ Winston and Langer, 18. Unlike most motorists who commute to work within a single city, truckers typically travel through multiple urban areas. Moreover, the hourly delay costs are

greater for truckers than for individual motorists: \$63.69 per hour for trucks versus \$9.71 per hours for individual motorists.

⁷⁸ Ibid, 22. Federal Highway Administration, *Highway Statistics*, VMT at Table VM-1 and revenues from user fees at Table HF-10. In 2005, total highway user revenues were approximately \$90 billion and total VMT were approximately 2.9 trillion. 19 HLB Decision Economics Inc., *Road Pricing on a National Scale*, March 14, 2005, page 30, Table 7-2.)



ANNEX B – RAIL: Lack of Policy and Guidance for the Railroad Industry

The amount of revenue generated and importance of the rail industry in this country requires federal government involvement to ensure the industry continues to thrive. Additionally, the federal government does not subsidize the railways and therefore lack of federal funding on rail operations exists. The Department of Transportation needs to take a more active role in developing and enforcing regulations and provide financial support in the railroad industry.

Even though the rail companies are showing record profits and their stock prices are soaring, railroads are increasingly looking to states and the federal government to help pay for expansion projects. They argue that by adding tracks, less freight moves by trucks on nearby roads, creating public benefits such as reduced highway congestion and less air emissions. Railroad officials believe the public should pay for those benefits.⁷⁹ Currently, the railroads provide their own funding to operate and repair or establish infrastructure. Since it is unlikely that the federal government will provide all the funding for the railroad industry, there needs to be a move for public and private venture as a means to assist in updating and building new rail systems to support our economy.

The freight rail market in the United States is one of the biggest movers of commodities today in the transportation industry. There are more than 600 freight railroads operating in Canada, Mexico, and the United States—all vital to North America's economic health.⁸⁰ They form a seamless integrated system that provides the world's most efficient, cost-effective freight service. North American railroads operate over 173,000 miles of track, and earn about \$50 billion in annual revenues.⁸¹ The rail industry focuses on maximizing its supply chain capacity to support Asia's growth and facilitate trans-Pacific trade.

The rail industry keeps the global economy in motion. Almost every product used today moves to a distributor by rail. The railroads move more than 65% of the coal in the United States, which in turn provides more than half of the nation's electricity.⁸² Thirty percent of the nation's grain harvest is transported by rail.⁸³

If the U.S. population wants to take advantage of the benefits of using rail, the federal government needs to get involved to allow the rail industry to develop and flourish. The railroad industry lacks consistent government regulations and guidance. There should be a move to regulate public and private partnership as a means to assist in funding to update and build new rail systems. The federal government needs to provide some type of incentive for companies that invest in the railroads. The railways are willing to provide some funding, but look to the federal government to assist in building up the rail infrastructure. To meet the increasing transportation requirements of the U.S. economy, the rail industry has to make significant investments in its infrastructure. Each of the railroad companies focuses on the future and wants to add additional capacity, new equipment, improved infrastructure, and security.

The freight railway industry is currently enjoying its largest growth in almost one hundred years. The cost of fuel, which makes the trucking industry less attractive as a freight movement modality, and growing global trade are two of the reasons for this development. A train can move a ton of freight more than 420 miles on one gallon of diesel fuel. To top it off, the trucking freight industry is one of the freight railway's biggest customers.

As the price of crude oil breached the \$100 per barrel price, analysts across the energy industry looked even harder at alternatives to help resolve the ensuing energy price increases.⁸⁴

Energy-dependent areas such as transportation (to include aviation) feel the immediate effects on the bottom line with changes in the price of crude oil.

Current rail capacity is sufficient to support existing production capacity for all forms of alternative fuels.⁸⁵ Additionally, according to a leading industry advocacy group, capacity is only congested in limited areas today and trade papers show there are essentially enough rail cars to support the existing production capacity.⁸⁶ However, studies across the board of industry and government show that growth in rail traffic is going to rapidly consume any excess capacity and drive significant challenges without major improvements.⁸⁷

For analysis purposes, there are a few characteristics of alternative fuels which have to be factored in.

- Research shows that due to lower energy content, alternative fuel refineries should be within 20-100 miles of their feedstocks.⁸⁸
- Research and industry trends show that most alternative fuel facilities operate in the 30,000 - 50,000 barrels per day range⁸⁹
- Demographic and current distribution capabilities have the majority of liquid fuel consumers on the east and west coast, with current resupply via pipeline from coastal and great lake refineries⁹⁰

These characteristics lead to a predicted distribution scenario, which plays out perfectly today in ethanol production. Most ethanol refineries are located in the central United States nearest the corn producing states. Expansion of alternative fuel production is expected to follow a similar pattern where new refineries are located closer to the feedstocks than to the end users. This is a simple matter of economics as it is easier to move one rail car of alternative fuels than the three hoppers of feedstock it took to create it. In the case of ethanol, much of the feedstock and nearly all of the finished products move by rail due to the incompatibility of pipelines⁹¹ and cost-prohibited effects of long-distance trucking.⁹²

Unlike public transportation modes, railroads own their route infrastructure and must support it through capital funding. For railroads to continue to meet the increasing customer demands, a large task for the companies is to figure out how to raise the capital costs necessary to maintain and improve their infrastructure.

The federal government is not well positioned to enhance freight mobility due to the lack of a clear federal strategy and role for freight transportation, an outmoded federal approach to transportation planning and funding, and the unsustainability of planned federal transportation funding.⁹³ The Association of American Railroads projects that Class I railroads need \$135 billion in capital improvements between 2007 and 2035, just to keep their primary routes on pace with increasing demand, without increasing the modal share.⁹⁴

Unlike the other two primary freight modes, railroads fund their own infrastructure costs. Their route infrastructure represents fixed investments that are capital intensive, and are subject to property taxes. These investments must be made up-front, and can only be amortized against income taxes. Trucks and barges, on the other hand, self-fund only their terminal infrastructure and movable stock, and make their contributions to route infrastructure as operating expenses (e.g., fuel taxes), which can be treated as deductions for income taxes.

Just to maintain market share, railroads need to invest \$175-\$195 billion over next 20 years. The railroads themselves, through existing sources of capital, are likely to raise \$142 billion.⁹⁵ Their ability to raise capital is directly tied to the rates they charge, as they must demonstrate a return on investment. They need another \$33-53 billion to fully fund the needed infrastructure improvements to accommodate growth.

Submitted by COL Mark Darden, United States Army

⁷⁹ Railroads are expanding at a record clip, April 7 2008 The Virginian-Pilot, Norfolk, VA.

⁸⁰ <http://www.BNSF.com>

⁸¹ <http://www.hoovers.com/industry/freight-railroads>

⁸² <http://www.hoovers.com/industry/freight-railroads>.

⁸³ IBID

⁸⁴ Kent N. Gourdin, "Alternative Fuels" in Defense Transportation Journal (June 2007), pp 5-6.

⁸⁵ Extensive literature search found no indication that any alternative fuel facilities was unable to get feedstocks or have finished products distributed.

⁸⁶ AAR brief to ICAF Industry Study. However, since the charts were not located on the public domain (included at Annex B), the reference to AAR will be deleted, and changed to industry advocacy group if this is ever released publicly. The trade paper reference was

Blanchard, Roy "Ethanol's Big Promise" in Railway Age (April 2007), p 37-38.

_____, "The Ethanol Conundrum" in Railway Age (October 2007), p DB4.

_____, "Railcar market: Thy name is ethanol" in Railway Age (June 2007), p 28.

⁸⁷ _____, "The Nation's Freight Rail Challenge" as prepared by the Association of American Railroads, Washington DC, and a commentary at Baumgarten, Stefan, "Trouble Down the Line," from ICIS Chemical Business (July 30, 2007), p 32.

⁸⁸ See the following:

Nicholas Kukrika, "Vegetable Oil Based Biofuels in India: An Overview of the Value Chain and Analysis of Biofuels' Pro-Poor Potential" Harvard Kennedy School of Government (January 2008)

Diane Greer, "Realities, Opportunities for Cellulosic Ethanol" in BioCycle (January 2007).

_____, "Increasing Security and Reducing Carbon Emissions of the U.S. Transportation Sector: A Transformational Role for Coal with Biomass" from the National Energy Technology Laboratory (August 24, 2007) DOE/NETL-2007/1298, p 13.

⁸⁹ _____, "Increasing Security and Reducing Carbon Emissions of the U.S. Transportation Sector: A Transformational Role for Coal with Biomass" from the National Energy Technology Laboratory (August 24, 2007) DOE/NETL-2007/1298, p 61. Also described at

_____ "Wellsville, OH eyed for new coal-to-liquid plant" in a news release from the Port of Pittsburgh Commission (23 Jan 08). Also described at

_____, "The Business Case for Coal Gasification with Co-Production, Task V(B)" prepared by the Scully Corporation (June 14, 2007), p 6.

Stephen P Bergin, PhD, "Ultra-clean Fischer-Tropsch (F-T) Fuels Production and Demonstration Project" prepared for the U.S. Department of Energy (June 2007).

_____, "Synthetic-fuel plant plans advance," from Youngstown Vindicator (December 21, 2007).

⁹⁰ The author recognizes this is an oversimplification but illustrative of "end user" location for final distribution point in this process

⁹¹ _____, "Key Challenges Remain for Developing and Deploying Advanced Energy Technologies to Meet Future Needs," Government Accountability Office (December 2006), report #GAO-07-106, p 28.

92 _____, “More Fight - Less Fuel, Report of the Defense Science Board on DoD Energy Strategy (February 2008)” prepare for the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics.

⁹³ Restructured Federal Approach Needed for More Focused, Performance-Based, and Sustainable Programs, GAO-08-400, March 2008.

⁹⁴ Cambridge Systematics, *op cit.*

⁹⁵ AASHTO, *op cit.*



ANNEX C – SHIPPING: A Global Modality

The continued globalization and growth of the world's economy has led to the rapid expansion of the maritime shipping industry. This trend has helped improve the level of wealth and quality of life of millions of people worldwide through the creation of jobs in the shipping industry and through the second and third order effects to the industries that rely on a strong import or export base resulting from overseas suppliers and markets.

This continued expansion has fueled the building of an increasing number of larger, ocean-going vessels capable of carrying the increased volume of trade. This trade is comprised of commodities such as wheat, oil and coal, and finished goods such as automobiles and consumer electronic products shipped in containers.

Short sea shipping: The short sea shipping market segment and its untapped freight movement capacity provide an attractive transportation opportunity because of its potential to enhance freight mobility and relieve the economic growth stifling congestion that is building on America's highways.

Senior officials at the U.S. Army Department of Civil Works recognize that while the container on barge market segment is in its infancy, this emerging mode of transportation promises significant potential to relieve congestion on America's highways at equivalent speed and lower transportation cost than truck transport.⁹⁶ The Maritime Administration (MARAD) reinforces this position when stating in their "Short Sea Shipping Initiative" brochure that the Maritime Transportation System provides the "smartest, cheapest, and easiest answer to growing surface transportation congestion."⁹⁷ The leading indicators mentioned above suggest that policy-changing momentum is building to rescind Jones Act cabotage protection in favor of "free market" competition.

Seamless / Integrated Coastal Transportation: Port and ship technology is colliding to establish an environment where a multi-modal approach can compete with a pure highway trucking business strategy.⁹⁸ The means exist for short sea shippers to effectively develop a networked – inter-modal – transportation service based on the measures of speed, reliability, quality of service and cost efficiency.⁹⁹

Pollution effects: One barge, in effect, removes 456 tractor-trailers from America's already congested highways.¹⁰⁰ Greater use of coastal and inland waterways would reduce land corridor congestion and would reduce harmful carbon emissions. Building greater efficiency across the entire shipping market segment would expand America's freight movement capacity without adversely impacting the environment.

Intermodal efficiency: Transportation is a "network" industry where the interaction of different market segments provides a capability much greater than the sum of the parts. In very simple terms, meeting the demands of future U.S. domestic transportation requires an expanded and more efficient cross-modal approach that leverages and integrates the efficiencies of each mode.¹⁰¹ U.S. transportation policy must embrace cross modal opportunities and must incentivize a future that shifts freight shipping demands from trucking to other modes of transportation; for example, air, sea, or rail.

America's overburdened highway transportation network is poised for gridlock. The U.S. Government Accountability Office (GAO) predicts that by the year 2020 America's productivity gains will "increase overall freight traffic by 70 percent."¹⁰² This growth prediction is alarming as approximately 78 percent of the nation's goods are moved via trucks.¹⁰³ Another challenge is to find port and trucking business partners ready to make a long-term commitment to partnering with the shipping industry and the existing inland waterway market segment in advance of regulatory incentives; that is, tax credits, or similar mechanisms that encourage capital investment to enhance capabilities.

Jones Act Restrictions: Provision within the 1920 Merchant Marine Act – Jones Act¹⁰⁴ – have outlived the conditions that caused it to be implemented. Drafted at the end of the World War I economic boom – recession – the Jones Act looked to eliminate wartime controls, cut taxes and restore high protective tariffs.¹⁰⁵ Newly elected President, Warren G. Harding declared that America needed "not submergence in internationality, but sustainment in triumphant nationality..."¹⁰⁶ In the context of 1920, efforts to develop a merchant marine by giving preference to domestic industry made sense for both the U.S. economy and for national security. Today's globalized economic environment and transportation industry capabilities are much different. While continued protection of the shipping market segment remains highly debated, both advocates and opponents agree that America's dependence on waterborne transportation and America's economic strength are interconnected.

Looking at the economic benefits of opening shipping to foreign competition against the social and political cost of change, it is clear that America's transportation policy makers must open the long protected short sea shipping market segment to free, open and competitive markets – the "free market" policy option. America's capacity for future economic growth is at stake and the "free market" policy option is the alternative that best expands transportation capability, enables economic growth, and supports the industrial base. U.S. policy makers must embrace globalization and stretch traditional political boundaries to position America to produce more efficient modes of transportation able to sustain America throughout the 21st century.

Conclusion

The importance of the shipping industry to the national and global economy cannot be understated. It is the shipping industry that permits nations to specialize in the production and development of the commodities and finished goods within their areas of availability and expertise, and to export those products worldwide. Without the efficient movement and offload of cargo, the continued relative growth and prosperity cannot be maintained and the synergistic benefits of international trade will be lost, plunging much of the developing world into an economic depression and hindering the further growth of the world's developed nations.

Submitted by CDR Mark Goodrich, United States Navy

⁹⁶ Senior administration officials at the U.S. Army Department of Civil Works confirm that, companies in Pittsburgh, Memphis and Houston are among the first to connect metropolitan areas with containers on barge transportation. U.S. Army Department of Civil Works, *Presentation on Civil Works and Corps of Engineers* (Washington, D.C: Industrial College of

the Armed Forces Transportation Industry Study Visit to U.S. Army Corps of Engineers, 17 Mar 2008).

⁹⁷ Maritime Administration, *Short Sea Shipping Initiative Brochure* (Washington D.C.: U.S. Department of Transportation), <http://www.marad.dot.gov/Programs/Shortsea/04/brochure.pdf>.

⁹⁸ Expanding on the inter-modal inland port concept, coastal container ports offer similar efficiency for effectively moving and transloading container freight between ports, coastal vessels and trucks.

⁹⁹ APM Virginia Terminals, while much larger in scale than the envisioned short sea shipping container transload facility, demonstrates how millions of dollars of investment in an international container shipping company can produce gains in the billions of dollars.

¹⁰⁰ *The Maritime Administration and the US Marine Transportation System: A Vision for the 21st Century* (Washington DC: United States Department of Transportation Maritime Administration, November 2007), 20.

¹⁰¹ Rick Everyday, Editor of “Florida Shipper” magazine argues that time is money, but large quantity freight shipping is always cheaper. He notes that, “bulk and break bulk shipping has long been the soul of domestic shipping whether it is cotton and wheat down the Mississippi or coal from the Gulf to Tampa Bay. That is, the supply chain makes financial sense to the shippers who know trucks and trains cost three times as much to fuel as a tug and barge.” Rick Everyday, “Costal Cargo: Grassroots Grow for Maritime Highways,” in *Florida Shipper* (April, 2007), 1.

¹⁰² Ibid, 1.

¹⁰³ Ibid.

¹⁰⁴ The Jones Act is named to reference the bill’s sponsor – Senator Wesley L. Jones of Washington. It is a cabotage law that restricts carriers of goods, or passengers, between U.S. ports to U.S. flagged vessels.

¹⁰⁵ The goal of creating a stable – U.S. – domestic maritime capability did not originate with the 1920 “Jones Act.” While the “Jones Act” is widely recognized and cited today, it largely restated America’s original cabotage protection for maritime commerce between U.S. ports that was enacted by America’s first congress in 1789. Today, of the 192 United Nations member countries, only 47 enforce cabotage laws/protections – 19 percent. Mike Murphy, *US Cabotage Laws: Transportation Industry Study lecture* (Fort McNair, Washington D.C.: Industrial College of the Armed Forces, February 2008).

¹⁰⁶ The White House, *Warren G. Harding*, <http://www.whitehouse.gov/history/presidents/wh29.html>.

ANNEX D – PORTS: Prepare for the Surge

Assured Access and Governance in Port Operations

Throughout history, seaports have been a cornerstone to a nation's rise and have allowed for the projection of economic and military power. Today seaport¹⁰⁷ importance remains significant; in fact, with globalization, seaports are more important than ever and directly affect a nation's prosperity. Projected surge in cargo over the next 10 -15 years will present critical challenges to American ports, the critical link in freight movement.¹⁰⁸ Even with what appears to be the onset of a recession, the near unanimous predictions call for continuing trade growth. Unfortunately, the U.S. has no strategic plan on how to build capacity to meet this growth or manage port operations to accommodate this growth efficiently.

Port Management

Port Authorities manage ports: public agencies or entities that act “as land managers with responsibility for safe, sustainable, and competitive development of the port.”¹⁰⁹ These port authorities vary in executing port operations with some exercising direct control over operations, some utilizing a government organization to oversee operations, while others utilize a port operating company. Ports enter into lease agreements with their major customers and shipping lines for access to the port facilities, Department of Defense (DoD) being an exception, having no contractual relationship with the commercial ports.

Assured Access and Congestion: A significant issue of concern regarding ports as they relate to DoD, is the lack of assured access to strategic ports. As the U.S. military steadily shifts more and more away from a forward presence strategy and more toward a force projection strategy, the demand that the DoD places on the nations' seaport system is steadily increasing. As this demand has increased, so has DoD's concern of being able to gain assured access to ports when needed.

Seaports optimize revenue and long-term viability by building a sustained business with shippers, with streams of revenues essentially coming from rents, tolls, and dues. Currently, 15 of the 19 strategic ports in the U.S. are commercial, while the remaining four are DoD-owned, three of which are ammunition ports. A significant concern is that DoD's relationship with these commercial ports is essentially an informal business relationship without contractual obligations. As a result, DoD, through the Military Surface Deployment and Distribution Command is “just another” customer of the port with no preferential contracts or agreements. Additionally, DoD is not necessarily the largest customer resulting in it having to compete for rail, staging, and berthing, even during mobilization.

Essentially, DoD is a surge customer, with no guaranteed access to ports in times of emergency. Being just another customer can result in bottlenecks at ports due to military requirements suddenly exceeding commercial capacity. This is a significant issue as DoD needs assured access to ensure uninterrupted deployment operations when needed. Combine increasing trade with projected port congestion and one can easily see impending bottlenecks and congestion delays, which could adversely affect deployment timelines, ultimately potentially adversely affecting national security.

Government Goals and Role: Within the port industry, the government ranges from absolute control to apparent ambivalence. Since 9/11 several laws have been passed directing policies at

the nation's seaports. These include: 2002 Container Security Initiative, 2002 Maritime Transportation Security Act, 2006 Security and Accountability for Every Port Act, and the 9/11 Commission Act of 2007. While all agree that security is vital in a post 9/11 world, lawmaker zeal is increasingly adding burdens to commercial seaports without regard to impact on commercial trade. The most egregious is the 9/11 Act requirement requiring 100% radiation scanning of inbound containers by 2012, which has been criticized by the GAO and Customs and Border Patrol Commissioner for not being technologically nor logistically supportable and having enormous impact on the flow of commerce. At the other end of the spectrum is the government's open market philosophy with respect to the transportation system efficiencies. The government essentially leaves private companies, to include the seaports, to internalize and maximize their segment within their business models.

Outlook

By 2010, significant port capacity shortfalls are projected along the West coast and the larger East coast ports. The projections for increasing trade volumes into the future will only compound the congestion issue, as planned infrastructure improvements do not add the necessary capability. Political leaders do have options, which ongoing Congressional studies will likely highlight. A prudent course of action to address both the overall port congestion issue and ability to deploy military capability is to authorize funding/incentives at designated commercial ports to improve infrastructure that facilitates military deployments. In return for funding, DoD would receive contractual guarantees to port infrastructure required to support future deployments.

With respect to governance, it is essential to reach a balance between too much and too little. Having no governance ultimately results in port inefficiencies leading to a waste of dollars and resources. Conversely, have too much governance can cause port authorities to ineffectively operate their ports by implementing national directives, which may not effectively/feasibly accommodate the local port operation. One alternative would be to have the government provide incentives or implement policies that would encourage regional or national efficiencies. The Virginia Port Authority and the Port Authority of New York and New Jersey provide excellent examples of how to gain such efficiencies. Ultimately, however, there is a lack of a coherent overarching strategy. A focused national effort toward improving port operations is essential to effectively implement and realize strength in U.S. ports.

Submitted by LTC Charles Harris, United States Army

¹⁰⁷ For brevity will refer to seaport as "port" for the remainder of the paper.

¹⁰⁸ U.S. Dept. of Transportation "MARAD – A Vision for the 21st Century", (2007), p. 6

¹⁰⁹ Larissa M. van der Lugt and Peter de Langen, "Port Authority Strategy: Beyond the Landlord – a Conceptual Approach," presented at International Association of Maritime Economists Conference, Athens, Greece (2007): 2, http://www.porteconomics.nl/docs/port_authority.pdf. These agencies may be governmental or quasi-governmental.

ANNEX E – AIR: The Sky Is Falling

Challenges and opportunities beset the air industry. The two major civilian components of the air industry are passenger and freight/package delivery services. Within the United States, passenger and freight generate over \$190 billion dollars per year.¹¹⁰ Presently, Americans make over 660 million flights annually.¹¹¹ The FAA predicts that by 2015, the number of passengers who take to the skies will grow to 1 billion a year.¹¹² However, issues of congestion, rising fuel costs, and potential economic downturn all present threats to the air mode of the transportation industry.

The Issues

First, consider the possibility that the air industry continues to grow. Based on projected increases in the number of flights, the obvious conclusion is the congestion of airspace will grow. One approach to decreasing this congestion is use of larger aircraft such as the Airbus A380, which carries up to 555 passengers and 38 LD3s (cargo pallets), where one LD3 carries a volume of 153 ft³ or 4.3 m³.¹¹³ However, realizing any reduction of congestion through a single approach requires extensive use of this aircraft by many companies. Few airfields have the necessary capability to meet the A380 requirements, thus limiting its widespread usage.

To handle increased air traffic, controllers will pack more aircraft into the same airspace, thus compounding the congestion problem. Another means of addressing congestion is implementation of the Next Generation Air Transportation System (NextGen) intended to automate and ease air traffic control. NextGen is a “major redesign of aviation infrastructure, aimed at replacing the traditional methods of separating planes ‘by hand’ with a far more automated, technology-intensive system that could triple air traffic capacity by 2025.”¹¹⁴ However, the FAA has not accomplished this for U.S. airspace. The existing situation where aircraft are handled on a “manual” basis results in the stacking of aircraft, thus delaying arrival and departure. This situation translates to aircraft burning even more fuel. Southwest Airlines demonstrated this congestion impact when it refused to accept an offer to open gates at Dallas/Fort Worth airport. Southwest determined that the additional time aircraft spent in the clearance process for landing or takeoff would increase fares by as much as fifty percent.¹¹⁵ The airlines alone waste \$3 billion a year in fuel and crew time due to the delays. Wasted passenger time translates into several billion dollars more.¹¹⁶

If air traffic continues to increase, no guarantee exists that the current control system has the capability to manage the aircraft safely. The possibility does exist that the lack of an effective air traffic control system, not economics, may limit growth in this industrial sector.

Where aircraft constitute the primary source of a company’s mobility and execution, high operational costs are the norm. Thus to create a greater profit margin in lieu of high operational costs, the company will raise rates, whether that be a ticket price or the cost of shipping cargo. Such responses occur typically in a measured fashion in order to maintain market share or prevent customer loss. Current situations, however, preclude such an approach.

Within a one-year period ending January 2008, jet fuel costs have risen 42 percent per gallon.¹¹⁷ Unfortunately, with trends now apparently outside the expected supply and demand patterns, no one can plan operating costs with any certainty. With the air industry subject to high operational costs, the increase in fuel costs only exacerbates the situation. These increased fuel

costs have taken a toll. Within a one-week period, Aloha, SkyBus, and ATA—all commercial airlines—ceased operations. Increased expenses are also driving aggressive talks on consolidation of airlines. Mergers between Delta/Northwest and United/US Air merger are possible.

Outlook

A potential challenge exists and one that contradicts the projections. With the overall downturn in the U.S. economy and a general slowing of worldwide commerce, projections of decreases in both passenger and cargo transactions exist. Analysis of entities such as Federal Express and United Parcel Services has suggested their business measures as demonstrated predictors of a national economic outlook, and both of these companies have experienced decreases in volume.

Potential exists for current and future advances in technology to affect negatively the overnight courier segment of package delivery services. Federal Express, the world's second largest package delivery service provider, currently receives 64 percent¹¹⁸ of their business as one day overnight express package shipping. The majority of overnight packages come from legal, financial and public administration businesses. With the advent of email, electronic signatures and other secure emerging communication technologies it appears likely that the industry will be negatively effective. If such a scenario comes to fruition, then air delivery services may be at the mature stage of the product life cycle and contraction of the industry is just ahead.

Submitted by Dr. Clint R. Browning, Defense Contract Management Agency

¹¹⁰ BISWORLD, *Couriers in The US*:49211, October 22, 2007, p 8.

¹¹¹ Edward L. Hudgins, "Airlines in the Aftermath," http://www.cato.org/pub_display.php?pub_id=3877 (accessed on April 13, 2008).

¹¹² Palmeri, Chris and others, "Fear and Loathing at the Airport," p. 1.

¹¹³ *Aircraft Information: Airbus A380*. <http://www.airliners.net/aircraft-data/stats.main?id=29>.

¹¹⁴ Robert Poole, "The Urgent Need to Reform the FAA's Air Traffic Control System," *Backgrounder*, No. 2007, February 20, 2006, p. 2.

¹¹⁵ M. Theodore Farris III and Stephen M Swartz, "The Wright Amendment: Time for Repeal: A Policy Issue Note," *Transportation Journal*. 45, no. 1 (2006): pp. 52 – 60.

¹¹⁶ Poole, p. 2.

¹¹⁷ Economics and Energy, "Monthly Jet Fuel Cost and Consumption Report," Air Transport Association, <http://www.airlines.org/economics/energy/MonthlyJetFuel.htm> (accessed April 6, 2008).

¹¹⁸ IBISWORLD, *Couriers in The US*:49211, October 22, 2007, p 8



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