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Industry Study**

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Transportation**



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National Defense University

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TRANSPORTATION

ABSTRACT: The United States has the largest, most advanced transportation system in the world. It efficiently serves almost 300 million people and six million businesses scattered around the country. It empowers America's political, informational, military, and diplomatic influence in the global community. The transportation system plays a critical role in national and international affairs. It empowers America's political, informational, and social influence in the global community. America's transportation system is also a critical element of national power. It enables the swift mobilization of the military and supports the sustainment of the armed forces during long-term conflict. National leaders must address the security, infrastructure, labor, and capacity issues facing the transportation system. Most importantly, federal, state and local governments must collaborate with industry to provide the significant capital investment needed to maintain and expand the infrastructure necessary to support the robust system demanded by the American people.

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DOMESTIC FIELD STUDIES

Norfolk Southern Railroad, Norfolk, VA
Military Transportation Management Command, Ft Eustis, VA
Overnight Trucking Corporation, Richmond, VA
Federal Express, Memphis, TN
Alameda Corridor Transportation Authority, Long Beach, CA
Long Beach Port Authority, Long Beach, CA
Union Pacific Railroad, Long Beach, CA

American President Lines, Long Beach, CA
Transportation Security Administration, LAX, CA
Boeing C-17 Facility, Long Beach, CA
Cal State Long Beach, Long Beach, CA
Louisiana Steamship Association, New Orleans, LA
Port of New Orleans, New Orleans, LA
Regional Planning Commission, New Orleans, LA
Coast Guard, New Orleans, LA

International Field Studies

Aalsmeer Flower Auction, Amsterdam, NL
Van Der Vlist Specialized Cargo, NL
Bureau Voorlichting Binnenvaart, Rotterdam, NL
Betuweroute Visitors Center, Rotterdam, NL
598th Transportation Group, MTMC, Rotterdam, NL
Maersk Sealand Europort, Rotterdam, NL
Rotterdam Port Authority, Rotterdam, NL
U.S. Mission to the European Union, Brussels, BE
Danzas, Paris, France
GE SeaCo, London, United Kingdom
Baltic Exchange and Intercargo, London, UK
British Airport Authority, Heathrow Airport, London, UK
British Airways, London, UK
U.S. Embassy, London, UK

On any given day in the United States, the commercial aviation fleet of 4,652 aircraft flies into and out of 635 certificated airports. There are 226 million vehicles (including 73 million trucks) moving on our nation's 4 million miles of highway. There are 560 thousand Class I freight cars transiting 100 thousand miles of commercial rail. Gas and oil move through 1.5 million miles of pipeline. Ships and barges travel on 26,000 miles of navigable domestic waterways. There are 102 major seaports in the U.S., where every day 17,000 containers arrive carrying 90 percent of our imported goods. There are 41,354 U.S. flag vessels including 33,152 barges, and 212 ocean-going ships. There are 3.8 million ton-miles of freight and 500 thousand passengers being transported.

To describe the transportation industry, we must consider several factors. First, the industry is composed of five key modes: air, rail, maritime, road, and pipeline. Then, we must consider the infrastructure required to support the transportation industry – the locks, ports, airfields, highways and rail lines. Next, we need to look at the relationship between the public and private sectors, and the role of government in the industry. Finally, the rise of intermodal transportation – the linkage between shipping, rail, trucking and air – and how this flexible way of moving cargo has affected the global economy.

Approximately 11 percent of U.S. gross domestic product is transportation related goods and services. One out of eight civilian jobs is transportation-related. The demands upon the transportation system increase every year. International trade has tripled in the past thirty years and is expected to double again over the next decade. “Just-in-time” manufacturing and E-commerce, just to name two areas of innovation, have placed a greater demand on the

transportation sector by generating more volume and higher expectations of on-time direct delivery. And in the post-September 11 world, like society as a whole, the transportation sector has recognized how crucial it is to adequately address the issue of security.

AIR

The Current State of Passenger Air The airline industry remains in front page headlines as giants such as United and U.S. Airways continue to gasp for life, fighting their way out of bankruptcy. Not far behind, the industry's largest carrier -- American Airlines -- takes drastic measures to stay out of bankruptcy court with workforce layoffs and unprecedented pay cuts by its pilots, mechanics, and other workers. Airline industry observers cite the dramatic drop in passenger traffic, increased security and insurance costs, soaring fuel costs, and excessive labor costs as the primary factors contributing to their dilemma. (ATA, 2003) The events of 9-11 and its aftermath, the war on terrorism, are often referred to as the "overriding" cause for conditions facing major U.S. airlines. However, the most significant factor affecting major U. S. airlines even before 9/11 is the lack of effective management action to implement major cost reduction initiatives and respond to a changing passenger market.

As a whole, we may characterize the airline industry as capital intensive, with high variable costs. The major U.S. airlines operate primarily as hub and spoke airlines with significant fixed costs, including aircraft fleets consisting of multiple types of aircraft, immense physical infrastructure, and a large workforce. Hub and spoke airlines also incur higher operating costs, due to longer aircraft turnaround times to allow passenger and baggage connections, as well as air traffic congestion, which reduce productivity and increase expensive fuel use. (Hanson, Ringbeck & Franke, 2002)

As the economy slowed near the end of 2000, major U.S. airlines already faced staggering labor costs and increased fuel prices. The major airlines needed to charge premium airfares in order to break even; however, the onset of recession, and an ever-increasing number of passengers flying with low-cost carriers created significant challenges. Cost conscious corporations encouraged employees to conduct business using new technologies such as video conferencing. If travel was necessary, flights were booked well in advance and tickets with lower fares and restrictions were purchased. Major carriers had relied upon charging business travelers significantly higher fares to offset their increased costs. At the same time, the economic slowdown provided low-cost carriers with opportunities to take market share. For example, the per seat mile cost for low-cost carriers for a 500 to 600 mile flight is 7 to 8 cents, compared to the major carriers estimated costs of 15 cents or more. (Hanson, Ringbeck & Franke, 2002) Only 5 to 10 percent of this 2 to 1 cost differential was associated with extras provided by major carriers, such as in-flight meals and entertainment. Rather, the major carriers' higher operational costs accounted for 65 percent of the difference.

If the overall economic trends continue, the financial troubles of the passenger airline industry could well lead to the elimination of more airline companies. Without government assistance or intervention, the passenger airline market will be increasingly concentrated, with four or even three major carriers instead of the present six. Very few airlines will be strong enough to compete in an environment of uncertainty and highly elastic demand, where the passenger population fluctuates with current news events. The traveler will likely face fewer choices and higher prices as a consequence.

Airfreight: Doing Better In contrast to the passenger sector, the airfreight business continues to grow profitably. As an example, the International Air Transport Association (IATA) projects a 5 percent annual cargo growth rate in the Asia region for the next five years. As for the relationship between the passenger and airfreight segments of the industry, cargo operations contribute between 13.5 and 25 percent of a passenger airline's revenue. Cargo revenue for the top ten U.S. airlines is roughly equivalent to 21 million paid passengers a year. (Krause, 7 Oct 2002, p. 29) To stay competitive, the airfreight industry has become heavily reliant on Information Technology (IT). The opportunity costs incurred by the airlines in staying competitive in the airfreight industry means that those carriers with both freight and passenger business face a tough choice. As FedEx's Chief Economist, Gene Huang, clearly explains, "Cargo airlines are in a much better position than their passenger counterparts because people always need to move merchandise and goods. While passengers can drive or choose not to travel, cargo has to keep moving and air is often the only alternative for international shipments." (Krause, 23 Dec 2002, p. 26)

TRUCKING

Industry Overview As an industry, trucking is characterized by low barriers to entry, low barriers to exit, high variable costs, and erratic sales fluctuations. The industry is characterized by intense competition and low profit margins (2-4 percent). Industrial production tends to drive long haul business while retail sales drive regional and local business. Trucks provide the sole transportation service for 80 percent of the communities in the United States. Trucking is a fragmented industry. At the end of 2000, there were over 500,000 carriers registered with the U.S. Department of Transportation. Over 81 percent of these carriers operate 20 or fewer trucks. Trucks move 29 percent of the intercity ton-mileage in the United States, which is the second largest modal share after rail. However, they earn 81 percent of the revenue, which is the largest market share.

There have been numerous structural changes in the trucking industry. As the U.S. economy has moved to the production of capital-intensive goods, a high percentage of freight consists of high-value, low weight goods. The entire supply chain strives to maintain low inventories of these high price goods. The supply chain depends upon just-in-time delivery of these goods. This emphasis on just-in-time delivery has produced increases in freight volume for the trucking industry, both in absolute terms and relative to other transportation modes. However, this structural change has been to the benefit of large carriers that are better equipped to provide the high level of service, demanded. Large carriers have seen a steady increase in revenues while small carriers have seen a decline in recent years. (ATA, 2001, p. 5)

The trucking industry is divided into several distinct segments. Approximately half (52 percent) of all trucking operations are private. Private operations are those where a company uses its own fleet to move its products. The "for hire" segment of the industry is divided into two categories: Truckload (TL) and Less Than Truckload (LTL). Truckload carriers represent approximately 46 percent of all trucking operations. TL carriers offer point to point service and typically move freight under 500 miles. At distances over 500 miles, their rates are often not competitive with rail. Truckloads can be more economical over greater distances when combined with rail as an intermodal shipment. LTL carriers represent less than 1 percent of the industry. LTL carriers operate elaborate hub and spoke systems, and will often use rail to cover

the segments between more distant hubs. LTL carriers face intense competition from TL carriers and package express services such as UPS. (Muller, 1999, pp. 102-5)

National Security The trucking industry has reacted proactively since September 11, 2001 to develop an Anti-Terrorism Action Plan that provides drivers and companies with appropriate actions to take under the various Department of Homeland Security (DHS) Threat Advisory levels. The federal government has also taken advantage of the large number of drivers, which are on the road each day through the National Highway Watch that enlists their aid reporting suspicious activities. However, despite these programs the trucking industry has not been a focus area of the Transportation Security Agency (TSA) as of yet with the exception of the Transportation Workers Identification Card initiative. The TSA's Operation Safe Commerce should provide a better focus on the security aspects of the trucking industry. Unlike the maritime, air, or rail industries, the Department of Defense (DoD) does not maintain any type of reserve fleet to augment the civilian-trucking sector. However, Military Traffic Management Command (MTMC) through its Strategic Highway Network (STRAHNET) does identify the public highway infrastructure that it needs to accomplish its missions. The STRAHNET is a system of approximately 61,000 miles of highway that includes over 45,000 miles of Interstate Highway. (MTMC, 2002, p. 1)

Challenges Although trucking productivity has increased over the last few years, federal limitations on size and weight, and public concern over highway congestion, mean that future productivity increases are likely to be modest. We doubt that these constraints will change in the near future. The truck industry also faces high costs in the areas of insurance and fuel. There is a direct correlation between diesel costs and the number of bankruptcies in the industry. The relatively high level of fuel costs has resulted in a large number of failures in the last three years. As recently as a year ago, there was surplus in capacity. However, high equipment replacement costs have resulted in a tightening of capacity although not a shortage. High driver turnover has been a constant problem for the industry as experienced drivers chase higher wages between competing firms. An aging workforce portends an even more acute shortage of drivers in the future. (Costello, 2003, pp. 1- 48)

SEA

Industry Overview Over the past few years, the U.S. commercial shipping industry has experienced a significant rate of mergers and consolidation. Big shipping firms have been either buying the smaller ones, or merging with other large U.S. firms. Furthermore, in most cases firms doing the purchasing and merging are foreign owned. Thus, for some time now, the U.S. commercial shipping industry has been shrinking, both in numbers of vessels and crews, because of fierce international competition, U.S. laws/regulations and high U.S. ship building cost. The United States continues to be the world's largest maritime trading nation. Ninety-five percent of U.S. trade is by water, but U.S.-flag merchant ships carry only 3 percent. There are some 60,000 ships estimated to be sailing in international trade. As of the year 2001, the U.S.-flag deep-sea commercial fleet consisted of approximately 212 vessels, about half of which were oil tankers. One requirement for U.S.-flag registered vessels is that all officers and 75 percent of the unlicensed crew be U.S. citizens. Due to the higher costs associated with the crew wages, as

well as other costs associated with U.S.-flag requirements, the U.S. merchant fleet has steadily declined over the past 50 years. The state of



the U.S. maritime industry has serious implications for U.S. strategic mobility requirements. The decreasing number of ships and, more importantly, the pool of available U.S. merchant mariners is cause for concern. Limited direct government assistance, through measures such as the Jones Act, has helped to support and maintain a minimum U.S.-flag merchant fleet. (Pouch, May 2001, Data interpreted from this and other sources. The 212 figure includes 47 MSP ships in commercial service.)

National Security There are many security concerns when relying on foreign-flag ships. During the recent Operation Iraqi Freedom, as in the first Gulf War, the United States succeeded in delivering the necessary cargo to the theater within the time constraints of the operation. However, future capabilities could be compromised if we do not have access to enough U.S.-owned ships and crews for multi-theater engagements. In general, during war, more than 95 percent of military cargo tonnage is moved by sea. The Merchant Marine Act of 1936 requires the military use U.S.-owned and operated vessels to carry its cargo. Maintaining a sufficient fleet of U.S.-flag ships and a healthy pool of U.S. mariners should be one of our priorities. Due to high operating costs most of the U.S. fleet has already re-flagged, taking with them jobs and the U.S.-owned commercial shipping industry. The mariner pool has adjusted and declined in proportion to the number of jobs. This decline creates more dependence on foreign flagships to carry U.S. military equipment during national emergencies. To rely on foreign flagships to accomplish our military objectives during national emergencies is a risky proposition. We cannot assume that the foreign owners of these ships will always carry our cargo, if they disagree with our objectives.

The primary cause for the shrinking number of U.S. merchant mariners is the decline in the number of U.S.-flagged vessels. Another reason for the decline are international standards for licensing set through the International Maritime Organization for merchant ship officers, not all countries enforce these requirements as effectively as the United States. Thirdly, the profession itself is no longer financially attractive. During the technology boom of the 1990's, the availability of other high paying jobs made this profession less attractive than in the past, considering the long periods the crews must spend away from their families. (Lewis, 40, Fall 2000) Another concern is the age of the crews and the vessels already in the inventory. Recruiting of qualified personnel is down significantly. This has contributed to the lack of an experienced labor pool as the existing crews retire. If the trend continues, this problem will significantly affect DoD's ability to support future combat requirements. Additionally, according to the Maritime Administration (MARAD), the average age of vessels in the U.S. inventory is now 23 years. Most reliable vessels have an average age of about 30 years before they will need either a major overhaul or replacement. There are not enough vessels being added to the inventory. At this rate, by 2010, the average age of vessels in the inventory will be over 30 years. (Whitehurst, August 2001)

RAIL

Industry Overview: Freight The United States rail industry is split into two distinct segments: passenger and freight. The freight rail industry has high barriers to entry due to the enormous costs associated with infrastructure maintenance and equipment. These costs must be borne by the railroads, in contrast to the other transportation modes where many of the infrastructure costs are paid by federal, state, and local government. During the period from 1980 to 2000, Class I

railroads spent \$278 billion or 45 percent of their operating revenue on capital and maintenance expenditures. This industry has seen a high level of consolidation. In 1917, there were over



1,500 railroads. Today, there are eight “Class I” railroads. Class I railroads are those with at least \$261.9 million in operating revenues. There are 35 regional railroads and 517 local railroads. Class I railroads account for 71 percent of the industry’s trackage, 88 percent of the employees and 91 percent of the revenue.

Railroads move 41 percent of the intercity ton-mileage in the United States – the largest modal share. However, they earn only 9 percent of the revenue share due to their low rates. Railroads tend to focus on the movement of bulk commodities over long distance. Coal represents the largest commodity moved by rail and accounted for 44 percent of the tonnage moved by the Class I railroads. The fastest growing segment of the industry has been intermodal traffic, which rose from an average 3.4 million loadings annually in the 1980’s to 9.2 million in 2000.

Freight rail was one of the most highly regulated industries in the nation until the passage of the Staggers Act in 1980. Before deregulation, the industry was on the verge of financial collapse. The industry gained the nation’s attention when the giant Penn Central went bankrupt in 1970, followed by several other bankruptcies in the Northeast and the Midwest. Since deregulation, the industry has improved its profitability. Return on Sales for the period 1980 – 2001 increased from 6 to 16 percent. However, Return on Assets remains at 6 percent, reflecting the huge investments that railroads must continue to make on infrastructure improvements after many years of neglect. The rail share of intercity ton-miles has been trending slightly upwards over the last ten years after having steadily declined for decades. (AAR, 2002, pp 1-5)

Challenges Profitability will continue to remain the major challenge for the rail industry. Freight railroads will need to continue to improve their profit ratios in order to maintain their infrastructure and equipment at an acceptable level. They will continue to face challenges from some sectors that are calling for re-regulation of the industry. Most notable are the so-called “captive shippers,” who are served by a single railroad and believe that their rates are unreasonable. For the most part, the railroads have been successful in defending themselves against these complaints. There are cyclical capacity shortfalls that for the most part are associated with grain harvests. The railroads have made significant improvements in efficiency, which have reduced but not eliminated these problems.

National Security Freight rail remains a key component of the Defense Transportation System (DTS) while passenger rail plays an insignificant role. The MTMC reports making over 1,000 moves by train in 2002. DoD maintains a fleet of cars called the Defense Freight Railway Interchange Fleet (DFRIF) in order to ensure that there are enough specialized cars available to meet its needs. The DFRIF contains over 2,200 cars with the most common being heavy lift flat cars followed by tank, box, refrigerator, caboose and schnabel cars.

MTMC also maintains the Railroads for National Defense (RND) program to ensure the ability of the rail infrastructure to support deployments and training requirements. RND integrates defense requirements into civil sector infrastructure development and maintenance. In conjunction with the Federal Railroad Administration (FRA), the RND established the Strategic Rail Corridor Network (STRACNET). The STRACNET is a network consisting of over 38,000 miles of track supporting over 170 military installations. MTMC and the FRA work together with the rail companies to ensure that lines identified as part of the STRACNET are not abandoned and are maintained at the level needed to support military traffic. The FRA also

makes change recommendations if alternate lines are believed to better support the military's needs. (Korpatny, 1999, p. 1)

Largely, the rail industry adequately supported the military's deployment during Operation Iraqi Freedom. However, in both the United States and Europe there were some instances of vandalism to cargo, usually when trains were delayed on non-secure sidings. In Europe, the decision was made to add military guards to trains. This caused some difficulties, as rail companies were not accustomed to providing passenger cars on freight trains. There was one unfortunate incident where a guard was electrocuted when checking a load in Germany. Austria's denial of permission for U.S. military equipment to transit by rail forced planners to develop much longer routes to get the equipment into the theater. (Douglas, 2003)

Passenger Rail AMTRAK, which was created in 1970, is the sole remaining national passenger railway. A few of the big freight lines operate local commuter services, but none provide national service. With the exception of the Northeast Corridor, AMTRAK operates its trains on infrastructure owned and maintained by the freight lines. This can cause difficulties because the freight lines will generally give priority to their own trains and often are not interested in maintaining the track to the level necessary for high-speed passenger trains. Unlike the freight railroads, AMTRAK is heavily subsidized, as are passenger railroads throughout the world. AMTRAK has seen increases in ridership but continues to lose money. Congressional subsidies are enough to keep the trains running, but not enough to make capital improvements. AMTRAK's CEO recently urged Congress to provide \$10 billion over the next five years in additional funding in order to make improvements.

FINAL THOUGHTS ON THE TRANSPORTATION INDUSTRY

National Security Implications and Overarching Issues

Air The health of the nation's airlines affects national security in several ways. The airlines contribute both directly and indirectly to the nation's GDP--they move more than half a billion passengers annually and they employ nearly three quarters of a million workers. Further, it is estimated that another four jobs are dependent upon each airline job. Ultimately, should several of the major airlines fold, we may be left with just a few mega-carriers. This could have an impact on the future competition within the industry – perhaps resulting in fewer choices and higher prices. The recent conflict with Iraq again demonstrated the importance of our strategic airlift capability and validated the nation's investment in the C-17. Under Civil Reserve Air Fleet (CRAF) Phase I activation, commercial airlines have been used to ferry soldiers and equipment to and from the Persian Gulf and other hot spots. CRAF supported Operation Iraqi Freedom: more than 90 percent of those deployed were transported by CRAF aircraft. Recently, there has been discussion about expanding the CRAF program to include the use of foreign-owned carriers. In such discussions, it will be imperative to consider the potential impact of foreign policy views of foreign governments or companies that might be involved in the CRAF. Will they necessarily fulfill their obligations if they disagree with U.S. policy leading to activation of the CRAF?

Sea Federal law requires the military to use U.S.-owned and operated vessels to carry its cargo. Maintaining an adequate fleet of U.S.-flag ships and a healthy pool of U.S. mariners should be one of our top priorities. Most of the U.S. fleet has already re-flagged, and the mariner pool has declined proportionately with the number of vessels. This decline creates more dependence on foreign flagships to carry U.S. military equipment during national emergencies. To rely on foreign flagships to accomplish our military objectives during national emergencies is a risky proposition. If the U.S. commercial shipping industry is not given the attention it needs, we might not have the sealift capability we need to respond quickly enough to the next major conflict. (Whitehurst, August 2001)

Rail Freight rail remains a key component of the defense transportation system. The rail industry adequately supported the military's deployment during Operation Iraqi Freedom. MTMC monitors the Railroads for National Defense (RND) program to ensure the ability of the rail infrastructure to support deployments and training requirements. RND integrates defense requirements into civil sector infrastructure development and maintenance. DoD maintains a fleet of cars called the Defense Railway Interchange Fleet. In order to ensure that there are enough specialized cars to meet its needs.

Trucking The trucking industry has reacted proactively since September 11 to develop an Anti-Terrorism Action Plan providing drivers and companies with appropriate actions to take under various DHS Threat Advisory levels. The federal government has also taken advantage of the large number of drivers on the road each day, through the National Highway Watch, which enlists their aid reporting suspicious activities. However, despite these programs the trucking industry has not been a focus area of the TSA as of yet with the exception of the Transportation Workers Identification Card initiative. Unlike the maritime, air, or rail industries, DOD does not maintain any type of reserve fleet to augment the civilian-trucking sector. However, MTMC through its Strategic Highway Network (STRAHNET) does identify the public highway infrastructure that it needs to accomplish its missions.

Security The events of September 11 have changed the way that we look at the world. Security has become a major concern for Americans. The immediate focus in the post 9-11 world was to try to bring a sense of security back for airline passengers. Unfortunately, this probably represents the proverbial "low hanging fruit" in the big transportation picture. TSA is charged with ensuring the security of all modes of transport. However, with the establishment of TSA a staggering amount of money has been spent for passenger air, and almost nothing on the rest of the transportation industry. Only recently has the focus been expanded to look at the more probable next target for terrorists -- shipping containers that are used throughout the intermodal transportation industry. The Container Security Initiative (CSI) is an attempt to push our borders out, inspecting hi-risk containers at their port of departure instead of when they reach our shores. This might seem easy but currently 15 million containers enter the U.S. each year of which 6 million come via ship. Only 2 percent of these containers are physically inspected. The American experience on 9-11 has proven that security must become another driver of the global marketplace. CSI uses automation and technology to pre-screen containers along with a 24-hour manifest review period to allow IT to identify suspect shipments. Any type of large-scale

terrorist attack on the elements of trade (planes, ships, railroads) will not only hinder trade, but would probably stop all trade for an undetermined period of time until all elements currently in the global supply system had been certified as safe.

Information Technology Transportation is one of the most IT-intense sectors of the economy. All modes of transportation are increasingly dependent on IT. To remain competitive and viable in today's global economy, the industry must continue to embrace and invest in IT. We see IT being used by the airlines to control labor costs by reducing cockpit manning and by replacing reservation clerks and travel agents with e ticketing. In the maritime and rail modes, IT makes it possible for ships to sail safely with smaller crews, and for container ports and rail yards to manage growing volumes of cargo with fewer personnel. In fact, intermodal transport depends on efficient use of IT. Cargo volumes are growing faster than the infrastructure needed to handle them, but IT makes smooth operations possible. "Just-in-time delivery" and routing depends on IT. In our visits to different facilities at home and abroad, we saw how the ports, railroads, trucking companies and air freight carriers use IT, including advanced communications to manage efficient loading of ships, marshalling of trains, truck dispatch and routing. They have to; their customers now expect "in-transit visibility" of their cargo.

Safety is another area where IT makes a major contribution to the transportation industry. Railroads use IT to monitor stock in the yard, to improve signaling and avoid collisions. Likewise, air traffic control and safe airspace management depends on IT. Improving security for cargo and passengers alike depends heavily on IT. Technology makes possible better monitoring and tracking of cargo. Different government agencies can maintain databases to identify suspect shippers, for example. Even more advanced are ongoing efforts to develop "intelligent agents" that can flag potential dangers by mining through manifest data.

Infrastructure To ensure our economic prosperity, we must continue to invest in our infrastructure. America's transportation infrastructure for roads, rail, air, and inland waterways is in a state of decay. The American Society of Civil Engineers gives the nation's infrastructure overall an overall grade of a D+. More specifically, the Society rates our navigable waterway infrastructure as a D+ because 44 percent of all the lock chambers have already exceeded their 50-year design lives and key deep-draft channels are inadequate for the mega-container ships. Transportation demand on waterways is expected to double by 2020, and serious performance problems are likely if current investment levels continue. The Society similarly rates our rail transit systems infrastructure as a C-. The major rail lines are in good shape but smaller and inner-city rail lines are deteriorating. Capital spending must increase 41 percent just to maintain the system in its present condition. Additionally, they give aviation infrastructure a D. Airport capacity has increased only 1 percent in the past 10 years, while air traffic has increased 37 percent during that time. Airport congestion delayed nearly 50,000 flights in one month alone last year. Finally, they rate our road infrastructure a D+. One-third of the nation's major roads are in poor or mediocre condition, costing American drivers an estimated \$5.8 billion a year. In a sense, it is a pay me now or pay me later scenario. (American Society of Civil Engineers, "Report Card for Americas Infrastructure")

Recommendations

Perhaps the biggest question regarding the airline industry is whether the government should provide bailout funding for the passenger airlines. Our consensus recommendation is that the government should fund mandated security improvements like hardened cockpit doors and the opportunity costs associated with the air marshal program. Further, we should ensure that airlines could obtain reasonably priced war and terrorism insurance. The federal assistance provided the airlines immediately after the attacks of September 11, which helped them deal with the enforced shutdown of all air traffic as well as their potentially enormous insurance liability, was due to unique circumstances. We do not see a need for a bailout of currently troubled airlines: it will be better for the country as a whole to let the marketplace sort out winners and losers. Like the other transportation modes, airlines are dependent upon an extensive infrastructure. Along these lines, we recommend investment into the air traffic control (ATC) system. Similarly, we should support codeshare and marketing initiatives between domestic and foreign carriers.

To ensure our strategic mobility, we should continue to invest in additional C-17s as recommended by USTRANSCOM. Finally, with regard to the CRAF, given the recent reluctance of supposedly long-time allies France and Germany, we should continue to restrict the CRAF program to only U.S.-owned carriers.

The Container Security Initiative (CSI) has set a worldwide standard for maritime commerce. Foreign governments and international organizations cannot agree on requirements for an international standard. The U.S. must continue to lead the effort while attempting to bring the international community into the process. In today's uncertain global environment it would be wise for the government to invest in energizing the maritime industry to ensure a steady growth in the pool of qualified U.S. mariners and vessels. This might be done by relaxing some of the rules and regulations that prevent entry into this field, or through tax incentives. In the future, the Federal government might also disapprove buyouts and mergers with non-U.S. firms.

In order to maintain the rail system needed to support military requirements, MTMC and the FRA need to maintain the Railroads for National Defense (RND) program. If the country desires to have a passenger rail system, it needs to recognize that AMTRAK will always need to be subsidized. If the country wants to have passenger rail service equivalent to that found in Europe and Japan, the taxpayers will need to provide funding to pay the construction of additional dedicated passenger rails lines such as those found in the Northeast corridor. The freight rail system is a vital component of the U.S. economy and of the military's transportation system. The robust, efficient system is showing renewed health after years of serious financial difficulties. It is challenged by the high cost of its infrastructure and equipment but has shown that it can survive and compete in a free market economy.

To ensure the security of the entire supply chain, TSA needs to implement adequate measures to cover the trucking industry. Increasing congestion along with deteriorating infrastructure is cause for concern for both DOD and the economy as a whole.

Congress needs to reauthorize the major roads program called for in the Transportation Efficiency Act-21. With tightening budget constraints, our leaders cannot afford to be shortsighted on reauthorizing this program. MTMC needs to continue to ensure that DOD's needs are addressed through the STRAHNET program. Federal and local governments need to continue to invest in the maintenance and expansion of critical highway infrastructure. The United States has a robust trucking industry that is currently adequate to meet both the needs of

the civilian economy and of DoD. Largely, the health of this sector will correspond with the health of the economy as a whole.

Conclusions

An efficient transportation system is imperative to today's supply chain model. The global economy is predicated on low cost and rapid, reliable transportation. U.S. manufacturers and retailers no longer maintain large inventories to ensure smooth production and sales. Instead, they rely on supply chains and just-in-time deliveries from around the world. Advances in communications and information technology, supported by an efficient transportation system, allow industries to be lean and cost-effective. Investments in domestic transportation infrastructure will directly benefit the U.S. economy. Improvements facilitate getting more goods to market faster and at a lower cost. The transportation industry is also vital to national security by providing a strategic lift capability. The U.S. is currently the only country in the world with this capability. U.S. commitment to global reach is demonstrated through recent purchases of the C-17. This capability must be maintained while encouraging our allies to buy/develop their own capabilities.

Three essays follow that provide a more detailed discussion of several issues of importance to national security. The first focuses on container security and is written by CDR Beatty and LTC Taylor. The second discusses the aviation bilateral treaties with EU nations by Mr. Schuchat. The final essay is a summary of a study on a strategic vision for the Defense Distribution Center written by Lt Cols Malone, Mosley, and Naylor.

The Container Dilemma

America's global economy is a wonder to behold. Our manufacturers and retailers no longer maintain large inventories to ensure uninterrupted production and sales. Instead, they rely on integrated supply management chains and just-in-time (JIT) deliveries from around the world. Advances in communications and information technology, supported by an efficient transportation system, have enabled industries to become lean and highly cost-effective. An integral and indispensable part of this process is a simple and low-tech steel box, the industry's standard shipping container. (Muller, p.31) Shipping by container is cost effective – each unit costs \$1,500 to build, can carry 30 tons of freight, is loaded an average of 10 times per year, and can be shipped on a transoceanic voyage for only \$1,500. (Hart Rudman Rpt, p.23-24) The intermodal transportation industry, using a 40-foot cargo container as its standard instrument, is a remarkably efficient system designed to move goods through the international marketplace in the most expeditious manner. Speed and cost are the overriding drivers of the system. (Binnendijk, p.2) Globalization and just-in-time delivery of goods to cut down the cost of doing business by reducing inventory mean that speed and cost must remain as key drivers, but the events of 9-11 have proven that security must join them and become another key driver. Representative David Obey, the ranking Democrat on the House Appropriations Committee, has stated that, "if one of those (cargo) containers is used as a bomb, the impact on all of international trade would be similar to the impact of 9-11 on the American airline industry, in short we would be talking about global depression." (Tumulty) A recent speech by the U.S.

Customs Deputy Commissioner Douglas M. Browning defended the government's efforts to tighten cargo security despite complaints that the stricter measures have made daily business more difficult and expensive for shippers and carriers, when he revealed that freight shipments are thought to be most likely the next target for terrorist attacks. (Edmonson, p.WP)

Today, there are more than 15 million containers in use carrying 90 percent of the world's cargo. More than 800 large container ships ply the seas, some carrying more than 10,000 TEUs (twenty-foot equivalent unit (TEU) is the standard unit for counting containers of various lengths and for describing the capabilities of containerships or terminals) per trip. These ships make more than 22,000 U.S. port calls per year. (Binnendijk, p. 2) The Customs Service reports that the nation's ports processed nearly 6 million containers in 2001 and another 9 million arrived by truck and rail from our NAFTA partners, Mexico and Canada. Traffic volume has nearly doubled since 1995 and experts expect the trend to continue. (www.customs.gov) For instance, the Port of Long Beach, the nation's third busiest port, processes nearly 350 thousand TEUs per month. (www.polb.com) Ships arrive, are offloaded, reloaded, and back at sea in 24 hours. During the recent lock out, losses at the Los Angeles and Long Beach ports were \$1 to \$2B per day. (Schoch, p. B3) Supporting these container movements is a veritable army of transporters, freight handlers, and brokers – by some estimates more than half a million truckers and another 400,000 importing and exporting companies. (Stokes) Thus, by all accounts, the economic implications of container movements on the U.S. economy and national security are staggering.

Given the amount of containers processed, the numbers of personnel involved with intermodal shipping, and the relatively small security structure charged with inspecting containers, it should come as little surprise that officials only inspect 2 percent of all containers entering the country. This cannot continue to be the way that we do business. Others have taken notice of this weakness. In October 2001, Italian authorities arrested an Egyptian who apparently was affiliated either with Al Qaeda or the Egyptian Islamic Jihad. The man was found inside a cargo container en route from Egypt to Halifax, Canada. He had a bed, a crude bathroom, airport maps, security passes, and an aircraft mechanic's license. (Richardson, p.5) He disappeared while awaiting bail so there are more questions than answers, but the idea of terrorists themselves instead of explosives or WMD inside the containers is of great concern to government officials around the world. Today's Customs procedures were developed for economic protection vice security concerns. The majority of the information required on shipping documents has to do with commerce, and unless hazardous materials are involved exporters rarely report the exact contents of their containers to protect the cargo from theft. ((Logistics Management 01 Aug 2002), p.21) Perhaps more troubling is the fact that there are no standards for securing containers from point of origin until unloading here in America. Any type of large-scale terrorist attack on the elements of trade (planes, ships, railroads) will not only hinder trade, but would probably stop all trade for an undetermined period of time until all elements currently in 'the system' have been certified as safe. Thus, the issue facing U.S. authorities is enormous – how to ensure the security of what enters the country by container without causing undue inspection delays or adding significant transportation costs. Goods coming into the United States provide a lucrative opportunity for terrorists to strike at America where it is perceived to hurt us the most, in the pocketbook. Explosive or chemical/biological/radiological (CBR) bombs detonating in airplanes or cargo ships would paralyze international commerce for an extended period of time while we certified that no further hazards are present. Thousands of airliners land and hundreds of ships moor in the United States

each day. Any one of these vessels could carry a Weapon of Mass Destruction (WMD) that could seriously affect the world's economy.

9/11 Response – Push the Borders Out In response to the 9/11 attacks, the U.S. enacted several initiatives to reduce our vulnerability to threats from container terrorism. These include the Container Security Initiative (CSI) and the Customs-Trade Partnership Against Terrorism (C-TPAT). CSI attempts to extend America's borders to a container's overseas point of origin. It focuses on enhancing security from the 20 largest ports that ship to the U.S. Participating ports now require the electronic submission of manifests at least 24 hours before container loading. In addition, manifests must be more explicit; approximately 25 percent of all containers arriving in the United States are labeled 'general cargo' or 'freight, all kinds' and do not list an originator or receiver. (Speer) Containers that supply generic descriptions such as "freight, all kinds" are likely to be inspected. To date, Customs reports that 18 of the world's top 20 ports, representing over 2/3 of all containers shipped to the U.S., have agreed to participate in the program. (www.customs.gov) In contrast, C-TPAT is a voluntary program designed to encourage participating companies (shippers, importers, carriers, etc.) to assess and strengthen security practices across their entire supply management chain. As an incentive for C-TPAT participation, participants earn a "trusted shipper" status that provides the benefits of expedited cargo processing, fewer inspections, and use of "green lanes" at certain ports. In general, foreign officials in Europe, Asia, and Canada support our security initiatives while shipper reaction to the new procedures is mixed. They understand the need for new procedures but complain that the 24-hour rule creates complications and increases costs.

Technology's Role in Enhancing Security With 15 million containers entering the U.S. each year, simply opening more boxes is not a viable solution to our security concerns. Instead, we must utilize the information systems and communications technologies that make JIT possible, for security. Two areas where technology can help are in fielding smarter containers and better inspection equipment for ports and borders. In the past year, two public-private partnerships sponsored pilot programs that proved the viability of "smart" container technologies. The first program, Operation Safe Commerce, officials electronically monitored containers filled with headlights loaded at a factory in Slovakia across the Atlantic to unloading at a plant in New Hampshire. (Harrington) In the second program, Smart and Secure Trade Lanes, 100 specially outfitted containers were shipped from Hong Kong and Singapore to three U.S. ports on the west coast. Throughout the journey, officials had complete visibility of the container's location and integrity. (Business Wire 09 Jan 03) Even if smart containers are universally fielded, there will still be a requirement to inspect certain containers either before loading aboard a U.S.-bound ship or, though less desirable, upon arrival in the U.S. What inspectors need are devices that can quickly scan containers for WMD or other contraband.

Policy Options Since 9/11, a myriad of sound policy recommendations for improving container security have been offered. In general, these can be broken down into three categories: increase R&D for advanced technologies for both containers and inspection devices; ensure foreign involvement since this is a global, not just American, problem; and improve information sharing between foreign and domestic customs and security officials – create intelligence fusion centers. Continued emphasis on R&D and fielding of container-related security technologies is key to our long-term success in improving transportation security. One method to do this is to provide

incentives for private sector and public-private partnerships to explore promising technologies. In effect, get Wal-Mart, Dell, and General Motors involved. Another option is to create an account administered by the TSA that funds promising technology developments, perhaps a Transportation Container Security Fund. A user fee, similar to the airline passenger security tax created after 9/11, would be levied on each container entering or leaving the U.S. Another option would be to offer incentives to firms that invest in transportation security R&D.

A similar issue is how to “incentivize” use of promising technologies by shippers, container manufacturers, and port officials. With millions of containers in use and thousands of ports and border crossings, the cost for implementing new technologies will be enormous. One option is to provide tax incentives for firms that install and use new technologies. For most of the private sector, however, what will force adoption on new security technologies is demonstrated cost savings. This can happen through increased use of “green” lanes at ports and border crossings for shippers and transporters who use smart, pre-cleared containers.

A final policy recommendation may sound like restating the obvious – make container security part of the global war on fighting terrorism. In essence, devote the same level of national commitment, resources and attention to this as we have to terrorism. A good example of this is what was done to create the TSA to address airport security. Congressional mandates along with substantial resource commitment are what motivated and enabled the TSA to succeed in improving airline security. The federal government is estimated to have spent \$200 million a month to support its baggage and passenger screening programs at the nation’s airports while spending \$200 million total in grants to the nation’s ports for security since 9-11. (Sanders, p. A3) We should mandate similar requirements for container security and set deadlines for implementation. Two examples of items that could be mandated for (relatively) rapid implementation include a national identification standard to better control access to ports, terminals, and other critical infrastructure and standardize container seals required for entry at the nation’s largest ports and border crossings.

EU CIVIL AVIATION POLICY, “OPEN SKIES,” AND TRANSATLANTIC MERGERS

THE COURT’S DECISION On November 5, 2002, the European Court of Justice (ECJ), based in Luxembourg, ruled in favor of the European Commission (EC) and against eight European Union (EU) member states on the question of who has the authority to negotiate and enter into treaties governing civil aviation between EU and non-EU states. (Brand, 2002, p. A4) This decision has important implications for the development of civil aviation in the EU, and the international competitiveness of EU-based carriers; it will also inevitably affect the U.S. industry and its global position. The court found that the bilateral agreements contravened EU law in three respects, the most important of which was that the agreements’ requirement that airlines “designated” to fly the U.S. by the other party be “substantially owned and effectively controlled” by nationals of the designating state. This is because firms in EU states have the right of establishment and receive national treatment in all other EU members. Originally, civil aviation was exempted from this right, but subsequent amendments to the Treaty of Rome have removed the carve-out. The ruling invalidated existing “Open Skies” and other bilateral agreements that the United States had negotiated with a dozen EU members, although the agreements will remain in force for a transitional period, until the member states are ready to give the Commission negotiating authority to replace them (Meller, 2003, p. 1). The Commission has, in fact, called upon the members to renounce their bilaterals with the U.S.,

which would create a one-year deadline for conclusion of an EU-US civil aviation agreement. (EC, 2002, COM 649) However, member states are likely to move cautiously in surrendering their negotiating authority to the EC, particularly at a time of relative weakness in the civil aviation industry.

INTERNATIONAL FRAMEWORK Commercial aviation internationally is governed first by international agreements, which create an overarching framework of various “freedoms” for carriers, such as the freedom to overfly (the first freedom) or the freedom to carry passengers “beyond” a destination (particularly important and often contentious, this is known as the “fifth freedom”). The International Civil Aviation Organization (ICAO) in Montreal acts as the global coordinating body. Within this framework, every nation enters into bilateral agreements with each other nation within whom they have civil aviation relations, guaranteeing their partners some or all of the freedoms set out in the Treaty of Chicago, which established the ICAO. These bilateral agreements may differ considerably, as they take into consideration the specific circumstances and interests of the carriers of the states which have signed them. Traditional bilateral civil aviation treaties often will designate a “flag carrier” and assign paired “flag carriers” set destinations, frequencies of service, and even guarantee slots at airports. Thus, the profitability of a carrier will be directly affected by the terms of a bilateral. “Open Skies” agreements differ greatly, but generally seek to create a less tightly regulated, more market-driven environment for carriers. Typically, they will protect the rights of carriers based in each nation to fly to, and engage in business in, the other.

In addition to the “freedoms,” the concept of “cabotage” is crucial for understanding the global civil aviation market. Cabotage refers to transporting freight or passengers between two points within another country. (Cabotage is applicable throughout the transportation industry; for example, the Jones Act prohibits maritime cabotage in the United States and its possessions.) A related right is the “fifth freedom” to transport freight or passengers from a destination in one country to a point in a third country. The crucial difference is the involvement of three countries in the routing. If a U.S. carrier were to fly from Washington to Moscow, by way of Paris, and had the right to add passengers between Paris and Moscow, this would be a “fifth freedom.” (Button, 2003). “Open Skies” agreements retain the concept of the carrier’s nationality, and none permit cabotage. (Buyck, 2003, pp. 36-37).

It is evident that the Commission would like to exercise as much (if not more) regulatory authority over civil aviation on the European continent as the Federal Aviation Authority (FAA) exercises in the United States. Paradoxically, concentrating regulatory authority at the EU level could lead to deregulation and a more market-driven civil aviation environment. National authorities, frequently closely linked with “flag carriers,” have an interest in protecting local airports, carriers, and other service providers, and employ their regulatory authority accordingly. Economic efficiency or customer service may not be as high a priority as national prestige or maintaining jobs. There are marginal carriers that survive on a combination of subsidies and preferred access to specific destinations, while other European airlines are globally competitive, compared with the major U.S. and Asian firms. (Michaels, 2003, p. A16)

The Commission opposes government subsidies to airlines. Some measures have been threatened against non-EU competitors, such as the imposition of punitive fees on U.S. carriers in retaliation for federal war risk insurance and loan guarantees to U.S. airlines (Wastnage, 2002, p. 18). However, the member states resist this, even the target is subsidies to non-EU carriers, both because the member states remain jealous of their sovereign authority, and doubt the EC’s

ability to implement its goals against non-EU states. (Baker, 2003, p. 16) Mergers and consolidations, including those that cross the boundaries of the EU, will be central to the development of the global civil aviation industry, and the Commission already has some authority to approve these, which will bolster its effort to gain control over EU-wide civil aviation.

FOREIGN OWNERSHIP AND ALLIANCES The ECJ ruling strikes down the national identification of an airline within the EU, at least in terms of civil aviation relations with non-EU states. Both the EU and the United States have restrictions on foreign ownership of air carriers. According to EU laws, foreign (i.e., non-EU) ownership is capped at 49 percent (“Aeroflot surprised,” 2003, p. 5). U.S. law is even stricter, with an absolute ceiling of 25 percent of voting stock in foreign hands (Peckinpugh, 2003, p. 56). Furthermore, U.S. law also prohibits an air carrier to be “essentially controlled” by foreign interests, which means that under some circumstances, a foreign investor could not acquire even 25 percent of a U.S. air carrier. (Brooks, 2003, p. B8) In practice, however, globalization of civil aviation takes place through alliances, in which carriers retain their national identities yet gain some of the benefits of a transnational system. Alliance members draw on each others’ routes to expand the number of final destinations which they can offer, and where allowed, will code-share flights so that a passenger might be ticketed on a single carrier even when different companies’ equipment is used. Within an alliance, frequent flier programs, related businesses such as resorts, and marketing expenses may be shared. The largest of these alliances, Star, has Lufthansa and United as its two lead members, with another dozen companies as members. After United went into bankruptcy, it sought regulatory approval to code-share with Lufthansa on United’s direct flights between non-German gateways in Europe and the United States. The access to Lufthansa’s marketing network would give United the opportunity to fill more seats between, for example, Paris and Chicago (Michaels, 2003/2, p. D12). In addition to sidestepping the nationality issue, alliances are relatively low cost.

In addition, the EC has proposed creation of a Transatlantic Common Aviation Area (TCAA). This would be the ultimate objective of EC open skies negotiations with the U.S. Ultimately, the TCAA would go beyond open skies-type agreements, “phasing out all ownership and control and cabotage restrictions. Within such a regime, U.S. and European carriers could freely merge (if competition authorities cleared the deals) and fly between any destinations within the new transatlantic common market.” (Flottau and Taverna, 2002, pp. 24-25). However, there will need to be considerable intra-European consolidation, and the benefits to carriers of alliances will have to be exhausted, before airlines will seriously consider transatlantic mergers and acquisitions.

PROSPECTS FOR NEW NEGOTIATIONS Only after the European industry has sorted itself out, consolidating into fewer and stronger carriers, are the member states likely to turn over international negotiating authority to the EC. The U.S. industry is also likely to undergo its own consolidation, in response to difficult economic conditions. Both sides are likely to take more than a year to realize. Afterwards, U.S. carriers, due to the nature of the domestic market, lower labor costs, and other factors, are likely to be stronger than their European counterparts are. Even now, with the U.S. industry in serious difficulties, European carriers do not seem any better off. Once the EC can negotiate on behalf of all Europe, further deregulation of the transatlantic market will be possible, and to the extent that U.S. firms are more competitive, they are likely to benefit significantly.

The Defense Distribution Center

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

To increase readiness and efficiency, enhance scheduled and synchronized time definite delivery (TDD) and provide scheduled replenishment, DDC has expanded its operations to include Joint Theater Distribution Platforms (JTDP) in Japan (Yokosuka), Hawaii and Germany (Germersheim). This is part of DDC's initiative to achieve more optimal materiel positioning in the United States, Europe, and the Pacific Rim. With all those efforts well under way, DDC is now focusing on the future by examining its customers, emerging logistics trends and requirements. Our task was to develop a strategic vision for a DoD distribution management center to manage and monitor the movement of material to the customer.

DoD's Supply Chain Management The challenge for DoD's supply chain and logistics system is to change to meet the expectations and needs of a smaller, highly mobile, technology based customer while continually reducing cost and increasing product and service quality. These responsibilities, coupled with decreasing resources, require increased innovation and technology. The DDC is challenged by an infrastructure far bigger than requirements dictate. DDC has too many warehouses and these warehouses and depots are holding a considerable amount of stock that has not moved in years. More than 50 percent of everything on the shelves has not received a requisition in two years (www.ddc.dla.mil). One of the top priorities is working diligently with the Inventory Control Points and the military services to keep what is needed and dispose of what isn't needed. This will allow for reduction in DDC's infrastructure and to become more efficient, while becoming more effective as well. Everything the DDC does and every dollar they spend affects their customers. The cost of DDC's operation is the cost to the customer in each of the military services and ultimately the U.S. taxpayer. The goal of the DDC is to enable customers to spend their resources on readiness and the tools of their trade, not logistics.

In order to meet this challenge, DDC must expand their current systems and, when necessary, develop new systems, which integrate with suppliers, customers, and commercial transportation resources to gain total asset visibility. As the agent for DoD distribution, providing a seamless link in the supply chain, DDC must expand the vision of distribution management to encompass the total spectrum of distribution, from the supplier's production line to the battlefield. The information technology focus of the distribution business is interoperability, making internal systems capable of interacting with those of customers, suppliers, and partners. Internet and message-based communications, Electronic Commerce/Electronic Data Interchange (EC/EDI), are some means used to achieve this goal. An "Interconnected Communications" system will afford the ability to collaborate with our supply chain trading partners, providing a significant impact on future competitive advantages.

DDC's Distribution Process DDC's continuing challenge is to identify the most cost-effective way of getting the right product to the right place at the right time, given a host of working and

business constraints and parameters. The DDC faces many challenges in the current end-to-end distribution process. Some challenges cannot be changed due to the nature of the DDC's mission. For example, multiple commodities such as military clothing; food, medical, and construction supplies; and equipment repair and sustainment parts will remain a requirement by the warfighter.

So what do DDC's customers require? First, we must understand who are DDC's customers...the customer end of the supply chain becomes slightly less defined when looking across the four U.S. military services. It is ultimately the warfighter or the end user of the product, piece of equipment or service, however each military service manages its supply system slightly different from the other. This presents a challenge to the DDC having a single metric to measure its success in meeting customer requirements. The DDC uses the metric of the time it takes to fill a requisition, ship the item and receipt of the item by the user. However, in most cases the system only tracks receipt of the item to a central supply point at each base or with each major command depending on the specific military service. The problem is that the actual warfighter isn't actually receiving the part when it is receipted for at central supply and further delays at the central supply point have reflected poorly on DDC's image of supplying the warfighter in a timely fashion. The challenge then is to design a customer-responsive supply chain.

Flexible and cost-efficient supply chains begin with improvements to supply-management processes. The DDC has made great strides through the implementation of technology with the military services in getting the right product, equipment, services or supplies to central or theater supply points in a timely manner. The biggest challenge remaining is getting these supplies the last mile to the actual user. This will only be accomplished through structural changes and new thought processes amongst the military services supply systems...however, the scope of our research does not cover what those changes or new processes should be.

DDC Transportation Requirements As the complexity of transportation management increases, DLA and USTRANSCOM must continually look for service providers that can integrate the value chain of transportation management functions (procurement, planning, monitoring and execution) while providing value-added services (analytics, freight payment and settlement). DOD can address these needs through optimized, multi-modal, supply point to supply point transportation management. DLA (through the DDC) processes transportation orders, determines the optimal shipping mode (with the customer), dispatches the shipment, facilitates claims management and provides consolidated reporting and invoicing enabling the customer to:

- Focus on core competencies
- Increase operational efficiencies
- Keep pace with advances in information technology

Bottom line is velocity—Transportation plays a key role in determining whether service goals are met, and at what cost. Transportation reliability is taking on new urgency as companies cut safety stocks and standing inventory. The consequence of failure equates to the possibility of diminished capability to the warfighter.

The Way Ahead Overall, we felt that the DDC has made great strides in the past few years to improve the end-to-end distribution process for DoD. The DDC has continued to provide support to the warfighter during two back-to-back events in the Central Command area of

operations (Enduring Freedom in Afghanistan and Iraqi Freedom). This was accomplished while the DDC continues to consolidate its hard infrastructure and implement new systems in its soft infrastructure. Of note, DDC has reduced its civilian personnel by 71% and its workload by 37% over the past ten years through investment in IT. Storage space has been reduced more than 50% over the past ten years through consolidation of warehouses/distribution centers, which has shown a cost savings of approximately \$180 million. To continue this trend of improving the DOD supply chain's support to the warfighter, we feel that the DDC is on the right track.

Our recommendation would be to continue with the DDC 2020 plan. However, there are three areas that should be addressed or emphasized along with the plan—(1) create the optimum infrastructure to meet the needs of the logistics providers, (2) improve collaboration/coordination between DDC and its customers and (3) develop an executive team responsible for supply and demand planning, management, and execution of the entire DoD supply chain.

1. Creation of the hard and soft infrastructure is required to meet the needs of the manufacturing, transportation and third-party logistics providers as part of the new world economy. Increasing sophistication provides new opportunities for servicing these special needs through hard infrastructure, soft infrastructure, and the ability to integrate these two components. DLA and the DDC need to continue to look at the best locations for components of the supply chain that best support the customer in the most cost effective manner.

2. There are three areas that would improve the DDC functions within the DoD's supply chain through improved collaboration and coordination. First, better collaboration with each of the military services'/combatant commands' supply systems to address demand planning as well as the "last mile" issue. Next, closer coordination with USTRANSCOM to deconflict and prioritize between unit movements and supplies during times of conflict. Finally, coordination with customs to expedite clearance on overseas shipments will help ease international difficulties.

3. Currently there is no one owner/manager of the DOD end-to-end supply chain but rather a combination of organizations that focus on one or a few of the components of the supply chain. DDC does handle many of the functions of the supply chain but not all. Additionally, each military service has its own view of how the supply chain should work. As noted earlier in this report, one of the key elements in an effective logistics organization is the executive team. This team is required for supply and demand planning, management, and execution. Although this is not necessarily within the realm of DDC or even DLA but rather at the DOD level, it is an area that when benchmarked against the commercial sector needs to be addressed.

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