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CARGO SECURITY-A PARADIGM SHIFT

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EXECUTIVE SUMMARY

Cargo Security is defined as safe, reliable intermodal movement of goods from the shipper to the consignee with no loss due to pilferage, theft or damage. It includes the key carrier assets that move the goods - the containers, trailers, chassis, tractors, vessels, and rail cars. The combination of 1) a significant increase in demand for information on the status of the goods movement process; 2) increased security and safety concerns; 3) the constant pressure to reduce transportation costs; and 4) the speed of cargo movement have created the need for a paradigm shift.

Technology advancements such as global position location systems, improved communications systems (wireless data and the internet), and manifesting and cargo movement software systems are creating a technology based paradigm shift in Cargo Security. The results will be significant as Cargo Security technology applications are developed, tested, the benefits understood and quantified. Multiple sources of these technologies are emerging resulting in reduced implementation costs. Early adopters will benefit from reduced operating costs, improved safety and security, and increased market share. The U. S. Military and regulatory agencies - such as U. S. Customs - will also be major beneficiaries of Cargo Security technology.

THE DEMAND

The constant demand to reduce the cost of goods sold has focused more emphasis on the transportation system. Just-in-time delivery, reduced inventory, and redistribution of products to meet geographical demand are significant factors in the decision process to achieve the optimum blend of transportation, manufacturing, and administrative costs. Customer satisfaction is becoming a more significant factor in the choice of carrier especially when it relates to reliable location and delivery information.

The recent increase in cargo theft and safety are of growing concern to the transportation industry. Thefts, coupled with the potential to use shipments as “weapons of mass destruction”, are placing new demands on Cargo Security. While terminal security has improved, there are significant increases in off terminal theft – ranging from

theft by organized criminal organizations that often have “inside” information on the shipments to thefts that are “targets of opportunity”. Access to information technology systems, including “corrupt” employees who gain theft targeting information, is increasing. Any time the cargo is stationary, the vulnerability to theft increases. The FBI recently stated that cargo crime is conservatively estimated at \$12 billion per year – “the fastest growing crime problem in U. S.” The FBI believes that the growth in cargo theft is due to lax penalties, high profit, and low risk of tracing the stolen goods. There is no central repository for cargo theft statistics including common criminal practices. Theft results in an increase in the cost of doing business including increased insurance rates.

In other areas of criminal activity, shipments imported into the U. S. are often used to conceal illegal goods – narcotics, trademark violations, etc. Recent emphasis on the potential to use cargo containers as “weapons of terror” will increase the need for better information and inspection technology. The results are increased costs as well as the potential for delay in cargo delivery.

Terminal operators and carriers work daily to reduce costs. Improved yard and gate systems, remote monitoring systems for reefer and high value cargo, and more efficient use of assets all contribute to reduced operating costs and the speed of transportation services. The chassis has become a key concern of the transportation industry – especially the ability to meet roadability safety requirements. The challenge and debate continues on the responsibility for chassis safety and liability, especially the inspection and reimbursement for repairs responsibilities. Increasing costs, caused by delays at terminal gates and road congestion, are significant factors impacting transportation system costs.

Hazardous cargo movement is also placing increased demands on the carriers - both in the reporting and storage requirements as well as the increased potential for use of these shipments as “weapons of mass destruction”. The list of cargo considered to be hazardous is growing as well as the concerns of the public, the regulatory authorities, the carriers, and the terminal and port operators.

THE TECHNOLOGY RESPONSE

Technology is beginning to address the carriers’ operational needs to reduce costs and increase safety and security. Some marine terminals are using Radio Frequency Identification (RFID) tags on their chassis, generator sets, and in a few cases containers to reduce on-terminal costs. At the terminal gate, the relationship with container number and the RFID chassis tag is entered into the manifesting system. These systems are improving the efficiency of terminals including a reduction in gate delays. RFID systems

eliminate the need for keystroke data entry systems, thus reducing the frequency of human error and increasing operational efficiency.

Rail carriers have installed RFID tags on all their rolling stock and placed readers on their tracks to provide rail car location. Recent innovations in their information technology systems have integrated the container or trailer number with the rail car identification providing location information on the cargo including the estimated arrival and de-ramp times. Customers who know which rail carrier are moving their cargo can access this data - often using the internet. Marine terminals are also reading the rail car RFID tag as it enters their terminal and using information provided by the rail carrier to immediately access the in-bound container numbers.

Rail and marine terminals are also using optical character recognition systems to read the container, trailer and chassis number. Driver information entered into the software manifesting system becomes part of the increase in terminal efficiency as well as improving Cargo Security – providing a permanent record for Cargo Security and movement information. Terminal operators are also using technology to remotely monitor the condition of reefer units and high value cargo.

A number of the long haul trucking firms initially installed remote monitoring, location, and communication systems in their tractor units to provide information on the performance of the driver, the tractor, and location of their tractor assets with in-transit cargo. Recently, they have invested in similar technology for trailers, permitting them to independently remotely monitor the trailer location and its status – e.g. connected to a tractor, doors open, doors closed, and volumetric load percentage. Newly developed systems permit the remote locking and unlocking of the transportation container. When theft is detected, the doors can be remotely locked and the truck engine disabled.

Cargo Security is already beginning to benefit from technology. Carriers, working with law enforcement authorities, have used these systems to make cargo theft arrests. The maturity of the technology, coupled with a reduction in cost, have contributed to “making the business case” for the technology investment to monitor the status of their assets - the truck and trailer. Increased asset utilization offsets the need to purchase additional equipment. Carriers are meeting the significant increase in customer demands for more information on their cargo location and estimated delivery time.

While these examples are critical to establishing the maturity and cost of Cargo Security technology, many challenges remain to be addressed. One organization that has taken the lead in the United States to advance cargo handling and Cargo Security is the Cargo Handling Cooperative Program (CHCP). The CHCP is a public-private

partnership sponsored by the U. S. Department of Transportations' Maritime Administration. CHCP members include ocean and rail carriers, port authorities, terminal operators, trucking companies, asset lessors, and industry associates. The CHCP is actively working on projects to apply technology to the movement of freight, including Cargo Security, in cooperation with the U. S. Department of Defense Transportation Command (US TRANSCOM) and the Center for the Commercial Deployment of Transportation Technologies (CCDoTT).

The container and the chassis represent a unique challenge. There are physical and operational challenges for the chassis. Chassis are often stacked for efficient storage on the terminal. Stacking can damage RFID tags as well as the new remote monitoring system installations. Sometimes chassis are not returned to the carrier or lessor within the agreed time period thus increasing asset operating costs. The approximately 750,000 chassis in the U. S. are an important part of the container transportation system – both on and off the terminal.

Projects are underway to investigate and test technology to remotely monitor the chassis and container location and status. Emerging technology will permit the remote reporting of the safety and status information on the chassis such as tire pressures, brake system status, lights, geographical location, generator set performance, and container Cargo Security – specifically seal integrity. Communicating this information to the carrier will make a significant contribution to improved Cargo Security and improve the utilization of cargo movement assets.

As previously noted, some of this technology is currently operational on trailers. Electronic cargo seals are currently being tested on “in bond” containers transiting the Northwest Corridor into Canada. This technology, whether in the form of disposable or re-useable seals is viewed as a critical part of insuring the security of the cargo shipped in containers. Knowledge of the containers' location as well as the seal integrity are vital pieces of information that can contribute to increased Cargo Security as well as responding to increased demands for the location, safety and delivery time for cargo that is in-route to or that has departed the carrier's terminal. Technology is the response to the long-standing need for off-terminal information.

The long-term technology vision must address improvements in imported container Cargo Security. One concept is to require pre-inspection at terminals and ports that export containers to the U. S. The container would be imaged at the overseas port with non-intrusive technology similar to the Gamma Ray Imaging System currently being used at the land border crossings into the U. S. from Mexico. Customs would pre-screen the image and compare it with a Gamma Ray Image made upon entry into the U. S.

Much of the processing could be automated through the application of image change detection software including the special U. S. Customs container examination techniques. While costly, this technology coupled with the electronic container seal integrity could provide major advances in Cargo Security especially the knowledge that the container has been tampered with prior to its entry into the U. S.

Hazardous cargo shipments also present challenges. The technology responses could employ biometric information of the authorized driver combined with the technology previously described for remote monitoring of the location of the tractor, chassis or trailer. Systems could track the location and status of the hazardous cargo to determine if the driver is straying from the “authorized route”. This information, in addition to an emergency alarm triggered by a hijacked driver, could immediately provide critical location and hazardous cargo identification information to law enforcement authorities.

The current CHCP program, in partnership with CCDoTT and U. S. TRANSCOM is addressing many of these challenges. The goal is to evaluate existing technology including adapting it to meet Cargo Security, chassis and container monitoring and location requirements. Operational tests utilizing CHCP members’ equipment are planned to evaluate available technologies and systems. Requirements not met will be documented for future research projects. The CHCP will describe and quantify the benefits and costs so its members can evaluate their Cargo Security requirements and make their individual business case decisions. The potential benefits are major in meeting the increasing demands of both the private and government sectors.