

INFORMED DECISIONS ON CATASTROPHE RISK

Countering the threat of nuclear terrorism at domestic and foreign ports

Estimating the Operational Impact of Container Inspections at International Ports

Each month, ocean vessels load and unload tens of millions of shipping containers at ports around the world. These containers provide terrorists with a potentially attractive way to hide a nuclear device.

- The successful smuggling and detonation of an improvised nuclear or radiological dispersal device would be devastating locally and disruptive globally. In addition to lives lost, the detonation of a nuclear device in a port could lead to precautionary port closures that would produce weeks-long disruption of the intermodal movement of cargo.
- Even if it were not detonated, the successful smuggling of a nuclear device into a U.S. port has the potential to immediately trigger the U.S. legal requirement for inspections of all U.S.-bound containerized cargo at the overseas ports of loading, adding significant uncertainty and cost to global supply chains.

A U.S. law, "*Implementing Recommendations of the 9/11 Commission Act of 2007*," requires that all cargo bound for the U.S. must be scanned by non-intrusive technology to detect radiological contraband before the cargo is loaded onto a ship at an international port.

- The deadline for compliance with this law is July 1, 2012, unless the Secretary of Homeland Security grants extensions, which can be offered in two-year increments.
- The operational feasibility of 100-percent scanning has been questioned by many government officials and private sector professionals involved with managing supply chains.
- In the face of this resistance to the legal requirement for 100-percent scanning, DHS Secretary Janet Napolitano has indicated that she will grant a two-year extension in 2012.

Given the importance of maritime trade, rigorous analysis of the impact of 100-percent scanning on container terminal operations is critical for policy makers, as well as for companies with an economic interest in the efficient movement of containers through the international supply chain.

- We collected detailed data on the movement of more than 900,000 individual containers at two of the world's largest international container terminals. We use these records as the basis for a simulation analysis that estimates the effect of a number of inspection protocols on terminal operations.
- The simulations we performed provide us with insights into the impact that each protocol may have on three key attributes of the inspection schemes: the transit delays that would be incurred by inspected containers, the additional real estate the terminals would need to stage in-process containers, and the average handling cost per container.

Our study compares two types of security measures implemented at international ports – the **Container Security Initiative (CSI)** and the **Secure Freight Initiative (SFI)** – which are designed to detect the presence of nuclear devices in shipping containers, before the containers are loaded onto vessels bound for the United States.

Our findings suggest that the **Secure Freight Initiative (SFI)** could be scaled up to satisfy the 100 percent radiation detection requirement as mandated by the 2007 U.S. law.

Moreover, if implemented globally, **SFI could be significantly less expensive** for U.S. importers than the costs associated with a fully implemented CSI.

Under CSI, all U.S.–bound containers that CBP determines to pose a high risk ought to be inspected overseas. But CBP still inspects nearly all high-risk containers after they arrive in U.S. ports.

- The **Container Security Initiative (CSI)** is administered by U.S. Customs and Border Protection (CBP). Under CSI, manifest data (container's sender, recipient and contents) and other data are analyzed using rules-based software to identify containers that are at risk of tampering by terrorists. Overseas customs officials at the port-of-loading require that a container selected for inspection be transported from the marine terminal – typically after being removed from the stack to which it has been assigned in advance of loading, and taken to a customs inspection facility. Inspectors then use gamma or high-energy x-ray radiography detection technology to screen high-risk containers before they are cleared for shipment to U.S. ports. These inspections are frequently not completed in time to make the originally scheduled loading and departure of the U.S.-bound vessel.
- The **Secure Freight Initiative (SFI)** is jointly administered by CBP, the U.S. Department of Energy, and the U.S. Department of State. Under SFI, all U.S.-bound containers arriving at participating overseas ports are scanned at terminal entrance gates. Sensor and image data are then transmitted in near-real time – typically several days in advance of the scheduled loading on the U.S.-bound ship – to the National Targeting Center in Virginia. Those containers whose scanned contents are deemed to be high-risk undergo a more sensitive inspection, potentially well in advance of loading onto the departing vessel.
- We find that SFI's use of rapid screening by relatively low-cost drive-through portals would allow it to handle 100 percent of **all** container traffic entering marine terminals via surface transportation – bound for the U.S., as well as other destinations – on a cost-effective basis. In most instances, it should be possible to incorporate inspection equipment into the operations of a terminal facility to support scanning of containers unloaded for transshipment from one vessel to another. The relatively small percentage of containers that fail this rapid primary inspection could be scanned by more sensitive drive-through equipment.
- In contrast, the CSI protocol would face significant hurdles if it were to be scaled up to scan more than the very small fraction of U.S.-bound container traffic it current handles. For instance, at a large marine terminal, a significant backlog would be created if overseas officials were directed to inspect as little as ten percent of U.S.-bound cargo.
- Requiring inspections at this level would not be unrealistic in the aftermath of a major maritime terrorist incident.

A possible way forward: “Industry-Centric” adaptation of the Secure Freight Initiative (SFI)

Our simulation was informed by experts both in terminal operations and in fielding and operating container inspection technology within international seaports. It suggests that a variant of the SFI inspection scheme, which we refer to as an “Industry-Centric” inspection scheme, is capable of being scaled-up to satisfy the scanning and radiation detection requirement mandated by the 2007 U.S. law. Under the Industry-Centric scheme, marine terminal operators purchase and install the inspection equipment. That equipment is then maintained and operated by certified third-parties who are overseen by government officials. The equipment and operational costs would be recovered by establishing a \$15 per-container terminal security fee. The potential economy and robustness of the Industry-Centric scheme results from the type and location of the equipment used. The current CSI protocol relies on transporting containers to centrally-managed customs facility where the contents are subjected to highly sensitive high-energy x-ray. While the percentage of containers targeted for inspection may be small, the process can be time-consuming and disruptive. In contrast, the Industry-Centric inspection scheme performs a rapid initial scan of 100 percent of inbound traffic as a part of the flow into or within the marine terminal. This is immediately followed, when required, by a secondary inspection using more sensitive equipment. The initial scan is done with lower-cost drive-through radiation and medium energy x-ray radiographic portals. While this equipment is less sensitive than that used under CSI, it is precise enough to verify the safety of the vast majority of containers, thereby substantially reducing to manageable numbers the amount of containers requiring a secondary inspection.

A qualitative analysis of the two schemes' logistical requirements suggests that disruptions to terminal operations are likely to be much more severe under CSI. Under the CSI scheme, containers targeted for inspection typically must be pulled from a terminal's storage stacks only hours before the time at which they normally would be retrieved for their vessel loadings. Under the Industry-Centric scheme, in contrast, targeted containers undergo inspection upon arrival to the terminal, before they are placed in the stacks. Thus, the Industry-Centric inspection regime avoids the disruptions and delays that would follow from the early removal of even a small fraction of containers from the terminal's stacks.

Comparison of the Simulation Results for Industry-Centric Adaptation of SFI and CSI Protocols

| | Industry-Centric Adaptation of SFI | CSI |
|---------------------------------|---|---|
| Percent of Containers Inspected | Capacity to inspect 100% of containers – U.S.-bound, as well as those bound for other destinations | Capacity to inspect approximately 5% of U.S.-bound containers, based on manifest information |
| Process Flow | Containers are inspected upon arrival at terminal and then taken to stack, typically days in advance of scheduled loading | Containers identified as highest risk are moved from stack to the inspection facility just 24 hours before scheduled departure |
| Equipment Location | At terminal entrance | At a customs inspection facility in the interior of the terminal or at an off-site location |
| Technology Used | <ul style="list-style-type: none"> • Portal monitors for passive radiation detection • Gamma ray radiography for nonintrusive imaging • Optical character recognition to record container ID | <ul style="list-style-type: none"> • Handheld detectors for passive radiation detection • High energy x-ray scanners for nonintrusive imaging |
| Cost per Container Inspected | ≈ \$15 | ≈ \$110* |

*This cost does not include the indirect costs associated with the typical delays that occur when overseas customs officials conduct inspections at the port of loading.

SOURCE: Nitin Bakshi, Stephen E. Flynn, & Noah Gans. **Estimating the Operational Impact of Container Inspections at International Ports.** *Management Science*, Vol. 57, No. 1, January 2011, pp. 1–20.

Issue Brief: *Countering the threat of nuclear terrorism at domestic and foreign ports*

INFORMED DECISIONS ON CATASTROPHE RISKS issue briefs are published by the Wharton Risk Management and Decision Processes Center of the University of Pennsylvania. For additional information, contact Carol Heller, hellerc@wharton.upenn.edu or 215-898-5688.

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