Going metric

Gustavo L. Bottan of Passport Systems asks if the planned changes to the US cargo inspection mandate will increase security

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The opinions expressed in this article are solely the author's and do not represent those of Passport Systems Inc. or any of its clients.

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In a previous article in this publication, I commented on the question:'When do you know you have sufficient security built into an inspection system?' (see *Cargo Security International*, October/November, page 20). As an inspection is conducted, how does the operator decide if the inspection is complete and more importantly, if it was effective? In that article I described how a new inspection technology, Nuclear Resonance Fluorescence (NRF), has the capability to identify all materials located in an enclosed space (container, suitcase, vehicle, freight car) and, of equal importance, the ability to predict the time needed to find or rule out the presence of any targeted materials. In this way, an operator would know when the inspection is completed and would have a quantifiable measure of its accuracy, i.e. an x% level of confidence (chosen by the inspectors) that targeted materials are present, as well as a y% level of confidence that other materials of interest are not. Thus, an inspection for security purposes may simultaneously provide economic benefits and vice-versa.

A quick observation of the inspections conducted today shows there is no direct metric used to determine the effectiveness of an inspection. Rather, there is a prescribed procedure in place and the inspection is deemed complete and sufficient when all the steps are taken. In essence, was the passenger or cargo checked? If yes, then the procedure is complete (the assumption is that the passenger or cargo was inspected to such a degree as to conclude that such person or cargo does not pose a threat).

Inspections today generally use x-ray scans, metal detectors, radiation detectors, various technologies for explosive detection, manual searches, canine teams, etc., or a combination thereof. The metrics for these methods are largely subjective. How long is the individual searched or the x-ray image looked at? How many times is the cargo passed through the x-ray scanner and how many views are examined? Unfortunately, because of the substantiated flaws in these inspection systems, we do not have

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a quantifiable level of confidence about the presence or not of a threat material in the released cargo. This matters because unless cargo inspection is done to a minimum level of performance, it will not matter if a mandate requires inspecting 100% of cargo or not.

In this article, I would like to continue with the theme of understanding how secure our inspections would be under the recently introduced bills in the **US Senate**.

US Congress and 100% scanning

A flurry of opposition has ensued around the world ever since the enactment of the *9/11 Commission Act of 2007*, which required that all containers shipped to the US be checked for radiation and scanned. Much of it justified in the sense that the technology existing then could not achieve inspection of all containers and keep the flow of commerce at an acceptable level.

There have been many proposals to deal with the problem, from mutual recognition of inspection practices between trading nations, using risk-based management approaches, and using container seals, to capturing x-ray images and passive radiation measurements of all containers before shipment and providing them to the destination's authorities (for review, if needed, while the vessel is in transit), and others. Unfortunately, regardless of the approach, there has been little emphasis on the measurable effectiveness of the inspection. The discussion normally

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defaults to the performance specifications of the inspection equipment deployed (e.g. the probability of detection and false positives) which only tells us the expected efficacy rather than how safe the container's cargo is actually measured to be.

The **US Congress** has heard the international uproar over the 100% inspection mandate and new bills are being introduced to resolve many of the outstanding issues. As reported in this magazine's last issue, there are two bills introduced in the US Senate that if passed, would amend the 100% scanning law now in the books (see *Cargo Security International*, October/November, page 14).

At first glance, the legislation will address some of the industry and foreign government concerns, but unfortunately does not do much to enhance security. If we are going to spend any money on this issue, whatever the final approach the mandate takes, we must make sure the safety of the cargo delivered to each nation has quantifiably increased.

SAFE Port Act

Senator Collin's *SAFE Port Re-Authorization Act of 2010 (S.3659)*, referred to the **US Senate Committee on Homeland Security and Government Affairs** to improve on previous legislation (*SAFE Port Act of 2006*), looks to address the concerns of the global community related to the mandate included in the 9/11 Commission Act of 2007 (namely 100% scanning). However, if this bill is not further amended, the most likely result will be to make the security of the United States mostly dependent on the effectiveness of the risk management approach referenced in the bill. This is comparable to the Automated Targeting System (ATS) currently used by **US Customs and Border Protection** (**CBP**). To explain, let's refer to Figure 1 which shows a typical inspection process today. The steps are named according to the language in the original 2006 SAFE Port Act.

Screening refers to the assessment made about a container. Normally this is done with background information about the container, is highly subjective and not based on a physical inspection. It classifies the containers as high or low risk. As seen in the figure, only the high risk containers receive a physical inspection (either through an 'examination' process by x-ray scanners or a 'search' operation unloading the cargo to manually check it).

Examining or searching only 2%-5% of containers, as normally done today on a risk assessment basis, make sense because

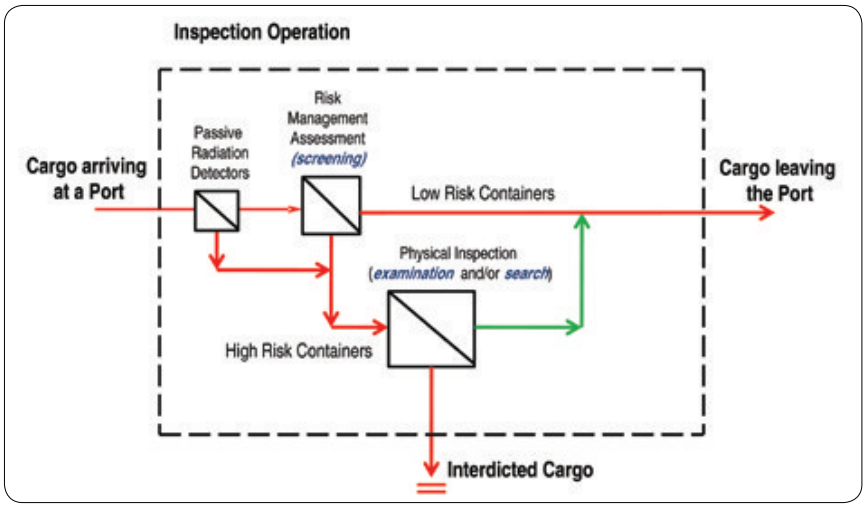

Figure 1: Typical inspection of a container – screening, examination or search

it can partially deal with contraband, illegal drugs and import tariff avoidance. However, this is not the way to deliver improved national security unless the risk assessment is highly accurate (if not 100%) in determining if a container could be harbouring a weapon of mass destruction (WMD).

If only high risk containers are physically inspected (assuming for now such inspections are completely accurate), the safety of the vast majority of cargo containers bound for the US is in question because such purportedly low-risk cargo is never verified. Also, a report by the US Inspector General earlier this year pointed out that the ATS, as recently used by the CBP, was that adopted to deal with drugs and other contraband, and by implication, not nuclear materials.

If a highly efficient physical inspection is not possible for all containers (i.e. 100% scanning) how could we justify any investment in the guise of improving national security? The consequences of failing to detect contraband in cargo containers are insignificant compared to the failure to detect a nuclear device or dirty bomb.

Senator Collin's bill recognises the need to establish some metrics to measure the performance of the ATS as the language contained in a waiver to Section 232(b) of the SAFE Port Act (6 U.S.C. 982(b)) reads: 'The additional data elements required… to identify high-risk cargo have improved the capabilities of the Automated Targeting System, based on empirical evidence of seizures of illegal narcotics and dangerous materials.' Unfortunately, the text only refers to the empirical evidence of inspected containers (high risk).

If some metric is to be established for the performance of the ATS, it is not just the high risk containers that should be checked, but more importantly those containers that have been judged to be of low risk.

As long as 100% of containers cannot be verified to be safe from carrying a WMD and a risk-based management system is used, randomly selected containers (both low risk and high risk-after their inspection) should be tested by an independent organisation with highly effective methods capable of identifying all cargo. This data should be continuously used to update the ATS and maximise its effectiveness.

MTSA 2010

Senator Rockefeller's *Maritime Transportation Security Act of 2010 (S.3639)* – which has been referred to the **US Senate Committee on Commerce, Science, & Transportation** – also tries to address the global difficulties encountered when mandating cargo inspection requirements. Among other things, it tries to bring together all parties in the supply chain to be part of the process and streamlines the data used for imports to the US by making it electronic. The bill in essence tries to expedite and maintain the flow of commerce. It also seeks to modify the current inspection requirement of checking for radiation AND scanning the cargo by only requiring one OR the other.

Although passive radiation detection has the promise of being affordable and should cause minimum disruption to the supply chain (deployed at entry to ports, in crane spreaders and even in straddle carriers), it does not provide high detection potential (or none at all) in the case of shielded nuclear weapons, shielded nuclear or shielded radiological materials. Passive radiation monitors should nonetheless be used. Their value is clear: they can detect the presence of unshielded radioactive materials. There have been innumerable cases where radioactive materials have entered the supply chain unknowingly and ended up in products for public consumption (radioactive belt buckles, radioactive wood pellets, etc.). However, they do not address the national security problem posed by the shipment of shielded nuclear weapons or shielded radioactive materials (dirty bombs). Furthermore, although radiation portal monitors' ability to distinguish between normally occurring radiation and that of threat materials can be improved, the reality is that too many false alarms are still triggered. For such cases, using another passive radiation monitor, albeit one with better discrimination between radiation signals, as a secondary inspection (as some recommend), still leaves the shielded threats undetected.

If the inspection of 100% of containers before embarkation is to be done on the grounds of stopping a nuclear weapon from being shipped to another nation, it should not be performed by radiation monitors or scanning alone. They should be inspected by radiation monitors and scanned to find potential shielding materials, particularly of the size that could harbour a nuclear device.

It is this basic fact that makes the sole use of passive radiation monitoring an insufficient solution to address what I believe is at the heart of the US mandate for 100% cargo container inspection: the issue of national security and not tariff avoidance or contraband detection. The motivation is to reduce or eliminate the chances of a nuclear weapon detonating in a destination country (in this case the US). This is the only threat that can instantaneously change the future of a country. All others, although highly undesirable, could still be handled by the container receiving country. Thus, mutual assurance between nations that a nuclear device is not present in cargo containers shipped to and from their shores is therefore a singularly important objective and perhaps the only reason for such a mandate.

Therefore, a combined passive and active interrogation inspection system must be used. An example of such inspection is shown in Figure 2. It is an artist's rendition of a combined passive and active interrogation system (note: for cargo arriving by ship in a transshipment operation, the passive radiation detection could also be performed with a crane or straddle carrier mounted unit). As the truck and container (or train freight car) go through the passive radiation portal monitors, if there is no alert, the container can be assumed not to carry unshielded radioactive materials. At the same inspection station, the vehicle and cargo would continue through an active interrogation step (expected to take

15-30 seconds for a 40 foot container). This system would automatically give an alert if there was shielded or partially shielded photo-fissionable material (e.g. plutonium and uranium). If there are no alerts, the container would be deemed not to carry a nuclear weapon. This approach would be able to handle the flow of commerce and not cause disruptions, as there would be no need to review x-ray images. The decision is instantaneous. The container either has or does not have a nuclear device (or nuclear materials for building a bomb).

Interdicted on arrival

Other threats, however, could still exist in the container, but these can be interdicted on arrival by the local receiving authorities (e.g. undeclared chemicals or biological weapons, arms, illegal drugs, contraband, etc.) using currently established procedures. The efficacy of the inspections on arriving cargo is a subject for a future article.

Although the most catastrophic and perhaps unmanageable case for a receiving nation is that of a nuclear weapon detonation, some may consider the detonation of a 'dirty bomb' before the container is inspected on arrival, as equally grave. If the dirty bomb is made not with plutonium or highly enriched uranium (the most likely materials for a nuclear bomb), but instead with non-fissionable materials, the containers would have to be further inspected by other means to find explosives and/or shielded radioactive materials, before embarkation.

Interrogation system

In such a case, the system shown in Figure 2 would have to be operated differently. Its active interrogation system would simultaneously look for high attenuation materials and only those with no significant attenuation would be allowed to ship. This may increase the time required for the inspection but most importantly, for any alert or ambiguity as to shielding possibilities, it would require the container to be separated for further inspection by the corresponding authorities using whatever means they have for cargo verification (x-ray scanner, unloading and manual search, etc.). Even in this case, rather than use these methods as traditionally done, the secondary inspection could be done to specifically check for explosives and shielding materials in automated ways, in essence resolving any suspicion of having a radiological dispersal device. Technologies like NRF and others can be used in this way. The fact they are automatic eliminates the time and personnel currently needed to review images. NRF would have completed such inspection in a predictable time and it would provide a quantifiable metric that the container does not contain a radiological dispersal device.

Funds for pilot technology

So, modifications to the Senate bills should provide for funds to pilot technologies at export points to enhance national security, while still allowing for a manageable approach that does not unduly impede the flow and speed of commerce of an exporting nation.

It is possible to clear 100% of containers for shielded/unshielded nuclear devices before embarkation by using the above described technologies. These exist and should be examined closely for trial deployment. This would significantly enhance national security.

In summary, US cargo container inspection mandates should be amended, but primarily to require that all containers bound for the US be determined nuclear weapon free before embarkation. A physical inspection using the technologies described in this article could be done at the port of embarkation in a shorter time than it would take for traditional Customs inspection and would significantly enhance the national security of the United States.

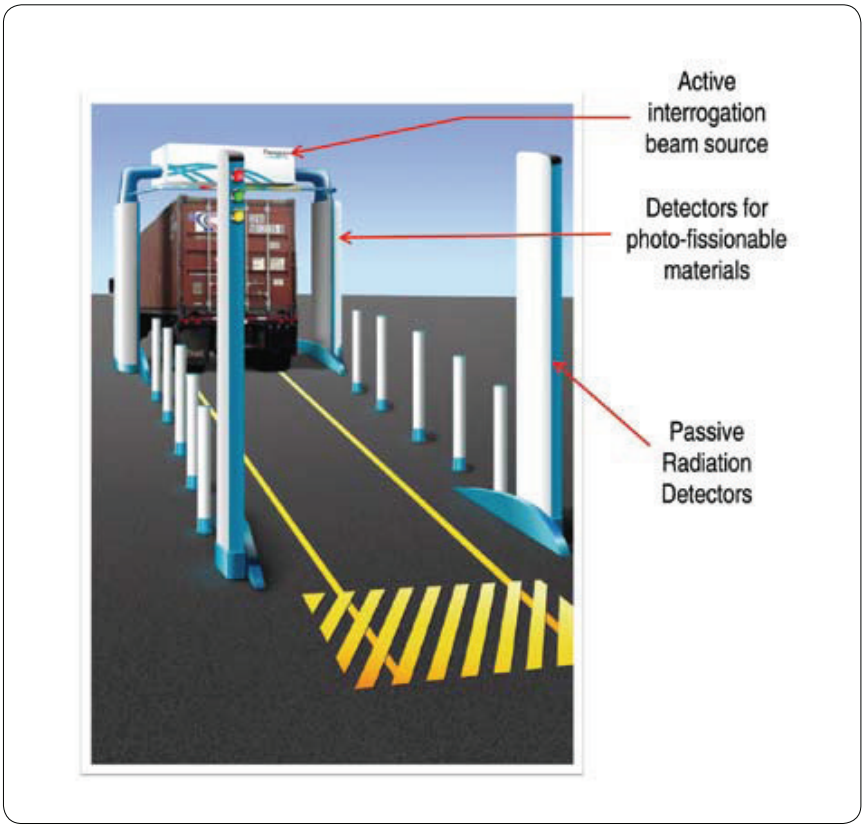

Figure 2: Inspection station for pre-embarking containers