Risk and continuity

Gustavo Bottan continues his exploration of risk management and cargo inspection

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This is the second in a series of articles Gustavo has written for *Cargo Security International* regarding risk management and cargo inspection. The first instalment was published in the February/March issue.

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The data available from the *Importer Security Filing* (*ISF*), more commonly known as the '10+2', and other intelligence information is used to determine the risk posed by each container arriving in the United States and provides a means to focus the inspection procedures, maximises the use of available inspection resources and facilitates trade.

The inspection practices can vary slightly depending on the port or border crossing in question; where issues such as throughput volume, space availability, whether the cargo is imported or exported, are key drivers determining how things get done. In general, when a container is thoroughly inspected by physical means, it is because not only was it considered to be of 'high risk' but also, given the inspector's experience, it is determined it needs to undergo closer scrutiny, sometimes requiring that it be opened and its cargo unloaded.

I have already described the concept of using different inspection technologies or procedures for dealing with different risks in the first article in this series (see *Cargo Security International*, February/March, page 20). In essence, because the risks of one or the other are different, the approach to inspection, using risk management methodologies, should be different. Thus, performing inspections before embarkation (for export purposes, for example) should not be the same as those after debarkation (imported containers).

In the February/March article, I also mentioned the potential to improve risk management approaches like the *Automated Targeting System* (*ATS*), by complementing the data used to determine the container's risk with physical measurements before shipment and after arrival at a port of destination. In this article, I will focus on the way in which technologies could be used in concert to provide pre-shipment data of value for the risk determination of an ATS. In a future third article, I will look at what could be done in a post-arrival/post-inspection mode to continue to improve the quality of the ATS performance.

Inspection before shipment

We all understand it is impossible to inspect a container with currently deployed technologies fast enough to allow for 100% cargo container inspections. However, it is possible to physically collect meaningful data about its contents without disrupting commerce, such that this 'hard' data can then be used to support the ATS's use of 'soft' data like the '10+2'. The goal is to make the targeting system more efficient and achieve the highest probabilities that the correct risk assessment is made for the containers.

In the past, there have been attempts to acquire physical information without slowing down the flow of cargo at a port of embarkation. One system deployed at one of Hong Kong's sea port terminals, for example, would read the container's ID with object character recognition (OCR), measure its radiation profile (obtained with passive radiation monitors) and take a transmission x-ray image before it was to be embarked. This was done relatively fast because the objective was not to analyse the data immediately onsite. Instead, it was to be made available to the Customs authority at the destination country before arrival of the cargo. The expectation was that there would be time to study the data collected while the vessel was in transit, and thus the inspection on arrival would be better targeted.

From a law enforcement point of view, this system would work well because if the reviewed data was found to show an anomaly pointing to illicit drugs, arms, or other contraband, it would be fairly easy to deal with the situation on arrival, using conventional inspection techniques. But, when it comes to matters of national security, the situation would not be so forgiving.

Let's image a scenario where inspectors find that of the 2,000 containers onboard a vessel currently at sea, 10 have shown a high radiation reading (from the passive radiation detectors) and there are another 50 containers where the x-rays did not properly penetrate and thus show dark images of an area large enough to accommodate a nuclear weapon. Even if one knew the location of these containers in the vessel, it would be difficult to allow the vessel into the port with the knowledge that a nuclear bomb could go off before the local Customs officer could have a chance to inspect the container.

However, the concept of collecting physical data on the containers before shipment is a valuable one – if executed properly. It would have to be designed to enhance an ATS on arrival for matters of law enforcement, as well as to interdict cargo affecting national security before shipment. To do this, the systems must possess some degree of automatic detection or risk assessment for all containers.

The importance of automation and immediate actionable data cannot be stressed enough, as it is not simply a matter of collecting information for future use. Instead, it should be achieving a 'risk validation measurement' right away, so cargo of the highest consequence risk is not loaded on a vessel unless properly cleared.

The characterisation of risk therefore is multifaceted. Cargo can pose risk of various consequences: a nuclear weapon, drugs, contraband, money laundering, counterfeit, arms, tariff violations, etc. A given container may be considered risky because of the high likelihood that it carries illegal drugs, but it may have little chance of containing a nuclear weapon (and vice-versa). Having the ability to determine what *kind* of risk the container may pose would be invaluable, because it would allow the necessary inspection or diversion of the container, if necessary, at the appropriate point in the supply chain. For example, if a container measures a high fissionable material ranking risk, it should be separated immediately and further inspected before it is loaded on a vessel, whereas containers with measured high risk ranking for containing undeclared goods could be handled by conventional inspections by Customs on arrival at the country of destination.

A physical measurement of this kind could be possible with the use of conventional technologies supplemented by new emerging ones. As a way of example, Figure 1 shows a measurement station where containers are brought in, classified and sent directly for embarkation or for an inspection before embarkation. This generic station could be deployed outside a port and a secure chain of custody be used for final transportation to the point of embarkation.

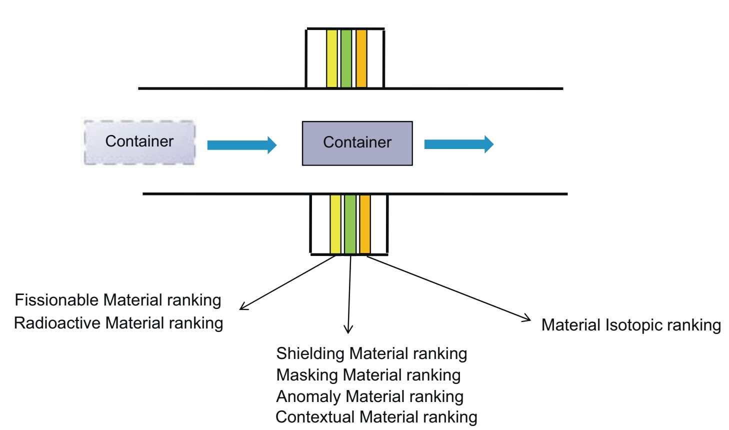

Figure 1: Verification Centre – Use of detection/identification technologies to obtain risk ranking information

As shown, there are a number of risk metrics which can be derived for each container:

- Radioactive material risk metric: This could be as simple as a yes or no ranking achieved by the use of passive radiation portals that would alert if they sense radiation. If the portal has the capability to identify the type of radiation, natural radiation common in many legal products could be ranked as lower risk than perhaps that of cobalt 60 which may be found in medical or industrial equipment.
- Fissionable material risk metric: The use of radiation portal monitors would not be enough to provide this risk metric because nuclear material like highly enriched uranium can be shielded from detection by passive detectors. Other methods using active interrogation beams and neutron detection could provide this metric.
- Shielding material risk metric: A number of technologies can be used to rank the risk of having shielding materials that could be harbouring threat materials or contraband, hiding them from conventionally used inspection methods like x-ray scanners. Density or mass, as well as atomic number determinations, in particular if done in a three dimensional readout, can rank this risk properly and automatically.
- Masking material risk metric: Shielding materials reduce or eliminate the ability of certain inspection probes to detect materials; masking materials are intended to be detected and found to be innocent or legal while rendering an illegal or threat material in their vicinity undetectable. A typical example is a nuclear material embedded in cargo with readily measurable radiation like bananas or ceramic tiles. By using active inspection technologies with the capabilities of providing a spectroscopic analysis of the radiation, measurements of specific isotopes can be made and a risk measurement of masking potential determined.
- Anomaly material risk metric: This refers to ranking the container by measuring material composition and determining there are anomalies. For

example, if a container is supposed to be full of bottles of water and no other cargo and a measurement in a given section is found to have high carbon concentration, then the risk rating of the container would be higher, even if the anomaly were not a threat (sugar, for example). There are a number of technologies and procedures that can address this.

- Contextual material risk metric: This ranking applies to anomalies which may be produced by the shape or form of the cargo. Many drug seizures are made this way, when an x-ray scanner will show that an object in a container has a different shape from the legal cargo in its vicinity. Material discrimination technologies can also be used to find possible contextual differences between an anomaly and surrounding cargo.
- Isotopic material risk metric: There are a few technologies which can determine the presence of a given material (actually isotope and isotopes ratios) which could provide a useful metric for certain risks. Certain concentrations of isotopes in a region of a container could be considered an anomaly or indicate the presence of an undesirable material: an explosive, a specific nuclear material, deviations in the quality or grade of certain cargo, etc. These measurements can be translated to risk indexes or be used for immediate action by authorities.

Facilitating trade

The proper design of the cargo verification installation and the use of non-intrusive, non-destructive and automatic measurements would ensure that containers do not get delayed. If anything, those containers with a validated manifest should experience improved facilitation given the lower probability of being characterised as high risk by the ATS of the Customs authority at destination.

Risk rankings could be produced in a number of ways, but if the facilitation of trade is to be improved, it is important that the measurements and data computations be fast and automatic. The flow of cargo in the facility should be such that the containers get classified first for the type of cargo they have, as this is an important factor determining how easy or difficult it is to obtain a reliable and meaningful risk measurement. In this sense, measuring some simple things such as weight, homogeneity of cargo, cargo density and so forth would allow the use of specific methods or technologies that can take the necessary metrics of risk.

One example of many is represented in Figure 2. Here, cargo containers arrive at the verification station, their serial number or ID is registered, then they get weighed, pass through passive radiation detection portals and are exposed to low energy x-rays.

This may appear to be the same thing as that which is already being done in some ports today. However, the difference is that this approach is not intended to perform the proper inspection to detect and identify a potential threat or contraband. Instead, it is a quick physical measurement to determine which container will undergo measurements with technologies/methods best suited to its cargo. In order words, it is a sorting operation – of the kind that is employed in many manufacturing processes. This approach ensures that the majority of containers will have their cargo ranked for risk quickly and by the simplest methods possible. The sorting stage does not require a driver to leave the vehicle used for transporting the container or the human analysis of an x-ray image – both factors which delay the flow of cargo.

Once the containers have been automatically sorted, there would be specific stations that can be designed to focus on one type of cargo or serve as swing stations, capable of taking different types should equipment be scheduled for maintenance. In Figure 2, three stations are shown but there could be one, two, or any number of stations. It would depend on the volume and most common cargo encountered at a given port terminal or border crossing.

Process 1 could be devoted to homogeneous, low density cargo, for example. The process for a thorough measurement would be done with low energy interrogation beams (lower cost of equipment and infrastructure). It would be likely that the vehicle driver would stay in the cabin while the container is scanned. Process 1 would be the fastest to go in and out of the verification centre, keeping in mind that this is just measuring data and not inspecting the container as a Customs operation.

Process 2 could be devoted to heterogeneous cargo, low or medium density cargo where a region in the

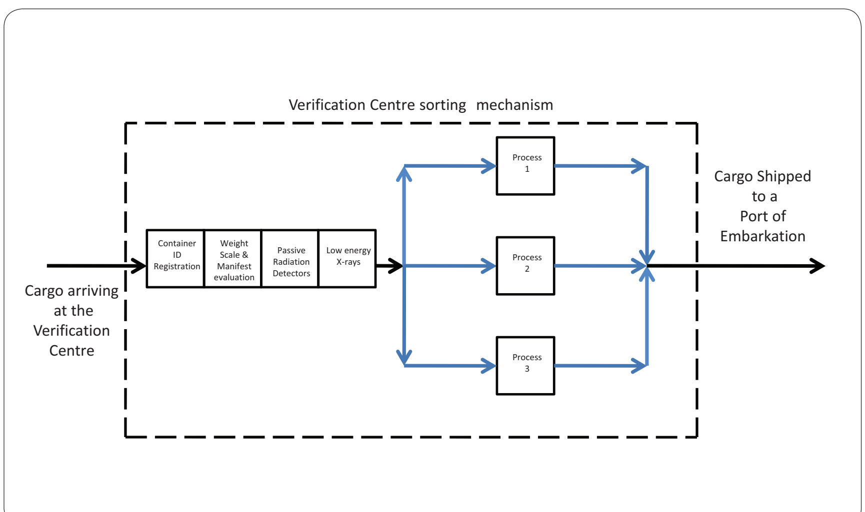

Figure 2: Verification centre – Use of conventional technologies to sort containers

container could have high density material i.e. the low energy x-rays in the sorting station did not penetrate sufficiently. This station would perhaps require the driver to step out of the vehicle in order to use higher energy (more penetrating beams). The measurements would not require the analysis of data by an operator, like in a Customs inspection of high risk containers. Here, the high energy beam is used to probe the cargo and extract information about its density, atomic number and other automatic measurements which can be computed into a risk index, thus a physical evaluation of risk. Should this station locate and send an alert for a high atomic number material, which could indicate a purposefully placed shielding object that is masking contraband or threats, the risk ranking of the container would increase accordingly. There are technologies which can in less than a minute map the full content of the container, providing specific three dimensional locations for each atomic number material (in essence locating anomalies). This information could automatically be registered in the risk evaluation metric.

Process 3 would be used for the most difficult to measure cargo: for example, those which are heterogeneous, dense or otherwise very challenging to an inspection process. Here the driver of the vehicle would certainly have to step out to allow for the use of the highest penetrating beam possible. There are new technologies that can quickly process the discrete data obtained, consistent with the type of materials encountered. This is in contrast to obtaining a transmission x-ray image which may not distinguish properly between legal and illegal cargo or threat materials and would take an inspector many minutes to attempt a characterisation. With fully automated systems, the cargo would be ranked for risk in a variety of categories i.e. the probability it contains chemicals, drugs or for having any type of inconsistency.

Every container exiting the verification centre *en route* to the port of embarkation would be assigned specific risk ratings and a composite total risk rating. Unlike having to transmit full image data overseas of thousands of containers every day, the data is concise, it can be easily encrypted and it will not create any network delay. This data can also be easily read on the receiving end by an inspector, or it can be incorporated into the algorithms used by an ATS which would determine which containers on arrival should be considered high risk and sent for Customs inspection.

Security versus law enforcement

Previously, I have focused on the distinction between national security and law enforcement issues in relation to the inspection of cargo containers. This is an important concept when it comes to the design and the operations of a cargo verification centre as shown in Figure 2. You may notice that in it there are only flows of cargo entering and exiting the centre to be embarked or exported. There is no cargo delayed, intercepted or removed from the supply chain. This scenario would be suitable if one expects any interdiction to take place only on the cargo's arrival where the local Customs organisation may decide to inspect the container.

If we take a look at the different risks for which a container may be ranked, it is easy to see that these should determine where in the supply chain the actual inspection and potential interdiction of cargo should take place. Some of the risk metrics discussed in this feature would be more relevant to national security purposes and others more to law enforcement. The distinction may be arbitrary but in this case I make it based on the consequences of an event, rather than on the probabilities of occurrence. In the case of a container carrying a nuclear weapon, the consequences of a nuclear event are very severe to a nation while a container carrying illegal drugs is not good for a nation, but not to the degree of immediately impacting its national security. Of course one could argue that national security could be affected if the flow of drugs is rampant, yet the destruction of the nation is not immediate. Therefore, a high risk metric for nuclear materials should be dealt with immediately i.e. before the

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container is shipped. A risk metric for drugs, however, could be dealt effectively on arrival of the container at the country of destination.

Therefore, a slightly modified verification centre operation could be considered. Any container going to a land border crossing or port for export would receive a physical verification with the ability to interdict high risk cargo of a national security basis. This is shown in Figure 3.

If the country of embarkation considers the national security of its trading partners, it would have an incentive to have on its soil a slightly different verification centre. The one represented in Figure 3 includes the advantages of the previously explained verification centre, in that it:

- serves the purpose of aiding its trading partners' Customs operations by providing them measured data to make the partner's automatic targeting system more robust, and
- benefits the supply chain industry, by reducing the probabilities of improperly classifying a container as high risk with the consequent delays at Customs on destination, plus
- would interdict any cargo destined to its trading partners, which could carry nuclear materials or a nuclear weapon.

As Figure 3 shows, the low x-ray scanning previously used to measure the cargo density or attenuation is now replaced by a higher energy interrogating beam capable of generating a measurable signal for the presence in the container of fissionable materials. There is a slight drawback in that the use of higher energy beams may require the driver to leave the vehicle which would delay the process somewhat.

The number of containers measured in this way that would trigger their separation from the supply chain and sent to be inspected by the proper authorities would be very low. Cargo containing shielded highly enriched uranium or plutonium is not likely to be a frequent occurrence. When it does occur, however, it should be separated and dealt with by the proper authorities. There should be few instances in which depleted uranium (also a fissionable material) could be found in the cargo as part of legally transported goods (certain military and industrial materials where depleted uranium adds hardening qualities).

Even if properly declared as such in the cargo manifest, there could still be shielded highly enriched uranium or shielded plutonium in a masking attempt to smuggle them. Therefore any trigger for the presence of fissionable material should prohibit sending the container to the port for embarkation before it can be properly inspected by the local authorities. As mentioned, the number of cases in which this would happen is low, so such inspections could be done manually or with portable detection methods, if the cargo can be unloaded. However, there are technologies that could differentiate between depleted uranium and highly enriched uranium or plutonium. Some of these are the same as the ones that could be used in the verification centre (most likely in processes 2 and 3) in Figure 2. Should there not be undeclared shielded or unshielded highly enriched uranium or plutonium, the container would not represent a national security issue and thus could make the voyage with the certainty (high risk ranking) of being inspected by the Customs organisation at destination. There are, of course, many variations to this concept.

The main point of this discussion is that we should not just consider cargo container inspections as one monolithic operation only done by Customs on arrival at a country. There are many ways of measuring physical data that can make any risk management methodology more robust and effective and in the world we live today, these should definitely be used.

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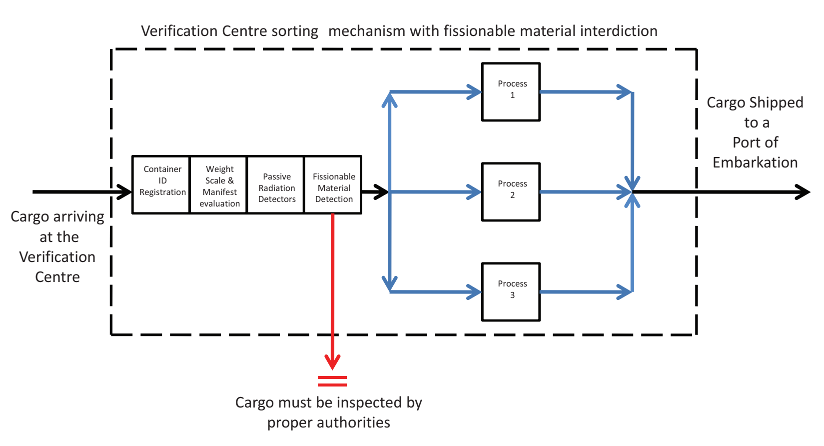

Figure 3: Verification Centre – Inspection only for high risk containers on national security grounds