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100% Container Scanning *It is Possible*

New technology, already in use by a major terminal operator, puts the requirement for 100% scanning of all inbound containers back on track. The breakthrough, however, represents so much more than that.

By Joseph Keefe

In July 2007, U.S. legislators passed a law requiring 100% scanning of U.S. bound containers at their last foreign ports by the year 2012. That federal requirement nearly died a quick death recently but has received a reprieve of sorts. Originally scheduled to take effect July 1, Homeland Security Secretary Janet Napolitano in May of 2012 notified Congress that she would use her authority under the 2007 law to delay implementation by two years. Napolitano said systems available to scan containers would result in a negative impact on trade capacity and the flow of cargo, and that some foreign ports do not have the physical characteristics needed to install such systems. If the last part was true then, however, it may not necessarily be the case now.

As reported in our 1Q 2012 edition of ***MarPro***, pilot efforts were established at several foreign ports under the Secure Freight Initiative (SFI) targeting in-bound containers for weapons of mass destruction (WMD) prior to loading. Objections by trading partners surfaced and were confirmed by the Government Accounting Office (GAO).

In her testimony before the Senate Commerce, Science and Transportation Committee, DHS Secretary Janet Napolitano said in part, "DHS has learned a great deal from these pilots, but it has also encountered a number of steep challenges. Some of

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Decision Sciences maintains that 100% container scanning is possible without bringing commerce to a crawl.

these issues relate to the limits on current technology. Technology doesn't exist right now to effectively and automatically detect suspicious anomalies and cargo. This makes scanning difficult and time-consuming. …Therefore, DHS is compelled to seek the time extensions authorized by law with respect to the scanning provision." At the time DHS's Science & Technology Directorate (S&T) had already spent nearly $10 million on efforts to develop a container security device; to no avail.

New Technology: New Hope for Compliance

As the U.S. government continues to try to find a solution to its own scanning requirements, it also continues to fund testing when a promising solution comes to light. In September of last year, Decision Sciences International Corporation (DSIC), a provider of security and detection systems, announced that it was awarded a $2.7 million contract by the DHS Domestic Nuclear Detection Office (DNDO) for an Advanced Technology Demonstration (ATD) of its Multi-Mode Passive Detection System (MMPDS). Under the contract, DSIC supports government testing of MMPDS intended to evaluate the system's effectiveness and readiness for transition to production. Before that, Decision Sciences was awarded another contract – this one worth $400,000 – by the U.S. Department of Defense to test muon tomography based scanning systems capable of detecting explosives.

The Multi-Mode Passive Detection System – how it works

Based in Chantilly, VA, with a development/production facility in Poway, CA, DSIC and its 27 employees and contractors hope to bring together hardware and software development, systems integration and cutting edge science to improve the safety and security of global commerce. Based on patented technology invented by scientists at the Alamos Na-

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> Our system is 100% passive; we don't generate any additional energy. We simply use the existing cosmic ray 'muons' to do the scanning. When cosmic rays hit the upper atmosphere, they create showers of atomic particles. One of the particles is a muon. High in mass, muons travel at near the velocity of light. Because of this, muons penetrate materials ... even very dense materials ... readily.

Dr. Stanton D. Sloane,
DSIC President and CEO

tional Laboratory, the Multi-Mode Passive Detection System (MMPDS) was developed with private sector investment and expertise. MMPDS is billed as a safe, effective and reliable automated scanning device for detecting unshielded to heavily shielded nuclear and radiological threats. In reality, and as ***MarPro*** found out during a focused site visit in Freeport, Bahamas, the system does so much more.

DSIC's passive scanning technology uses naturally occurring cosmic ray muons to detect potential threats in cargo, vehicles and other conveyances. DSIC President and CEO Dr. Stanton D. Sloane explains, "Equipment can generally be classified into two main categories; active and passive. Active systems include x-ray and/or radiation technologies. In other words, they add some sort of radiation or energy to the environment. Our system is 100 percent passive; we don't generate any additional energy. We simply use the existing cosmic ray 'muons' to do the scanning. When cosmic rays hit the upper atmosphere, they create showers of atomic particles. One of the particles is a muon. High in mass, muons travel at near the velocity of light. Because of this, muons penetrate materials ... even very dense materials ... readily.

Normal cosmic radiation is 5000 muons per minute and penetrates through lead, steel, concrete and just about anything else. Sloane adds, "That's really the breakthrough technology. We have upper and lower detectors. As the muons go through the upper detector we calculate their trajectory. As they go through the bottom detector, we calculate their trajectory and we look for a change in that track. The angular change of the track is a function of the density of the material that the muons go through. The denser the material that the muons penetrate, the larger the angular change."

Beyond the efficacy of the system is its vivid imagery of the inside of the container it is scanning. With x-ray machines, if something is found, the container must be taken to the side, analysis performed and

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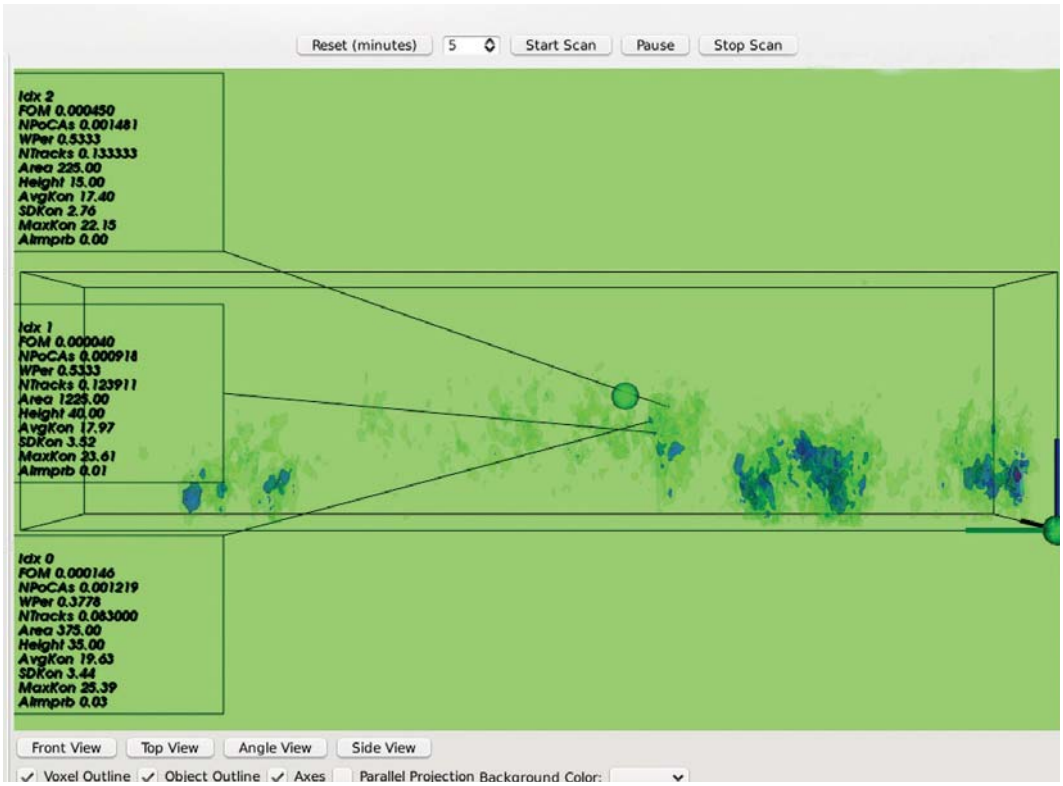
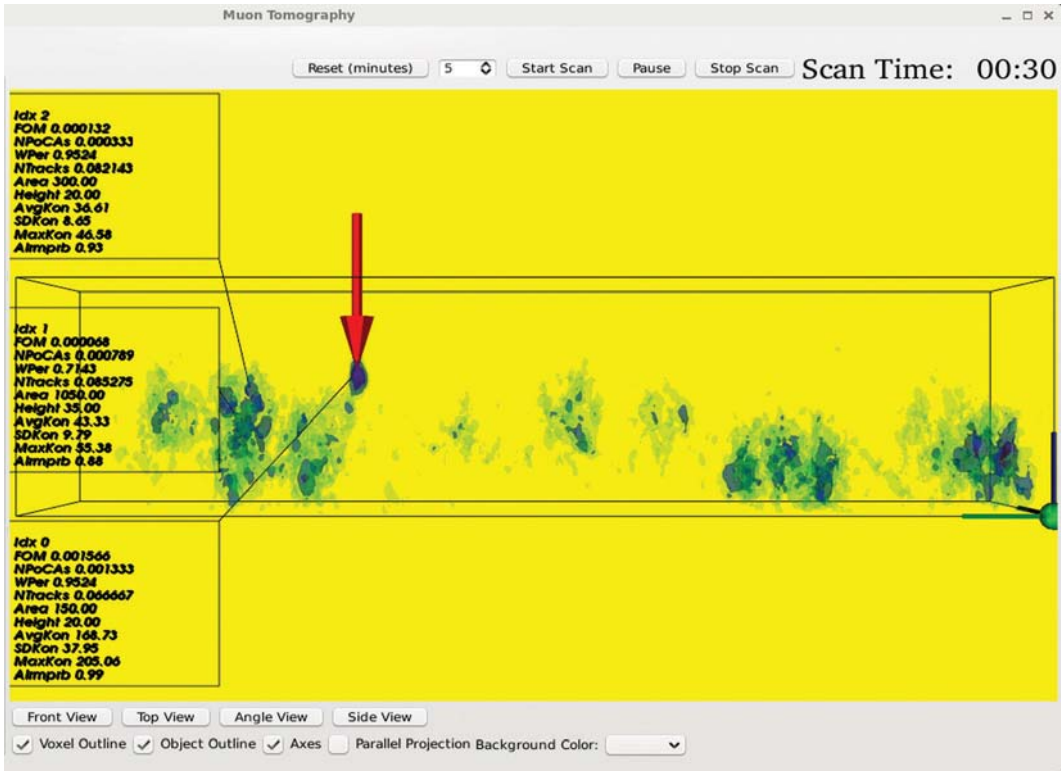
What's in that Container?

Truck #1 – Medium Density with Naturally Occurring Radioactive Material (NORM).) Successful scan is elevated non-localized radiation (gamma marker or "ball"), no Muon Tomography (MT) objects located, clear container.





If a threat is detected, MMPDS automatically alerts the operator. Threats are located in three dimensions within a few inches in the container.

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delays to the container magnified. Not so with Decision Sciences technology: false positives are eliminated because the density of typical items – and the dangerous ones too – can be catalogued.

Testing – Proving the System

According to Sloane, private investment saw a need, found technology, and put together the solution. They did that, by Sloane's estimation, "Fairly quick by U.S. government standards. The talk of repealing the 100 percent scanning requirement was therefore distressing because it threatened to eliminate the entrepreneurial incentive in the marketplace to create and invent the solution." As it turned out for DSIC, this was not a problem.

In January, ***MarPro*** traveled to Freeport to get a firsthand look at the technology. A demonstration involving four trucks, each towing containers in the usual fashion, showed that each could be easily driven into the scanner through a normal traffic lane. Scanning for each took 50 seconds or less – or in other words, in less time than it took for the driver to interface with Customs, exchange documents and clear the truck for departure. The configuration can be scaled up or down as needed, for high traffic facilities. Sloane insists, "A principal design parameter of the technology is that it should not impede the flow of commerce."

As a part of the requirement for an acceptable system, the scanner has to be automatic or in other words, provide a green or red indicator. No operator interpretation is needed. Consistent with the initial intent to eliminate the need for expensive, extensive training and/or the need to make judgment calls, the system showed itself to be fully operational and able to detect partially shielded and completely shielded nuclear threats. But, in reality, the system's utility extends far beyond mere nuclear detection capabilities.

Through a contract with DoD, testing the detection of other materials is underway now. This involves a software change, says Sloane, but not to the technology itself. And a testing mechanism is built into the system, the results of which can be remotely transmitted elsewhere to make sure machines are working properly. Sloane added, "We believe we are the solution. The technology had not been converted into an operationally useful system prior to this, so I think the objections to the 100 percent scanning are based on previous technologies. I think we've addressed all of the issues that have been raised by all of the people who are in opposition to the 100% scanning requirement."

Feasibility & Cost

According to DSIC, their passive solution is significantly less expensive – perhaps as little as 25% of the cost of active scanners. The machines – the detectors – are made out of aluminum tubes and as a result, are very scalable closer together. The pilot program set-up at the Hutchinson Container Terminal located at Freeport, Bahamas, for example, is designed so that entire tractor trailer can be driven into the system without having to take anything apart or interfering with the flow of commerce. And one scanning machine, unlike x-ray or active systems, can handle multiple lanes at once, giving real economy of scale to the system.

Unique Partners – Real Results

The DSIC partnership at Freeport is with Hutchinson Ports, who operates the Freeport Container Terminal. Hutchinson also operates 52 ports in 25 countries around the globe. The partnership, says Sloane, was not undertaken lightly, nor should it be viewed as a one-off deal. He says, "Based on our initial successes here, the Hutchinson management is encouraging other ports to look at the technology." He adds that the system, deployed under public/private partnerships, would not require the U.S. or foreign governments to fund it. Instead, a 'pay per scan' system could be employed.

Testing will continue through next summer. And the partnership with Hutchinson, with its footprint in ports all over the world, makes a great deal of sense. Experienced in transshipment, Hutchinson's Freeport terminal is more than just a container port. The DSIC scanner and traffic lane there is set up to

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mimic a high traffic port; something Freeport may someday aspire to be.

At Freeport today, only 1% of containers that arrive go in and out of the facility. Primarily a transshipment point now, it could become a very important one for East and Gulf Coast ports in the very near future. Although only handling 1.2 million container TEU's annually, the deep draft port is capable of accepting 9,000+ TEU ships. And, the Bahamas is looking quite seriously at the Panama Canal expansion, preparing now to handle vessels and cargo from post-Panamax ships that might be too big and deep for US ports and infrastructure.

For Hutchinson, DSIC and the Bahamas, the possibilities are endless. Industry insiders complain that the hassle at U.S. ports for inbound containers can include a four to six day wait for clearance, something which could be avoided by pre-screening – as the U.S. laws intended – in Freeport and cargo then transshipped via niche, feeder vessels to the U.S. mainland. The Bahamas already has a rich history in transshipment – oil and crude oil have been handled here in that fashion for decades. That's not just a model; it's a proven concept.

Leverage the Cost: Expanded utility, economy of scale

DSIC President Sloane claims that they could be up and running in production with added plant space within two to three months of approval of their technology. Installation would take six months initially; eventually as little as four months – much of that construction involving the set up of multiple traffic lanes. Scaling up for production would be a function of investment in the technology. The passive technology has no complicated high energy outputs or shielding necessary for employees. Unlike bigger, more dangerous x-ray machines, the scanning unit itself would fit into a small closet.

Advantages of the Decision Science scanning solution include a low physical footprint, no dangers (radiation), one machine can scan 3 lanes of traffic and using redundant power sources, the system could run for as much as a month on backup power. And, how much quicker could a container facility in the port of NJ/ NY come back up to speed in the wake of a calamity such as Sandy or a deliberate interruption of power designed to sidestep an effective scanning program?

This summer, more stringent testing with the federal Department of Nuclear Detection Office (DNDO) will include blind testing with various materials to determine the viability of machine. But, as ***MarPro*** already discovered in the Bahamas, the DSIC scanning analysis already can see the scale and density of various objects, and will eventually cross reference with pictures of each and manifest data for each container. Plans are also underway to collect data for existing machines, providing expected response of scans for a particular type of cargo and then to program the computers for *"what if"* scenarios for deviations. For example, the machine's alarm could be set to detect Gold smuggling by simply setting parameters for that material's unique density.

In the end, the ultimate utility of the Decision Sciences technology could extend far beyond its intended goal of effectively meeting the requirements of U.S. scanning laws. This system could be used by Customs and Border patrol personnel to detect and seize contraband, and because it is passive and operates without harmful radiation, will be extremely effective in checking for human trafficking, stowaways and myriad other illegal activities. Finally, and when measuring the cost of system, buyers need to think far beyond the obvious nuclear threat.

The idea that commerce-friendly, effective and safe 100% container screening can be put into widespread practice appears to be alive and well. For now, that concept is confined to the confines of a happy container terminal operation on a small island just off the coast of Florida. And unless something changes between now and the end of some focused U.S. government vetting of DSIC's new technology, Janet Napolitano's edict that "technology doesn't exist right now to effectively and automatically detect suspicious anomalies and cargo" might just have to be amended. Let's hope so.

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