PJMurray
Associates, Inc.

Global Leader in Risk Management Solutions

Cargo Container Vulnerabilities

Prepared as an informational tool for organizations such as:

International Organization for Standardization (ISO) The World Shipping Council (WSC) & The Organization of American States (OAS)

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P.O. Box 472627, Charlotte, NC 28247 / Ph. 704.844.8600 / Fax 704.849.9197
information@pjmurrayassociates.com / www.pjmurrayassociates.com

I. Right Container Door Manipulation

The right door hardware has long been considered the Achilles' Heel of oceangoing container security. Through the accompanying pictures and schematics, you will see that the method used to defeat the locking bar handle is relatively quick and efficient and can be accomplished with nothing more than a hammer and chisel.

Several years ago when this method first appeared, the perpetrators would use a steel chisel and hammer to remove the rivet from the door handle. Now, as you can see from Exhibit 1.1, a power drill is often the preferred tool.

Exhibit 1.1

The handle can then be dropped out of the handle hub and the door easily opened without disturbing the high security seal (Exhibit 1.2).

Exhibit 1.2

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In earlier instances, the perpetrator – after pilfering the container – would then recover the original rivet from the ground and hammer it back into place, hoping that the rivet would hold for the duration of the shipment. As perpetrators became more adept, they began replacing the rivet with a pre-cut carriage bolt that was then inserted into the handle hub and secured with a locking nut (Exhibit 1.3-1.5).

Exhibit 1.3

Exhibit 1.4

Exhibit 1.5

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After worldwide bulletins alerted inspectors to the above methods, perpetrators began manufacturing a device that duplicates the head and tail of the called for rivet (Exhibit 1.6-1.8).

Exhibit 1.6

Exhibit 1.7

Exhibit 1.8

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Today's container inspection practices instruct the security inspectors to be mindful of these methods and to pay particular attention to the door hardware during their security inspection protocols.

II. Left Container Door Manipulation

Throughout the 50 year evolution of oceangoing shipping containers one of the rare standards has been that the left door is closed first followed by the right door. The right door is then secured with appropriate high security seals or other locking/securing devices. While the right door, in almost all cases, does not overlap the left door, it does provide somewhat of a sealing/weather resistant feature by allowing the rubber gasket surrounding the right door to overlay the left.

Until recently (2004), it was usually considered adequate to only secure the right door. However, that is no longer the case. The explanation and pictures that follow substantiates conclusively that the left door can be easily breached and that previous efforts at securing only the right door are for the most part of no security value.

To explain the process we will begin with the tools required. They are three in number, most basic in nature, and easily acquired or fabricated. The first is a metal bar similar to a breaker bar that has two hardened steel tabs welded to the end (Exhibit 2.1).

Exhibit 2.1

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The function of these tabs is to sandwich the Customs Plate affixed to the right container door. It is the common practice of container manufacturers to install a Customs Plate in order to prevent the intrusion method we are describing. The leverage provided by the breaker bar allows a single perpetrator to bend the plate back at a 90-degree angle from the container door (Exhibit 2.2-2.3).

Exhibit 2.2

Exhibit 2.3

The handles of the left door are then opened and the left door is forcibly pulled past the rubber gasket of the right door. The container is now open for theft, pilferage, or the insertion of WMEs or other explosive devices.

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To return the left door to its proper closed position the breaker bar and the other two tools (a spray bottle full of liquid detergent and a small hooked probe similar to a very large crochet hook) are all that is required.

The liquid detergent is sprayed liberally on the gasket material to soften the rubber and enhance its pliability. While the "crochet hook" is used to work the gasket out in front of the left door as it was in its original position.

Once the gasket has been restored to its original configuration, the bar tool is again used to bend the custom plate back to its original position. The only tell tale signs of manipulation are a crack in the paint of the customs plate, which will likely not be noticed in a container inspection and the liquid residue from the soapy solution, which will quickly evaporate – again leaving no sign of intrusion. The following video demonstrates left door manipulation technique as described above **(To play video: Double-click on image below, then find CD drive folder, then select Left Door Manipulation Video.mpg file)**.

Until such time as container door manufacturing is improved to prevent this method of container intrusion, we strongly recommend the use of locking and/or sealing devices that engage the vertical locking bars of both the left and right container doors (See section IV). It is only through both doors being properly secured that door intrusions will be avoided.

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III. High Security Seal & Other Container Vulnerabilities

A. High Security Seals – The issue of high security seal integrity and the manipulation of the seal itself is a subject that has been addressed frequently over the past two decades. It has long been known in the maritime security community that manipulation of the HSS itself preceded later efforts to defeat door hardware.

Past standard operating procedure often allowed the trucker performing the origin dray to affix a HSS to the container upon completion of the loading process. This practice allowed an unscrupulous driver the ability to manipulate the seal itself. This manipulation took several forms:

- Filing off the edge of the locking ring groove on the stem of the HSS bolt
- Removing the locking ring and shortening its length using wire cutters
- Wrapping dental floss around the stem groove to prohibit the locking ring from functioning properly
- Securing a formerly compromised seal with epoxy or other adhesive

The unscrupulous driver would then dray the container from the loading site to a safe location where he would then open the manipulated seal and pilfer the cargo. The perpetrator would then remove the dental floss or other foreign materials and correctly affix the HSS to the container.

With that in mind, an inspection protocol should include physically pulling on the HSS to ensure that it is firmly seated. Additionally, the bulbous end of the HSS should be twisted or turned to demonstrate that it turns freely and is not hampered by epoxy, dental floss, or other foreign materials.

B. Door Removal – While it is widely held primarily in the importer/exporter community that the entire door has sometimes been removed to gain access to the container, we have seen this method used in only the rarest of occasions.

As demonstrated in Sections I and II of the instructional piece, it is far easier to gain entry into the container using methods that do not require either the machinery or manpower that would be necessary to remove the container doors. Similarly, it should be remembered, that today's cargo containers are manufactured in such a way that the door hinges are not easily accessible.

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C. Container Walls – Another method utilized by perpetrators is to cut holes into the walls, floor or ceiling of the container in order to access the container cargo. Sections of the wall or other surfaces are removed and then re-affixed using epoxy, aluminum rivets, or even duct tape. It is essential, therefore, that inspections include an examination of the container walls, floor and ceiling, and that the inspectors are trained to identify legitimate container repairs from those performed by cargo thieves.

IV. Alternative Security Container Initiatives

Due to the shortcomings of the container door hardware for high security seals, new container-locking initiatives have been introduced. To follow are examples addressing the benefits and weaknesses of several alternate locations for locking devices.

A. Secura Cam – This method, originally developed by Maersk-Sealand several years ago, is again gaining traction in the container manufacturing industry. However, while it avoids the door hardware weaknesses mentioned earlier, it too is not the ideal solution for the reasons below.

Weaknesses to CAM Lock:

- Position at bottom of container renders it liable to damage
- Location on container hampers seal inspection procedures
- Does not address left door vulnerability
- Only able to be fitted to new build containers

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B. Pardo Hole – The Pardo Hole, named for CBP's Ray Pardo, calls for a ½" hole to be drilled into the locking rod and bottom bearing bracket. A HSS probably with a longer than normal stem would then be inserted horizontally in this hole. This technique prevents perpetrators from gaining access via the door handle breach method because while tampering can occur at the door handle, the Pardo Hole with an HSS will prevent the door from opening.

Weaknesses to Pardo Hole:

- Ability of installers to properly modify existing containers (drilling straight hole while avoiding huck bolt)
- Eventual corrosion and subsequent failure of locking rod
- Expense associated with altering the legacy fleet and new build containers

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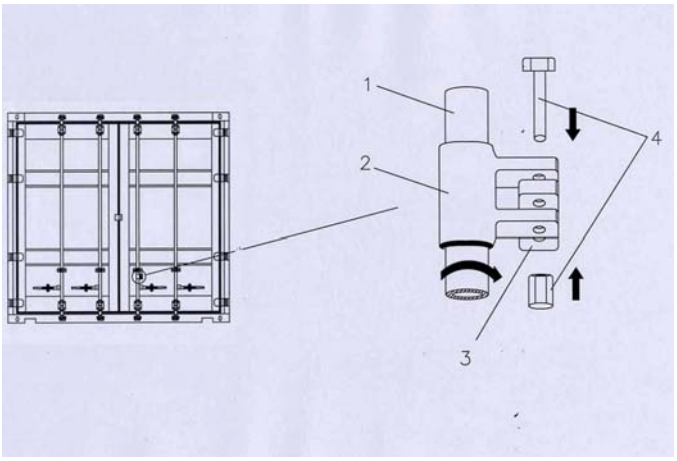
C. P&O Nedlloyd Alternative – The P&O alternative is a tubular collar fitted on the locking rod above the right door handle. This initiative, again, prevents a door handle breach by fixing the HSS to an alternate location. The P&O device can be welded as a retrofit to the legacy fleet as well as made part of the manufacturing process for new builds.



1. Locking Rod
2. Collar
3. Door Tab
4. Bolt Seal

Weaknesses of P&O Nedlloyd Alternative:

- Does not address left door vulnerability
- Expense to retrofit the legacy fleet of containers, which is estimated to be 14-15 million units
- Added expense to manufacture

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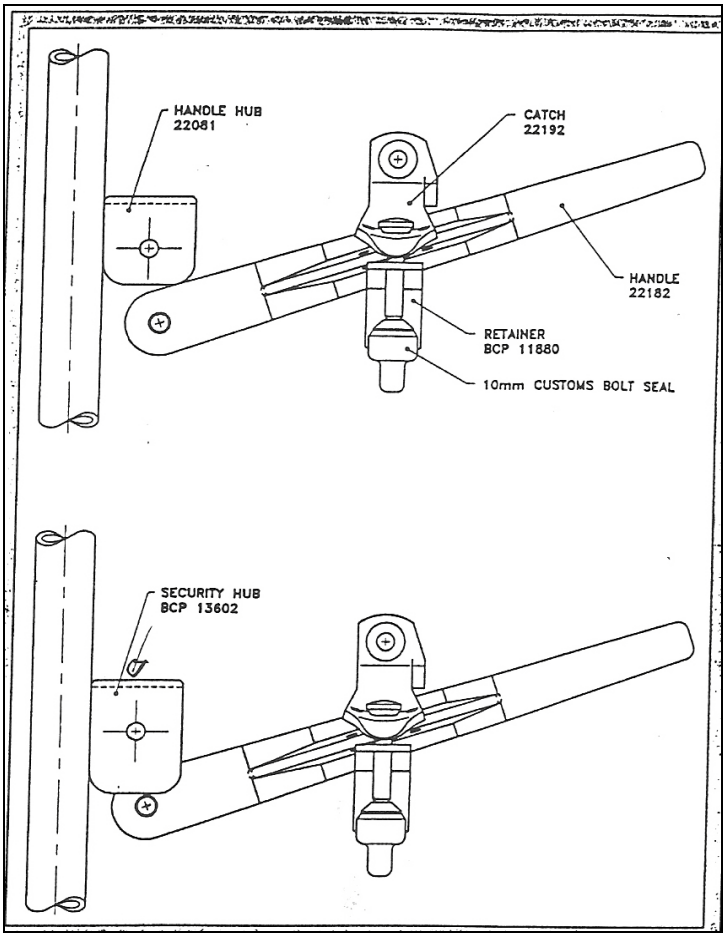
D. Handle Hub, Security Hub and Rivet Weld – Within the door handle manipulation detailed earlier, two weaknesses are apparent. The first is that once the handle hub rivet is removed it is relatively easy to lower the door handle and move it free of the handle hub. For that reason, it is recommended that container manufacturers utilize an elongated handle hub known as a Security Hub. This elongated security hub prevents the handle from being removed (See schematic below).



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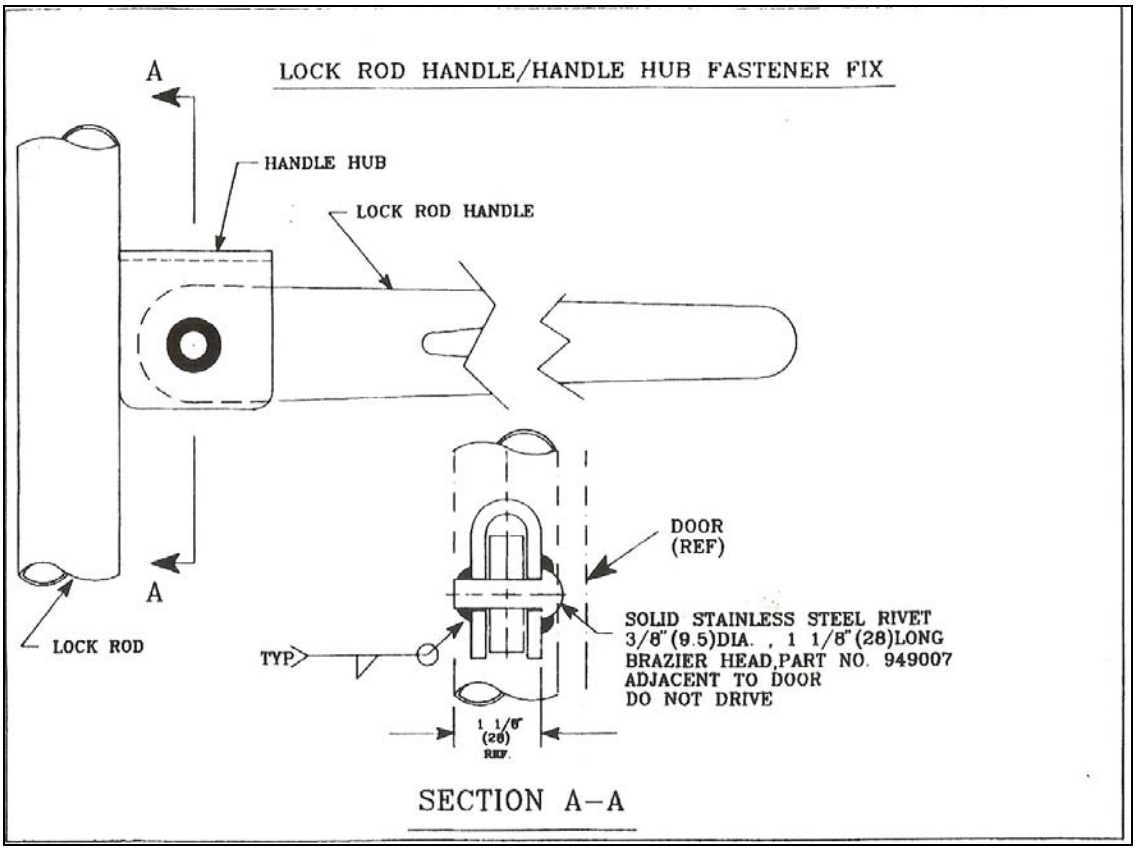
Another weakness detailed earlier is the ease with which the rivet can be removed from the handle hub. This vulnerability can be mitigated through the installation of a 3/8" by 1-1/8" **stainless steel** rivet with the rivet head towards the container door. Then the rivet is welded to the locking handle hub on both sides (See schematic below). The handle should then swing freely when completed.



Weaknesses of Handle Hub, Security Hub and Rivet Weld:

- Does not address left door vulnerability
- Expense of retrofitting legacy fleet of containers

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E. Locking bars and Cable Seals – Traditional locking bars and barrier devices, while adequately securing both the left and right doors, provide only a false sense of security. Once removed, their absence is likely to go unnoticed because the container's primary seal would still be intact and affixed.

Locking Bar

Cable Seal

Weaknesses of Locking Bar and Cable Seals:

- Locking bar and cable seal does not incorporate acceptable high security seals
- Upon removal of locking bar or cable seal, absence will go unnoticed

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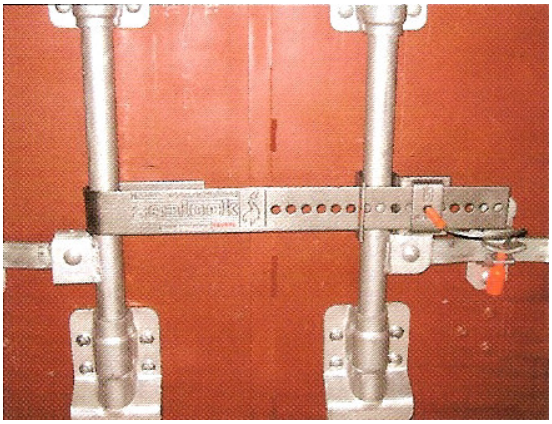
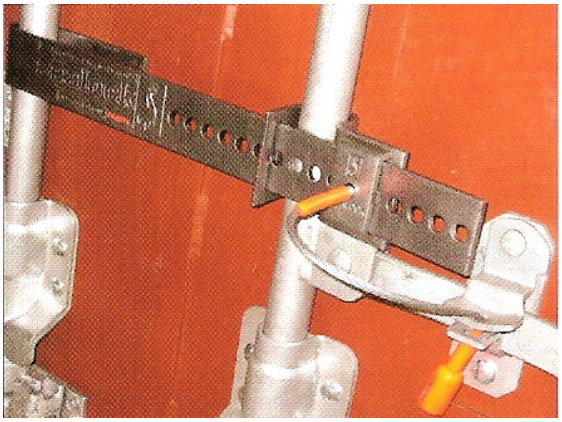
F. Locking Bar Incorporating HSS – Our research has identified a system which offers the distinct benefit of securing both the left and right door ***while also*** incorporating the high security seal within its locking mechanism to create a complete sealing and locking system. The Sealock Security System provides the benefits of both – a steel locking bar and a HSS. To remove the Sealock system and gain access to the container, perpetrators would also need to remove the HSS thereby making its absence immediately noticeable at an inspection gate.



Sealock Security System

The Sealock is unique in that the same numerical sequence appears on all three components for added security. The Sealock systems meet and exceed all ISO/PAS 17712 and ASTM "F" 1157 standards, and are C-TPAT compliant.



Sealock Security System

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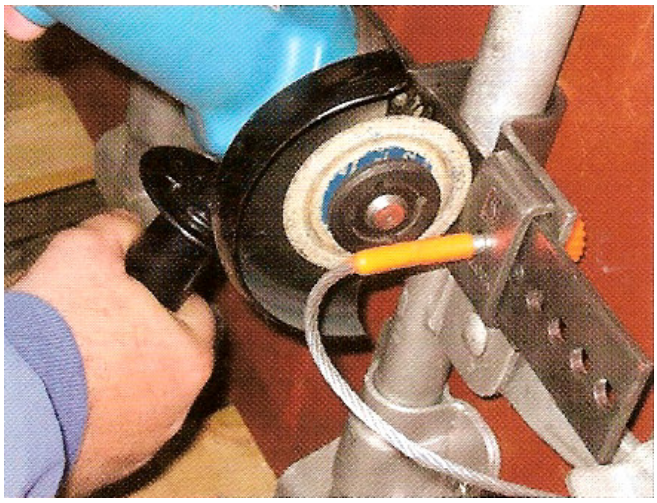
The preferred locking bar/HSS combination, such as the Sealock, must be of all-steel construction, resistant to most break-in methods, and require a power-cutting tool for removal. Most perpetrators breaking into containers will do so as a "crime of opportunity" and will not normally be equipped with a power-cutting tool.



Systems that both lock the container door and integrate a HSS within the same device provide significant benefits, including:

- Securing both the left and right container doors
- Incorporating the HSS within the locking mechanism to inhibit HSS tampering.
- Requiring a power-cutting tool to remove, preventing break-ins from thieves who generally do not carry such sophisticated equipment.
- Allowing easy recognition by inspectors if tampering has occurred.

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V. Summary

The preceding material researched and developed by PJ Murray Associates, Inc. accurately depicts container vulnerabilities as identified in July 2005. It is anticipated that as enhancements to container security are developed perpetrators at the same time will continue to develop counter-measures to defeat those enhancements.

It is essential; therefore, that world and domestic regulatory bodies i.e., the IMO, ISO, WCO, OAS, USCG, and CBP become fully knowledgeable in container invasion methods outlined within this analysis and incorporate that knowledge into their rule-making and regulatory efforts.

It is also critically important that container inspection protocols are developed and faithfully followed by inspectors around the world. For it is only through the inspection process that these methods, as well as the next generation of manipulation techniques, will be counteracted.

Additionally, the port and terminal operators and the vessel common carriers each have a part to play in the identification and mitigation of cargo container vulnerabilities. It should be remembered that the terminal operators and ocean carriers often times form the first line of defense in our industry war against terrorism and cargo theft, and therefore materials contained in this analysis and other sources should be incorporated into their operational procedures and security awareness training.

Lastly, PJ Murray Associates, Inc. would like to thank the World Shipping Council for the chance to partner in the development of this analysis and we welcome the opportunity to continue our efforts with the WSC in the future.

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