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14. ABSTRACT

Maritime container security has been identified as a critical vulnerability in the U.S. national strategy to prevent a terrorist attack on the United States. Since the attacks of September 11th, 2001, there has been an increased interagency effort to close the security gaps in the maritime domain, with the U.S. Coast Guard (USCG) acting as lead agent. Maritime security initiatives have been implemented and the security posture has been improved, but progress has often been measured by efficiency-based level of effort rather than by effectiveness that is objective-based. Development of objective-based measures of effectiveness (MOEs) can be accomplished by analyzing previous similar low-intensity conflicts, such as counterdrug and humanitarian assistance operations. From these, operational commanders today may develop objective-based MOEs for their decision-making process in order to properly allocate limited resources. This paper proposes guidelines that any operational commander could use to develop objective-based MOEs. The purpose of this paper is not to present an exhaustive list of specific MOEs that should be used in the maritime container security domain, but rather to offer guidelines for developing objective-based MOEs that can serve as effective tools in the decision-making process.

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DEVELOPING OBJECTIVE-BASED MEASURES OF EFFECTIVENESS FOR MARITIME CONTAINER SECURITY

By

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A paper submitted to the faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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17 May 2005

Abstract

Maritime container security has been identified as a critical vulnerability in the U.S. national strategy to prevent a terrorist attack on the United States. Since the attacks of September 11th, 2001, there has been an increased interagency effort to close the security gaps in the maritime domain, with the U.S. Coast Guard (USCG) acting as lead agent. Maritime security initiatives have been implemented and the security posture has been improved, but progress has often been measured by efficiency-based level of effort rather than by effectiveness that is objective-based. Development of objective-based measures of effectiveness (MOEs) can be accomplished by analyzing previous similar low-intensity conflicts, such as counterdrug and humanitarian assistance operations. From these, operational commanders today may develop objective-based MOEs for their decision-making process in order to properly allocate limited resources. This paper proposes guidelines that any operational commander could use to develop objective-based MOEs. The purpose of this paper is not to present an exhaustive list of specific MOEs that should be used in the maritime container security domain, but rather to offer guidelines for developing objective-based MOEs that can serve as effective tools in the decision-making process.

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INTRODUCTION

On the night of January 15th, 2005, a crane operator at the Port of Los Angeles discovered thirty-two Chinese illegal immigrants stowed away inside two cargo containers on a Panamanian-flagged vessel.[1] A container security lapse of this magnitude causes one to ponder U.S. vulnerability to terrorist acts originating from inbound maritime cargo containers.

Maritime container security has been identified as a critical vulnerability in the U.S. national strategy to prevent a terrorist attack on the United States. Since the attacks of September 11th, 2001, there has been an increased interagency effort to close the security gaps in the maritime domain, with the U.S. Coast Guard (USCG) acting as lead agent. Maritime security initiatives have been implemented and the security posture has been improved, but progress has often been measured by efficiency-based level of effort rather than by effectiveness that is objective-based. Development of objective-based measures of effectiveness (MOEs) can be accomplished by analyzing previous similar low-intensity conflicts, such as counterdrug and humanitarian assistance operations. From these, present day operational commanders may develop objective-based MOEs for maritime container security for their decision-making process in order to properly allocate limited resources.

This paper proposes guidelines that an operational commander should use to develop objective-based MOEs for maritime container security. These guidelines were developed by applying lessons learned from similar low-intensity conflict cases to the maritime container security threat. The analysis of lessons learned utilizes a systems approach and regressive planning in order to identify proper objectives. To illustrate this method, an overview of general systems theory is provided. Then a discussion of the current status of maritime container security, as well as where it needs to be applied, is offered to identify the measurable gap

between the current and desired states. Defining what constitutes a good MOE is presented in order to bridge this gap. Then, the maritime container security strategy objectives are traced from national to operational levels. Finally, the types of data currently being collected are analyzed and a framework provided to apply MOEs that relate to achieving the strategy objectives.

The purpose of this paper is not to present an exhaustive list of specific MOEs that should be used in the maritime container security domain, but rather to offer guidelines for developing objective-based MOEs that can serve as effective tools in the decision-making process. However, the author does offer some MOEs for maritime container security as examples to illustrate this process.

THE PURPOSE OF MEASURES OF EFFECTIVENESS

> Data without concepts is blind. Concepts without data are empty.
>
> Immanuel Kant

In a memorandum of October 16th, 2003, concerning the Global War on Terrorism, Secretary of Defense Donald Rumsfeld noted that, "…today, we lack the metrics to know if we are winning or losing the global war on terror."[2] There are many "metrics" or measures being captured and analyzed today during the global war on terrorism (GWOT), but what the Secretary of Defense may be suggesting is the need to have the "right kinds" of measures. These "right kinds" of measures are metrics that are objective-based and identified as "measures of effectiveness" (MOEs). Although there has been a tremendous progress in the global war on terrorism, "…defense officials still lack formal measures of effectiveness that allow them to chart their worldwide battle against terror."[3] Without proper, accurate MOEs, operational commanders find it difficult to reassess and better direct efforts toward attaining their objectives.

In order for an operational commander, or any decision maker, to choose the best from various courses of action, each course of action requires an MOE whose assigned value reflects its worth in attaining the objectives that gave rise to the decision problem. Although the objective need not be stated quantitatively, MOE properties must be (a) quantitative, (b) measurable or estimable from available data, (c) must correspond to improving or worsening the objective, and (d) must reflect the benefit or penalty of a selected course of action.[4] Although there is no single best method to develop an MOE because this is mission-specific, joint doctrine does suggest certain characteristics that an MOE should possess. A good MOE should be appropriate, mission-related, measurable, numerically reasonable, sensitive, and useful.[5]

Another useful analytical tool available to the operational commander is the "model." A model is a quantitative description of an operation that proposes a cause-and-effect relationship among its variables and results. A model can be used to express the interaction of variables that influence an objective so that a problem can be understood and can be useful in making predictions about outcomes of alternative courses of action.[6] A model is used in this paper to illustrate the relationship between operational objectives and the national objective.

In analysis of a problem, an operational commander must consider the objectives, models, and MOEs of the problem to choose a course of action that is effective and focused. The analysis process can best accomplish effective results through identification of a correct center of gravity as determined through a systems theory approach and by planning regressively. This process ensures that the MOEs focus on the correct center of gravity of the problem.

THE LACK OF HOMELAND SECURITY MOEs

Like many U.S. government components involved in the GWOT, the Department of

Homeland Security has struggled to identify proper metrics for measuring accomplishment of homeland security objectives. One of the reasons that the current metrics used are considered inadequate is because they are not necessarily objective-based. For example, it has been pronounced repeatedly concerning the maritime container security effort that, "100 percent of high-risk vessels" are screened and boarded prior to coming into U.S. ports.[7] However, this metric contains flaws that prevent it from being a true measure of effectiveness.

The first flaw may be associated with what actually constitutes a "high-risk" vessel. The Department of Homeland Security (DHS) states that it targets "suspect cargo using a set of specific indicators."[8] This practice suggests that the organization that designates a vessel as high risk is also the one that screens the vessel, which poses a question of the real integrity of the screening process because it is in DHS interest to attain an objective of one hundred percent. The second flaw emerges from the fact that even after Phase Two of the Container Security Initiative (CSI) is fully implemented, only eighty percent of container traffic will be in the container security net.[9] This statistic suggests that there are still gaps in the container screening process that may be exploited by a terrorist organization. Furthermore, a third flaw exists where recent studies reveal there is only a ten percent probability that a radiation sensor could detect a nuclear device in a shielded container.[10] Thus, even if one hundred percent of high-risk vessels are screened and boarded, there is still a probability of a terrorist weapon getting through the security screen. The metric associated with screening one hundred percent of high-risk vessels relates to the level of effort or efficiency of the DHS in screening containers. However, because the ultimate objective is to find and eliminate all terrorist capabilities, this metric is not a true measure of effectiveness in relation to the objective.

Another example of an ineffective metric used by the DHS is an information sharing initiative that synthesizes information from various sources at the Homeland Security Operations Center. This information is disseminated to federal agencies across the country. The DHS metric to evaluate this process is the number of bulletins disseminated, recently cited at nearly one hundred bulletins. Although this metric captures the scope of effort undertaken by the DHS, it does not adequately connect to the overall objective of preventing terrorist attacks.[11]

THE NEED FOR ACCURATE MOEs

> The general who loses a battle makes but few calculations beforehand. Thus do many calculations lead to victory, and few calculations to defeat: how much more no calculation at all! It is by attention to this point that I can foresee who is likely to win or lose.
>
> Sun Tzu, The Art of War

With less than four percent of inbound container traffic being inspected, maritime container security may be described as vulnerable to a terrorist WMD attack. A Brookings Institute study estimated that a WMD attack at a major port would cause extended shutdown in deliveries, physical destruction and lost production in contaminated areas, massive loss of life, and medical treatment of survivors with a combined impact to the Gross Domestic Product of up to $1 trillion.[12]

Although DHS initiatives to eliminate maritime security gaps have made progress, improvement is still needed. The failure to close the gaps may not be due to lack of effort, but rather a misdirected focus by the maritime container security effort, a failure to plan strategically, and performance measured inaccurately. Specifically, "while Customs has created some performance measures to quantify operational activities and efforts, it has not developed measures to establish accountability and measure program achievement."[13]

The DHS faces a unique dilemma concerning the analysis of maritime container security, because the MOEs must not be restricted to analyzing the security dimension alone. While opening every single container would grind imports to a halt, letting them all go through uninspected would be an egregious security lapse. Efforts therefore must be balanced between improving security and minimizing economic harm to the global supply chain.[14] Thus a special MOE must be considered to account for the two separate MOEs that usually oppose one another. Since the security measures must be expressed as 'effectiveness' of threat reduction and 'cost' of implementation, a 'cost-effective' MOE must be considered to account for this additional dimension to the MOE dilemma.[15]

MARITIME COMMERCE SECURITY OBJECTIVES

At the highest level, the National Security Strategy (NSS) of the United States defines the defeat of global terrorism and terrorist attack prevention as being able to defend "the United States, the American people, and our interests at home and abroad by identifying and destroying the threat before it reaches our borders."[16] The National Strategy requires proactive use of all instruments of national power, including economic, military, diplomatic, and informational sources. It becomes clear from the start that an interagency approach is critically needed to achieve this objective.

The National Defense Strategy outlines a layered approach to the defense and security of the nation. Its strategic objective is to secure the United States from direct attack by giving "top priority to dissuading, deterring, and defeating those who seek to harm the United States directly, especially extremist enemies with weapons of mass destruction (WMD)."[17] Likewise, the National Strategy for Homeland Security outlines a coordinated national effort with the

Department of Homeland Security as the lead federal agent to prevent terrorist attacks with WMDs. The national vision emphasizes deterrence and the use of technology through better sensors, "…to detect and prevent the transport of nuclear explosives toward our borders and into the United States."[18]

The National Strategy for Combating Terrorism reinforces the homeland security strategy and objectives by emphasizing the collaborative efforts of the federal agencies to defend U.S. sovereignty, territory, and national interests from terrorist attack. Vital elements to the success of the national objectives come "from enhancing the analytical capabilities of the FBI and recapitalizing the U.S. Coast Guard, to preventing terrorist use of WMD through better sensors and procedures and integrating information sharing across the federal government."[19]

The Maritime Transportation Security Act of 2002 also emphasizes the importance of strengthening essential systems, applying a layered defense, and collaborating among agencies to prevent and deter threats to U.S. ports.[20] Following from national strategy, the U.S. Coast Guard Maritime Strategy for Homeland Security lists the following as some of its objectives:

- Prevent terrorist attacks within, and terrorist exploitations of, the U.S. Maritime Domain
- Reduce America's vulnerability to terrorism within the U.S. Maritime Domain
- Protect U.S. population centers, critical infrastructure, maritime borders, ports, coastal approaches, and the boundaries and seams among them.[21]

These overall objectives of maritime commerce security have the protection of the economic benefits of global trade interdependently linked to its security. Thus, the United States must promote global supply chain security practices as well as reduce the risk of terrorist acts in the maritime domain. To this end, the President has tasked the DHS to lead a collaborative interagency effort in the development of a comprehensive international maritime supply chain

security plan. This plan must define measurable national "end state" supply chain security goals.[22]

THE USE OF GENERAL SYSTEMS THEORY

A systems approach can be employed to examine DHS efforts toward maritime container security and how these efforts contribute to the overall GWOT. The study of analyzing systems originated in the 1940s by researchers who wanted to study the interaction among subsystems relative to its larger associated system. The resulting principles became known as General Systems Theory (GST). GST refers to a 'system' as any set of components that can be seen working together for an overall objective. 'Components' refer to the primary elements that comprise a system.[23]

A system may have components that are also systems, called subsystems. Likewise, any system may be a subsystem of a larger system. Thus, an operational planner must choose which system to analyze. If the Global War on Terrorism (GWOT) is considered a system, then a possible subsystem could be maritime container security system. This system could be a subsystem of the overall Interagency Maritime Security System, which could be a subsystem itself of the overall Defend U.S. Interests System that is the primary objective of the DHS (See Figure 1).

The fundamental benefit of viewing the container security problem through the GST model is that it assists the operational commander in accurately focusing effort and resources toward an objective that influences a higher level center of gravity through regressive planning.

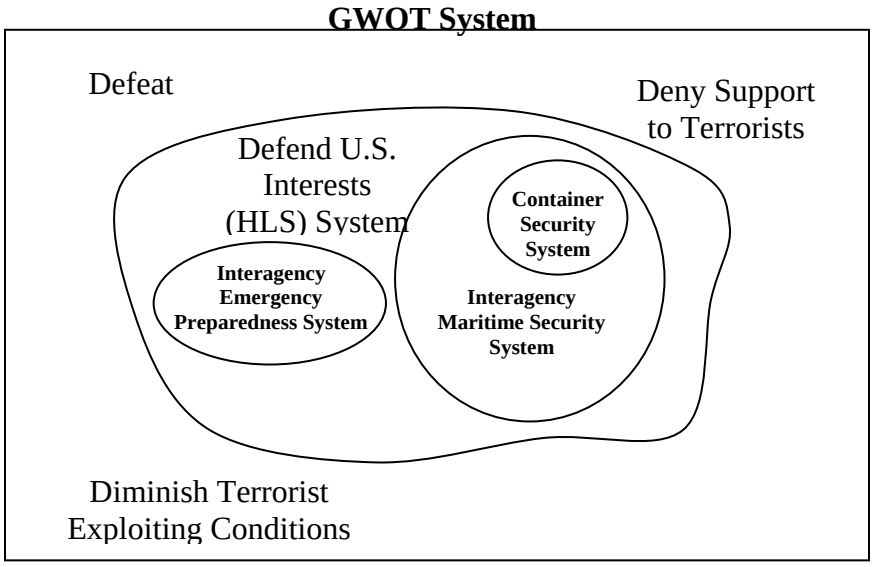

Figure 1. GWOT System

Then, with the higher level center of gravity identified, the current state of maritime container security can be compared to the desired state in order to identify a measurable gap in the security posture. The desired state for maritime container security would be to reduce the terrorist threat of WMD attack using maritime containers to a level that is acceptable to U.S. society and the global economy.

THE USE OF REGRESSIVE PLANNING AND MODELING

Regressive planning may be employed by an operational commander to analyze a problem by using operational art in order to isolate the correct center of gravity of the objective. Clausewitz described the center of gravity as "the hub of all power and movement, on which everything depends. This is the point against which all our energies should be directed."[24]

Since MOEs allow an operational commander to track progress in achieving the objectives, MOEs must be tied to the appropriate objective as determined by identifying the correct center of gravity of the problem. If the wrong center of gravity is focused upon at the

operational level, then inappropriate objectives will be targeted and the wrong MOEs will be utilized.

The U.S. experience in the Vietnam War infamously exemplifies how a focus on the wrong center of gravity can lead to inappropriate objectives and flawed MOEs. The center of gravity that the U.S. focused on was destroying the regular military forces and insurgents rather than winning the hearts and minds of the Vietnamese people. This focus resulted in objectives and MOEs based on "body counts" which did little to show progress toward the correct center of gravity.

Another more current example comes from analysis of the ongoing U.S. counterdrug effort. Counterdrug operations provide many lessons for the development of objectives and MOEs for maritime container security. It could be argued that the U.S. counterdrug effort has been focused on the wrong center of gravity at the national level. The desired end state of the counterdrug effort is U.S. drug use below the level that threatens national security. A model could illustrate the variables that influence the drug use reduction objective. The model is represented as:

$$DU = P \times S \times D$$

Whereby DU represents drug use, P represents drug production in foreign nations, S represents smuggling of illicit drugs, and D represents the demand for drugs. The majority of the counterdrug effort has been directed at the supply side variables of production and smuggling. However, it has been argued that the true center of gravity is the demand. In a recent speech concerning the status of the counterdrug effort, the Assistant Secretary of State for International Narcotics and Law Enforcement Affairs cited that despite an unprecedented increase in drug

seizures and a thirty-three percent reduction in production through collaborative efforts with Latin American nations, there is no evidence of reduced drug use in the U.S.[25]

A similar model can be adopted in the analysis of maritime container security to illustrate the relationship between the terrorist threat and the variables that influence it. This model is represented as:

$$T_{mc} = V \times C \times I$$

Whereby T_{mc} represents the terrorist threat of WMD attack using maritime containers, V represents the vulnerability of the maritime commerce supply chain, C represents the capabilities of the terrorists to attack with WMD, and I represents the intent of the terrorists to attack.[26] The objective of the maritime container security mission has been to reduce V to near zero and thereby reduce T_{mc} to near zero. However, at the national level, it could be suggested that the center of gravity is focused on I in the GWOT. This evidence of this suggestion comes from taking the offensive to project effort and resources toward establishing democracy throughout the region that harbors terrorist intent. Furthermore, Operation Iraqi Freedom was executed by the United States to reduce, and in theory preempt, future threats of WMD proliferation.[27]

If the assumption is that intent rather than vulnerability is the correct center of gravity in national terrorist threat reduction effect, then what is the objective of the DHS in its operations? According to the national security policy, reducing the vulnerability will complement the center of gravity of the global war on terrorism as it serves to prevent, deter and dissuade the terrorists from their intention to attack via WMD. Therefore, at an operational level, the objective becomes reducing the vulnerability of WMD attack via maritime containers as an adjunct to reducing terrorist intent by acting as an instrument of deterrence.

With the help of an appropriate model and regressive planning, a proper center of gravity and appropriate objectives have now been determined. From this determination, it is now possible to develop MOEs that will reflect the progress of the effort toward the objective.

DEVELOPING MOE GUIDELINES

> …When you can measure what you are speaking about and express it in numbers, you know something about it, but when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind.
>
> Lord Kelvin

In developing MOEs for maritime container security, an operational commander must show prudence in choosing the right data to gather. When structuring a broad set of measures, criteria of good MOE development should be considered as well as the types or categories of MOEs being defined.

Various studies have addressed the criteria that are critical in choosing analytical measures. MOEs should reflect the characteristics of being mission-related, comprehensive, meaningful, measurable, sensitive, timely, and cost effective.[28] Mission-related traits mean MOEs should reflect the overarching mission or reason for the operation, not just specific tasks. Comprehensive traits require that there must not be only one measure of focus. Meaningful traits strive for effectiveness rather than just for the accomplishment of a task, and require that MOEs of all types must be used together to understand an operations whole context. Measurable traits imply MOEs comprise consistent, accurate values for the purposes of trend analysis. MOEs should have sensitive traits whereby progress toward results is evident for trend analysis purposes. MOEs that have timely traits are responsive and detect changes over the near-term. Cost effective traits mean MOEs must be reasonable and not a burden to collect, which often conflicts with the desire to be comprehensive.

Regressive planning is crucial part to an operation's mission analysis process and structuring appropriate measures to track the progress of an operation. In regressive planning, the higher-level objectives are translated into tasks, tasks then require capabilities, and capabilities then utilize resources. This process may be challenging if the objectives are initially vague, such as with maritime container security. A hierarchy of MOEs can be developed to represent the key elements of regressive planning:

- Mission-level MOEs
- Task-performance MOEs
- Level-of-effort measures
- Transition measures
- General Indicators

While level-of-effort measures have a narrow focus and relate to specific actions or resource employment, task-performance MOEs translate these actions into a broader context and indicate the relevance of these actions to total requirements. Likewise, mission-level MOEs represent an even broader context and relate the tasks to the higher-level objectives of the operation.[29]

Mission-level MOEs should be relevant to objectives determined at the strategic level. For Maritime Container Security operations, objectives include preventing WMD attacks using maritime containers, deterring WMD attacks by reducing vulnerabilities in maritime container security, and protecting the integrity and efficiency of operation of the global supply chain.

Task-performance MOEs relate to the many interagency tasks and initiatives that contribute to improving Maritime Container Security. These MOEs are usually more specific than the mission-related MOEs, and typically are expressed relative to a requirement. The most

commonly cited example of this type of MOE for Maritime Container Security is that one hundred percent of all high-risk vessels are screened and boarded; however, this lacks the attribute of being a "meaningful" MOE.

Level-of-effort measures pertain to the sum of actions completed in support of the mission, but are not necessarily tied to measuring the effectiveness in attaining the objective. For Maritime Container Security, these measures may include the total number of vessels screened and boarded.

Transition measures are useful when an operation has multiple phases and/or strong interagency cooperation. These measures track progress among agencies to ensure the synergistic benefits of interagency collaboration are captured during the operation. An example of these measures for maritime container security may include the fraction of vessel boardings that are conducted by DOD assets in support of the U.S. Coast Guard.

Finally, general indicators support MOEs by listing intangible, non-quantitative circumstances that may shed light on the progress of an operation. Some examples of these indicators may include incidents of container security lapses, such as Chinese refugees discovered in Los Angeles, or polls in foreign nations that suggest the perception of maritime container security as vulnerable.

The value in defining each level and type of MOE separately comes from being able to examine all MOEs as a whole rather than individually. That is, task-performance MOEs are a function of mission-related MOEs and level-of-effort measures are each a function of task-performance MOEs. Likewise, transition measures must be viewed relative to the task-performance and mission-level MOEs. In other words, each MOE type cannot be viewed in isolation but rather examined according to how it influences the other MOEs.

THE CHALLENGE OF MOE DEVELOPMENT

One problem that operational commanders may encounter when developing MOEs is that the operation may be very intangible in nature. Maritime container security could be described as having intangible attributes associated with its conduct and can be very difficult to represent quantitatively. A noted strategist, retired Major General Robert Scales, has even argued that using MOEs for the global war on terrorism proves unproductive. He adds, "in terms of understanding the conflict, in terms of being able to predict performance and success or failure, that is a very subjective, very intuitive type of judgment. And it cannot by its very nature − because it deals with human nature − be quantified, even estimated."[30]

Another problem with using MOEs for maritime container security results from pegging the MOEs to the single objective of vulnerability reduction. It can be argued that no matter how successful the efforts are to reduce vulnerabilities in the maritime supply chain, the vulnerability will never reach zero. For example, USCG counterdrug efforts have not interdicted 100 percent of illicit drugs entering the United States. If the USCG approaches homeland security and maritime container security in the same manner, then a WMD attack may occur and the result of just one such event would be a catastrophic failure.[31]

A danger in using MOEs to track the progress toward an objective is that an operational commander can rely too much on MOEs and become tactically inflexible. The global war on terrorism has demonstrated the enemy to be very adaptable. "No matter how much work goes into making an area more secure, it can never be made invulnerable."[32] Although it has been argued that the vulnerability can never be reduced to zero, it may not have to be. Deterrence works best when security measures can work in layers. Each layer in itself need not be perfect,

but when all the layers are combined, deterrence works effectively.[33] Therefore, any effort that reduces vulnerability compliments deterrence and ultimately reduces the terrorist threat.

CONCLUSION AND RECOMMENDATIONS

In the context of General Systems Theory, maritime container security is a critical component of the larger war on terrorism. Through regressive planning, the true terrorist center of gravity has been proposed to be their intent. The objective of maritime container security therefore has been to reduce the vulnerability in order to support this overall objective of attacking the terrorist intent and to dissuade the terrorists from launching a WMD attack using the maritime commerce system. As the lead operational commander for maritime security, the Commandant of the Coast Guard may benefit from development of a comprehensive list of MOEs that will be based on the objectives for maritime container security. Finally, the guidelines outlined in this paper can assist any operational commander in developing objective-based MOEs.

Assessing the effectiveness of the maritime container security effort can be difficult, since the effect on the operational objectives may be vague and available data is often transparent. However, such an assessment is vital to the operational commander to track progress and allocate resources and effort appropriately. Using the different types of MOEs cited in this paper, MOEs can be developed based on an interagency approach, technology, and supply chain management.

The recognition for transition measures to track the interagency collaboration efforts and level-of-effort measures seems apparent as the DHS officials have recently created a new office dubbed the Domestic Nuclear Detection Office which will be staffed by the departments of

Energy, State, Defense, the FBI, and intelligence agencies.[34] This unit will attempt to improve the WMD detection capabilities and the need for objective-based MOEs would prove vital to tracking their progress.

In support of the national objective of reducing the vulnerability of WMD threat using maritime containers, an operational objective has been identified by Assistant Secretary of Defense of Homeland Defense Paul McHale. He proposes that the U.S. should be able to detect radiation from sensor packages mounted on aircraft or UAVs in the future.[35] This operational objective needs MOEs of multiple types that will track the progress of this effort. By improving the probability of detection, the vulnerability would be reduced and would serve to dissuade and deter the terrorists' intent of using maritime containers as their preferred device to launch a WMD attack.

A final group of MOEs might be developed to focus on the need to establish a security net centered on managing maritime container security as a supply-chain. Cost-effective MOEs could measure the performance of the maritime container supply-chain in terms of both efficiency and security. Proposed MOEs can be based on the five inherent capabilities of supply-chain performance: efficiency, shipment reliability, shipment transparency, fault tolerance, and resilience.[36] This concept also presents the best opportunity to utilize cost-effective MOEs since efficiency and security are distinct but interrelated.

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