Rapid Acquisition of Commercial Chemical, Biological, and Radiological Detection and Analytical Equipment: Implications for Training and Education

By Mr. Peter G. Schulze

The movement toward the "rapid" acquisition of commercial, off-the-shelf (COTS) equipment for detecting chemical, biological, and radiological compounds has created new challenges for joint acquisition and the development of appropriate training solutions for Soldiers, Sailors, Airmen, and Marines. From a purely acquisition program perspective, acquiring readily available, independently tested COTS equipment to meet defined capability gaps or urgent operational needs is a fundamentally sound strategy. However, the corresponding fielding and integration of approved COTS chemical, biological, and radiological detection systems with evolving Department of Defense (DOD) chemical, biological, radiological, and nuclear (CBRN) organizations and personnel can have significant training and education implications and can negatively impact the selected materiel solution.

Defining the Problem

Training and education can make or break the implementation of a technology and determine if, and when, the investment in a materiel solution will pay dividends in expected capabilities. Unfortunately, there is a growing notion that simply providing initial training in the operation of individual detection equipment—to any target audience and in any form—is sufficient to realize its expected capability. The processes that acquisition and training specialists use to ascertain the need for training and determine its effectiveness are often not applied—or, if applied, are nonprescriptive, are time-consuming, and lack empirical rigor. In addition, the processes used by DOD to determine, develop, institutionalize, validate, and fund training requirements and their associated supporting products were established and promulgated more than 25 years ago. These processes have not kept pace with the urgent needs of the joint warfighter or the evolving Joint Capabilities Integration and Development System (JCIDS). As a result, the rapid procurement, training, fielding, and maintenance of CBRN COTS equipment often results in a mismatch between the expected operational capability of the materiel solution and the ability of individuals or units to achieve and sustain that capability.

There are many human and organizational performance issues associated with the fielding of CBRN systems and equipment and the subsequent achievement of a full spectrum CBRN capability. Among these are loosely defined missions; insufficient doctrine or guidance; the diversity of CBRN organizations; conflicting priorities; poorly maintained equipment; ineffective training; and a lack of management controls, qualified personnel, funding, and equipment. Individually, each of these performance issues can potentially impact a unit's CBRN capability and associated readiness. Together, they can complicate and frustrate traditional, analytical efforts to ascertain and document sustained operational capabilities.

The rapid procurement of COTS systems and equipment taxes institutional processes and poses challenges in developing appropriate performance strategies and obtaining the resources needed to sustain capabilities. The fielding of CBRN COTS systems and equipment without accompanying performance strategies can result in undefined capability gaps and sets of improvised solutions that do not solve the underlying problems. While there are many potential performance issues associated with the rapid procurement of CBRN COTS systems, one of the most misunderstood problems regarding Army institutional and new-equipment training is that of skills acquisition and retention. The CBRN skill set is one of the most difficult and diverse to teach and retain, primarily because most personnel infrequently use the knowledge and skills needed to respond to *actual* CBRN events. Nevertheless, CBRN training and education are constrained to standardized training development and execution process stovepipes without the benefits that are typically associated with continued practice and validated lessons learned.

Figure 1 illustrates the manner in which skill acquisition and retention can potentially complicate the spectrum of performance issues associated with the rapid and continuing procurement of CBRN COTS systems and equipment within the training and education continuum.[1] The theoretical knowledge/skills gap at the conclusion of institutional or new-equipment training should be a reflection of an *individual's* ability to employ newly acquired CBRN systems or equipment. However, because robust job task analyses and empirically based posttraining and fielding evaluations of institutional training are rarely conducted, that

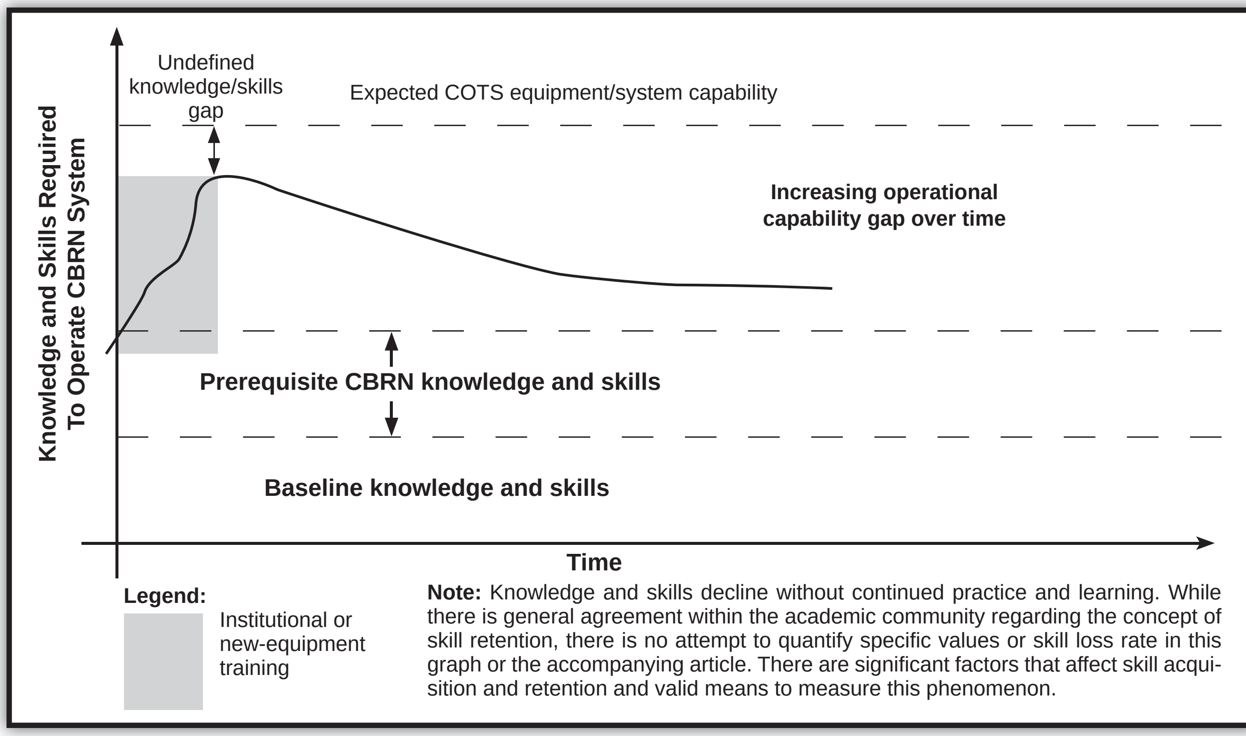

Figure 1. Skill Acquisition and Retention as a Function of Time

gap typically remains undefined. And because skill retention depends on structured practice, the lack of unit management controls, personnel, experience, self-development, equipment, training, and maintenance can potentially further decrease *unit* operational capability, resulting in an increasing—but still undefined—operational gap. Defining this potential gap is much more complicated than a cursory glance suggests. The unique personnel composition and mix of DOD CBRN organizations, complex array of CBRN systems and equipment, competing operational demands, and evolving CBRN threats contribute to the complexity. While many factors influence an organization's ability to maximize the capability of a new equipment set or system, training and education have the most potential to *maximize* or *limit* operational capability.

Developing the Solution

The DOD has published a blueprint for the institutionalization of ongoing reform and the reshaping of America's military to counter weapons of mass destruction and prevent their proliferation.[2] This broad review serves as a catalyst for an enterprising approach to the development of a measurable joint CBRN training and education strategy that—

- Recognizes the need to anticipate evolving threats and associated technological countermeasures.
- Promotes Service integration and efficiency, while accounting for differences, limitations, and Title 10 responsibilities.[3]
- Serves as a platform and facilitation instrument for the continuous, rapid assessment of CBRN readiness.

The strategy must provide the foundation for capabilities-based, Service CBRN training and education programs designed to be ready and responsive to technical innovations and evolving threats. The programs must challenge traditional Service training and education stovepipes, redundant processes, and resourcing models.[4]

The success of future Service CBRN training and education programs depends on their ability to complement the evolving JCIDS acquisition process, while concurrently advancing joint and interagency cooperation; the procedural use and operational employment of advanced detection, analytical, and information systems and equipment; techniques for operating in hazardous environments; and the culture of continuous improvements as a specialist and leader. In addition, these programs should emphasize the development and sustainment of the individual and the unit based on operational expectations in regard to necessary tangible skills and desired intangible attributes. The systematic application of human performance technology (HPT), aligned with Service organizational and capability goals, has the best potential to provide the analytical foundation necessary for rapid training analysis, appropriate implementation and, ultimately, improved operational capabilities for the Services.

Traditional doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) analytical processes, which are typically nonprescriptive, are often applied as a gap analysis tool, generating perceived requirements for each DOTMLPF component without a causal or comprehensive set of performance indicators and potential solution sets for the entire system. The visibility, complexity, evolving nature, and cost of CBRN acquisition programs require that potential performance issues be rapidly and accurately assessed to implement a targeted set of solutions. The use of a structured performance analysis model is important in matching potential performance issues to their appropriate solutions. HPT (which has been used successfully throughout industries, the U.S. Navy, and the U.S. Coast Guard) can be applied to DOTMLPF analytical processes to pair performance gaps with appropriate solutions and to provide the CBRN community with measurable improvements in CBRN organizational performance.

HPT is an engineering approach that involves the systematic application of a method or series of methods to identify performance gaps. Performance parameters, issues, and gaps are considered to be components of systems that can potentially impact other systems. Because the focus of HPT is on human and organizational outcomes, rather than on a specific bureaucratic process, all available means and methods of obtaining results can be explored. Whenever possible, validated best practices are applied and empirical evidence is used to achieve and document the desired performance.

As a result of DOD Office of the Inspector General Audit Report Number D-2001-043[5] and a subsequent Deputy Secretary of Defense directive to develop training standards and "institutionalize" training for the Weapons of Mass Destruction–Civil Support Team Program, the U.S. Army Chemical, Biological, Radiological, and Nuclear School (USACBRNS) somewhat successfully applied HPT in support of the development and validation of weapons of mass destruction–civil support team training and education. The performance analysis was guided by the application of various versions of Thomas Gilbert's Behavior Engineering Model—a model that is commonly used by the HPT professional community.[6] USACBRNS staff modified the original Gilbert model to support military-specific doctrine, organization, training, materiel, and personnel performance issues. The USACBRNS model has continued to mature and is now derived, in part, from Dr. Anthony Marker's Synchronized Analysis Model.[7] In this variation of the Behavior Engineering Model, performance indicators are stratified into various levels, allowing the analyst to pinpoint potential barriers to full performance at individual, job, organizational, and external levels. Figure 2 shows a typical performance outcome (or expectation) that USACBRNS staff has modeled to organize volumes of data and determine cause-and-effect relationships. This data organization is applied to the analysis process to validate actual or potential performance gaps that ultimately support the development, modification, or elimination of training and education solutions.

Summary

Acquiring readily available and independently tested CBRN COTS equipment to meet defined capability gaps can be a fundamentally sound strategy. However, the Services and the Joint Program Executive Office need to reconsider how the acquisition of COTS impacts the ability of the Services to respond to existing and emerging CBRN threats and to remain ready to support national strategies. The operational capability and associated readiness of a CBRN unit cannot be defined by fielded CBRN system and equipment capabilities. These parameters must be measured by the organization's overall ability to continuously employ materiel and nonmateriel solutions to meet clearly defined missions and expectations. CBRN capabilities must be analyzed using a comprehensive, open system that considers the technical, operational, fiscal, and social parameters required to achieve the desired capability of the materiel solution.

	Level of Performance Indicators	Critical Performance Indicators			
		Training/Education (doctrine, data, feedback, knowledge, skills)	**Materiel/Facilities** (support, tools, capacity, equipment, funding, transportation)	**Personnel** (prerequisites, consequences, rewards, incentives, motives)	
Environment	External				Outside DOD
Environment	Organizations				Within DOD
Environment	Team				Within DOD
Individual	Job				Within DOD
	Performance Outcome (Expectations)	As a member of a domestic survey team, identify trace residue and vapors emitted from explosives, illicit drugs, chemical agents, and toxic industrial chemicals (ion mobility spectrometry). End-of-training (EOT) standard: 80 percent accuracy with 15 samples/9 compounds randomly selected (92 percent accuracy at EOT plus 6–9 months).			

Figure 2. Sample of a Typical Performance Outcome Modeled by USACBRNS Staff

The challenge for the Services is to develop comprehensive training and education programs designed to complement and support the rapid and continuous acquisition of CBRN systems and equipment within their organizational and institutional constraints. For the past few years, the USACBRNS and joint program managers have, to some extent, successfully navigated the complex JCIDS acquisition and other institutional processes. In many cases, they have supported and reinforced communication and negotiation between diverse stakeholders (each with their own set of perspectives, processes, agendas, and perceived requirements), keeping them focused on supporting the warfighter. However, the continued lack of a JCIDS connection with the institutional processes of the Services, coupled with the uncoordinated approach to CBRN training and education within DOD, remains problematic.

The globalization and evolving nature of CBRN threats must be met with a diversity of Service organizations and personnel, the ability to synchronize DOD capabilities, and the "rapid" acquisition of COTS for the analysis and detection of CBRN materiel. However, the success of the acquisition depends on the use of an integrated approach in which training and education considerations are appropriately applied throughout the total life cycle management framework. The application and integration of HPT within the JCIDS and Service training processes significantly enhance the likelihood of closing known capability gaps and help Services focus on results rather than solutions. Overall, HPT supports a continuous, adaptive set of processes to ensure that CBRN specialists and units receive timely and effective education and training that is aligned with the "rapid" acquisition of commercial chemical, biological, and radiological detection and analytical equipment.

Endnotes:

[1]Christina Stothard and Robin Nicholson, "Skill Acquisition and Retention in Training: DSTO Support to the Army Ammunition Study," Defence Science & Technology Organisation Electronics and Surveillance Research Laboratory, Commonwealth of Australia, December 2001.

[2]*Quadrennial Defense Review Report*, DOD, February 2010.

[3]"Title 10" refers to U.S. Code, Title 10, *Armed Forces*.

[4]James J. Blascovich and Christine R. Hartel, editors, *Human Behavior In Military Contexts*, Committee on Opportunities in Basic Research in the Behavioral and Social Sciences for the U.S. Military, 2008.

[5]Audit Report Number D-2001-043, "Management of National Guard Weapons of Mass Destruction–Civil Support Teams," Office of the Inspector General, DOD, 31 January 2001.

[6]Thomas F. Gilbert, *Human Competence: Engineering Worthy Performance*, Tribute Edition, International Society for Performance Improvement, Silver Spring, Maryland, 1996.

[7]Anthony Marker, "Synchronized Analysis Model: Linking Gilbert's Behavior Engineering Model With Environmental Analysis Models," *Performance Improvement*, Vol. 46, Issue 1, pp. 26–32, January 2007.

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