
Abstract. Performance testing plays an integral role in determining the effectiveness of a site’s overall protection system and evaluating a response force’s ability to perform certain responsibilities as they apply to detection, assessment, response, interruption, and neutralization.

16.1 Introduction

Why Performance Test? Performance testing is a critical function in the Evaluation Stage of the Design Evaluation Process Outline (DEPO). Performance testing can be used both to determine response force times and to ensure that the response force is meeting established performance criteria.

The most appropriate and useful method of evaluating a response force’s ability to perform routine and emergency duties is to observe the performance of these duties under controlled and sometimes simulated conditions. To develop useful and valid information, the controlled conditions under which performance tests are conducted must be as realistic as possible. Necessary constraints and artificialities should be designed to have a neutral effect on response force performance.

16.2 Background

Level of Rigor When security culture is cultivated to an acceptable level at the national and nuclear facility levels and when dedicated resources such as time, equipment, people, and money are applied to the protection of nuclear material, then a nuclear facility will see favorable results in the effectiveness of its Physical Protection System (PPS).

As an example, in the United States, its Department of Energy (DOE) applies the necessary resources to adequately performance test response forces at each nuclear facility. In addition, the DOE has created a robust process for evaluating the effectiveness of the response force.

Nuclear facilities in the U.S. are designed and evaluated to a certain level of effectiveness to protect against an adversary attack. Necessary resources are dedicated to the protection of nuclear material because the consequences of theft or sabotage of nuclear material or facilities are unacceptably high. Some countries model the U.S. in the design and evaluation of a PPS for the protection of nuclear material; however, other countries are unable to follow the U.S. model because of limited resources. One of the limitations may be the lack of ability to maintain a quality assurance program to ensure adequate proficiency in the response element of the PPS.
The majority of countries with nuclear facilities have an on-site guard force performing guard duties; however, some facilities rely on an outside agency as the primary armed response to an adversary attack or emergency. In either case, facilities are required to have a mechanism to evaluate the effectiveness of the response force, whether on-site or off-site.

Previous International Training Courses (ITC) have shown that many countries are interested in methods of evaluating the response force. Early versions of the response and evaluation modules identified tools that could be used to measure the effectiveness of response. However, the content was at such a high level that participants did not have the opportunity to understand how the tools could be applied at their own facilities. In the current version of the ITC, we have developed field exercises that allow participants to gain some hands-on experience with performance testing in the context of a site’s response.

16.3 Purpose

Why Is Performance Testing Important?

A primary purpose of response performance testing is to collect data on the capabilities of the site’s guard and response forces along with related physical protection system elements. Performance testing is conducted for numerous reasons:

- Training personnel
- Motivating personnel
- Identification of system effectiveness or recommending areas for improvement
- Validation of physical protection systems

The purpose of this paper is to outline how system performance testing is conducted and how all functions of a guard and response force are tested. The scope of performance testing ranges from very simple individual performance tests to more complex collective requirements.

16.4 Concept

What Is Performance Testing?

Performance testing is a method of evaluating the ability of an implemented and operating system element or total system to meet an established requirement. Individual performance tests for the response function are used to determine whether guard and/or response procedures are effective, whether personnel understand and follow the procedures, and whether personnel and equipment interact effectively.

Performance test exercises are a means to realistically evaluate the effectiveness of response force programs, provide skills application training for personnel, identify areas requiring system improvements, validate implemented improvements, and motivate personnel to perform duties in the most efficient, effective, and safest manner.
### Types of Performance Testing

Types of performance testing discussed here include qualification performance testing, subsystem performance testing (limited scope performance tests), and whole system tests, such as force-on-force testing.

#### Qualification Performance Testing

In Qualification Performance Testing, response force personnel should periodically be tested on all critical skills and knowledge to maintain their qualifications to perform their duties. Semi-annual or quarterly performance testing on firearms and special response requirements should be implemented to ensure mission capability.

#### Limited Scope Performance Testing

Limited Scope Performance Tests (LSPT) are basically subsystem tests. They are limited in size and scope and generally test an individual’s knowledge, skills, or abilities. LSPTs that should be conducted routinely are:

- **Alarm Response Assessments** – After notification, the response force should be able to respond to the correct location, in the required time, and with the right equipment to interrupt the adversary
- **General Knowledge Assessments** – Response force personnel should be tested regularly on the use of force policy, deadly force policy, and emergency response plans
- **Equipment Operation** – Response force personnel should be tested regularly on the operation, function testing, and maintenance of all issued equipment, such as gas masks, night vision, firearms, etc.
- **Time Motion Studies** – LSPTs should be conducted initially to determine actual response times to pre-established locations and periodically thereafter to validate interruption capabilities
- **Critical System Element Testing** – Systems whose failure would significantly increase the risk to the protected material should be identified as critical system elements. A critical system element performance testing program should be formally documented with the task, condition, and standard of the test established. The program should also direct testing intervals and actions taken on failure, such as compensatory measures and regulated repair requirements.

### Force-on-Force and Engagement Simulation System

Whole system testing includes all aspects of the physical protection system. Force-on-Force (FOF) performance testing is a type of whole system testing that permits the site to evaluate the response force’s actual, not perceived, capability under stressful, realistic conditions. In conjunction with FOF, a full-scale Engagement Simulation System (ESS) testing provides the site security analysts with valuable system effectiveness data. During an FOF, an adversary force executes a prescribed facility attack and the response force responds according to the site’s security incident response plan. These types of exercises or tests are extremely valuable as a training exercise and as a data collection activity for the site’s security analysts.

To provide the maximum training benefit for the response force, as well as the analyst collecting data from the event, the exercise is best conducted at the facility being protected or in a realistic comparable-scale facsimile.
FOF exercises can be high-risk events if not carefully planned and controlled. In the United States, there have been several deaths resulting from the introduction of live ammunition in ESS exercise firearms. Proper planning, a strict conduct of operations standards, and proper equipment selection are all critical to the safe conduct of ESS exercises.

ESS can be either very sophisticated or very basic. While sophisticated systems provide more data for detailed analysis and are generally safer, FOF exercises can be conducted with duty weapons firing blank ammunition. Sophisticated systems consist of a firearm configured to fire blank ammunition, a transmitter (usually a Class 1 or Class 3 laser), a harness that records hits and near misses, and a terminal to download data from the engagements. Engagements can be reconstructed from the data collected from each harness and transmitter. Firearms used in the advanced systems are usually modified to preclude the introduction of live ammunition, making the system much safer for training and testing. Use of this equipment should include rigorous administrative controls established to prevent live ammunition from being introduced into the exercise area and individual firearms.

FOF performance testing can also be accomplished using standard-issue weapons firing blank ammunition through the use of a blank ammunition firing adapter. However, without the use of the transmitters and harnesses to record the data, the results of the engagements would be based on qualitative analysis and expert opinion rather than hard data.

When planning and executing large-scale FOF exercises, equal consideration should be given to the safety of the participants and the site’s security posture. To ensure a capable and effective response to an actual security incident during an exercise, the site should maintain a fully armed response force during the entire exercise. For the safety of the exercise participants, these regular response personnel should be sequestered in a predetermined holding area to be released only in the event of an actual emergency. The direction to release the response force should be given only by the exercise director or senior security manager. Maintaining the actual response force in a holding area during the exercise ensures the safety of all participants without increasing the risk to facility.

In addition to providing valuable information on the response force’s ability to interrupt and neutralize a postulated adversary, FOF exercises provide the opportunity to collect information and validate assumptions relative to the following capabilities of the response force:

- Knowledge and application of the use of force and rules of engagement
- Ability to communicate clearly and respond under stress
- Command and control
- Ability to distinguish between friendly and adversary activity under realistic conditions
- Use of individual and team tactics

Safe Conduct during FOF

- Effectiveness without the use of their primary communication system
- Effectiveness of planned defensive positions and offensive tactics
- Use of cover and concealment

To ensure the exercise’s safe conduct, a suitable number of trained exercise controllers should be used. Controllers can be assigned either to participants or to zones to control. The controller’s two primary functions are to ensure the safe conduct of the exercise and to serve as an evaluator for the event.

In addition to ensuring that the exercise is conducted safely, the controller documents observations and records all activity of the area or personnel assigned to him for the analysis of the exercise. By carefully capturing all relevant data, the controller provides a means of reconstructing the assault. When the data are compiled, the site’s security analysts are provided with a means to measure several components of system effectiveness and identify performance trends.

Classroom / Field

Some response force skills can be evaluated in simulation courses in the classroom. Others, especially the testing of the application of the skills, can take place only in the facility or a similar venue. The measure of proficiency being tested under engagement simulation exercises in these circumstances is the response force’s ability to stop an attack. The only acceptable level of proficiency in response procedures is the prevention of damage to, or loss of, vital facility assets.

16.5 Controllers and Evaluators

The phases of planning performance tests is similar to that explained in Section 15. Planning specific to response testings includes the selection and assignment of top-quality controllers and evaluators. Although these individuals may be drawn from non-participating areas of a response organization, the use of these personnel to support the performance test or exercise should not compromise the effectiveness of the response organization.

- Controllers are primarily responsible for enforcing rules of engagement, safety rules, and other control measures, as well as ensuring the timely and proper accomplishment of specific scenario events
- An evaluator’s function is to observe and document performance test activities, conditions, and outcomes

In many instances, controller and evaluator functions can be combined. However, each role has specific responsibilities that require total concentration to be performed effectively.

Controllers and evaluators should have specialized training to ensure that they are adequately prepared for their roles in performance testing. The training should focus on controller/evaluator roles to ensure that a system of command and control is in place. Command and control is necessary to ensure that all
safety and security requirements are met and to maintain an environment free of the hazards associated with each test.

16.6 Categories and Levels of Performance Tests

Recognized differences exist among protective forces, physical facilities, and security interests in the international community; these differences require a flexible approach to the application of testing and evaluation techniques. A combination of specific types of performance testing is used to evaluate the performance of a guard and response force.

Performance tests range in complexity from simple demonstrations of a single individual skill to major integrated tests involving an entire protective force operating with other elements of a facility’s physical protection system. Performance tests should be planned, conducted, and evaluated through the development of a graded approach. Four levels are associated with the performance testing process for the guard and response force. Each level builds on another while increasing in complexity. Levels I through III are associated with subsystem performance tests, while Level IV is associated with whole-system performance tests.

The use of levels in response testing allows for lower levels to establish effectiveness of response foundations. With each level, testing becomes more complex to conduct. Examples of levels include the following:

- Level I Examples
  - Time Motion Studies
  - Limited Scope Performance Test
- Level II Example
  - Alarm Response Assessments Performance Test
- Level III Example
  - Enhanced Limited Scope Performance Test

16.6.1 Time Motion Studies

Response force times are considered the foundation of a response element because it is essential for the responders to arrive at a designated response point per a required time. Time motion studies determine the required response time to arrive at various response locations. When a time motion study is conducted, the time begins at the responders’ origination point and ends at the dedicated response point identified in a contingency plan. (A contingency plan is a plan to respond to a target during an adversary attack.) Also included in the overall time is the time it takes for a responder to don all required equipment and firearms, and the time it takes to enter through entry gates, doors, or other type of barriers.
Outlined below are steps taken to successfully implement a time motion study:

### Designing/Revising a Time Motion Study

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Determine the need for a new or revised time motion study</td>
</tr>
<tr>
<td>2.</td>
<td>Develop or revise a time motion study plan according to vulnerability analysis, procedures, and/or operational needs</td>
</tr>
</tbody>
</table>
| 3.   | Route the new or revised plan for concurrence and approval as appropriate:  
  - On-site Guard Supervisor(s)  
  - Off-site Response Force  
  - Management |
| 4.   | Distribute the new or revised plan to appropriate personnel as required |
| 5.   | Review the plan at least annually to ensure that tests are current and consistent with orders and procedures |

### Scheduling and Planning a Time Motion Study

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Obtain the appropriate time motion study plan</td>
</tr>
<tr>
<td>2.</td>
<td>Identify and mitigate any unsafe conditions that exist in the test/exercise area</td>
</tr>
<tr>
<td>3.</td>
<td>Notify the affected facility representatives before conducting the time motion study, where applicable</td>
</tr>
<tr>
<td>4.</td>
<td>Notify the appropriate manager or other outside agency personnel for necessary assistance before conducting the study, where applicable</td>
</tr>
<tr>
<td>5.</td>
<td>Conduct a safety brief for all controllers and evaluators before conducting the study.</td>
</tr>
<tr>
<td>6.</td>
<td>When applicable, conduct a thorough question and answer session regarding tactics, response locations, timelines, equipment, duties and responsibilities</td>
</tr>
<tr>
<td>7.</td>
<td>Ensure that one controller is in the Central Alarm Station (CAS), when involving role-players, simulated weapons, or inert explosives before initiation</td>
</tr>
</tbody>
</table>

### Halting a Time Motion Study

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>If…</td>
</tr>
<tr>
<td></td>
<td>A time motion study halts for any reason, (injury, emergency, etc.)</td>
</tr>
<tr>
<td></td>
<td>Then…</td>
</tr>
<tr>
<td></td>
<td>a) Notify all participants, controllers and evaluators, and the CAS of the halt</td>
</tr>
<tr>
<td></td>
<td>b) Resolve the issue</td>
</tr>
<tr>
<td></td>
<td>c) Restart or reschedule the time motion study</td>
</tr>
</tbody>
</table>
### 16. Performance Testing: Response

#### Failing a Time Motion Study

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Notify the appropriate supervisor and explain the reason for the failure</td>
</tr>
<tr>
<td>2.</td>
<td>Conduct an additional iteration if requested by the supervisor/management</td>
</tr>
<tr>
<td>3.</td>
<td>Document all failures and pertinent information on the TMS test/exercise plan checklist</td>
</tr>
<tr>
<td>4.</td>
<td>Forward failure information to appropriate personnel for trending and analysis</td>
</tr>
</tbody>
</table>

It is recommended to conduct a large number of time motion studies for each tactical position to quantitatively justify the average response time. A larger sample size ensures the time for a responder to get to the required response point. The Pass/Fail Criteria is established through the response times determined in the vulnerability analysis and is documented in the Contingency Plan.

When the performance test activity is complete, a debriefing should be conducted immediately by test controllers/evaluators. The purpose of the debriefing is to ensure that all relevant information regarding test activities is revealed and understood. Furthermore, the debriefing provides a forum to discuss the following:

- Ensure that the results of evaluations are understood
- Identify issues
- Resolve any disagreements
- Recommend actions that may affect the physical protection strategy

#### 16.6.2 Limited Scope Performance Tests

**What Are Limited Scope Performance Tests and How Do They Work?**

Limited scope performance tests narrowly focus on the performance and effectiveness of a sub-set of response elements. Limited scope performance tests realistically test an operation or procedure, verify the performance of a policy requirement, or verify possession of a requisite knowledge or skill needed to perform a specific guard or response force task. The tests may involve large numbers of guard and response force personnel working together, as individuals, or in small teams. The test should be repeated several times to ensure quantitative significance.

Outlined below are steps taken to successfully conduct a limited scope performance test:
### Designing/Revising a Limited Scope Performance Test

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Determine the need for a new or revised limited scope performance test</td>
</tr>
<tr>
<td>2.</td>
<td>Develop or revise a limited scope performance test plan according to vulnerability analysis, procedures, or operational needs</td>
</tr>
</tbody>
</table>
| 3.   | Route the new or revised performance test plans for concurrence and approval as appropriate:  
  - Shift Captain(s)  
  - Management |
| 4.   | Distribute the new or revised plans to appropriate personnel as required |
| 5.   | Review the plans at least annually to ensure that limited scope performance tests are current and consistent with orders and procedures |

### Scheduling and Planning a Limited Scope Performance Test

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Obtain the appropriate limited scope performance test plan</td>
</tr>
<tr>
<td>2.</td>
<td>Identify and mitigate any unsafe conditions that exist in the test or exercise area</td>
</tr>
<tr>
<td>3.</td>
<td>Notify the affected facility representatives before conducting the test, where applicable</td>
</tr>
<tr>
<td>4.</td>
<td>Notify the appropriate manager or other outside agency personnel for necessary assistance before conducting the test, where applicable</td>
</tr>
<tr>
<td>5.</td>
<td>Conduct a safety briefing for all controllers and evaluators before conducting the test</td>
</tr>
<tr>
<td>6.</td>
<td>When applicable, conduct a thorough question and answer session regarding tactics, response locations, time-lines, equipment, duties, and responsibilities</td>
</tr>
<tr>
<td>7.</td>
<td>Ensure that one controller is in the CAS for tests involving role-players, simulated weapons, or inert explosives</td>
</tr>
</tbody>
</table>

### Halting a Limited Scope Performance Test

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
</table>
| 1.   | If…  
  A limited scope performance test halts for any reason, (injury, emergency, etc.)  
  Then…  
  a) Notify all participants, controllers and evaluators, and the CAS that the test has been halted  
  b) Resolve the issue  
  c) Restart or reschedule the test |

Failing a Limited Scope Performance Test

<table>
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<tr>
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<tr>
<td>1.</td>
<td>Notify the appropriate supervisor and explain the reason for the failure</td>
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<tr>
<td>2.</td>
<td>Conduct an additional iteration if requested by the supervisor/management</td>
</tr>
<tr>
<td>3.</td>
<td>Document all failures and pertinent information on the LSPT test/exercise plan checklist</td>
</tr>
<tr>
<td>4.</td>
<td>Forward failure information to appropriate personnel for trending and analysis</td>
</tr>
</tbody>
</table>

When the performance test is complete, a debriefing should be conducted immediately by test controllers and evaluators. The purpose of the debriefing is to ensure that all relevant information regarding test activities is revealed and understood. Furthermore, the debriefing provides a forum to discuss the following:

- Ensure that the results of evaluations are understood
- Identify issues
- Resolve any disagreements
- Recommend actions that may affect the physical protection strategy

16.6.3 Shift Drills

What Are Shift Drills and How Do They Work?

Shift drills are used as tools to maintain the proficiency of the guard and response force function of the PPS. Shift drills are conducted as on-going training during shifts. Shift drills are a specific type of performance or knowledge-based test designed to be administered primarily by supervisors to members of the guard or response force while on shift.

Shift drills test the individual’s knowledge and ability to perform security duties. Job tasks that can be tested include:

- Operation of equipment and vehicles
- Knowledge of post or patrol operations
- Operation of communication equipment and communication terminology

16.6.4 Alarm Response Assessment Performance Tests

Alarm response assessment performance tests (ARAPT) evaluate a response to a specific location under alarm protection (i.e., a building, room, or other area that has a site-specific security interest) when an alarm is annunciated. It is important to coordinate the ARAPTs with facility representatives to ensure that safety requirements are fulfilled, the exercise is not compromised, and operational disruption is minimized. This test
How do You Develop an ARAPT?

requires developed scenarios based on simulated adversary actions.

Outlined below are steps taken to successfully develop and conduct an ARAPT:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
</table>
| 1.   | Coordinate the following regarding the planned alarm response assessment performance test with the facility manager/facility security representative:  
• Safety issues  
• Operational issues  
• Security issues |
| 2.   | Develop a rough draft test plan, including the following topics:  
• Objective(s)  
• Scenario description  
• Pass/fail evaluation criteria, issues, and findings  
• Specific elements of the guard and response force being tested  
• Facility or facilities involved  
• Response according to the appropriate procedures  
• Test boundaries  
• Number of iterations  
• Test controls  
• Resource requirements  
• Training requirements  
• Operational effects  
• Compensatory measures that may be required  
• Coordination and approval processes |
| 3.   | Develop evaluation forms |
| 4.   | Review and update the safety briefing as necessary |
| 5.   | Distribute the plan to the appropriate departments for review and concurrence  
At a minimum, the following departments or persons should review the plan:  
• Safety representative  
• Management as applicable |
| 6.   | Incorporate comments from the review process, as necessary, and complete the plan |
| 7.   | Route the final plan to management for approval |
### Conducting an ARAPT

<table>
<thead>
<tr>
<th>Step</th>
<th>Personnel</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Senior Controller or designee</td>
<td>Notify controllers and other representatives of the date, time, and location of the controller briefing</td>
</tr>
</tbody>
</table>
| 2.   | Senior Controller or designee | Provide controller/evaluator forms to controllers/evaluators that include the following:  
  - Alarm response evaluation sheet  
  - Maps (if necessary)  
  - Briefing |
| 3.   | Senior Controller or designee | Conduct the controller briefing to include the following topics:  
  - Safety requirements  
  - Scenario  
  - Objectives  
  - Assignment of controller/evaluator duties  
  Hand out controller/evaluator forms, as applicable  
  Issue equipment as needed  
  Conduct the test by performing the following activities:  
  - Stage controllers/evaluators  
  - Notify the controller in the CAS to initiate a radio check with all controllers/evaluators to ensure definitive exercise control |
| 4.   | CAS Controller              | Advise personnel in the CAS to initiate the test                       |
| 5.   | CAS Operator                | Initiate the test                                                       |
| 6.   | Response Force              | Respond to simulations as indicated in the applicable contingency plans |
| 7.   | Controllers, Evaluators     | Evaluate the response                                                   |
16.6.5 Response Function Performance Tests

Response function performance tests are used to test the effectiveness of parts of the PPS. Three functions (detection, delay, and response) of the PPS system are measured against a fictitious yet credible adversary attack. Response function performance tests are a diluted version of a Force-on-Force test to enable sites to evaluate the response function of a PPS using minimum resources such as time, people, equipment, and money. Response function performance tests are easier to plan, organize, manage, and implement.

An adversary team is used in this test; however, it is used in a manner that only needs to stimulate the response element to respond to their necessary response positions. Responders and controllers will make interruption and neutralization determinations. For example, the responder will articulate to the assigned controller the actions taken to engage the adversary, relaying information such as identifying adversaries, distance, and number of rounds the responder is shooting.

All controllers should attend controller training to ensure competence in making controller calls as information is being articulated to them, or when a critical event or engagement takes place. The controller training also identifies and mitigates safety hazards, exercise artificialities, and adversary attack plan limitations. Certain terminal objectives are designed for evaluation of these tests, such as:

- Command and control – The responders’ command and control structure and response supervisors facilitate and provide clear direction and control over those responding to the threat, and ensure the protection of assets.
- Communications
  - Responders’ communications are commensurate to the tactical environment
  - Responders’ communicators make the appropriate notifications within the facility
  - Responders are able to utilize backup systems effectively and verify that systems function as designed without significant degradation of the radio system effectiveness or impact on effective communications
- Individual and team tactics – Responders use effective individual and team defensive tactics, appropriate to the situation
- Response – Responders implement a contingency plan and correctly adjust to the tactical situation as directed.
- Equipment, weapons, vehicles – Responders are trained in their use and are able to deploy them tactically
- Ability to implement a contingency plan – An evaluation of how well the responders deployed and implemented their tactics relative to the contingency plan requirements
### 16.7 Whole System Performance Tests

#### Whole System Performance Testing

Whole system performance testing focuses on methods to evaluate the overall performance measures for the response function. Testing the sections of the whole system ensures that individual components work together. Two performance measurement criteria are evaluated:

- **Interuption** – This criterion is the successful arrival of the response force at an appropriate location in time to stop the adversary.
- **Neutralization** – This criterion is when the response force kills, captures, or causes the adversary to flee before the adversary is able to complete the task.

#### Types of Whole System Tests

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tabletop</strong></td>
<td>Tabletop analysis involves using a map or site schematic with either icons or miniature figures to represent combat elements. This method has been used in warfare at least since Roman Legion times, and probably earlier. Commanders can place the icons in various positions on the map and debate the outcome of possible engagements. A crucial element for tabletop analysis is the method used to determine the outcome of engagements. Expert judgment, data tables, or a set of rules with simple numerical calculations are the most common methods.</td>
</tr>
<tr>
<td><strong>Computer Simulations</strong></td>
<td>Computerized engagement simulations are used for small force engagement to determine the effectiveness of tactical movement. Simulations include weapon/explosive calculations of an actual adversary attack. The simulations contain large databases for weapons, equipment, and individual combatant performance, including operations on varied terrain and day or night conditions. The computerized engagement simulations require operating the system, simulating the engagement, designing the battlefield, and activating the appropriate numerical combatants.</td>
</tr>
<tr>
<td><strong>Force-on-Force</strong></td>
<td>The FOF is a full-scale field simulation of an adversary attack scenario on a site involving all on-site guards and response forces. An FOF permits the site to evaluate the response force’s capability under stressful, realistic conditions against a DBT-based adversary; provides the site physical protection analysts with valuable system effectiveness data; and is extremely valuable training for response forces. At an actual facility, an FOF exercise requires four groups: mock adversaries, mock responders, referees, and the on-duty response force personnel. These exercises are expensive in terms of both personnel and planning, are usually run only a few times at a facility, and can produce skewed results. Statistically, there are usually not enough engagements to produce a probability of system effectiveness with a high confidence level.</td>
</tr>
</tbody>
</table>

Tabletop analysis, computer simulations, and FOF are examples of whole system performance testing.