National Nuclear Security Administration

Module 6

Vulnerability Analysis Methods Overview

Vulnerability Analysis - a systematic evaluation process in which quantitative and qualitative techniques are applied to detect weaknesses in an MPC&A system.

Purpose of a Vulnerability Analysis

- **Provide a measurement tool for determining how well system performance requirements are met**
  - **Identify weaknesses**
  - **Identify measures to address weaknesses**
  - **Management tool for decision making**

Evaluation Methods

- Analytical Methods
  - Pathway analysis
  - Scenario analysis
- Direct Methods
  - Performance testing
  - Field exercises

Pathway Analysis

- Computer-based model- ASSESS is one example

- Strengths
  - Typically computer-based
  - Can quickly analyze numerous pathways, calculating probabilities of assessed detection along each path
  - Once initial model is developed, can be modified

- Weaknesses
  - Difficult to evaluate complex adversary tactics & strategies
  - Labor intensive initial model development
  - Lack of transparency
  - Imply greater precision than available data often allows
  - Inaccurately depicted as not affected by professional judgment
  - Lack of artificial intelligence in software can result in unrealistic paths

Scenario Analysis

- Examples
  - VISA
  - Battle Board (War Gaming)

- Strengths
  - Flexible – can evaluate complex adversary tactics & strategies
  - Transparent
  - Results typically based on professional judgment
  - Can be either quantitative or qualitative

- Weaknesses
  - Number of scenarios limited by time and resources
  - Results only as good as capability of team
  - Collective judgment of team can sometimes be skewed by single strong individual

Performance Testing

- Time and resource intensive
- Can evaluate:
  - Equipment
  - Personnel and Procedures

Exercises

- Extremely time and resource intensive
- Can be limited or extensive
  - Response Drills
  - Force on Force
- Can be simulated using computer software
  - JCATS
  - STAGE

Conclusion

- Analytical modeling versus physical testing and exercises
  - Analytical modeling less time and resource intensive
  - Testing and exercises provide more realistic results
- Pathway analysis versus scenario analysis
  - Both have inherent strengths and weaknesses
  - Strengths of one complement weaknesses of other
- Should include a combination of all methods