



VA Methodology and Demonstration

ASSESS & SAVI

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SANDXXXXXX



What is a VA?

- A systematic analysis that attempts to determine the effectiveness with which a “Petroleum Facility” is being protected against defined threats.
- Effectiveness is measured by Risk
- Based on the performance of a security system rather than a checklist or compliance approach.



Vulnerability Analysis

What is a VA?

- Design/Evaluation Process
- Path Analysis using ASSESS/SAVI
 - ASSESS software Overview
 - Path Analysis
 - Scenario Analysis



Evaluation of PPS Design

Step III Evaluate the Design

- EASI Model
- Table top
- SAVI
- ASSESS
- JCATS
- FOF



Risk Analysis

- How do we know if security measures are good enough?

$$\text{Risk (R)} = P_A * [1 - (P_I * P_N)] * C$$

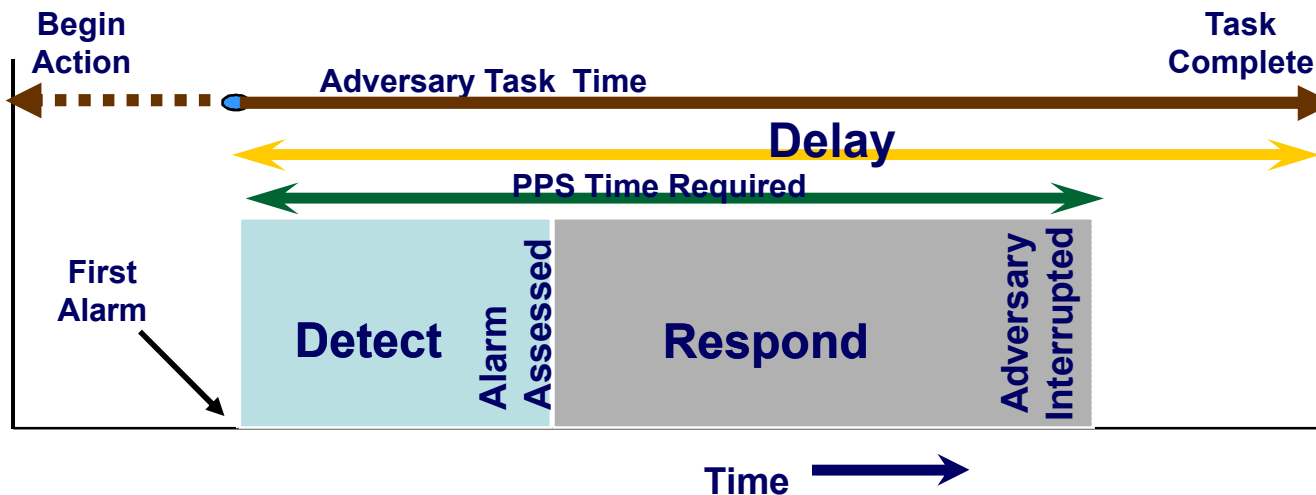
- Probability of Interruption - P_I from ASSESS/SAVI
- Probability of Neutralization - P_N from JCATS/STAGE
- Consequence Value (C)
- Probability of Adversary Attack P_A



Sandia Security Methodology

- Detection
 - Assessment
- Delay
- Response

Sandia Security Methodology



Adversary Task Time
VS.
PPS Time Requirements



Path Analysis

- Describe Petroleum Facility by Adversary Sequence Diagram (ASD)
 - Concentric layers
 - Protection elements between layers
- ASSESS algorithm identifies paths with lowest Probability of Interruption



ASSESS

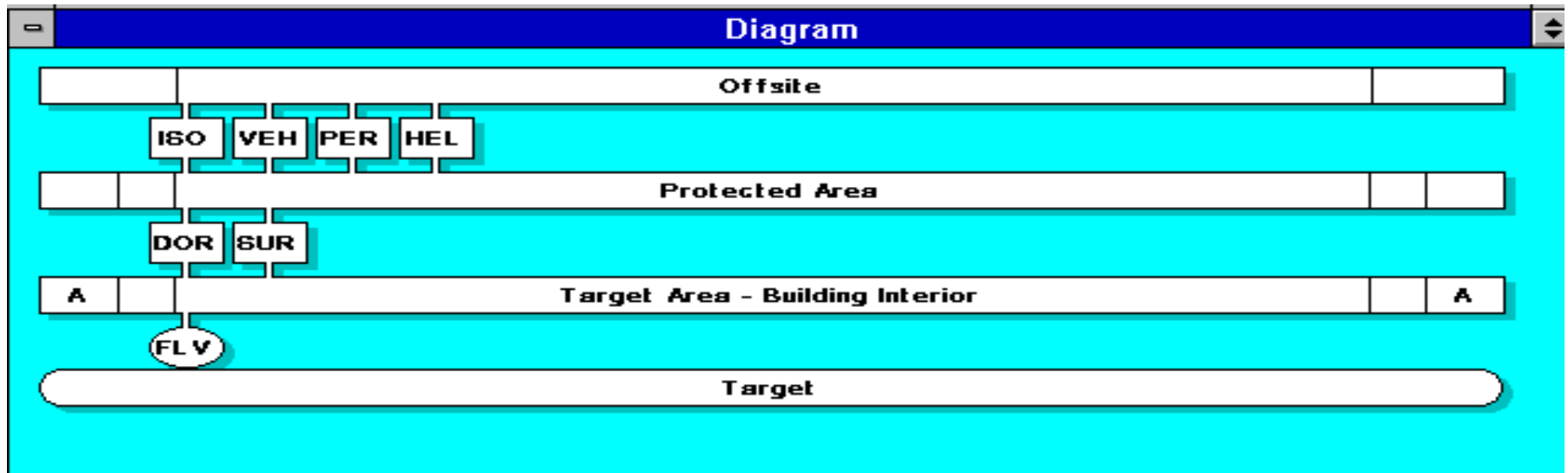
- ASSESS is a computerized tool for performing integrated safeguards evaluation
 - Considers nonviolent insiders, outsiders, and a special form of insider / outsider collusion
 - Focuses on theft and diversion of nuclear material
 - Provides a capability for “planning” and “managing” evaluation for many targets and facilities



ASSESS Facility

- The Petroleum Facility Description Module is used for inputting common data for all the evaluation modules
 - Uses a graphical display (ASD) to depict facility layout
 - Contains extensive catalogs of safeguards hardware and procedures
 - Considers two states (e.g., open and secure)

Adversary Sequence Diagram





ASSESS Outsider

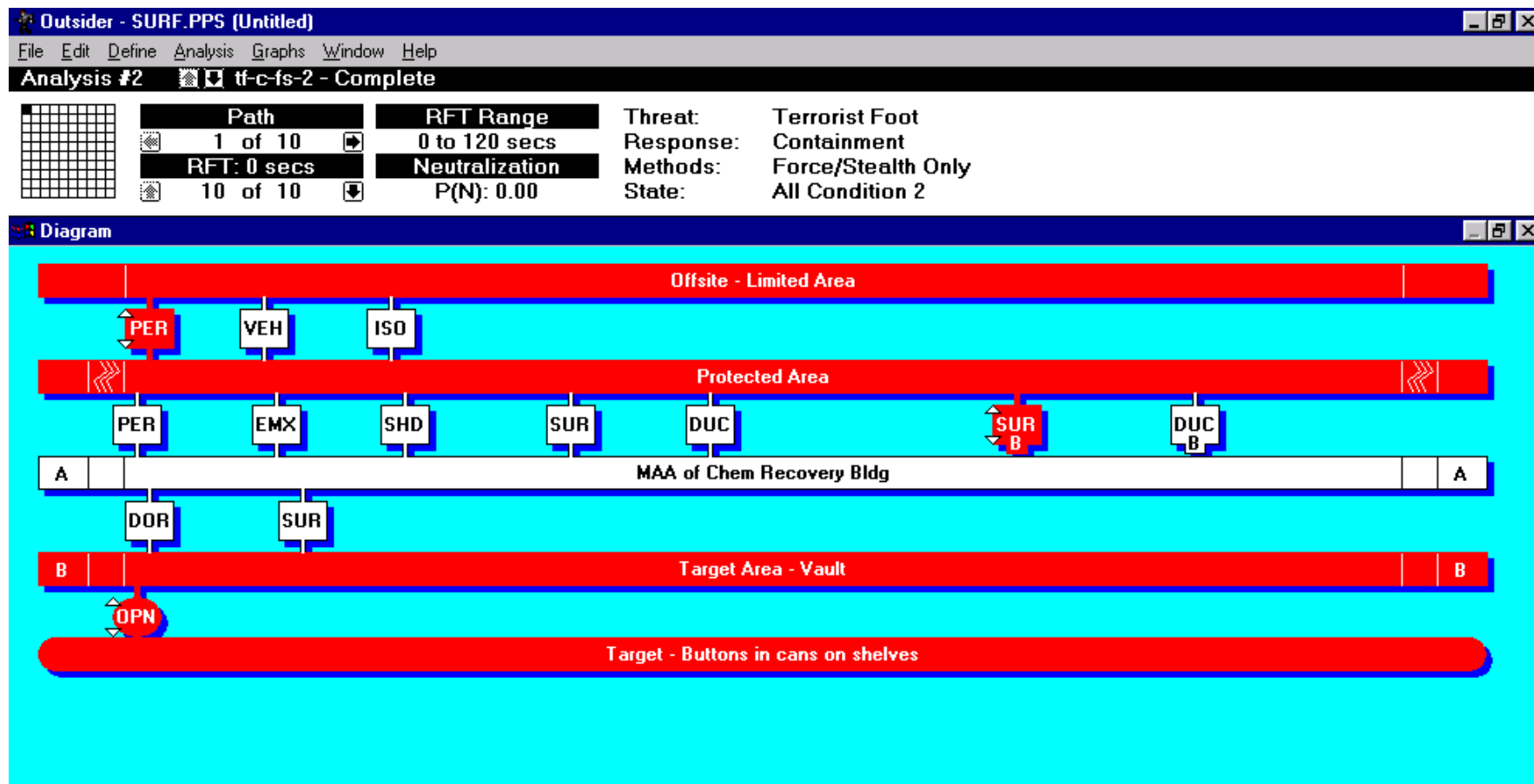
- The Outsider module calculates the “most vulnerable paths” for a spectrum of outsiders
 - Considers terrorists, criminals, psychotics, and antinuclear extremists
 - Analyze both the detection and delay components of a facility’s safeguards system
 - Incorporates a fast algorithm for path calculations



Outsider Input

- Facility State Information
- Defensive Strategy (Containment / Denial)
- Threat Capabilities
- Threat Tactics
- Protective Force Response Times

Outsider Output





ASSESS Insider

- The Insider module incorporates many features
 - Uses detailed facility data
 - Explicitly defines adversary access and authority attributes
 - Includes an extensive database
 - Predefined strategies based on facility-specific features

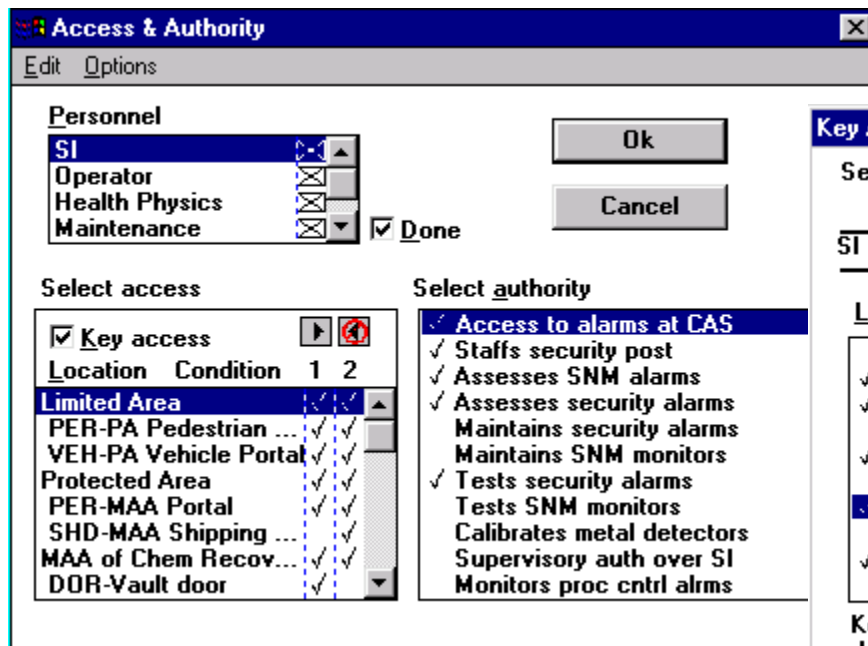


ASSESS Insider

- The Insider module incorporates many features
 - Probabilities of detection based on safeguards and target characteristics, strategies, and adversary attributes
 - Provides for summary and detailed graphical and tabular results
 - The Insider Module combines data gathered in the Facility module and insider-specific information

Insider Input

- Insider Types
- Access
- Authority
- Keys



Access & Authority

Edit Options

Personnel

SI	<input checked="" type="checkbox"/>
Operator	<input checked="" type="checkbox"/>
Health Physics	<input checked="" type="checkbox"/>
Maintenance	<input checked="" type="checkbox"/>

☒ Done

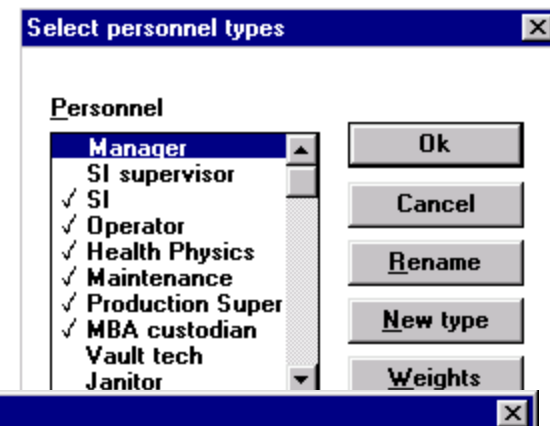
Select access

Location	Condition	1	2
Limited Area		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
PER-PA Pedestrian ...		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
VEH-PA Vehicle Portal		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Protected Area		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
PER-MAA Portal		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SHD-MAA Shipping ...		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
MAA of Chem Recov...		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DOR-Vault door		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Select authority

<input checked="" type="checkbox"/> Access to alarms at CAS
<input checked="" type="checkbox"/> Staffs security post
<input checked="" type="checkbox"/> Assesses SNM alarms
<input checked="" type="checkbox"/> Assesses security alarms
<input checked="" type="checkbox"/> Maintains security alarms
<input checked="" type="checkbox"/> Maintains SNM monitors
<input checked="" type="checkbox"/> Tests security alarms
<input checked="" type="checkbox"/> Tests SNM monitors
<input checked="" type="checkbox"/> Calibrates metal detectors
<input checked="" type="checkbox"/> Supervisory auth over SI
<input checked="" type="checkbox"/> Monitors proc cntrl alrms

Ok Cancel

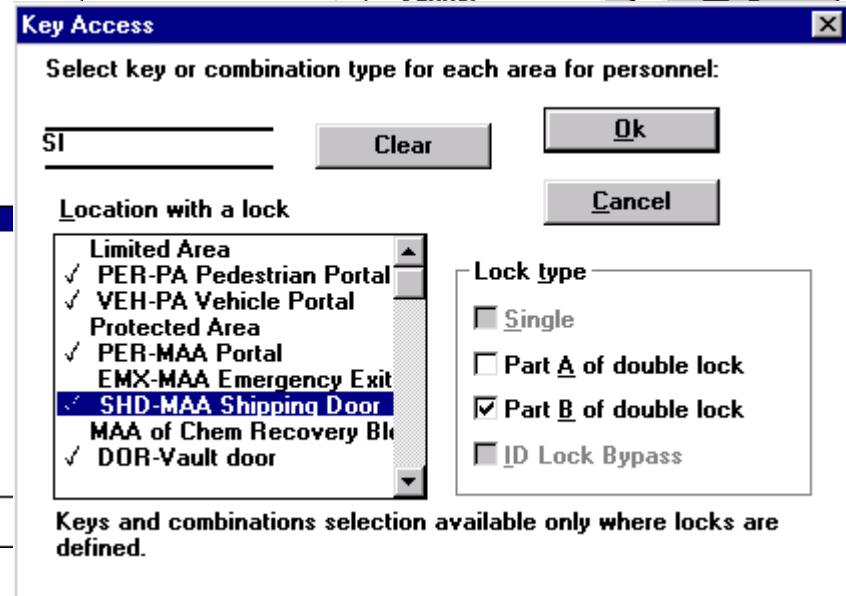


Select personnel types

Personnel

Manager
SI supervisor
<input checked="" type="checkbox"/> SI
<input checked="" type="checkbox"/> Operator
<input checked="" type="checkbox"/> Health Physics
<input checked="" type="checkbox"/> Maintenance
<input checked="" type="checkbox"/> Production Super
<input checked="" type="checkbox"/> MBA custodian
Vault tech
Janitor

Ok Cancel Rename New type Weights



Key Access

Select key or combination type for each area for personnel:

SI Clear Ok

Cancel

Location with a lock

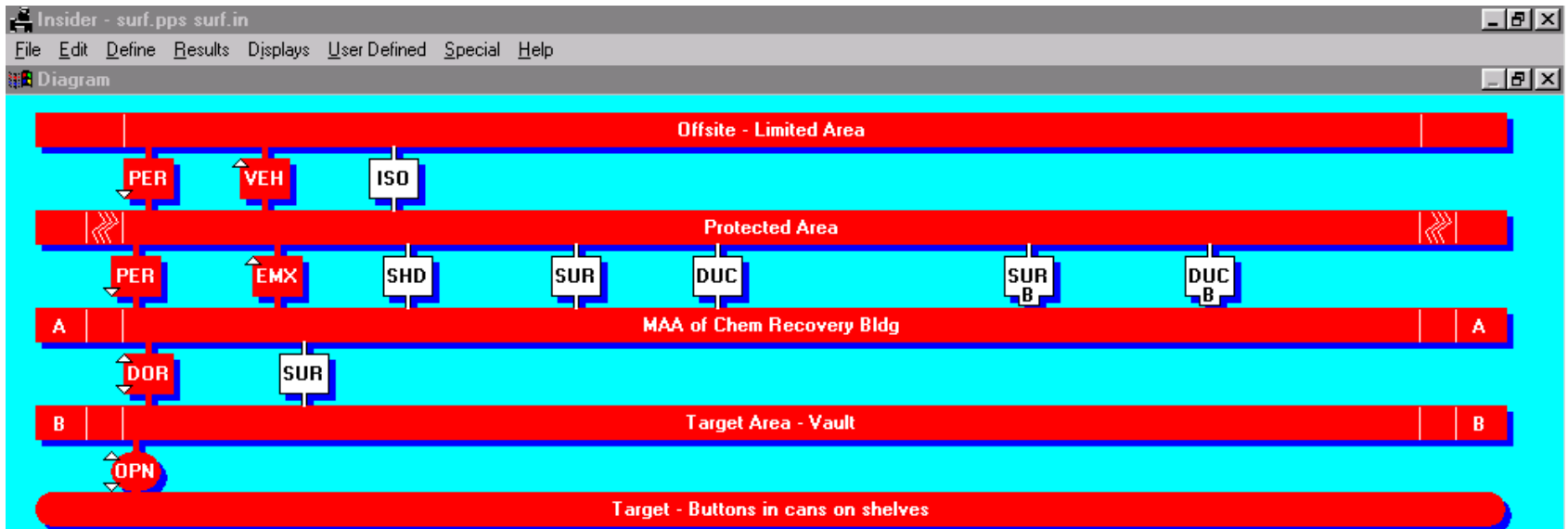
Limited Area
<input checked="" type="checkbox"/> PER-PA Pedestrian Portal
<input checked="" type="checkbox"/> VEH-PA Vehicle Portal
Protected Area
<input checked="" type="checkbox"/> PER-MAA Portal
EMX-MAA Emergency Exit
<input checked="" type="checkbox"/> SHD-MAA Shipping Door
MAA of Chem Recovery Bl
<input checked="" type="checkbox"/> DOR-Vault door

Lock type

<input type="checkbox"/> Single
<input type="checkbox"/> Part A of double lock
<input checked="" type="checkbox"/> Part B of double lock
<input type="checkbox"/> ID Lock Bypass

Keys and combinations selection available only where locks are defined.

Insider Output



Optimal scenarios

1 2

Overall Personnel	Pd.	exit from Target Location			Strategy
		Pd	Elem (C)		
SI	.33	.25	OPN (1)		Unauthorized removal
Operator	.00	.00	OPN (1)		Append to authorized removal
Health Physics	.10	.00	OPN (1)		Acquire during evacuation
Maintenance	.19	.10	OPN (2)		Unauthorized removal
Production Super	.33	.25	OPN (1)		Unauthorized removal
MBA custodian	.25	.25	OPN (1)		Unauthorized removal

Insider Output

Offsite - Limited Area

Protected Area

DUC SUR B DUC B

A of Chem Recovery Bldg

Target Area - Vault

- Buttons in cans on shelves

Strategy Detail

Path element probability calculation for:
 Strategy: Unauthorized traversal
 Path element: EMX-MAA Emergency Exit
 Personnel: SI
 Condition: Dayshift-Open Direction: Exit
 Calculated Pd at path element = .10

Safeguards:	Defeat method:	Pd:
Position monitor	Disable/alarm statn	.10
SI patrol	Avoid suspicion	.00
General observation	Avoid suspicion	.00
Evacuation alarm	Not applicable	.00
Penetration sensor	Not applicable	.00

User defined:
 Outsider safeguards note (#)
☐ Override strategy Pd.
 Probability of detection:
 Note:

☒ User defined
☐ Description

EMX-MAA Emergency Exit alternate strategies

12

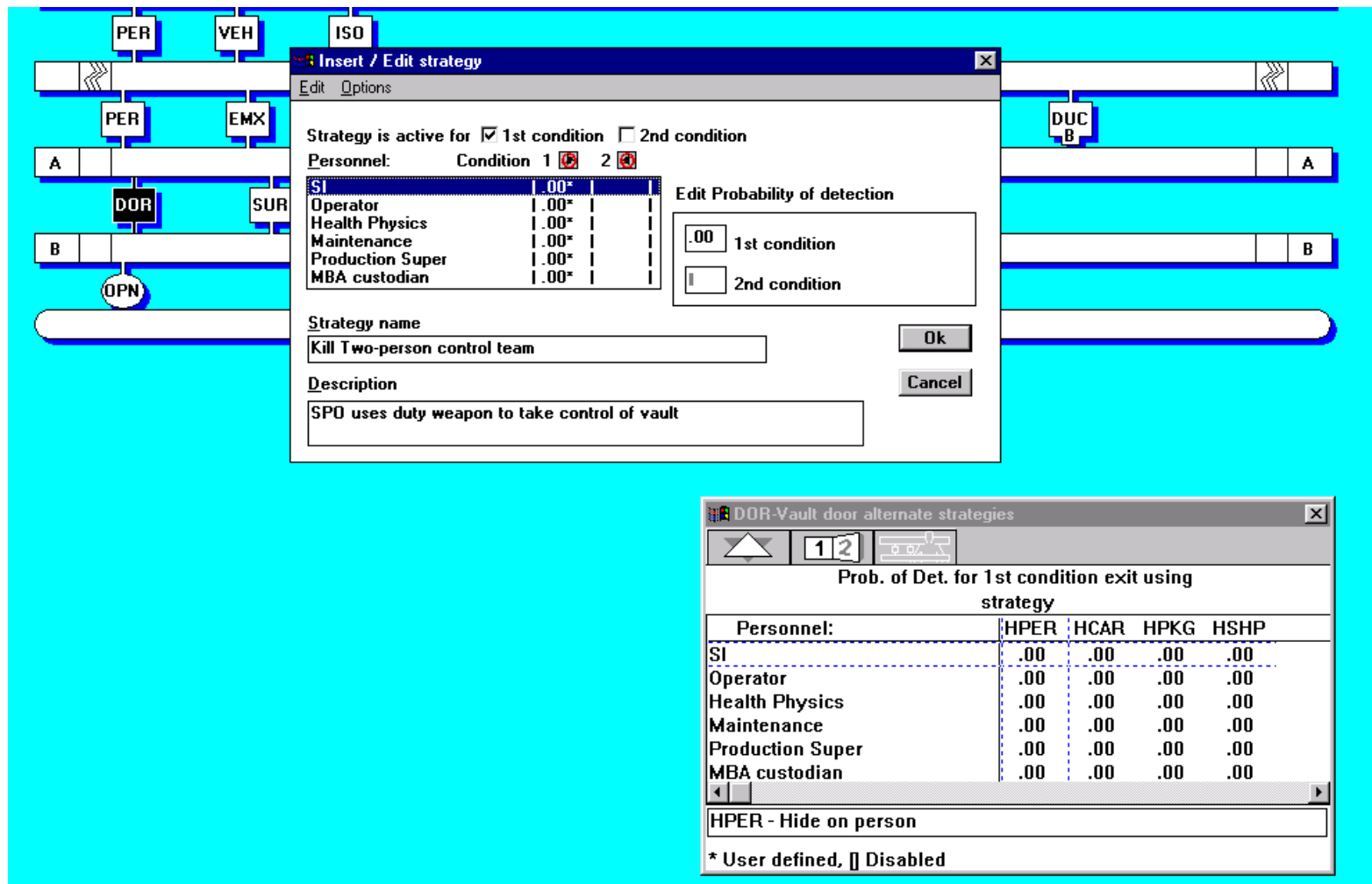
Prob. of Det. for 1st condition exit using strategy

Personnel:	TRVS	DRLL	EVAC
SI	.10	.00	.00
Operator	.25	.00	.00
Health Physics	.25	.00	.00
Maintenance	.25	.00	.00
Production Super	.25	.00	.00
MBA custodian	.25	.00	.00

TRVS - Unauthorized traversal

* User defined, [] Disabled

Active Violent Strategies



Insert / Edit strategy

Strategy is active for ☒ 1st condition ☐ 2nd condition

Personnel: Condition 1 ☒ 2 ☒

SI	.00*	
Operator	.00*	
Health Physics	.00*	
Maintenance	.00*	
Production Super	.00*	
MBA custodian	.00*	

Edit Probability of detection

1st condition

2nd condition

Strategy name
Kill Two-person control team

Description
SPO uses duty weapon to take control of vault

Ok Cancel

DOR-Vault door alternate strategies

1 2

Prob. of Det. for 1st condition exit using strategy

Personnel:	HPER	HCAR	HPKG	HSHP
SI	.00	.00	.00	.00
Operator	.00	.00	.00	.00
Health Physics	.00	.00	.00	.00
Maintenance	.00	.00	.00	.00
Production Super	.00	.00	.00	.00
MBA custodian	.00	.00	.00	.00

HPER - Hide on person

* User defined, ☐ Disabled



Collusion

- Insiders Assisting Outsiders
 - Change Protection Effectiveness against Outsiders
 - Insiders Open Vaults, disable alarms, impede response, etc.
- Outsiders Assisting Insiders
 - Change Protection Effectiveness against Insiders
 - Outsiders engage responders, facilitate facility exit, etc.

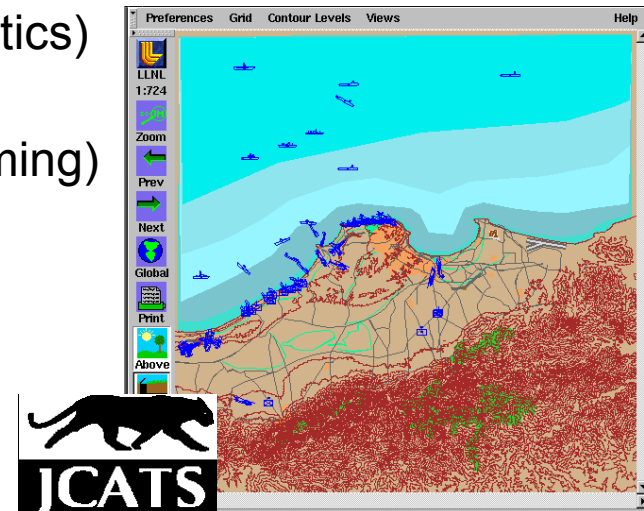
JCATS

What is JCATS?

JCATS is a cost effective method for modeling small force engagements in both rural or urban settings.

JCATS is a computer-based conflict simulation used by a number of government agencies for:

- training (individuals, staffs, command elements)
- analysis (weapons, force structure, tactics)
- planning (course of action analysis)
- mission rehearsal (coordination and timing)



JCATS

JCATS/Warrior Code Elements

- Terrain Map
 - DTEDS
- Force Plan
 - (ALPHA Files)
 - Adversary Composition
 - Response Force Composition



Google Earth



JCATS Terrain Editor



JCATS

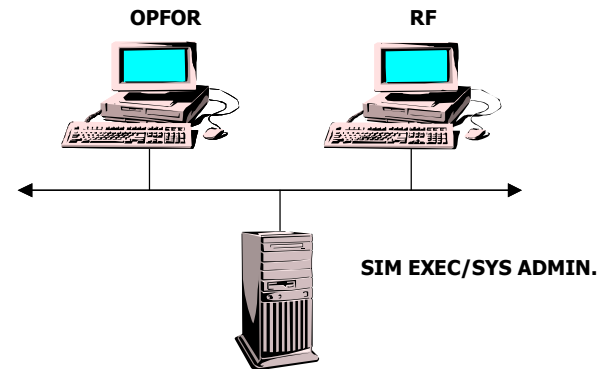
Protocol

- ASSESS/ATLAS Path & Thieves scenario
- SME round table creates overall scenario
 - Delay Expert
 - Physical Security Experts
 - Pro Force and Military Tacticians
- BATTLE P_N / Order of battle
- Setup JCATS scenario, test, & run
 - One Time Set-up (Baseline & Upgrade)
 - Time / Run starts @ 0:00
 - Pause @ after target task time (Data collection point)
 - 3-5X speed during certain activities

JCATS

Warrior Code Methodology

- Two operators
 - Response Force
 - OPFOR
- Limited number of systems available (predefined)
- Pre-node and lengthy setup
 - Nodes inclusive of delay and task times
- Shoots On
- Short run times





JCATS

What JCATS Can Model

- Optical and thermal sensors
- Explosives
 - Bombs
 - IED
 - Claymores
- Entity level movement, acquisition, and targeting
- Movement and engagement in rural and urban areas
- ChemBio Effects
 - ChemBio agents affect the health of systems
 - Effects are modeled in two ways:
 - Red-Blood Cell Acetylcholinesterase (RBC-A ChE) depression model
 - » Relates cumulative ingested dose of nerve agents to the % inhibition of RBC-A ChE activity
 - LD50
 - » Expressed as mg-min/m³