NDIA 16th Annual Security Technology Symposium

Systematic Assessment of Airport Risk

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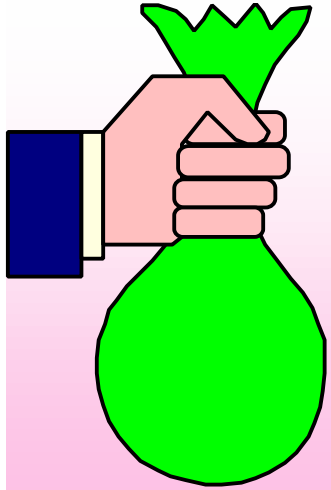
Background



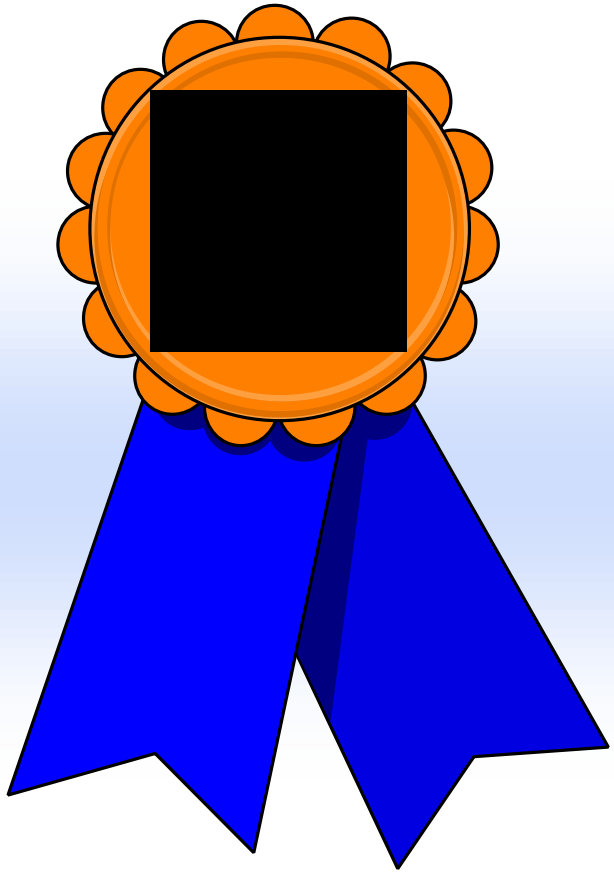
- Response to the Congressional Funding of White House Commission Recommendations
- Refers to the Use of Quantitative Methods

Project Organization

- **7 Performing Organizations**
- **13 Major Airports**
- **Completion within FY98**
- **Blue Ribbon Panel-Evaluation**

Blue Ribbon Panel

- Representatives from FAA, National Labs (BNL, ORNL, ANL, SNL) & US Army Corps of Engineer
- Evaluation process based on "Decision Science" methods
- Act as advisors and evaluators
- Develop recommendations for automated tool



Evaluation Criteria

Technical Credibility	Applicability
Comprehensiveness	Subjective Judgments
Usefulness	Hardware Cost
Usability	Software Cost
Flexibility	Technical Support Cost
Ease of Implementation	

Evaluation Results

Methodology from SAIC found clearly superior

- Excel spreadsheet based

Improvements made to “idiot-proof” tool

- Inputs from pick-list
- Color coded cells
- Equations locked (tamper-proof)

Tool entitled “Systematic Assessment of Facility Risk” (SAFR)

SAFR Approach

- Table-top analysis, consensus building
- Involves local facility security personnel
- Uses subjective inputs (not “data”)

Basics of Table-Top Analysis

- Two-day Analysis Session
  - Led by FAA Facilitator
  - Airport Security, Law Enforcement and Air Carrier staff (2-4)
  - Evaluate FAA supplied Scenarios

SAFR Method

- Threat scenario driven
- For each threat:
  - Evaluate current security
  - Compute Relative Risk
  - Estimate upgrade effectiveness

Relative Risk **(RR)** Calculation

- RR = TI (1-LA) (1-LS), where
  - RR = **R**elative **R**isk
  - TI = **T**arget **I**mportance (Attractiveness x Consequences)
  - LA = **L**ikelihood of Preventing Aggressor **A**ttempt

  (or) 1-LA = Likelihood of Aggressor Attempt
  - LS = **L**ikelihood of Preventing Aggressor **S**uccess

  (or) 1-LS = Likelihood of Aggressor Success

  (aka "Vulnerability")

Attractiveness of Target

- Determine a Qualitative Target Rating
- Assign a Numerical Value to Rating

Qualitative Rating	Quantitative Value	Typical Example
• Extremely Attractive	5	Aircraft with passengers and an identified threat or an air carrier with an identified threat.
• Very Attractive	4	Aircraft with passengers or an operational terminal.
• Attractive	3	Passenger aircraft without passengers or support services essential for operations.
• Less Attractive	2	An in-service cargo aircraft or retail operations.
• Unattractive	1	Out of service Aircraft

Consequence Scales

$$C = 0.5F + 0.2U + 0.3E$$

LEVEL OF CASUALTIES (F)		FACILITY DOWN TIME (U)		EXPOSURE (E)	
Very High (4)	>Than 10 Fatalities	Very High (4)	>Than 24 hours	Very High (5)	Public Outcry/ Dismay
High (3)	1-10 Fatalities	High (3)	>16 to 24 hours	High (4)	Congressional Mandates
Moderate (2)	1 Fatality and/or Multiple Injuries	Moderate (2)	>8 to 16 hours	Moderate (3)	Potential Litigation
Low (1)	1 Person Injured	Low (1)	8 hours or Less	Low (2)	Major Investigation
Very Low (0)	No Injuries	Very Low (0)	No Down Time	Very Low (1)	Minor Investigation

Note: number and definition of scales user definable

Preventing Aggressor Attempt **(LA)**

- Can be based on Intelligence - Specific Threat

- More typically used to indicate Deterrence factor of security measures

Preventing Aggressor Success **(LS)**

- Two Critical Components:
  - Alert (LSA) -- The ability to:
    - Detect a malevolent act
    - Correctly assess the act
  - Response (LSR) -- The ability to:
    - Intercept the activity (may involve delay)
    - Neutralize the malevolent act

Scenario Analysis and Calculations

- Conduct Table-top Scenario Analysis
  - Part I Baseline (existing conditions)
  - Part II Upgrade Set 1
  - Part III Upgrade Set 2
- Calculate RR using Spreadsheet
- Develop Composite Upgrade Sets & Costs
- Compare Costs & Benefits

Baseline Evaluation Worksheet

Likelihood of Preventing Aggressor Success (LS)					
Detection Opportunity	**1st Opportunity**	**2nd Opportunity**	**3rd Opportunity**	**4th Opportunity**	**5th Opportunity**
Aggressor's Tasks	Breach Boundary Fence	Cross AOA	Place IED in aircraft		
Time to Complete Task (seconds)	10	600	120		
Total Time Remaining at Start of Task (seconds)	730	720	120		
ALERT (LSA)	**1**	**2**	**3**	**4**	**5**
Detect					
(Threatening action is detected)	0.1	0.3	0.5		
Detection Element	Casual Observation	Casual Observation	Casual Observation		
Assess					
(Given that a detection occurs, the threatening act is correctly assessed)	0.7	0.3	0.5		
Assessment Element	Worker Observation	Worker Observation	Worker Observation		
LSA	**0.07**	**0.09**	**0.25**		
RESPOND (LSR)	**1**	**2**	**3**	**4**	**5**
Assuming that the act has been detected and properly assessed , interception and neutralization are based on a comparison of security response time with the time the aggressor needs to complete the act and the relative capabilities of security forces and aggressors (e.g., number of individuals, weapons, training).					
Intercept					
(Activity is interrupted)	0.9	0.9	0.3		
Neutralize					
(Activity is neutralized)	0.9	0.9	0.1		
LSR	**0.81**	**0.81**	**0.03**		

Likelihood of Preventing an Attempt (LA)		Target Attractiveness (A)	
	LA Rating		**A Rating**
Very High (0.9)		Extremely Attractive (5)	
High (0.7)		Very Attractive (4)	4
Moderate (0.5)		Attractive (3)	
Low (0.3)		Less Attractive (2)	
Very Low (0.1)	0.1	Unattractive (1)	

Consequence (C) Calculations					
Casualties (F)	**F Rating**	**Down Time (U)**	**U Rating**	**Exposure (E)**	**E Rating**
Very High (4)	4	Very High (4)		Very High (5)	5
High (3)		High (3)	3	High (4)	
Moderate (2)		Moderate (2)		Moderate (3)	
Low (1)		Low (1)		Low (2)	
Very Low (0)		Very Low (0)		Very Low (1)	
				C = .5F+.2U+.3E C=	**4.1**

Relative Risk Calculations (RR)			
TI = Target Importance = A * C =	**16.4**		
LA = Prevent Aggressor Attempt =	**0.1**		
***LS= Prevent Aggressor Success =**	**0.13**	**RR = TI(1-LA)(1-LS) =**	**12.83**

*NOTE: LS is calculated using the following formula:

LS = LSA1*LSR1 + (1-LSA1)*LSA2*LSR2 + (1-LSA1)*(1-LSA2)*LSA3*LSR3 + (1-LSA1)*(1-LSA2)*(1-LSA3)*LSA4*LSR4 + (1-LSA1)*(1-LSA2)*(1-LSA3)*(1-LSA4)*LSA5*LSR5

SAFR Results

- Values for Vulnerability and Relative Risk for baseline and upgrades
- Comparison across threat scenarios prioritizes weaknesses
- Part of overall security planning process

SAFR Analysis Characteristics

- Clear and understandable results
- “Ownership”
- <u>Focus</u> on significant details

SAFR Benefits

- Clear understanding of current and potential security effectiveness
- Identifies multi-purpose security measures
- Provides a basis for prioritization and decision making

Implementation Plan

- Initial Roll-out beginning 2000
  - Trained FAA agents conduct sessions
  - Airport retains spreadsheets/manual
  - Expect that locals can continue to use tool without FAA Agents support
  - FAA revisit/audit periodically
  - Alternative to AVSEC table-tops