

RAMPART

Risk Assessment Methodology Property Analysis Ranking Tool

SAND2013-2988C

CARVER & Resilience

NUCLEAR ENERGY & GLOBAL SECURITY



T E C H N O L O G I E S

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Risk of Extended Infrastructure Loss

The baseline problem, prior to the implementation of the method described by Vugrin et al., is to determine the risk of extended infrastructure loss.

Vugrin, et al., “A mission resilience assessment methodology for infrastructure disruptions,” *2012 46th Annual IEEE International Carnahan Conference on Security Technology* (ICCST 2012), pp53-8.



CARVER & RAMPART

- RAMPART determines the relative risk to individual buildings of infrastructure losses caused by natural hazards and that exceed on-site backup capability.
- CARVER determines the relative attractiveness and vulnerability of nodes on any modeled system to malevolent actions by knowledgeable aggressors.
 - Includes assessment of effects of attacking a node, and downstream systems that mitigate those effects.
 - Downstream algorithms could be expanded to accurately model any infrastructure.



RAMPART History



- **1990s:** Hurricane Andrew (\$38.1 B in losses) and the Murrah Building bombing (168 deaths) led to focus on safety in public buildings
- **1998:** Sandia met with GSA Chief Architect, about a risk-assessment tool for GSA buildings. RAMPART project began
- **Initial goals:**
 - Develop methods for performing risk assessments for buildings
 - Implement these methods in software
 - Create a user interface that allows any GSA employee to perform and interpret a risk assessment and begin to mitigate risk.



Early Development



- **Version 1.0, 2002:**
 - **7 hazards** (earthquake, hurricane, flood, tornado, winter storm, crime, terrorism)
 - **6 consequences** (mission loss, death, injury, property loss, contents loss, use loss)
- **Version 2.0, 2003:** added hazard (infrastructure loss), consequence (first-responder risk), a roll-up of all hazards risk, improved algorithms
- **Version 3.0, 2004:** added hazard (fire), improved algorithms, updated crime DB, improved flood data, revised DB to reflect post-9/11 federal government



RAMPART technology survives the test of time.



- **2000s:** Copies requested by and provided to many federal, state, and local agencies

SNL licensed technology to three companies, two of which marketed derivative software:
 - CAP Index, Inc., marketing and has sold RedFlag
 - Ducks in a Row, Inc., marketing and has sold Safe at Home
- **2005:** SNL began the CARVER food-defense software for FDA/USDA
- **2008:** GSA requested RAMPART incorporate Interagency Security Committee criteria (ISC)



Recent Development



- **Version 4.0, 2008:** New data, RAMPART questions and algorithms transferred to CARVER framework, C# .NET overcame limitations of Visual Basic
- **Version 5.0, 2011:** Aligned with ISC's *Physical Security Criteria for Federal Facilities*, Interface is completely 508-compliant
- **Version 6.0, 2012:** Multibuilding averaging capability, GIS capability
- **Version 7.0, TBD:** Environment, Safety and Fire modules being added



RAMPART Equations



- For each ISC hazard, a unique equation calculates threat level based on threat indicators
- Scoring drew on ISC's Design Basis Threats, and expert opinion
- The threat equations take the general form

$$\text{Threat} = \text{Sum [Threat Indicators]}$$

- Example: Arson Threat = f (FSL) + f (Arson rate) + f (Content) + f (law enforcement)
- Equations for natural hazards and an overall crime and terrorism take the general form

$$\text{Risk} = [\text{Threat}] * [\text{Consequence}] * [\text{Vulnerability}]$$



Address Information (Screen Shot)

RAMPART GSA - [Building2.PEX]

File Reports Window Help

Address Information

↓

FSL Determination: Baseline

↓

FSL Determination: Intangibles

↓

Identified Baseline LOP

↓

Identify and Assess Risks

↓

Risks = Baseline LOP ?

↓

Determine LOP Required to Meet Risk

Address Information

Existing GSA Building GSA Building #

Building Name

Street Address 1

Street Address 2

City

ZIP Code *

County

State

Session Notes

Test | Use this field as a memo pad while performing the analysis. These notes will not appear in the printed report.

Preparers' Names

Report Create on: 7/8/2010 7:33:25 AM

Report Last Modified: 7/8/2010 2:46:56 PM

Help

Use this field as a memo pad while performing the analysis. These notes will not appear in the printed report.

* Fields are required.

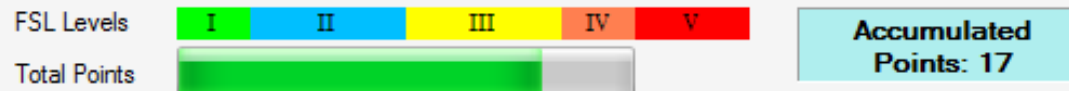
[Go to FSL Determination](#)



FSL Determination (Screen Shot)

Calculated Facility Security Level

FSL Final Score



Raised by one level: No
Lowered by one level: No
Set to level 5: No

Preliminary FSL: **III**
Final FSL: **III**

ISC Facility Security Level Determination Matrix (Points)

Factor	1 Point	2 Points	3 Points	4 Points	Score
Mission Criticality	LOW	MEDIUM	HIGH	VERY HIGH	4
Symbolism	LOW	MEDIUM	HIGH	VERY HIGH	4
Facility Population	< 100	101-250	251-750	> 750	1
Facility Size	< 10,000 sq. ft.	10,001-100,00 sq. ft.	100,001-250,000 sq. ft.	> 250,001 sq. ft.	4
Threat to Tenant Agencies	LOW	MEDIUM	HIGH	VERY HIGH	4
Facility Security Level	I (5-7 Points)	II (8-12 Points)	III (13-17 Points)	IV (18-20 Points)	17



Identify & Assess Risks (Screen Shot)



RAMPART GSA - [Building2.PEX]

File Edit Reports Window Help

Threat Indicators Tenants Occupancy Patterns Contents Real Property Building Construction Building Security Disaster Resilience

Status 100% Complete 193 out of 193

How many peak business days per year affect traffic in this building?

- No seasonal peak
- 1 to 10
- 11 to 30
- 31 to 90
- 91 to 180
- 181 to 270

Question Help

Some agencies have a substantially greater number of customers during some parts of the year than others. For example, the Post Office is busier than usual in November and December. If a building tenant has this type of seasonal peak in the number of workers or customers entering the building, select the range of days that best fits the time the larger number of persons will be present. If business is about the same year-round, select 'No seasonal peak.' Include only relatively predictable peaks, not transient influxes connected with occasional events.

Previous Question Tab Next Question Next Tab Clear Answer Print this Question

Interview Navigation

- How many peak business days per year affect traffic in this building?
- What is the total number of employees, on-site contractors, and visitors who enter this building between 8 a.m. and 5 p.m. on peak business days?
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- What is the total number of employees, on-site contractors, and visitors who enter this building between 8 a.m. and 5 p.m. on off-peak business days?
- What is the total number of employees, on-site contractors, and visitors who enter this building between 5 p.m. and 8 a.m. on off-peak business days?
- Is this facility routinely visited by families or school groups?
- Are more than 25% of the people in this facility each day visitors?

Back Risk = Baseline Show desktop



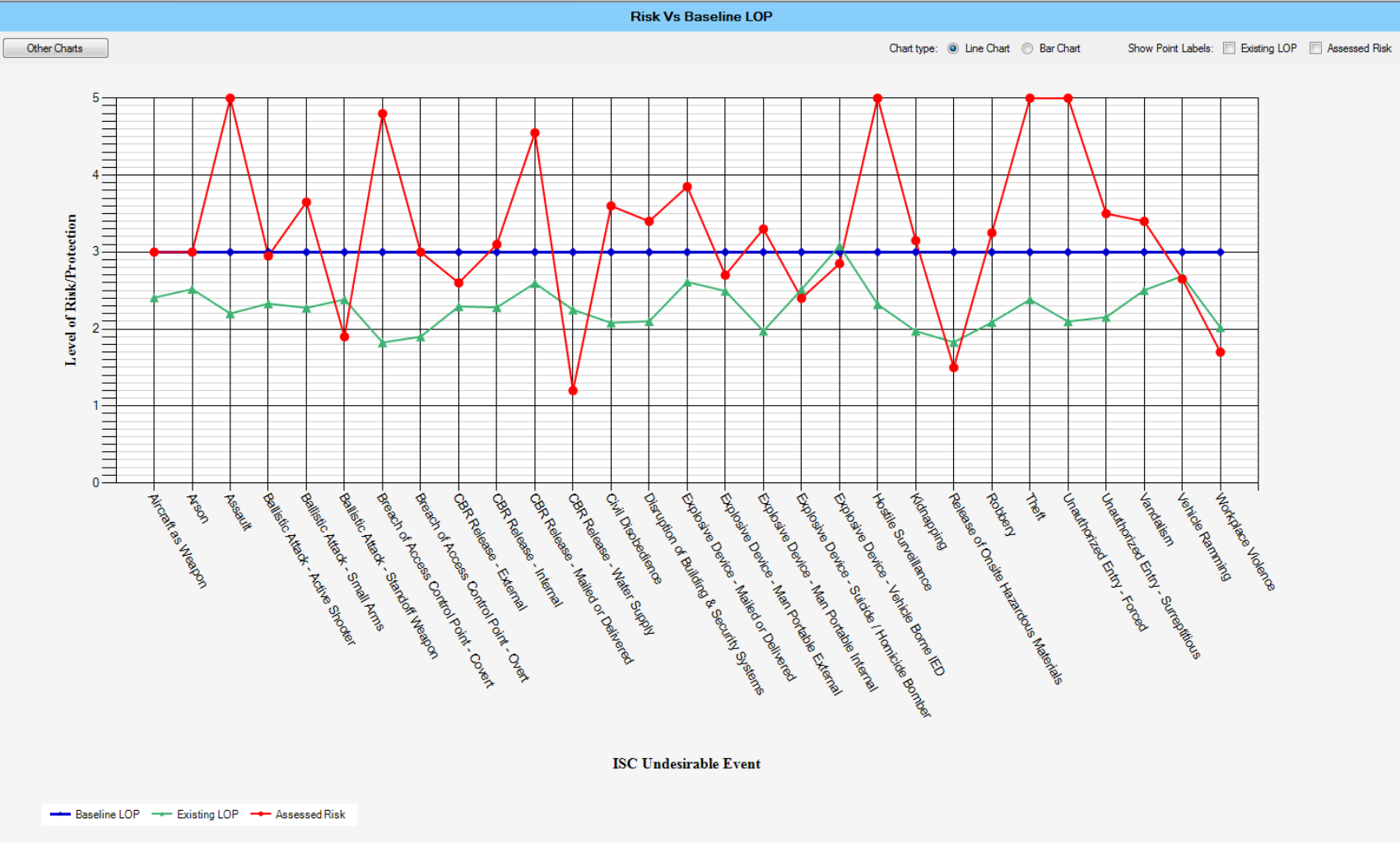
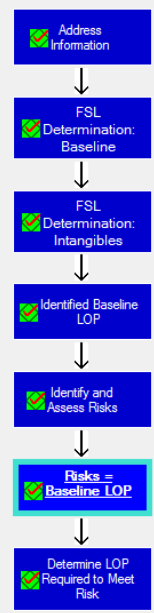
Risk = Baseline LOP?

(Screen Shot)



RAMPART GSA - [Building2.PEX]

File Chart Reports Window Help



Back

Determine Countermeasures Show desktop



CARVER Defined

C	–	Criticality:	Public health and economic impacts
A	–	Accessibility:	Ability of an attacker to reach a target
R	–	Recognizability:	Ease of identifying a target
V	–	Vulnerability:	The potential success of an attack
E	–	Effect:	Direct loss of production
R	–	Recuperability:	Ability of the system to recover



CARVER Scoring

(Criticality scale as an example)

CRITERIA	SCALE
Loss > 10,000 lives OR loss of > \$100 billion	9 – 10
Loss 1,000–10,000 lives OR loss \$10 - \$100 billion	7 – 8
Loss of 100 – 1000 lives OR loss of \$1 - \$10 billion	5 – 6
Loss of < 100 lives OR loss of < \$1 billion	3 – 4
No loss of life OR loss of < \$100 million	1 – 2

Strategic Partnership Program Agroterrorism

DHS/FBI/USDA/FDA

2005-2007

Agriculture/Manufacturing/Retail & Food Service

FDA/USDA	LA	Grain – export elevators
USDA	IA	Swine Production
USDA	PA	Egg Products – liquid
USDA	AR	Poultry Processing
USDA	NE	Beef Cattle Feedlot
USDA	KS	Ground Beef Processing
USDA	MO,KS	Livestock Auction Barn
USDA	ID	Dairy Farm
USDA	IL	Soybean Farm
USDA	IL, IA	Corn Production
USDA	IA	Domestic Grain Cooperative-Grain Elevator
FDA	CA	Fresh-Cut Produce – bagged salads
USDA	GA	Poultry-Broiler Industry
FDA	TN, MN	Yogurt
FDA	PA	Bottled Water
FDA	MI	Baby Food – jarred applesauce
FDA/USDA	WI, FL	Frozen Food – pizza
FDA	NH	Juice Industry – apple juice
FDA	AZ	Infant Formula
FDA	NY	Fluid Dairy - processing
FDA	TX	Retail Fluid Milk
FDA	OK	Flour Milling
USDA	WI	Link Sausage Production
USDA	OH	Correct. Inst. Processing-Ground Beef Production
FDA	IA	Commercial Feed Mill
USDA	PA	Hot Dog Production
FDA	MN	Breakfast Cereal (production)
FDA	AL	High Fructose Corn Syrup (production)
USDA	NC	School Central Kitchens
FDA	KS	Stadium Food Service
FDA	PA	Grocery Stores
USDA	MO	USDA Commodity Warehouse
FDA/USDA	VA	Distribution
USDA	MD	Import Re-Inspection Facility

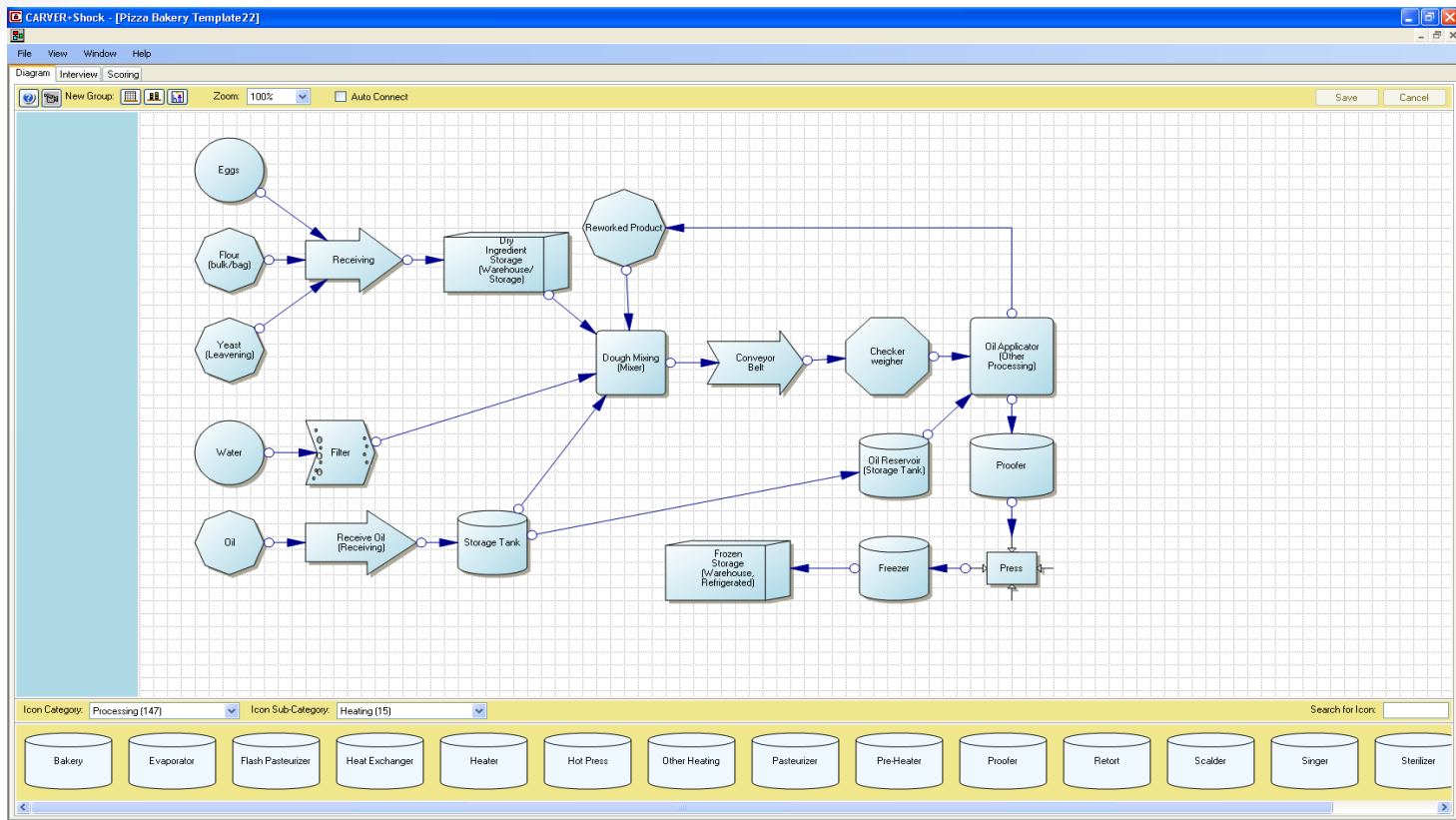
SPPA

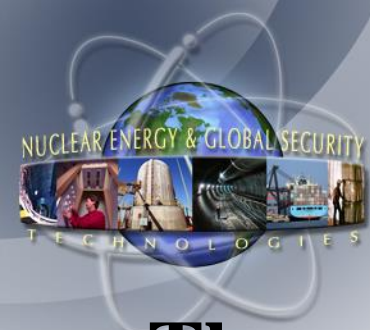


CARVER+Shock Functions

- Three main steps

1. Develop a process flow diagram



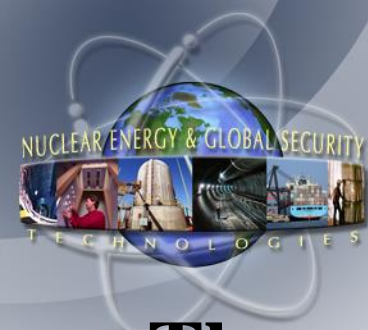


CARVER+Shock Functions

- **Three main steps**

1. Develop a process flow diagram
2. Interview questions

1. Are vehicles allowed to enter the fenced area?
2. Do you control all access points through fixed guards, limited-rate gates (e.g. revolving gates), or detection-activated surveillance?
3. How do you control access to the building? (check all that apply)
4. What kinds of security do you have inside the building during working hours? (check all that apply)



CARVER+Shock Functions

- **Three main steps**

1. Develop a process flow diagram
2. Interview questions

3. Scoring

Element Rankings by Total (Agent: Water soluble modest heat survivability)

Rank by the selected category:

C	A	R	V	E	R	S	Total	Description
10	10	10	8	7	10	10	65	Water
10	8	10	8	8	10	10	64	Press
6	10	10	8	7	10	10	61	Yeast (Leavening)
8	7	10	8	8	10	10	60	Dough Mixing (Mixer)
7	8	10	8	7	10	10	60	Freezer
6	8	9	8	8	10	10	59	Filter
7	7	10	6	8	10	10	58	Conveyor Belt
3	10	10	8	7	10	9	57	Frozen Storage (Warehouse, Refrigerated)
8	2	10	6	8	10	10	54	Oil Reservoir (Storage Tank)
4	8	9	6	7	10	10	54	Oil Applicator (Other Processing)
6	10	5	6	7	10	10	54	Reworked Product
10	4	10	2	7	10	10	53	Storage Tank
6	8	8	1	7	10	10	50	Proofer
3	8	10	3	7	10	9	50	Checkerweigher
6	10	5	1	7	10	10	49	Eggs
4	10	5	1	8	10	10	48	Flour (bulk/bag)

OK



Agents

(4 for agriculture)

	Max Temperature Degree C	Solubility	Relative Toxicity
Agent 1	80	Water	High
Agent 2	100	Water & oil	Medium
Agent 3	100	Oil	High
Agent 4	All temps	Water	Low
Agent 5	All temps	Water	Very high



User Session

(Mitigation)

Score Detail for Agent: Water soluble modest heat survivability

Storage Tank

The following shows the detailed score for the process (click on the bar to get the mitigation measures):

C	10
A	4
R	10
V	2
E	7
R	10
S	10

The following shows the score detail for each category (max per category = 10):

- Criticality Score = 10
- Accessibility Score = 4
- Recognizability Score = 10
- Vulnerability Score = 2
- Effect Score = 7
- Recuperability Score = 10
- Shock Score = 10

TOTAL SCORE = 53 of 70

Mitigation Measures - Criticality

A node is critical when introduction of threat agents into food at this location would have significant health or economic impact. Other factors that significantly affect Criticality include product traceability and recall policies and procedures.

* Product cannot be traced to distribution centers and retail outlets. Consider establishing traceability procedures such as matching product code dating with destinations. Accurate traceability will decrease the potential scope and effect of a contamination event and decrease product recall time.

* Consider establishing product codes. Coding should include a process to match codes with distributions pathways.

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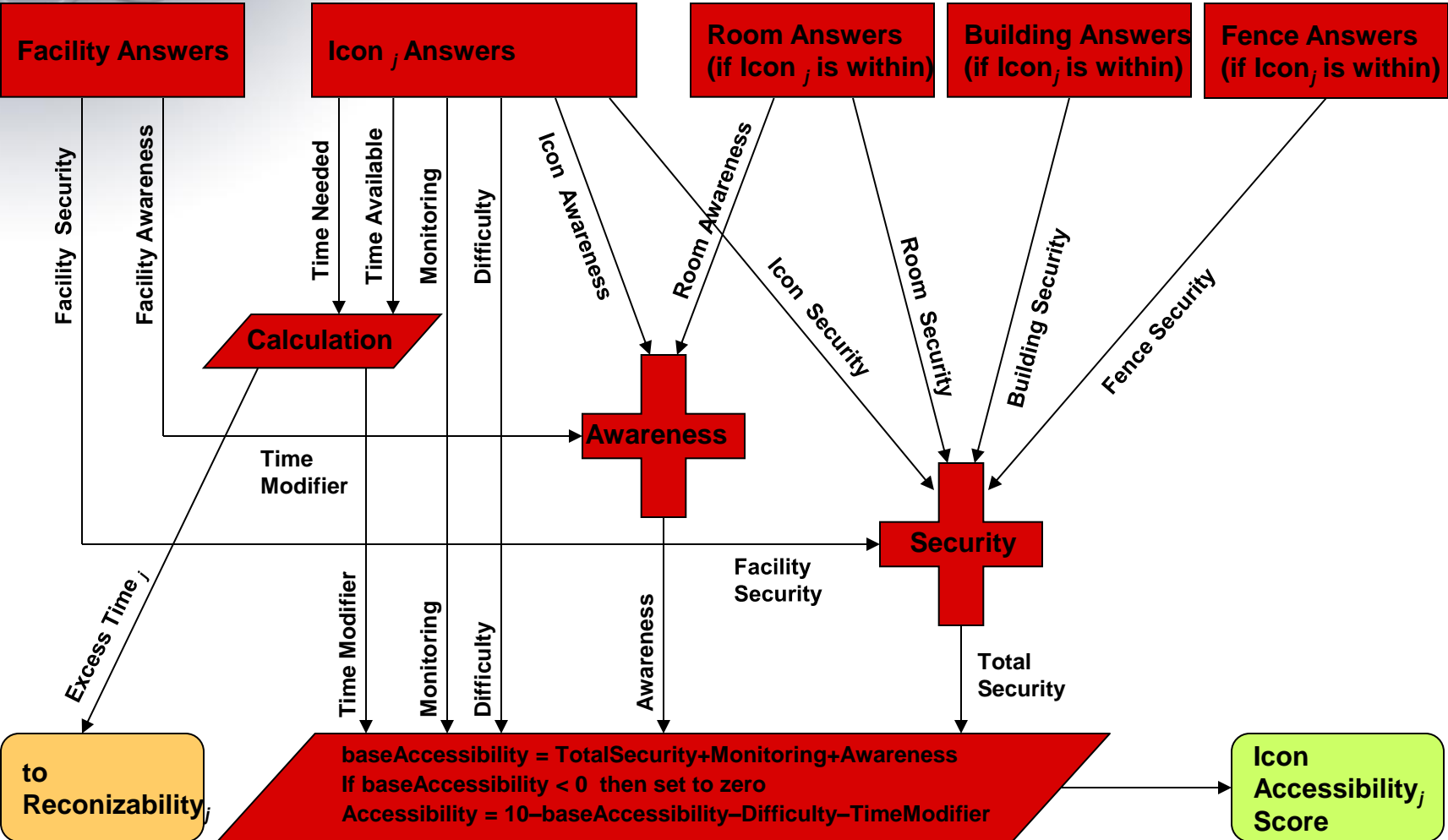
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*** Consider establishing product codes. Coding should include a process to match codes with distributions pathways.**



Algorithm Structure

(Accessibility used as an example)



baseAccessibility = TotalSecurity+Monitoring+Awareness
 If baseAccessibility < 0 then set to zero
 Accessibility = 10-baseAccessibility-Difficulty-TimeModifier

Icon Accessibility_j Score



WHAT CAN **YOU** DO
TO PROTECT YOUR FOOD BUSINESS
FROM INTENTIONAL CONTAMINATION



PREPARE
WITH THE
FREE

NEW

WWW.CFSAN.FDA.GOV/FOODDEFENSE



CARVER
+
SHOCK
SOFTWARE

Conclusions



- Structure and functionality of these tools suited to analysis of baseline Resilience issue
- RAMPART and CARVER are existing, tested software needing slight modification and validation to be applied
- Current RAMPART and CARVER versions designed primarily for civilian facilities assessment
- Modifying the software for the assessment of military installations would be straightforward



Questions?
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