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System Engineering Considerations

Implementing Radiation Detection Systems at International Seaports and Borders

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Topics

- Systems Paradigm
- System Design Considerations
- Concept of Operations
- Radiation Detection System Elements
- Challenges and Lessons learned

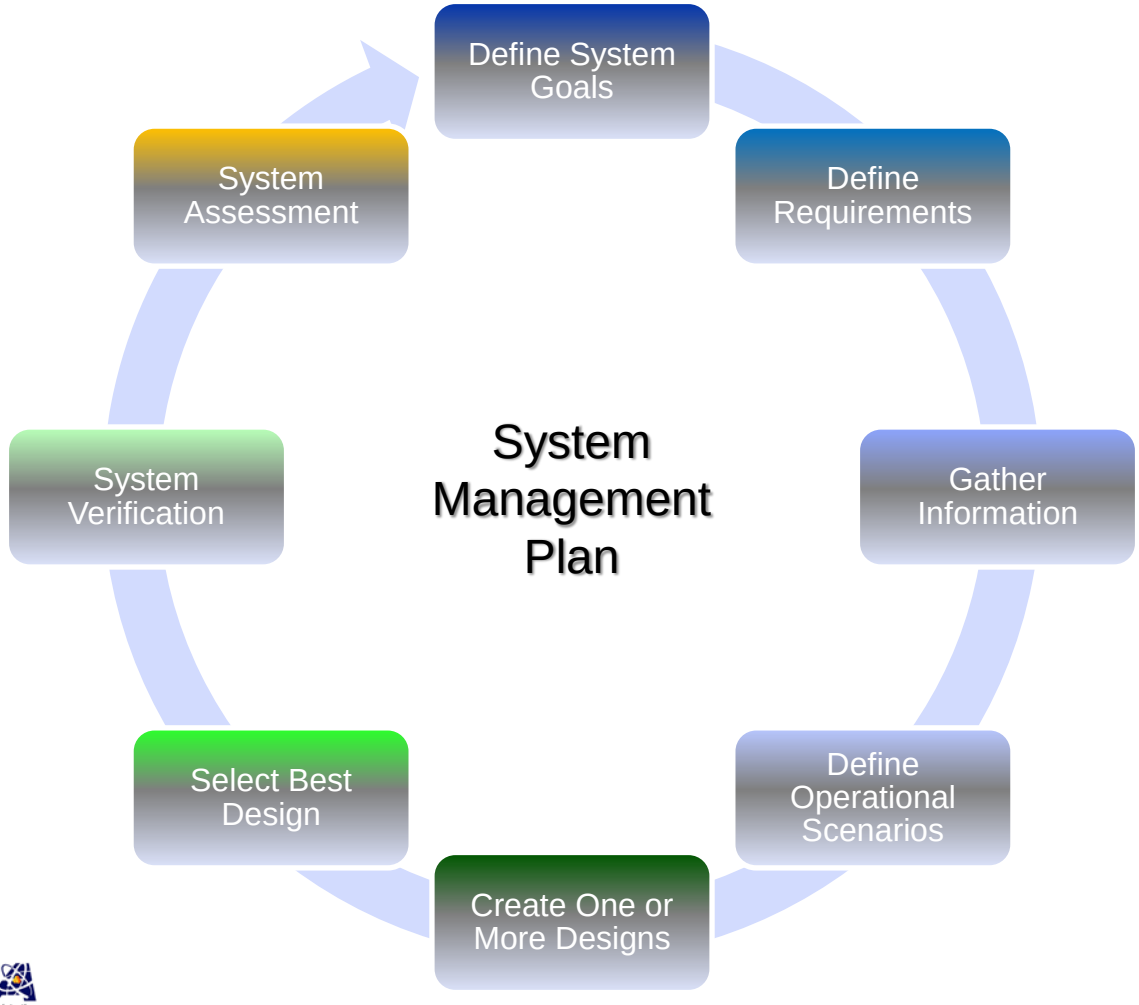
Radiation Detection Systems

Radiation detection systems, used in non-proliferation applications at seaports and border crossings, have unique and often complicated engineering, integration and operational challenges to overcome.

- Technical constraints
- Operational constraints
- Engineering constraints
- Resource constraints

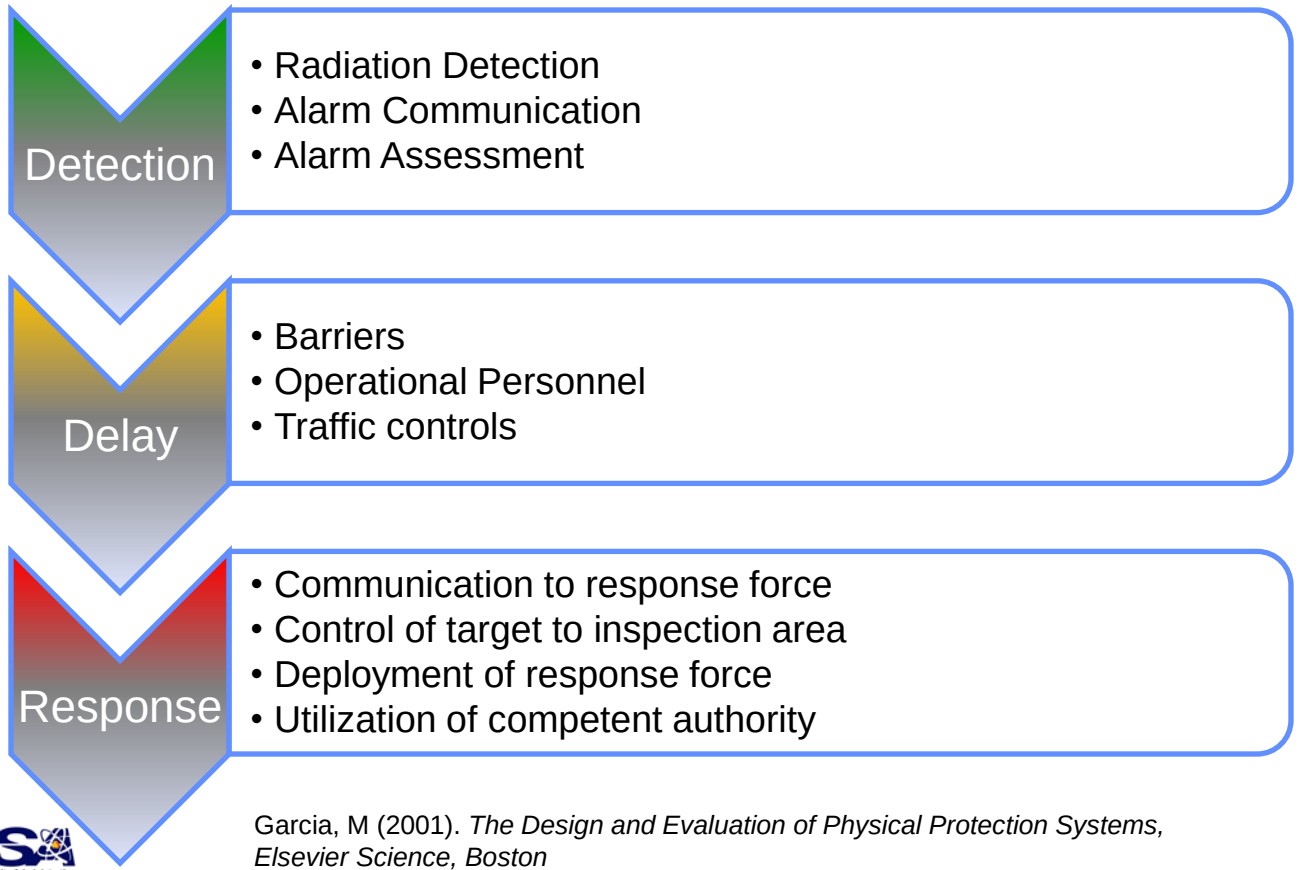
Consideration of these factors yields significant improvements in overall detection, provides for more effective response, provides effective data security and increases operational efficiency.

Systems Engineering Approach



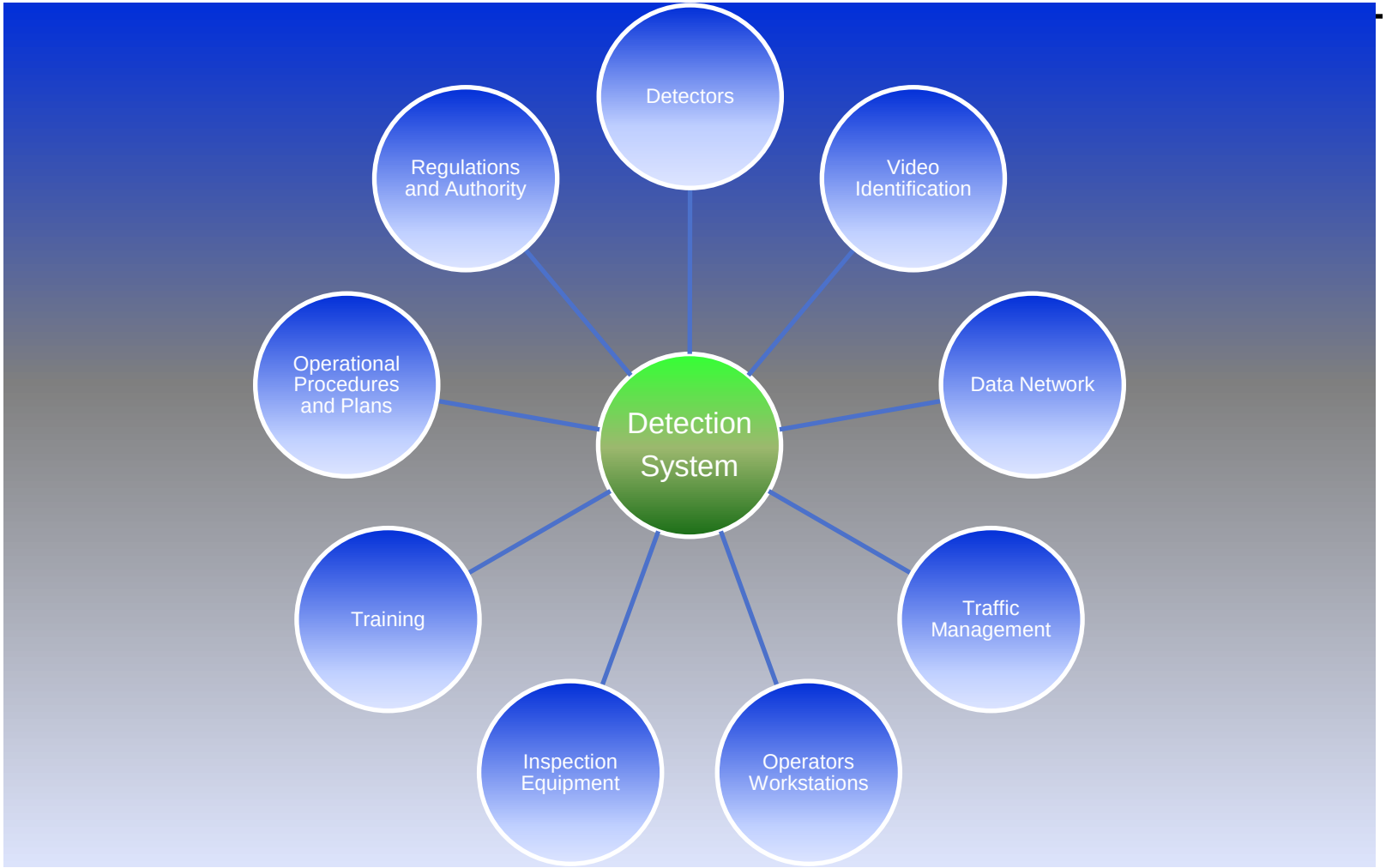
Concept of Operations

The Concept of Operations describes how the site will operate to achieve the desired objectives. It includes the principles of the Design and Evaluation Process for Physical Protection Systems:



Garcia, M (2001). *The Design and Evaluation of Physical Protection Systems, Elsevier Science, Boston*

System Design Elements



Radiation Detection System Key Elements

- Radiation Detectors
- Pedestrian and vehicle traffic control
- Visual identification systems
- Communications network
- Display and assessment
- Inspection and control
- Response

Equipment selection considerations

- **Type of facility** (Gate traffic, rail, pedestrian, cargo, baggage)
  - Appropriate radiation portal monitor type (fixed or mobile)
- **Geographical layout**
  - Communications system (wireless, fiber optic, copper)
- **Planned changes / future expansion**
  - Traffic flow impacts
- **Constructability** (type of surface, construction traffic management, existing infrastructure, distances, etc.)
- **Type of traffic** (out of gauge, scooters, pedestrians, other non-target vehicles)
  - RPM types, Occupancy sensors,

Typical Challenges

- Technical limitations of radiation detectors
- Impact on operations
- Traffic congestion
- Existing infrastructure
- Constructability
- Facility changes
- Control of threat
- Interference
- Construction costs
- Operational costs
- Staffing
- Stakeholder resistance
- Competent authority identification
- Fear

Common Mistakes in System Design

- Exceeding technical limits of equipment
- Inadequate equipment
- Ability to circumvent
- Traffic congestion, crowds and queues
- Lack of identification and control
- Complicated software
- Inadequate response procedures
- Inadequate training

Summary

- Systems are composed of their related elements and interfaces
- System elements include the physical components that make up the systems as well as the people required to operate or support the system
- An effective system will consider all required elements