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Logical Foundations for Protecting Materials and Facilities from those with Malicious Intent—Proposed 1st Principles for Security Systems

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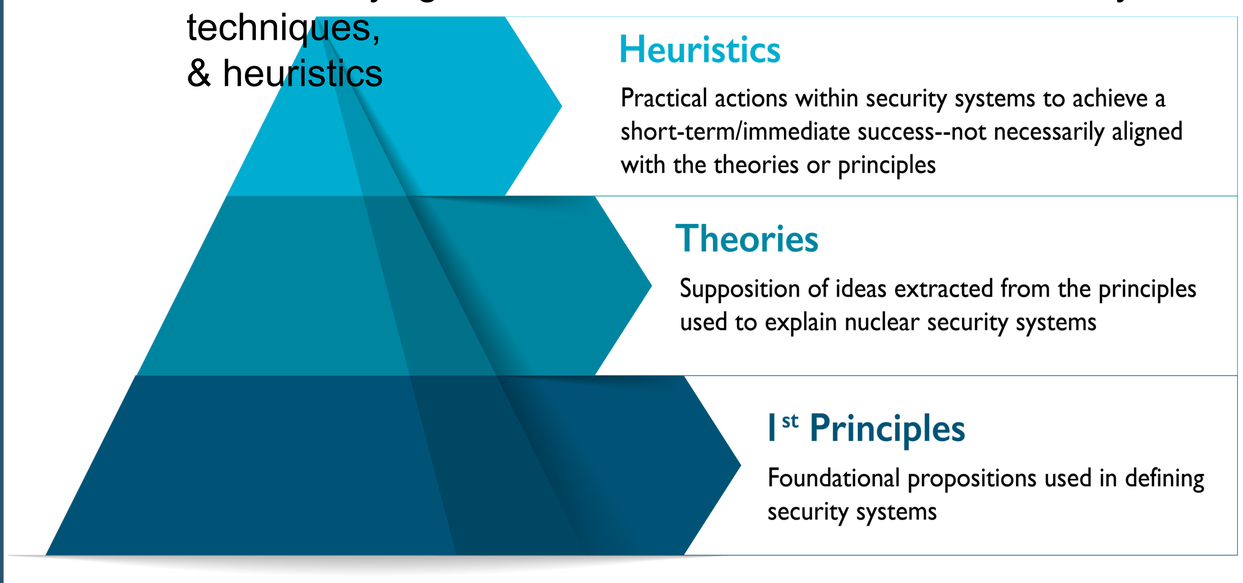
The ***1st Principles for Security Systems*** presented here are:

- Based on a dynamic, systems theoretic paradigm of nuclear security.
- Derived from both professional observation & empirical interviews with SMEs
- The underlying foundation for associated theories, analysis techniques, & heuristics



Conceptual hierarchy of logical elements for security systems

The 1st principles of security systems are defined as:

1. Security risk will never be zero
2. Security risk is dynamic
3. Threats are adaptive

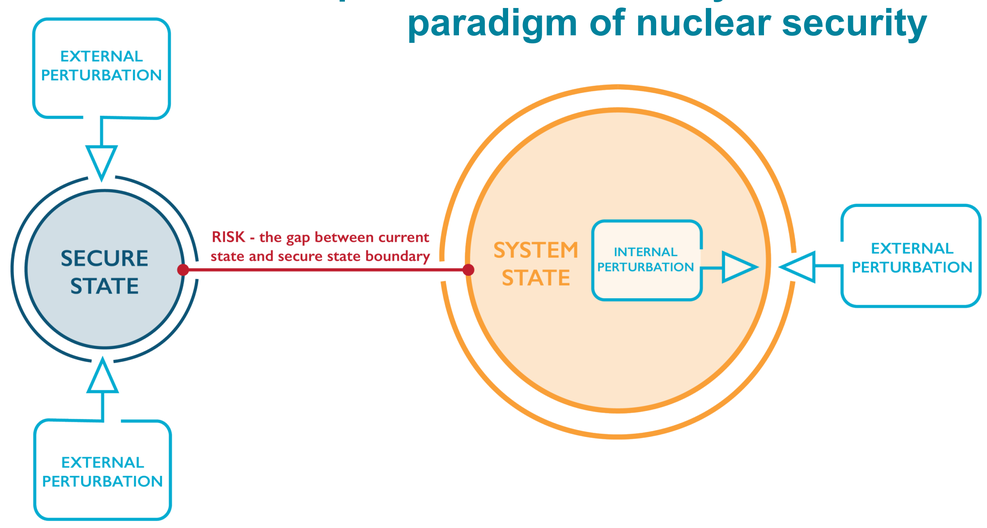
Representative Elements of Security Systems Theory

- Adequate security performance emerges from ***actively observing*** & ***proactively responding*** to security risk
- A security system should ***not be*** evaluated/analyzed as ***static***
- A security system must also be implemented ***to support & align*** with the ***operational objectives***

Representative Example Heuristics

- Without detection, physical security barriers are only a deterrence
  - Ex: *2005 Brazil bank heist*
- Without assessment and response to the detected threat there is no detection
  - Ex: *2012 security incident Y-12*
- Without resilience security risk will grow over time
  - Ex: *2016 Dyn DDoS Cyber Attack as compared to 2020 AWS DDoS attack*

Representation of the systems theoretical paradigm of nuclear security



Specific characteristics related to this ***paradigm of security*** include:

- Security = being in a state free from threat, not just the absence of attractiveness.
- The security state is dynamic, impacted by external perturbations (environment or threat)
- Security systems are *dynamic, complex systems* whose performance directs movement RE: a secure state
  - Any internal (e.g. component behavior) or external perturbations (e.g., weather, threat actor capabilities, etc.) can move the system closer or further from this state.
- Security *risks* are the gaps between current state and secure state.

Venn diagram reflecting the three 1st principles of security systems

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