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Basics of Physical Protection Systems

IPEN

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Objectives

- Explain the timing relationships of a PPS and define the Critical Detection Point (CDP)
- Discuss the concept of in-depth protection
- Discuss the concept of balanced protection
- Discuss the concept of timely detection/response
- Discuss the concept of protracted theft
- Describe “Protected Zone”
- Recognize that design and evaluation may take place at a subsystem level, but, in the end, performance-based designs will require assessment at the system level.

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Defeating an Adversary requires…

- PPS requirements and design analysis must focus on how well a system performs in defeating a defined adversary
- Protection-in-depth
- Minimum consequence of component failure
- Balanced protection

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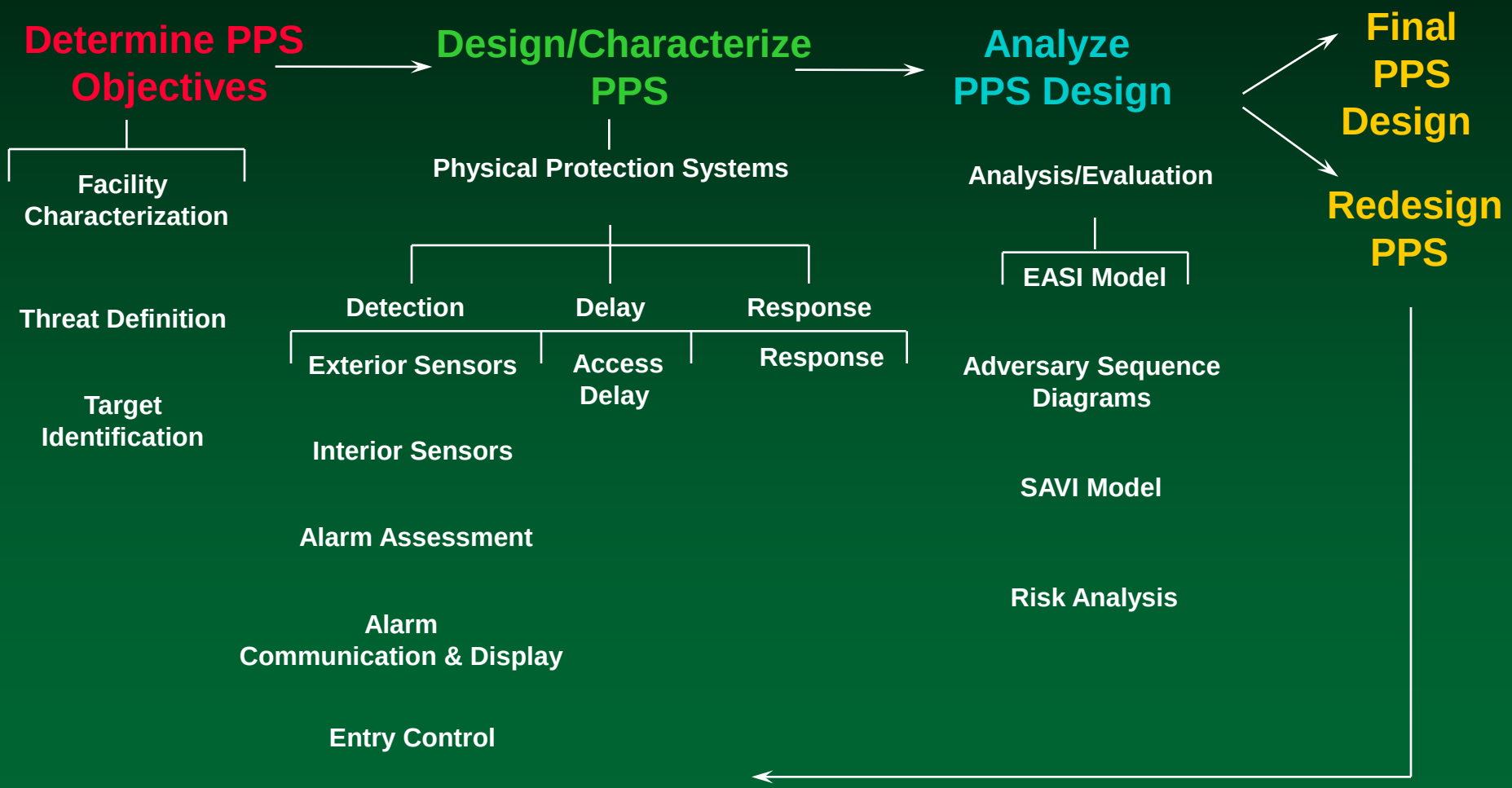
Design and Evaluation Process Outline (DEPO)



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PPS Function: Prevent Theft and Sabotage

- Deter the adversary
  - Implement a PPS which all adversaries perceive as too difficult to defeat
  - Problem: Deterrence is impossible to measure
- Defeat the adversary with PPS
  - PPS functions required: detection, delay, response
  - Actions of response force prevent adversary from accomplishing his goal

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Physical Protection

Detection

- Intrusion sensors
- Video assessment
- Alarm control and display

Delay

- Locks/Keys
- Window gratings
- Hardened doors
- Cages

Response

- Communications equipment
- Guard equipment

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Some PPS Design Principles

- Detection toward the perimeter and delay near the target
- Multiple layers of detection and delay (Protection-in-Depth)
- Minimum consequence of component failure
- Balanced protection
- Combine physical protection components into a system within constraints of the host facility
- Use components that complement each other and correct for weaknesses
- For cost effectiveness, work from the target out
- Assume the adversary will use covert tactics until detected, and will then switch to overt tactics

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Protection-in-Depth

- Adversary must defeat or avoid a number of protective devices in sequence
- Protection-in-depth (defense-in-depth) should:
  - Increase adversary's uncertainty about the system
  - Require more extensive preparations by adversary prior to attacking the system
  - Create additional steps where the adversary may fail or abort his mission

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Balanced Physical Protection System

- Provides comparable protection against all threats along all possible paths
- Applies to both detection and delay

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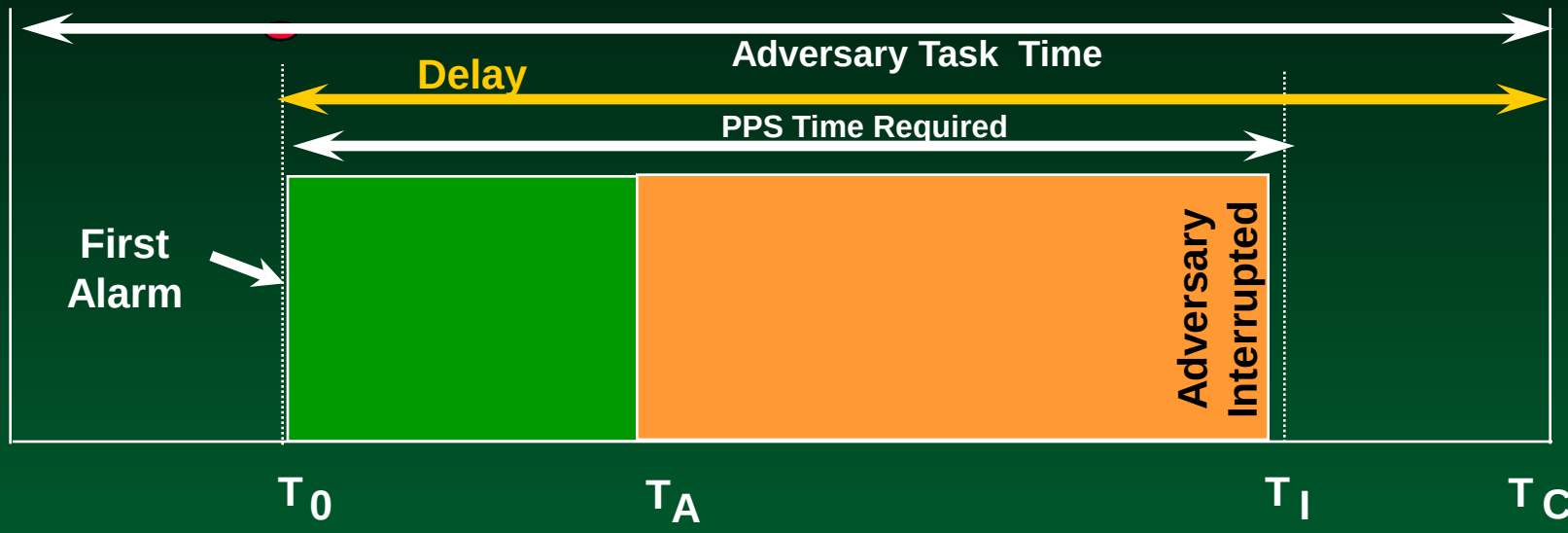
Adversary Task Time line



- System detection and response time must be less than adversary task time to increase system success probability
- Detect intrusion earlier
- Increase adversary task time
- Reduce assessment time
- Reduce response time

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Timely Detection / Response

- Timely Detection – Detection of an adversary early enough to ensure that the system delay elements are sufficient to give the response forces time to respond before the adversary completes their tasks.
- Timely Response – A response that is quick enough to stop the adversary once they have been detected given the system delay elements that the adversary must defeat.

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Physical Protection System Design / Characterization

- Design / characterize the physical protection system by:
  - Combining physical protection components into a system within a facilities constraints
  - Using components that complement each other and correct for weaknesses
  - Placing detection toward the perimeter and delay toward the target

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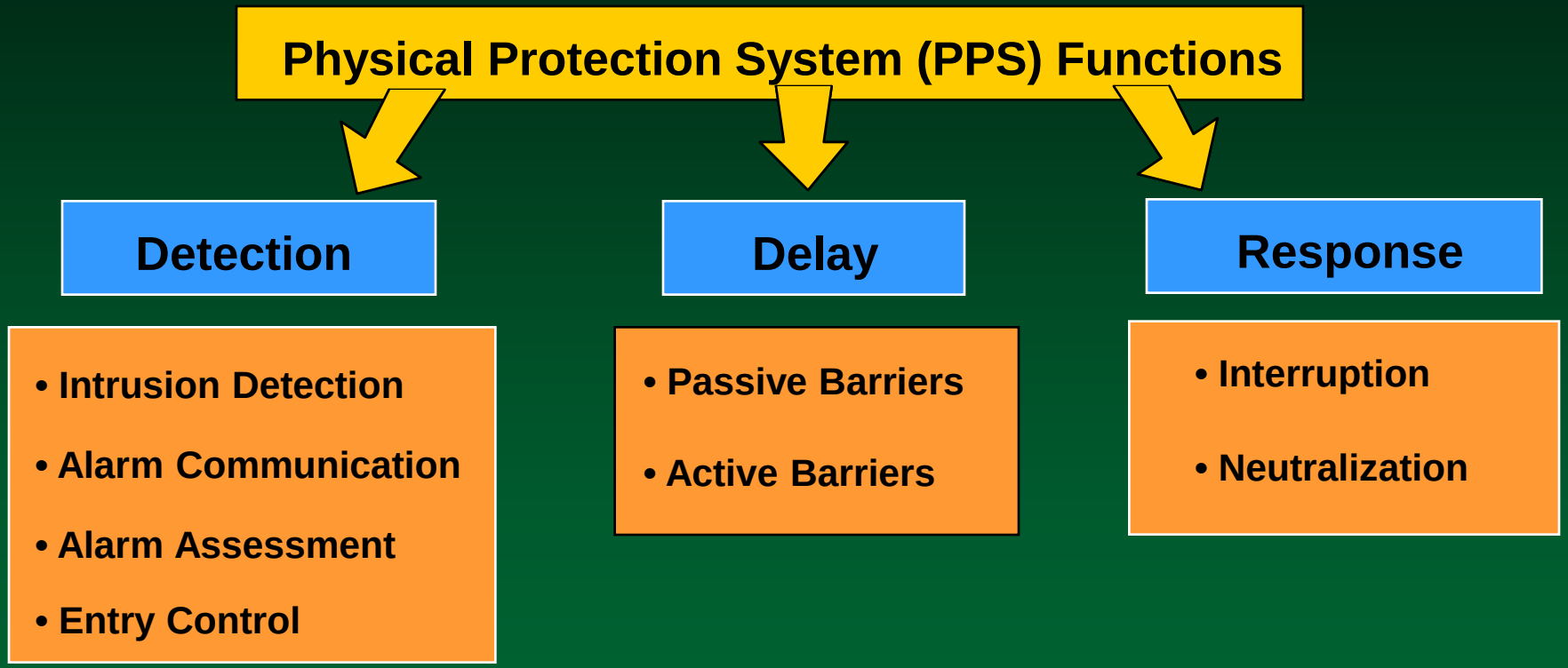
PPS Sub-systems by Function



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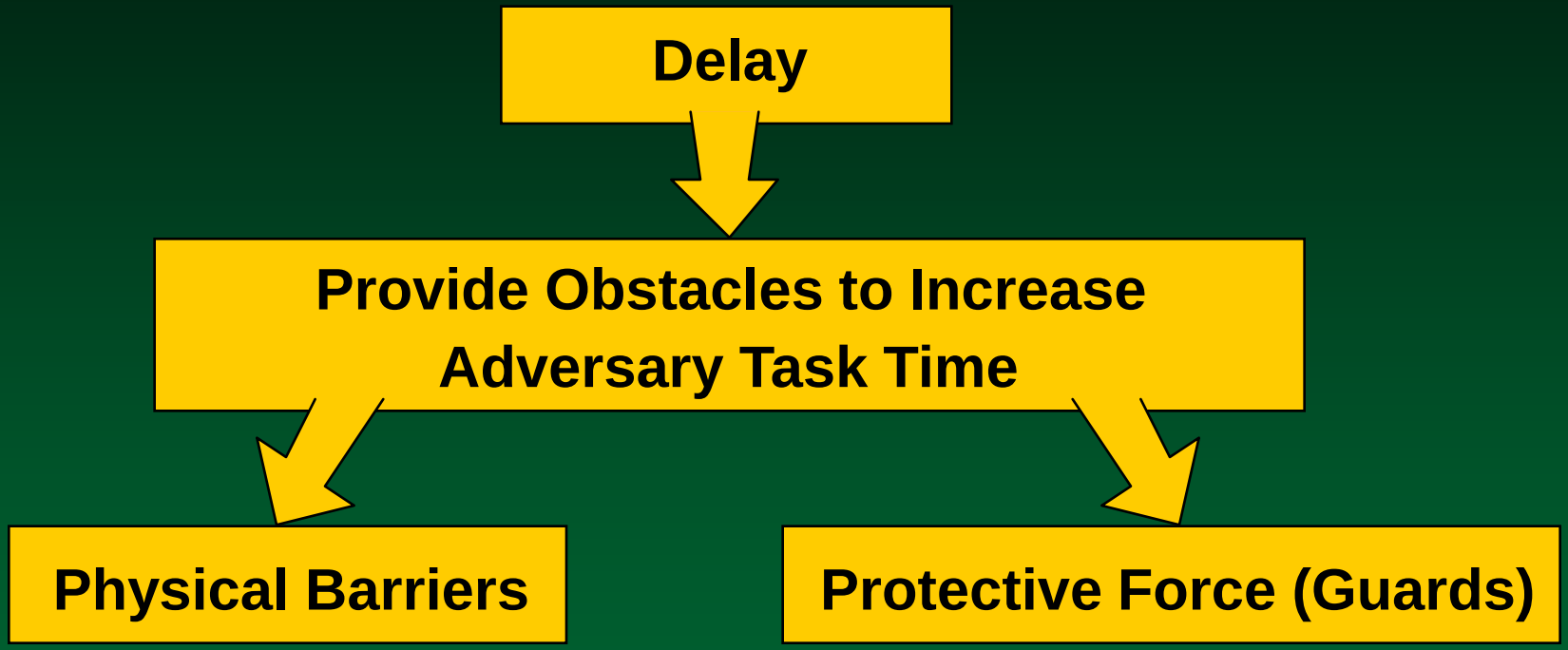
PPS Function Descriptions

- System functions that must always be present for defeat:
  - Detection
    - Alerts the system to the presence of an adversary
    - Includes the assessment function
  - Delay
    - Impedes the progress of an adversary to give the guards or police time to respond
    - Effective only after detection is accomplished
  - Response
    - From on-site guards, off-site police, or military personnel
    - Must be capable of defeating the adversary

Delay



- Performance measure
  - Time to defeat obstacles

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Response

- Performance measures
  - Probability of communication to response force
  - Time to communicate
  - Probability of deployment to adversary location
  - Time to deploy
  - Response force effectiveness

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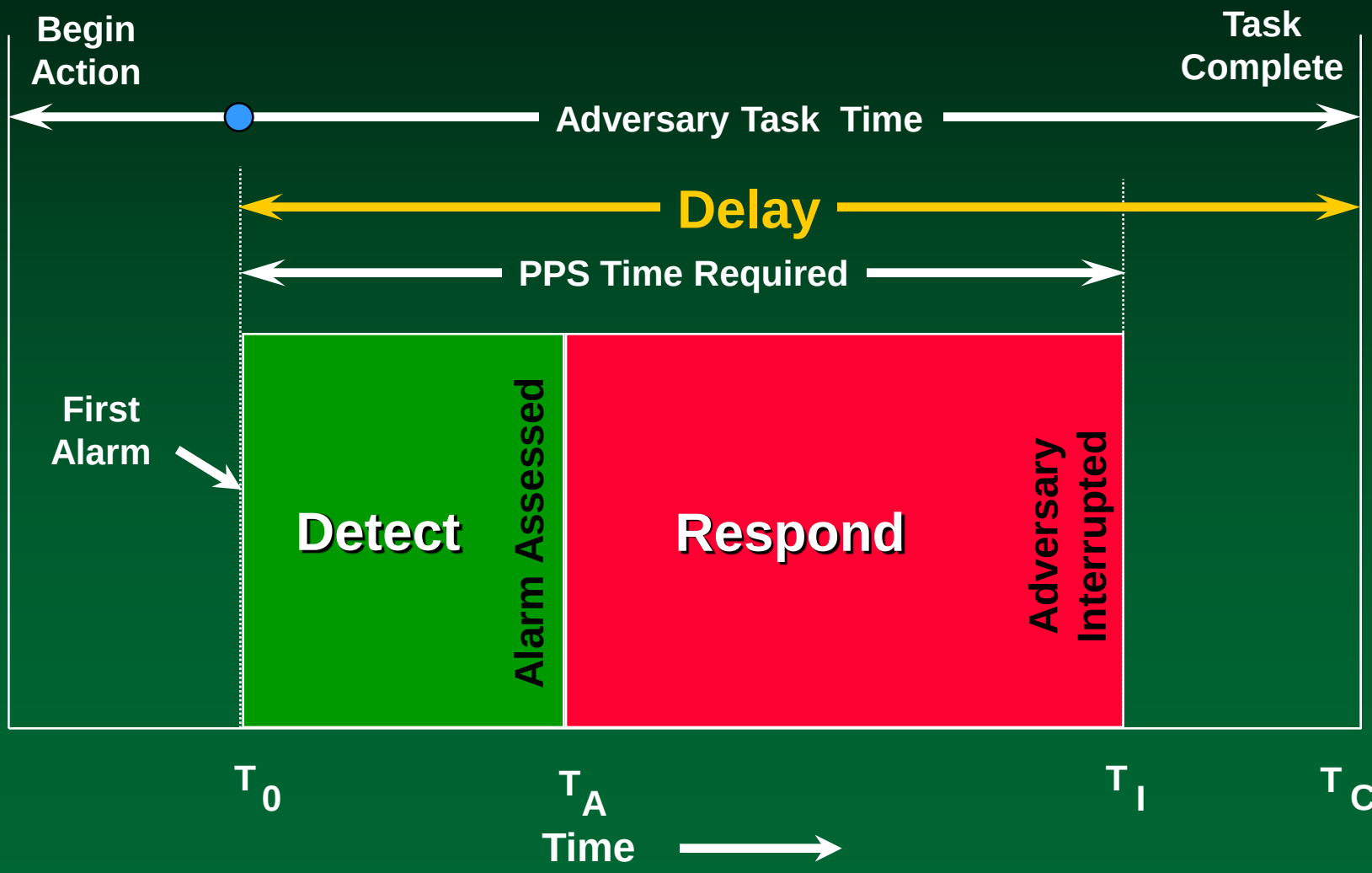
Adversary Task Time vs. PPS Time Required



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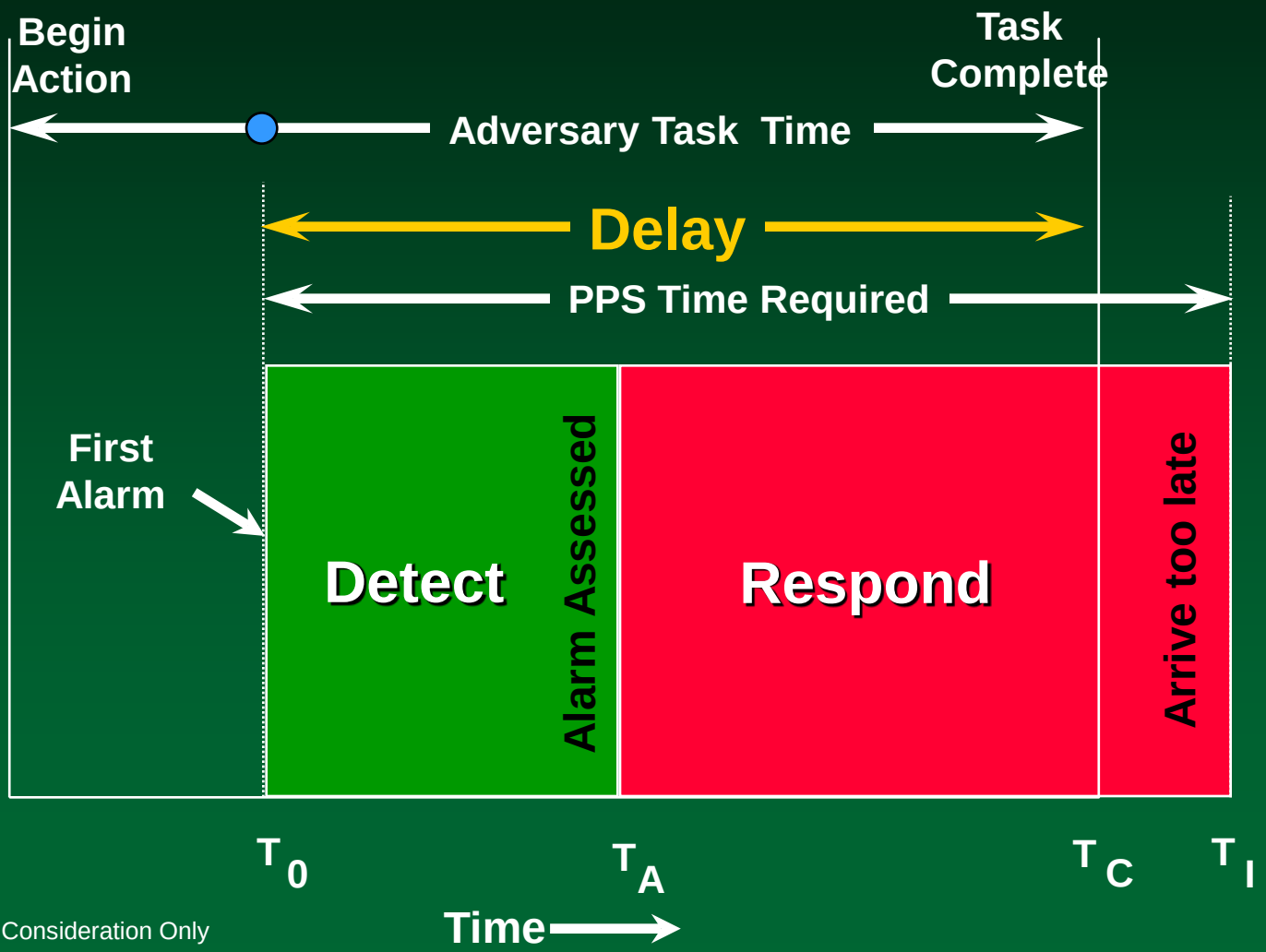
Less Delay



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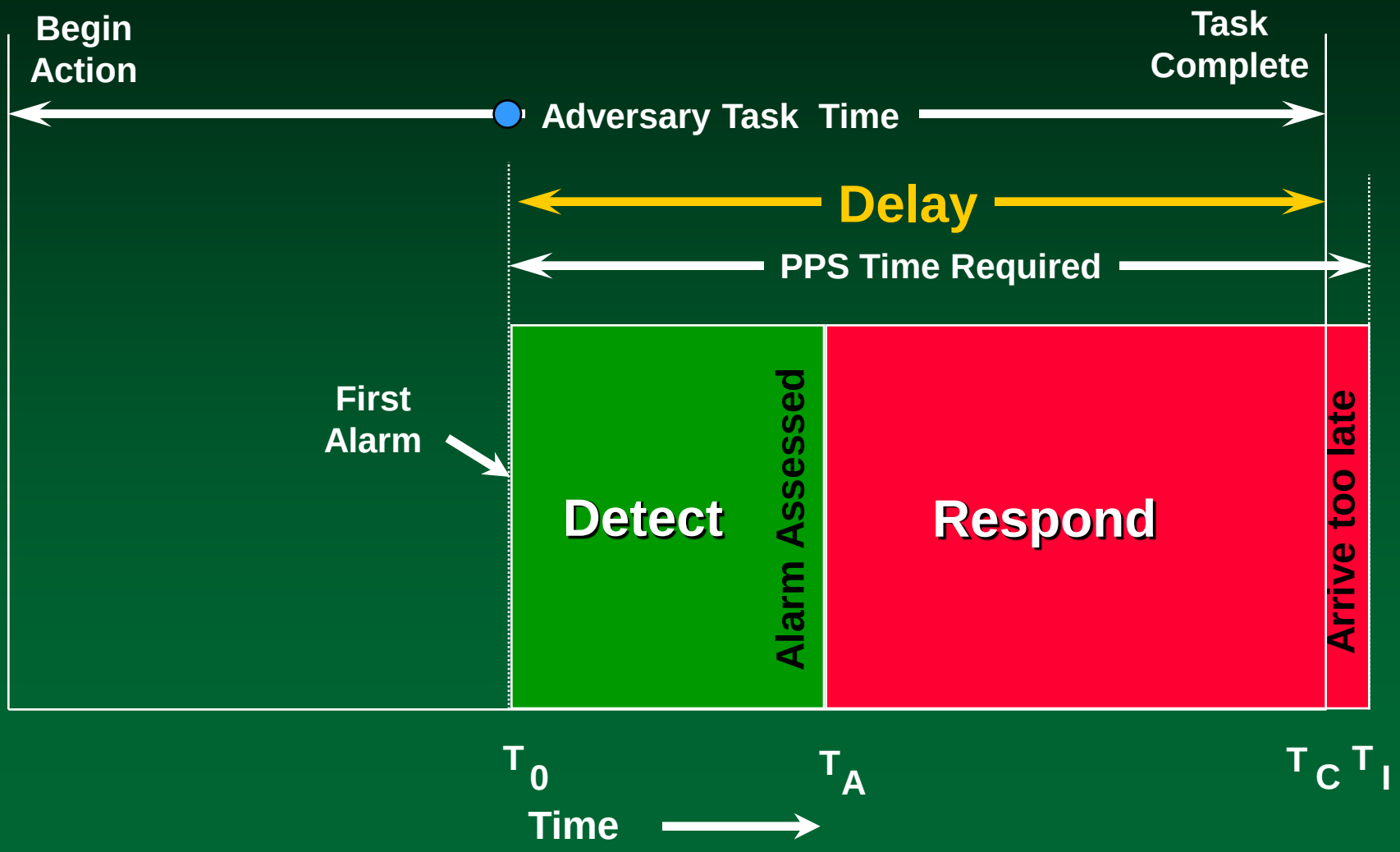
Late Detection



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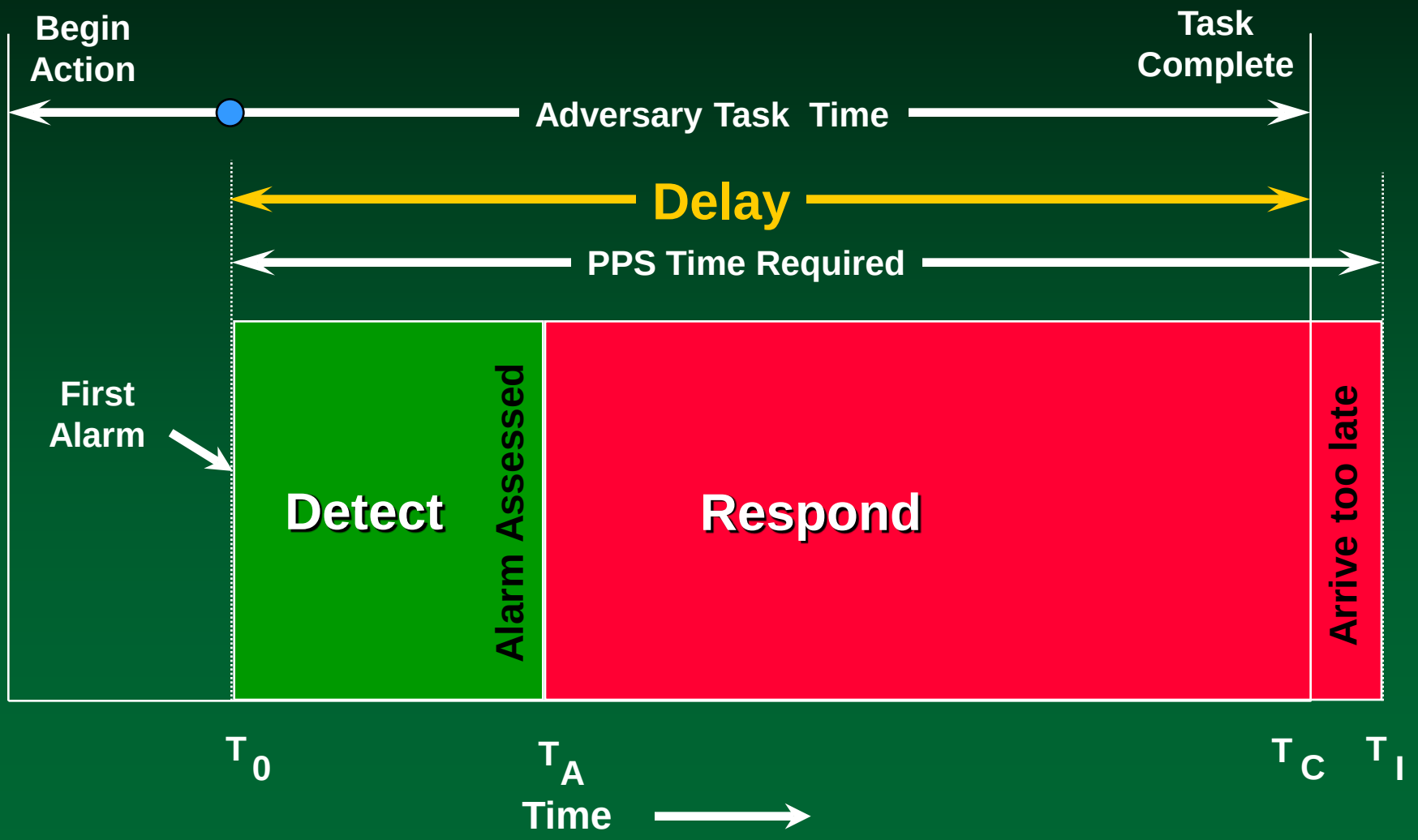
Slow Response



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Characteristics of an Effective Physical Protection System

- Protection-in-depth
- Minimum consequence of component failure
- Balanced protection

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Conclusion

- PPS designs are based on an integration of detection, delay, and response functional elements
- The total time for detection and response must be less than adversary task time once the first detection occurs
- Protection-in-depth, minimum consequence of component failure, and balanced protection are all present in a well-designed PPS

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Summary

- Performance-based Physical Protection Systems (PPS) are designed to defeat adversaries, although they also provide deterrence
- Intrusion detection systems include sensors, signal lines, annunciators or alarm displays, and a means for assessment
- Detection must precede delay, and adversary delay must exceed system response (interruption) time
- Response forces are responsible for interrupting and neutralizing the adversary

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