*Presented to:*

**National Defense Industrial Association**

**Joint Armaments Conference & Exhibition**

**U.S. ARMY RDECOM**

# *Active Protection System (APS) Simulations*

**AMRDEC**

## *TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.*

*Presented by:*

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- **System Purpose**
  - **Protect a volume of space using some active defeat mechanism**
    - o **Detect the incoming threat**
    - o **Quantify nature of the threat**
    - o **Actively engage when required**
    - o **Minimize harm to protected area**
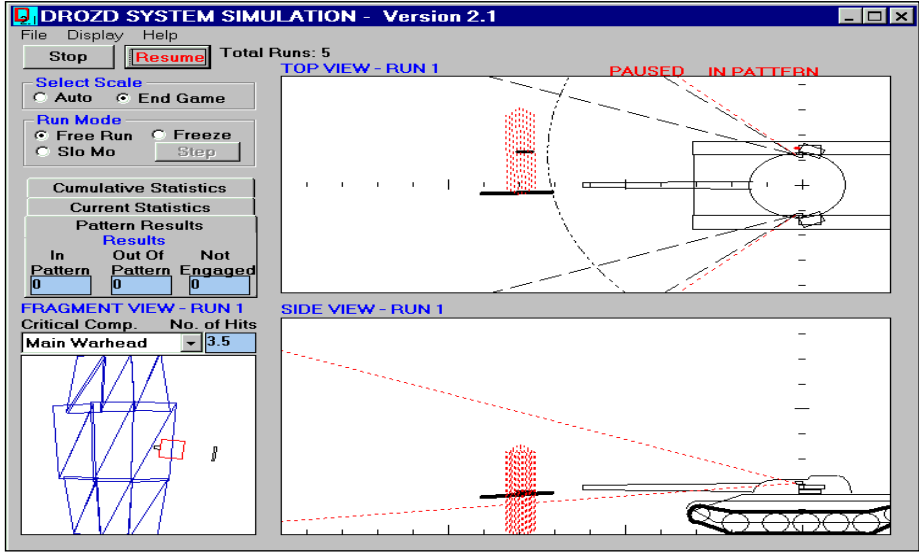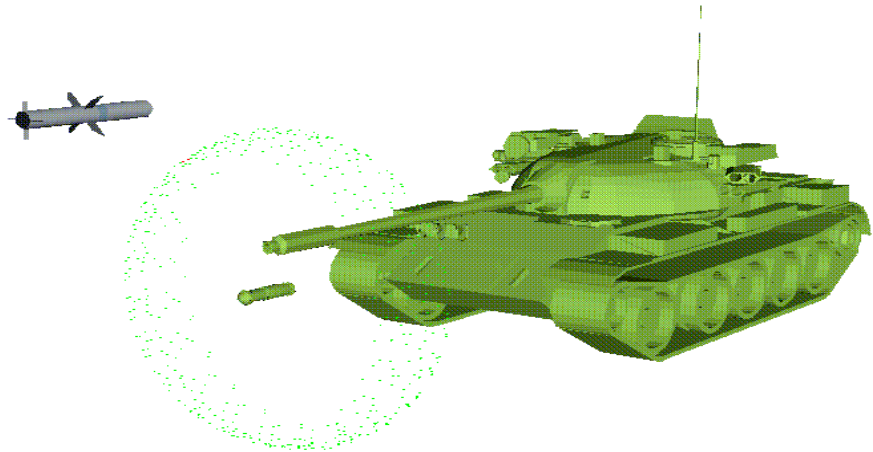


- **APS Systems Fielded Since 1980s**
  - **Limited interest during early years**
    - o **Complex, expensive, & hazardous**
    - o **Almost solely foreign development**
- **New systems in development now**
  - **Recent technology advancements**
    - o **Improved sensors / countermeasures**
  - **Evolving battlefields and threats**
    - o **New conflicts, tactics, & operations**
  - **More foreign developers than U.S.**

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- **Encompassing Efforts Across Multiple RDECOM Agencies**
  - AMRDEC/AMSAA Co-Chair Joint Interagency APS Simulation Working Group
    - ARL, ARDEC, CERDEC, TARDEC, and other contributing agencies

- **End-to-End, System-Level, Engineering Simulations**
  - High fidelity models of each component contributed by the contractor developer and/or relevant RDECOM developer
    - Sensor Systems: Electro Optical, Infrared, Radar, and Tracking
    - Interceptor Systems: Guided/Unguided, Fixed/Slewing, and Airbag
    - Warhead Countermeasures: Projectile, Fragmentation, and Blast
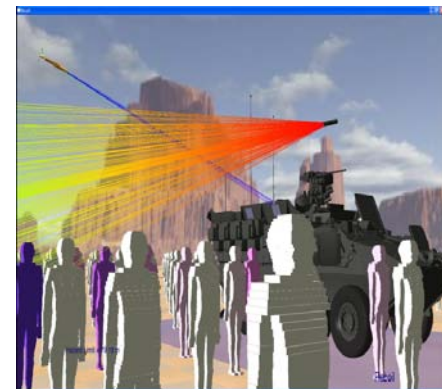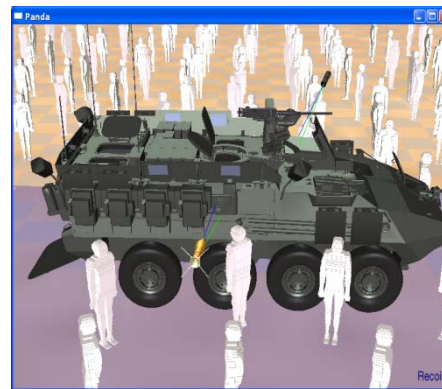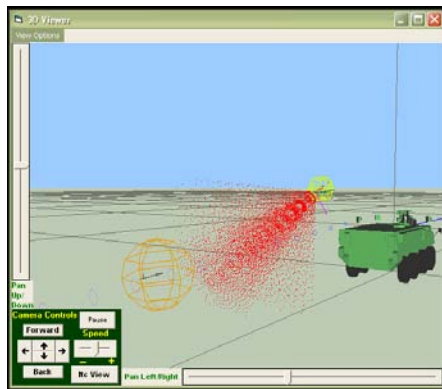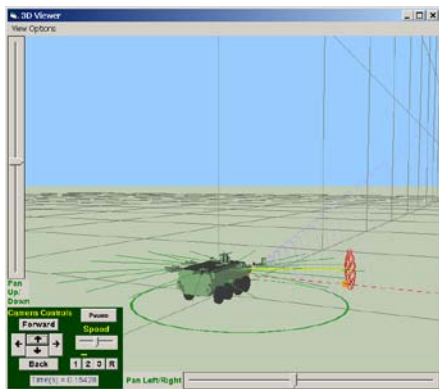
**APS System Simulation Suite Provides the Ability to Analyze an End-to-End APS System and its Design Considerations**
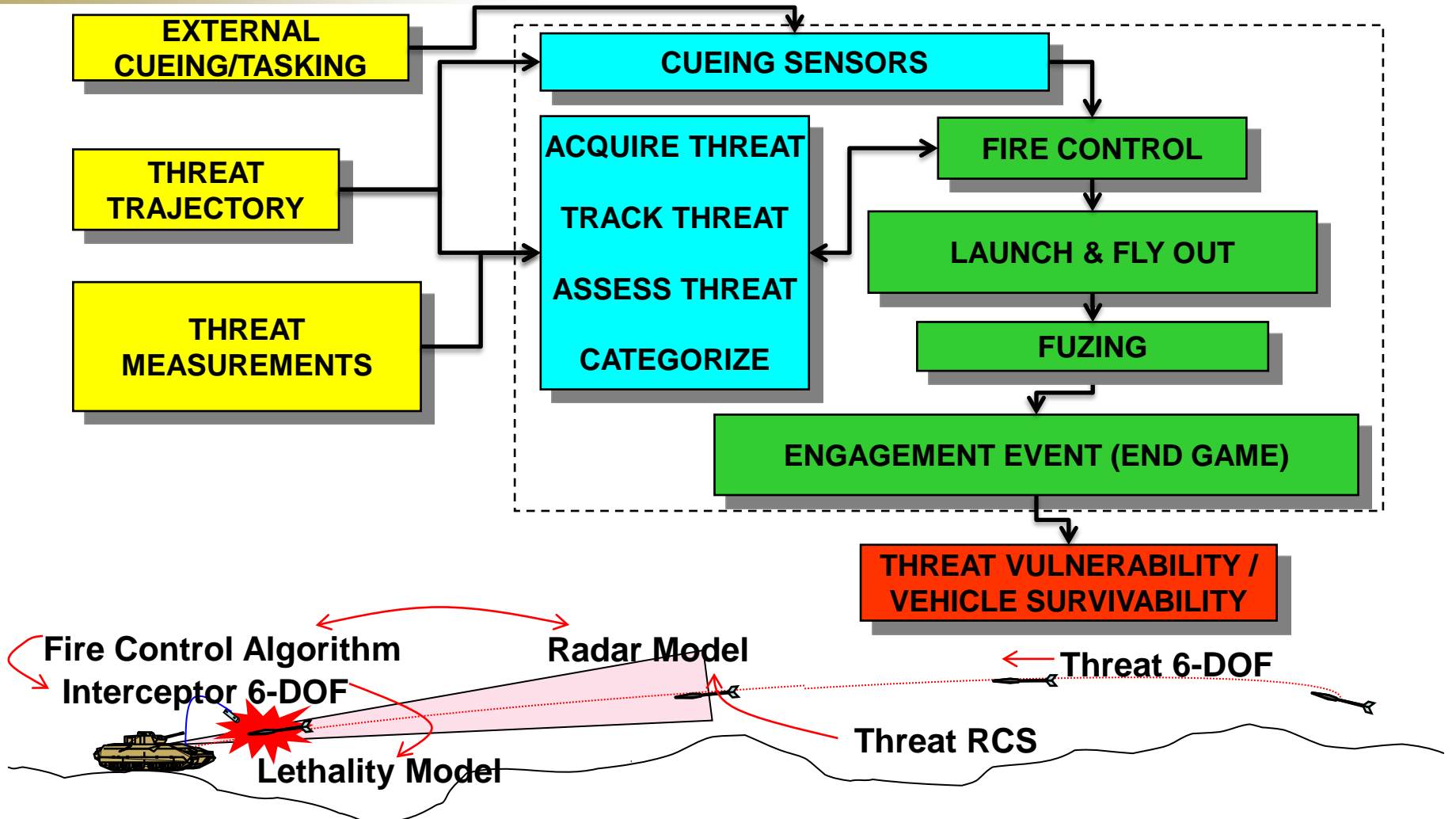
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APS Simulation Structure

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| Simulation | Description | Threat(s) |
|---|---|---|
| **LRAPS** | Long Range APS simulation employing an infrared warning system and radar sensor to detect and track the inbound threat, and launchers that eject guided interceptors equipped with blast warheads | ATGM, HEAT, KE |
| **SRAPS** | Short Range APS simulation employing a radar sensor to detect and track the inbound threat, and launchers that eject unguided interceptors equipped with a forward-firing fragmenting warheads | RPG, ATGM |
| **FLAPS** | Fly-out APS simulation employing an infrared warning system sensor to detect an inbound threat, a slewing radar sensor to track the inbound threat, and a slewing launcher that eject fly-out interceptors equipped with fragmenting warheads | RPG, ATGM |
| **PAPS** | Projectile APS simulation employing radar sensors to detect and track an inbound threat, and a slewing launcher that launches projectiles to intercept the threat | RPG, ATGM |
| **ABAPS** | Air-Bag APS simulation employing radar sensors to detect and track an inbound threat, and fixed assemblies deploying airbags with attached counter measures | RPG |
| **CIAPS2** | Close-In APS simulation employing radar sensors to detect and track an inbound threat, and launchers that eject rotatable interceptors with fragmenting warheads | RPG, ATGM |
| **APS M&S SUITE** | Compilation of 20+ APS simulations developed over the past 15 years | Varies |

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**High Maturity**

- APS simulation has all required components developed. Formal V&V at both the component and system level utilizing both SME experience and test data. Also, it has undergone independent V&V by supporting agencies.

**Medium Maturity**

- APS simulation has most required components and/or adequate surrogates developed. Only limited formal V&V at the component level that is mostly SME experience with limited supporting test data. Only limited independent V&V by supporting agencies.
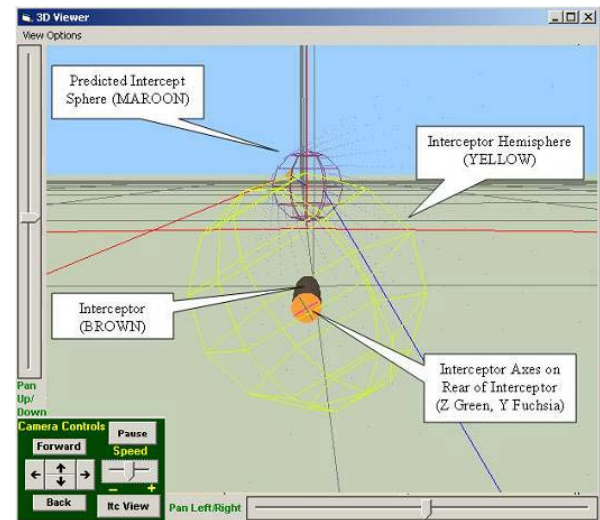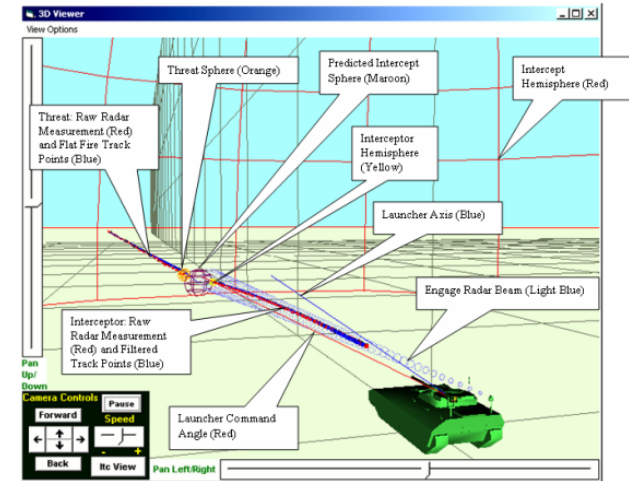
**Low Maturity**

- APS simulation has some required components and/or simplistic surrogate or stubbed component models developed. There has been no formal V&V at any level.

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- **System Level Support**
  - **Concept Analysis / Evaluations / Component Studies / Trades / …**
- **Testing Level Support**
  - **Planning / Execution / Evaluations / Assessments / VV&A / …**
- **Program Level Support**
  - **Planning / Execution / Evaluations / Assessments / Milestones / …**
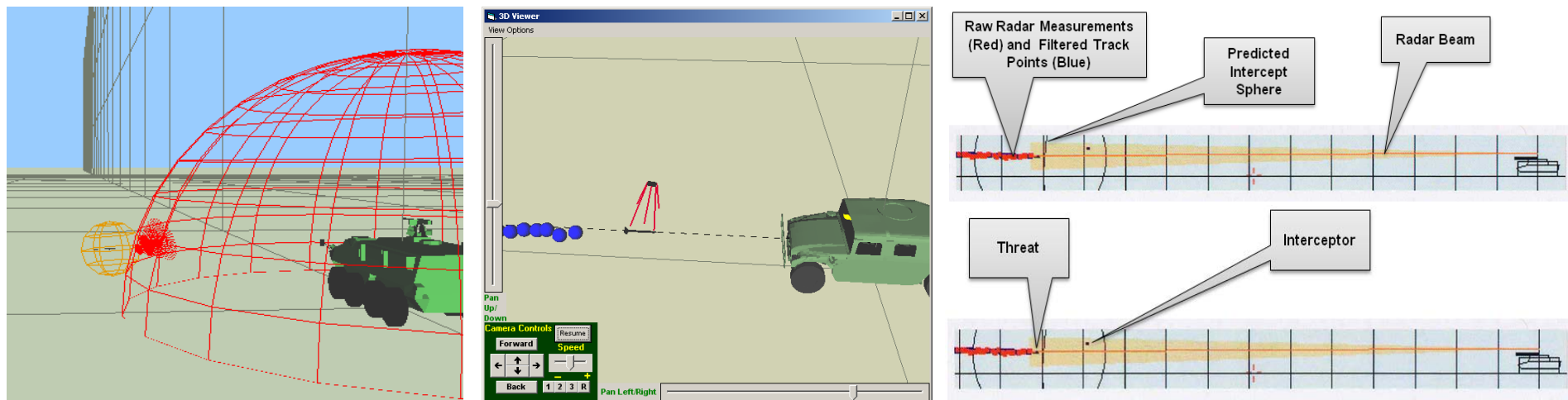


**APS Modeling and Simulation provides deep insight into overall system and individual component and subcomponent assessment and evaluation**

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- **Support System Development**
  - **Supports All Involved Agencies**
  - **Insight into Development**
    - o **Verify System Level Performance**
    - o **Identify System Challenges**
    - o **Assess Performance Trade-offs**
  - **Design Tool for System Developers**
    - o **Understand design change impacts**
    - o **Test component designs at system level**
  - **Aid Test Program**
    - o **Support test planning and execution**
    - o **Assist in filling in testing data gaps**
  - **Allow Army to be a "Smart Buyer"**
    - o **Independent Government Assessment**
    - o **Verification, Validation, & Accreditation**



## APS M&S supports all phases of the Army Acquisition Cycle

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- **RDECOM has a core engineering-level suite of APS simulations**
  - **Simulations of various concepts are at differing stages of maturity and development**
  - **Modularity of simulations and component models compliments APS testing  analysis, and evaluation**

- **Cohesive RDECOM team with years of collaborative work**
  - **All agencies focus on key areas of expertise and then feed outputs up to higher level analyses and decision points**

- **Benefits of an APS system of system simulations are:**
  - **Ability to conduct system trades and studies at system level**
  - **Unique analysis capabilities to support the program life cycle**
  - **Addresses the proliferation of these advanced technologies**

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**Active Protection System Simulations.pptx**

# Questions?

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