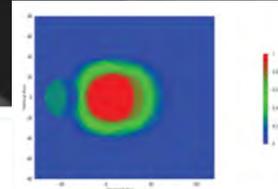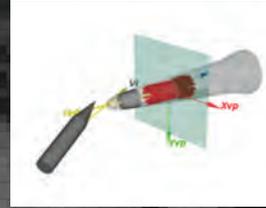# PEELS

Parametric Endo/ Exoatmospheric Lethality Simulation

The Parametric Endo/Exoatmospheric Lethality Simulation (PEELS) is a core lethality model (CLM) under the Missile Defense Agency's Modeling and Simulation Program (MDA/DES). It is physics-based simulation that predicts body-to-body (BTB), blast fragmentation warhead, and aligned-rod impact lethality resulting from interceptors engaging ballistic threats. PEELS predicts lethality specifically for a first impact event and provides event parameters to support post-intercept debris and ground effects analyses.

- Inputs include interceptor model, lethality enhancer or warhead model, threat model, engagement parameters such as closing velocity, strike angle, and orientation.
- Outputs include payload lethality delineated by lethal mechanism, component lethality, component overlap information, momentum, energy and mass on target, location of surviving submunitions.

Verified

PEELS has had continuous IV&V since its inception. AMRDEC SSDD is currently the IV&V agent. PEELS utilizes a configuration management process based upon CMMI for development. A Software Configuration Control Board (SCCB) chaired by MDA, with the IV&V agent and developer also participating, meets regularly to review code status and make decisions regarding enhancements, problem resolution and schedule.

Validated

PEELS is validated against a database of over 160 sled and light gas gun tests. PEELS is accurate and unbiased with a Mean Absolute Deviation of less than 15% and a Mean Relative Error of less that 1%.

Accredited

Versions of PEELS have been accredited 12 times since its first accreditation in 1993 to support PAC-3 Downselect. LTPO, THAAD, GMD, and ATEC have all accredited multiple versions of PEELS. The latest accreditation was by ATEC for PEELSv10.5.1 on January 13, 2011.

PEELS is utilized as a fast-running tool to assess system performance, predict lethality for test and operational scenarios, support post-flight test assessments, provide parameters for higher fidelity debris and gound effects analyses, and to support acquisition decisions. It is benchmarked against test and hydrocode data, and meets fidelity acceptability criteria for U.S. systems.

PEELS is a critical component to understanding the capabilities and limitations of the systems that comprise the BMDS.

Product Summary

- C++ modular architecture with a Fortran lethality kernel and C-based visualization, analysis and data reduction program
- Windows, Linux, and Altix systems supported
- Interface
  - PEELSSViz GUI (Windows only)
  - Command Line via API
- Targets Library
  - Over 100 Target Models (Conventional, Chem/Bio, Nuclear)
  - Common models with KIDD and PEGEM
- Fully Documented
  - Over 13 individual product documents including target manual, technical manual and V&V documentation.
- Flexible, Comprehensive Input and Output
  - 9 Input Options (Vector and Parametric)
  - 16 Output files including ASCII Interfaces with PEGEM and KIDD
- Users include
  - Elements: GMD, THAAD, PAC3
  - Evaluators: ATEC, DOT&E
  - Commands, Agencies, Services: MDA, SMDC, STRATCOM, NORTHCOM, Army
  - International: NAMEADSMA, Italy, Germany, UK, Netherlands, NC3A
  - Numerous support contractors and government analysts

For further information on this or other questions regarding missile defense or the Missile Defense Agency please contact MDA Public Affairs at mda.info@mda.mil

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