Individual Protection System Performance Model (IP SPM) Gen-2

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Objectives

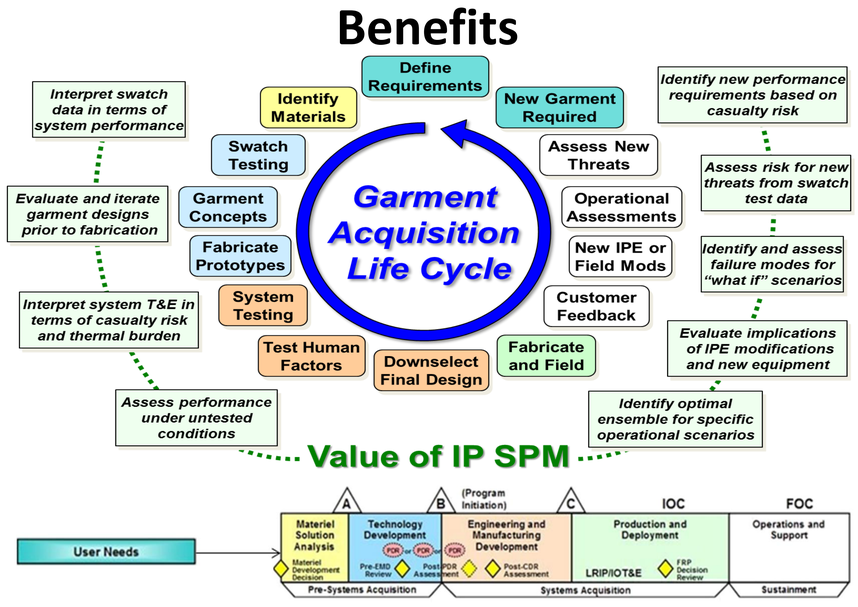
Develop the Individual Protection System Performance Model (IP SPM) second-generation (Gen-2) with physics-based modeling and simulation (M&S) capabilities for:

- Characterizing the protective and thermal performance of IP garment ensembles
- Enhancing analysis, interpretation and understanding of swatch, component and system test data
- Assessing toxicological casualty risk and thermal burden for existing and future IP garments and materials
- Ultimately providing better protection for the Warfighter

Description of Effort

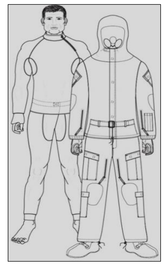
- Building upon capabilities of the Gen-1 IP SPM
- Model combines a physics-based, mechanistic characterization of the transport phenomena relevant to IP materials with a simplified representation of the Warfighter and IP garment ensemble.
- Software framework of the IP SPM consists of three components: (1) simulation builder, (2) modeling engine, and (3) simulation results viewer
- Model endpoints include toxicological casualty risk and thermal burden assessments for specified operational conditions
- Validating physics-based models by comparison to component and system-level test data, including man in simulant test (MIST), aerosol system test (AST), and thermal manikin studies
- Supporting the U.S. Army Natick Soldier Research, Development and Engineering Center's (NSRDEC) Integrated Protective Fabric System (IPFS) program through IP SPM analysis of testing and evaluation (T&E) data and comparisons of garment design alternatives.

Benefits



Approved for Public Release

Garment Design

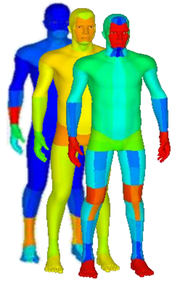


New Designs or Fielded Garments

IP SPM Model

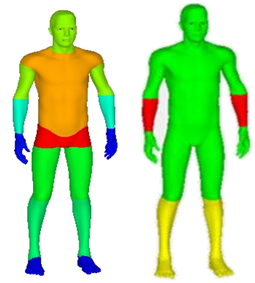
Garment, Environmental and Challenge/Threat Conditions

Predicted Under-garment CT, Temperature and RH



Garment, Environmental and Challenge/Threat Conditions

Casualty Risk and Heat Stress

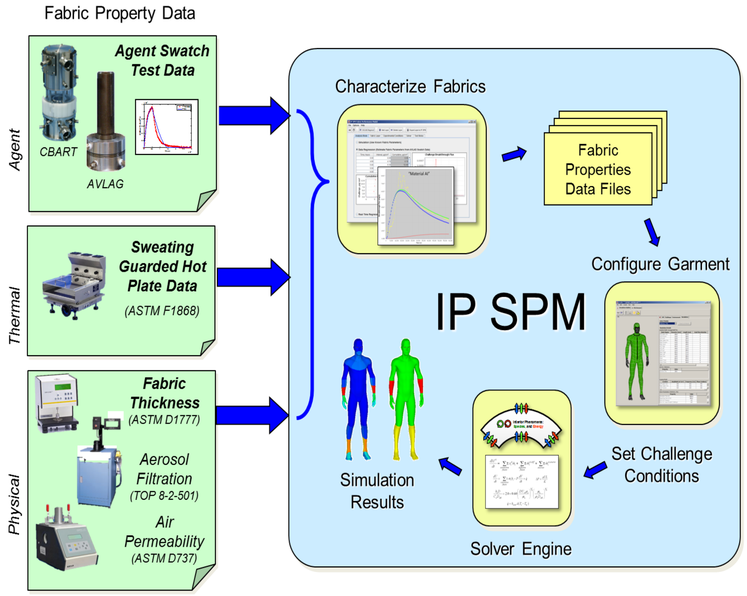


Under-garment Temp/RH Conditions, Blistering and Nerve Agent Toxicity

Features

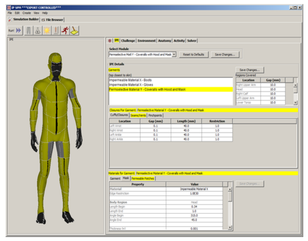
- *Flexible user interface allows specification of seams, vents, multiple fabric layers, fabric patches, pads, ballistic vest, hood/mask interface.*
- *Configurable challenge types include liquid droplets, agent vapor, monodisperse aerosols.*
- *Toxicological casualty risk assessment (TCRA) estimates casualty risk using an updated BRHA methodology.*
- *Thermal simulations output suit temperature and relative humidity (RH) for subsequent analysis with thermal effects software tools (e.g. HSDA)*

Software Design



Software Interface

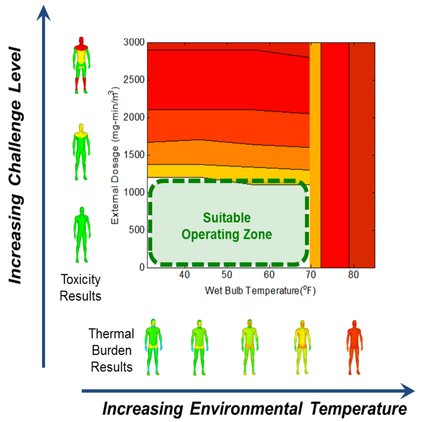
Configuration GUI



Compare to Experimental Data

Includes Comparisons to Toxicological Casualty Risk Estimates

Example: Tradespace Analyses



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TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.