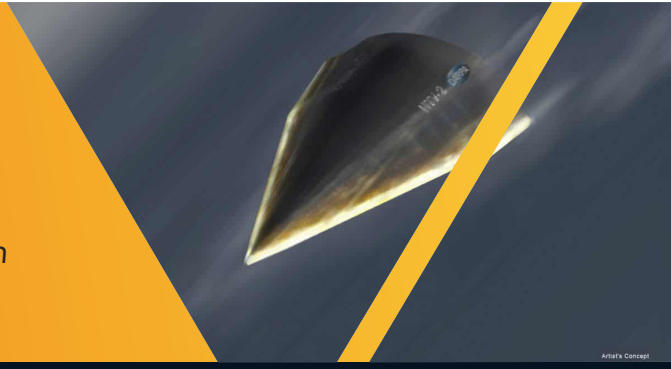
Axient Capability Highlight: Threat Engineering

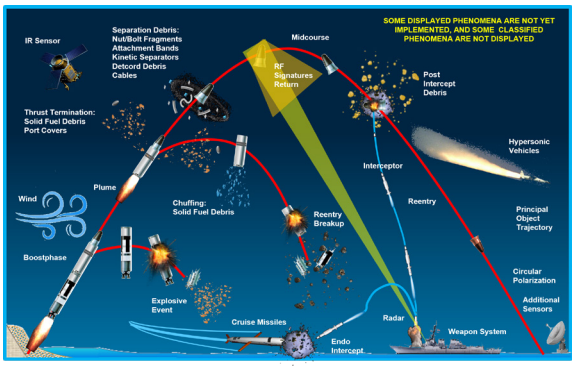
Developing a characterization of the adversary threat, with fidelity, to drive weapon system design to meet operational needs.



Why Threat Engineering?

Threat data and models are needed for design and test of defensive weapon systems.

- DoD is working to counter all threats through the acquisition of defensive weapon systems (software and hardware).
- Design of defensive weapon systems to counter threats requires threat information at all phases of development:
- Conceptual phase – general threat metrics are needed.
- Requirements development – requires detailed threat information and low/medium fidelity data and tools.
- Detailed design – requires high-fidelity threat data and simulations.
- Requirements verification – verified using high-fidelity threat data and simulations.
- Test and evaluation – high-fidelity threat data, simulations, and test targets.

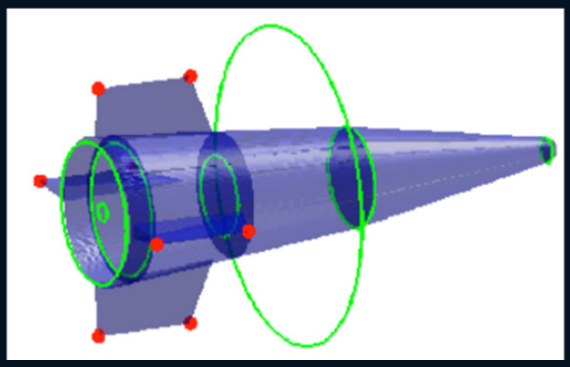


Threat engineering is an essential part of the development of a weapon system and provides the data and models necessary to support each phase of development.

- Fidelity must match the analysis tools used by the designer and must capture all phenomena that can be observed by the weapon system.
- Threat engineering requires capability in many different disciplines to successfully represent all aspects of the threat and environment.
- This requires knowledge of all information available, including understanding unknowns and uncertainties, to be successful.
- Axient's focus has been primarily on missile related threat systems.

Axient threat models are developed under the cognizance of the Intel community and government customer. They are reviewed and approved by both parties before acceptance. Once accepted by the government, the data may be released to weapon system designers to support the development lifecycle of the weapon system and continue to verify performance capability against emerging threats.

Axient data and models are unique because they provide the highest level of fidelity available when necessary. Tools and processes have been developed by Axient that allow for development of composite-fidelity models. The composite models allow for an excellent compromise of high fidelity while meeting cost and schedule.



About Axient

With over 2,200 employees, Axient is the result of the merger of four leaders in the defense and civil markets: QuantiTech LLC, Millennium Engineering and Integration LLC, Systems Engineering Group, and Dynamic Concepts LLC. Axient is headquartered in Huntsville, Alabama and has provided premier services and solutions to the Federal Government for more than three decades. Axient is certified in the following: ISO 9001:2015, AS9100 Rev D, CMMIDEV Maturity Level 3, and has a DCMA Purchasing System, DCMA Property System, and DCAA Accounting System.

AXIENT

Trajectory

- Key Tools: GENESIS and SEG6DOF kinematic flight simulations; DATCOM, CART-3D, and Kestrel for aero-predication; Various Monte Carlo tool suites to provide variation to individual trajectories to account for Intel uncertainty.
- Characterization of missile concepts-of-operation (CONOPs) through boost phase, mid-course, and terminal flight. Captures kinematic capability of missile system.
- Generation of kinematic data for all missile configurations (e.g., boost phase, spent boosters, reentry vehicles, etc.).
- Flight test reconstruction analysis to benchmark and validate flight models.
- Products include: kinematic data files for all configurations of the threat system and executable flight models that are able to produce trajectory data given user inputs.

Phenomenology

- Key Tools: DebrisSim for debris modeling. TMCAT for clutter modeling. WakeSim and PHANTASM for RF wake modeling.
- Debris can contribute significantly to the overall scene of a threat missile system. DebrisSim is able to characterize thrust termination debris, chuff, separation debris, post-intercept debris and reentry break-up debris.
- TMCAT can provide a high fidelity representation of the radar scene for Aegis BMD with fully correlated trajectory and RF signature returns.
- A hypersonic vehicle moving though the atmosphere will ionize the atmosphere and stream ablation products from the vehicle's exterior. This may cause a significant perturbation to the hardbody RF signature returns and must be characterized to supplement the hardbody–alone response.
- Products include: input files to run the DebrisSim, TMCAT, and WakeSim tools in addition to documentation.

SEG's Threat Engineering Characterizations Include:

Design

- Through coordination with intel agencies such as NASIC, Axient's design team gathers all available intelligence information on a given threat.
- Intel gaps are filled through engineering judgment, analysis, and research.
- Final threat design is provided to other engineering disciplines to develop threat models and data.
- Products include: intelligence compendiums to document all related intel on the threat system that was used to produce the threat models.

CAD

- Key Tools: Solid works, Creo, and NX for solid modeling. FEMAP, ModelMan, CrossCheck, and Pointwise for meshing, edge, and ILDC file creation.
- CAD models feed development of other engineering characterizations such RF signatures, CFD, infrared (IR), and mass properties for flight models.
- Products include: solid models, line drawings, meshed models, and documentation.

RF Signatures

- Key Tools: Xpatch, SENTRi, CICERO, Scattering Center Extraction (SCEX).
- Development of 4Pi Steradian RF signature field data through the use of Xpatch, SENTRi or CICERO electromagnetic software for each configuration of a threat system.
- Generation of field data through measurements in anechoic radar chambers.
- Direct use or comparison of flight test data collects and chamber measurements to enhance RF signature models and perform V&V of those models.
- RF signature model variations (size, material type and thickness, etc.) to account for Intel uncertainty.
- Development of 3-D scattering center models to compress field file data by 100 fold for use in simulations and hardware in the loop applications.
- Products include: field file data, 3-D scattering center models, and documentation.