GAMMA TECHNOLOGIES

DEFENSE SYSTEMS SOLUTIONS

Engineering the Future of Defense with Predictive Simulation

The New Era of Defense Engineering

Modern defense platforms are evolving into highly integrated systems where propulsion, electrification, thermal management, controls, energy systems, crew environment, and mission operations must function as one coordinated architecture. Performance is no longer defined by individual components alone, it is determined by how complete systems behave under dynamic operational conditions.

Engineering teams are now expected to design systems that are efficient, resilient, adaptable, and mission-ready from the outset. This requires the ability to predict behavior before deployment, understand subsystem interactions early, and evaluate performance across a wide range of operating scenarios.

Simulation is therefore becoming a strategic engineering capability, one that enables predictive understanding, supports system-level decision-making, and accelerates development with greater confidence.

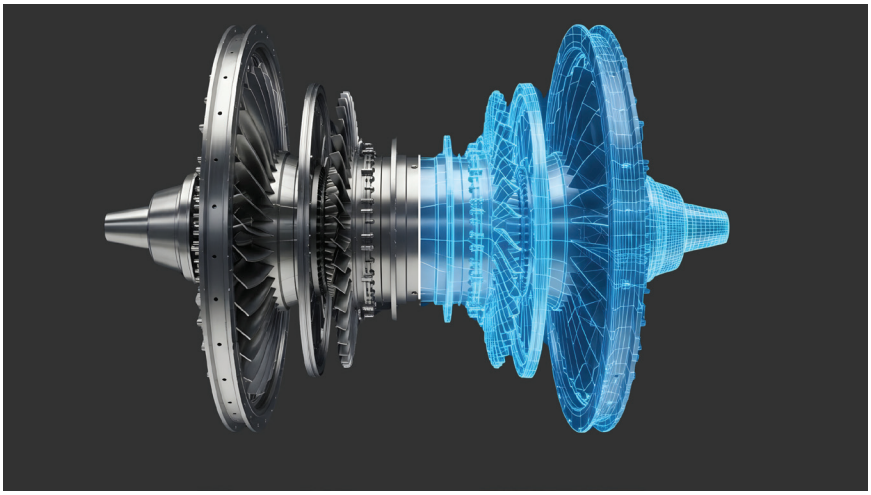
Digital Twin: From Design Models to Operational Intelligence

Digital Twin technology extends simulation beyond engineering design by creating a dynamic, physics-based representation of a real system that evolves throughout its operational lifecycle.

Digital Twins Support:

- Real-time monitoring of system behavior
- Prediction of degradation and performance drift
- Scenario-based operational evaluation
- Continuous optimization throughout system life
- Improved mission planning and asset readiness

By connecting engineering models with real-world operational insight, Digital Twins become a foundation for smarter decisions—from concept development to deployed operation.



Accelerating Decisions with Metamodels

High-fidelity engineering simulation delivers deep insight, but operational applications often require speed.

Metamodels and reduced-order models provide fast-running representations of detailed engineering models.

This enables:

- Real-time Digital Twin deployment
- Rapid architecture evaluation
- Fast scenario exploration
- Integration into controls and operational systems
- Continuous optimization during operation

System Simulation Across the Development Lifecycle

System-level simulation provides engineering teams with a holistic view of performance, enabling decisions to be made earlier and with greater confidence.

FEASIBILITY ASSESSMENT

Evaluate architectures, compare concepts, and understand trade-offs during early development.

PROOF OF CONCEPT

Validate operating principles, assess subsystem interactions, and evaluate mission-level performance.

SYSTEM INTEGRATION

Understand how thermal, fluid, electrical, mechanical, and control systems interact as one architecture.

OPERATIONAL READINESS

Evaluate performance under mission-dependent operating scenarios and continuously refine system behavior.

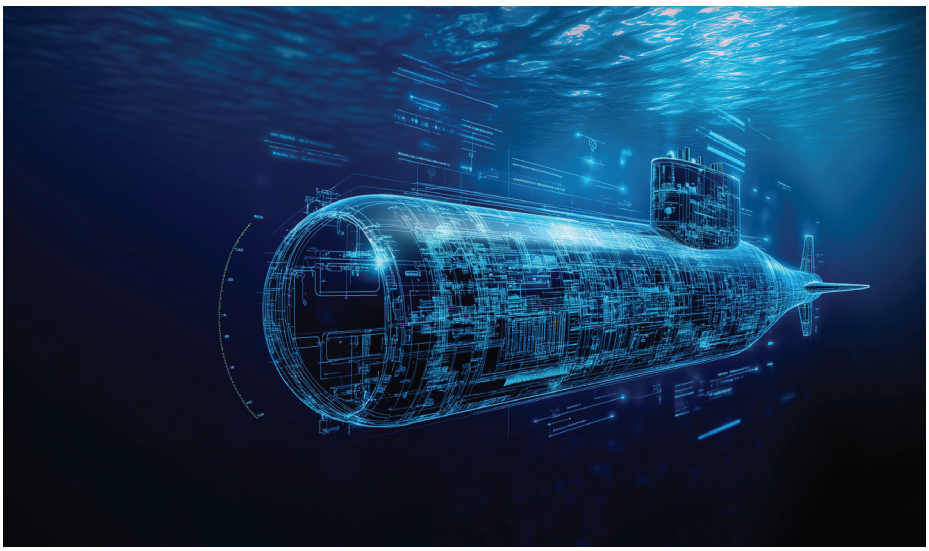
Engineering Next-Generation Defense Systems

ELECTRIFICATION & POWER SYSTEMS

Electrification is reshaping defense platforms through hybrid propulsion, battery systems, electrical architectures, and intelligent power management.

Simulation enables:

- Battery performance prediction
- Electrical load balancing
- Thermal-electrical system coupling
- Hybrid propulsion system optimization
- Power electronics and control strategy evaluation

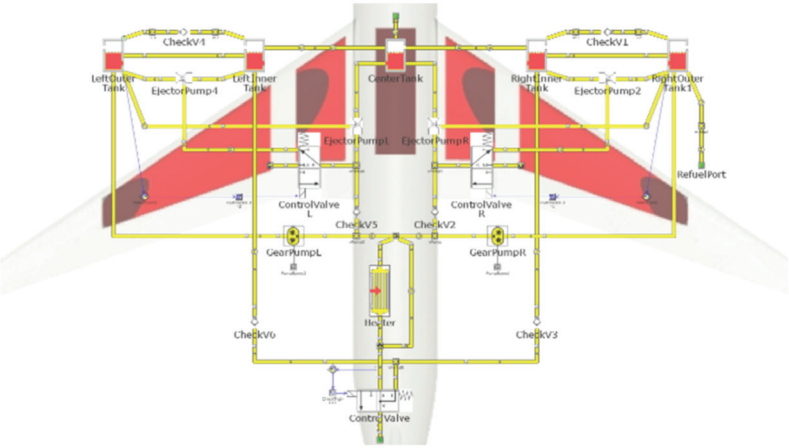


HYDROGEN & FUEL-AGNOSTIC COMBUSTION SYSTEMS

Next-generation combustion systems must operate across evolving fuel landscapes, including hydrogen and alternative low-carbon fuels.

Simulation enables:

- Combustion behavior prediction
- Fuel system design and optimization
- Injector and delivery system analysis
- Thermal loading evaluation
- Emissions and aftertreatment modeling
- Calibration across multiple fuel strategies

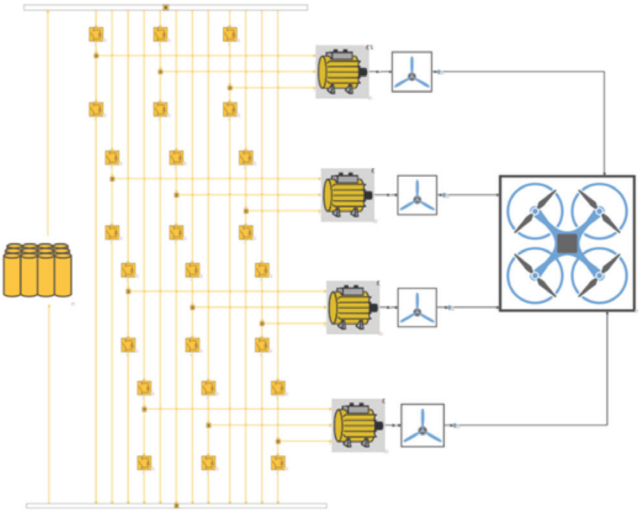


ELECTRIC FLIGHT & ADVANCED AIR MOBILITY SYSTEMS

For defense applications, electric flight technologies offer opportunities for reduced acoustic signature, distributed propulsion, improved energy efficiency, and enhanced operational versatility across logistics, surveillance, and tactical mobility missions.

Simulation supports eVTOL development by enabling:

- Electric propulsion system design and integration
- Battery sizing, thermal management, and energy optimization
- Rotor and propulsion interaction studies
- Flight control strategy development
- System-level performance evaluation across mission scenarios
- Multidisciplinary integration of aerodynamics, electrification, and controls

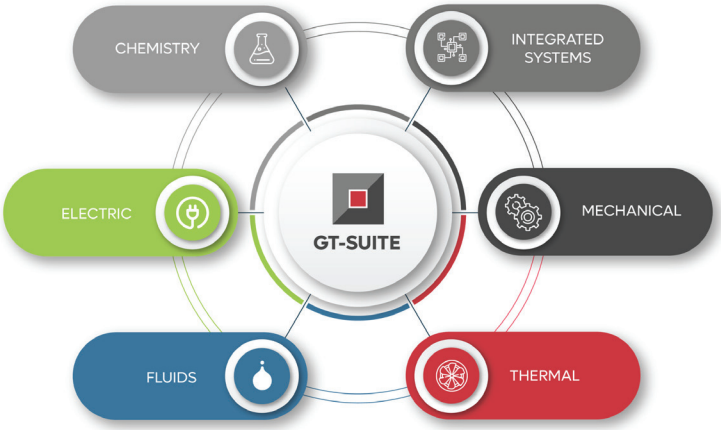


HUMAN COMFORT & CREW ENVIRONMENT

Crew effectiveness is strongly influenced by thermal comfort, cabin air quality, and environmental control systems—especially in harsh operational environments.

Simulation enables:

- HVAC system optimization
- Cabin airflow and ventilation studies
- Defogging and de-icing performance
- Thermal comfort prediction
- Air filtration and environmental control analysis
- Crew compartment climate optimization



INTEGRATED MULTIPHYSICS SIMULATION

Accurate system prediction requires multiple physical domains to be mode

Integrated simulation capabilities include:

- Thermal systems modeling
- Fluid systems and flow networks
- Mechanical systems and dynamics
- Electrical architectures and energy systems
- Chemical reactions and kinetics
- Controls integration and embedded systems modeling

Connecting Virtual Development to Real-World Deployment

Simulation becomes increasingly valuable when it directly supports validation and deployment.

MODEL-IN-THE-LOOP (MIL)
Validate concepts, architectures, and control strategies early.

SOFTWARE-IN-THE-LOOP (SIL)
Evaluate embedded software behavior in realistic virtual environments.

HARDWARE-IN-THE-LOOP (HIL)
Test physical hardware against dynamic simulated system behavior.

The future of defense engineering will be defined not only by how systems are built but by how intelligently they are modeled, understood, and optimized before reality unfolds.

INTELLIGENT ENGINEERING WITH AI
Artificial Intelligence is helping accelerate engineering workflows by making simulation development faster, easier, and more accessible. GT Intelligence Studio brings AI-powered capabilities that support engineers across model development, automation, and troubleshooting.

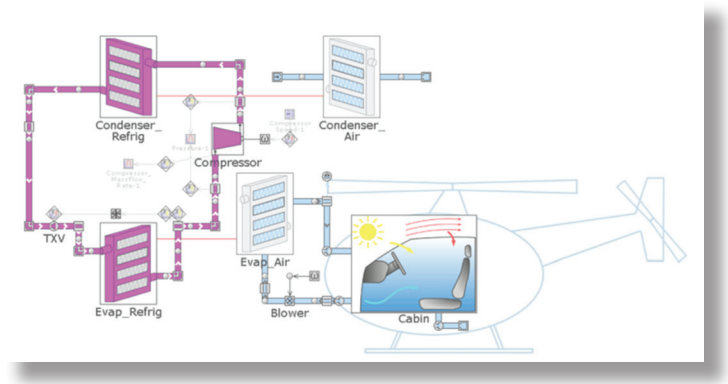
AI.ADVISOR – INSTANT SUPPORT
Provides real-time answers to GT-SUITE questions, offers best practices and modeling guidance, and helps diagnose model issues quickly, keeping engineering projects moving efficiently.

AI.CODER – AUTOMATE WITH EASE
Converts natural language instructions into GT-Automation-powered Python scripts, simplifying workflow automation, simulation setup, and post-processing without requiring coding expertise.

AI.MODELER – BUILD FASTER
Accelerates model development by enabling model creation from natural language inputs, automating model scanning and documentation, and significantly reducing manual setup effort.

By combining expert guidance, workflow automation, and intelligent model creation, **GT-Intelligence Studio helps engineers move from idea to insight faster.**

To learn more about Gamma Technologies' comprehensive simulation solutions, please visit GTIsoft.com.



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