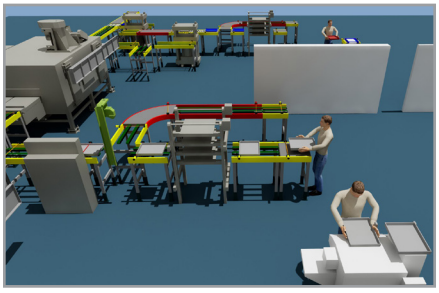
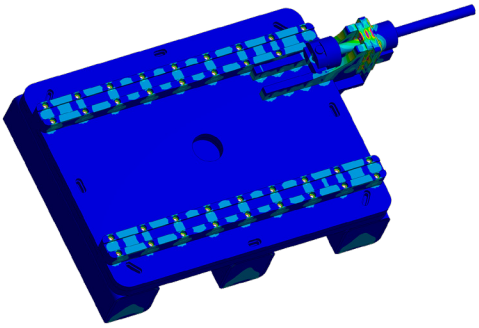
Digital Engineering

Redefining Engineering with Advanced Digital Capabilities

Model-Based Systems Engineering (MBSE) & Digital Thread



Digital Twin for Lifecycle Management



High-Fidelity Simulation & Multi-Physics Analysis

How does CTC combine engineering and IT solutions across the complete product lifecycle?

As a nonprofit applied research organization, Concurrent Technologies Corporation (CTC) brings 100+ engineers and IT professionals together under one roof—where digital models meet physical hardware, and innovation moves at the speed of mission need. From concept to fielding to disposal, we deliver unbiased expertise and integrated solutions across the complete product lifecycle.

Digital engineering enhances system design confidence, informs decision-making, and accelerates product acquisition. Our approach ensures secure information exchange across people, processes, data systems, and capabilities.

Why partner with a nonprofit for integrated digital engineering solutions?

Partnering with CTC for your digital engineering needs offers distinct benefits:

- Objective, Nonprofit Perspective
- Integrated Design-Build-Test Under One Roof
- Proven Speed Through Integration
- Mission-Focused Solutions
- Enhanced Insight & Confident Decisions
- Secure & Collaborative Environment
- Integrated Toolsets

CTC® *Concurrent Technologies Corporation*

continued

Why partner with a nonprofit for integrated digital engineering solutions? (continued)

- Objective, Nonprofit Perspective: As a nonprofit organization, we provide unbiased technical assessments and recommendations without commercial conflicts of interest. When you need trusted advisor analysis or independent verification, our mission is your success—not our profit margin.
- Integrated Design-Build-Test Under One Roof: Unlike traditional systems integrators who coordinate multiple vendors, our digital engineers work alongside the machinists, welders, and test engineers who build and validate your system. This co-location eliminates handoff risks and accelerates development—we've delivered complex prototypes in months where traditional approaches take years.
- Proven Speed Through Integration: By controlling design, manufacturing, and testing resources directly, we compress development timelines without sacrificing quality. Our digital-to-physical feedback loop accelerates prototype iterations and gets critical capabilities to the field faster.
- Mission-Focused Solutions: We align our digital engineering strategies directly with your program objectives, leveraging advanced digital tools and methodologies to accelerate development, reduce risk, and enhance overall mission effectiveness.
- Enhanced Insight & Confident Decisions: Our digital engineering approach provides unparalleled understanding of system design and performance. By visualizing, simulating, and analyzing in a digital environment, we empower you to make more informed, data-driven decisions with greater confidence.
- Secure & Collaborative Environment: We operate within a robust network infrastructure that prioritizes advanced cybersecurity and intellectual property protection for your sensitive designs and data. Our virtual collaboration tools enable effective teamwork and communication, regardless of location.
- Integrated Toolsets: We utilize comprehensive and integrated engineering tools for product and process model development, simulation, analysis, and optimization.

What technologies & tools does CTC offer?

CTC is committed to continuously evaluating and adopting best-in-class technologies to ensure we provide the most effective and innovative digital engineering solutions to meet your mission objectives.

Advanced Design & Modeling (CAD/CAE):

To create precise and detailed 2D and 3D digital representations of components, assemblies, and systems. These models form the geometric foundation for analysis, simulation, and manufacturing.

Manufacturing, CAM & Metrology:

To seamlessly translate digital designs into efficient manufacturing processes, generate optimized toolpaths for CNC machinery, and perform high-precision 3D inspection and quality control.

Specialized Engineering, Automation & Costing Tools:

To support specific engineering calculations, automate data acquisition and testing, and perform detailed cost modeling and estimation.

Model-Based Systems Engineering (MBSE) & Requirements Management:

To establish a clear, interconnected digital blueprint of your system. We use these tools to capture, analyze, trace, and manage system requirements, architecture, and design in an integrated model, fostering consistency and reducing ambiguity from concept through sustainment.

Comprehensive Simulation & Multi-Physics Analysis:

To virtually test, predict performance, and optimize designs under a wide range of operational conditions before physical prototyping. This includes structural, thermal, fluid dynamics, electromagnetic, fatigue, and system-level performance assessments. We leverage high-performance computing (HPC) resources to tackle complex simulations.

continued

How does CTC apply digital engineering?

Our comprehensive digital engineering approach seamlessly integrates modeling, simulation, and analysis to address complex challenges across the full solution development lifecycle:

Requirements Definition & Model-Based Systems Engineering (MBSE):

Activities:
Collaboratively defining and analyzing system requirements, performing digital trade studies to explore alternatives, and employing MBSE to create an integrated system model.

Client Outcome:
You receive clear, unambiguous, and verifiable requirements, a shared understanding of the system architecture, and early identification of potential integration challenges, significantly reducing downstream risks and rework.

Design Optimization & Virtual Prototyping:

Leveraging the digital system model, we develop and refine designs in a virtual environment.

Activities:
Creating detailed 3D Computer-Aided Design (CAD) models, conducting multi-physics simulations (e.g., Finite Element Analysis (FEA), Computational Fluid Dynamics (CFD)) to analyze performance, virtually integrating components, and rapidly iterating on designs.

Client Outcome:
You benefit from designs that are optimized for performance, manufacturability, and cost, with a significant reduction in the need for expensive and time-consuming physical prototypes. Our integrated facilities mean your digital designs transition seamlessly to physical prototypes without vendor handoffs, reducing development risk and timeline.

Verification & Validation (V&V):

We rigorously test and validate designs against requirements using digital methods.

Activities:
Conducting virtual testing under a wide range of operational scenarios, predicting system performance with high fidelity, simulating complex test scenarios that may be difficult or costly to replicate physically, and developing initial Digital Twins for fielded systems.

Client Outcome:
You gain increased confidence that the system will meet its intended objectives, with reduced reliance on extensive physical testing, leading to faster V&V cycles and more robust systems.

Manufacturing & Sustainment Support:

Our digital engineering approach extends into production and beyond.

Activities:
Simulating manufacturing processes to optimize workflows and identify bottlenecks, designing smart tooling, generating machine code directly from models, predicting and controlling quality, and utilizing Digital Twins to support sustainment, upgrades, and predictive maintenance.

Client Outcome:
You achieve more efficient and predictable manufacturing, reduced production errors, improved quality, and optimized lifecycle support for your systems, ensuring long-term operational readiness.

How has CTC turned complex engineering concepts into mission-ready fielded solutions?

Next-Generation Military Power Systems

Integrated battery management, power electronics, and thermal control systems for a 60kW mobile generator, delivering reliable power for critical military operations. Digital modeling reduced physical prototyping cycles and accelerated fielding timelines.

Sector Areas

- Ground Systems
- Energy & Infrastructure

Advanced Ammunition Manufacturing Integration

Developed integrated digital thread connecting design, automated manufacturing processes, and real-time quality monitoring for high-volume ammunition production. Systems engineering approach enabled seamless integration of mechanical handling, energetics processing, and inspection systems.

Sector Area

- Armaments & Ammunition

Resilient Military Installation Microgrids

Engineered integrated energy systems combining renewable generation, energy storage, and intelligent load management for mission-critical Air Force installations. Digital modeling optimized system performance and ensured autonomous operation during grid disruptions.

Sector Areas

- Energy & Infrastructure
- Installation Support

continued

Concurrent Technologies Corporation

Concurrent Technologies Corporation (CTC) is an independent, nonprofit, applied scientific research and development professional services organization. CTC collaborates with its technology transition affiliate, Enterprise Ventures Corporation, to leverage research, development, test and evaluation work to provide transformative, full life-cycle solutions. To best serve our clients' needs, we offer the complete ability to fully design, develop, test, prototype and build. We deliver robust, technical, and innovative solutions that safeguard our national security, retain U.S. technological advantage, and ensure the primacy of American manufacturing

CTC's quality management system is certified to the ISO 9001:2015 (Quality) and 14001:2015 (Environmental) standards, and to AS9100D:2016 (Quality-Aerospace-Related Products).

www.ctc.com

Ready to accelerate your next program?
Whether you're developing first-of-a-kind systems, modernizing legacy platforms, or need objective technical assessment, CTC's integrated digital engineering approach delivers results. Let's discuss how we can support your mission.

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