Selected Services and Capabilities

Advanced Coatings and Coatings Removal

CTC identifies, demonstrates, validates, and implements innovative coatings technologies that are environmentally friendly, safe, and effective. *CTC* works for its clients to ensure that cost-effective and environmentally sound advanced coatings application or removal processes are implemented. *CTC* offers the following specific capabilities with regard to advanced coating application and removal.

- Advanced Coatings Applications
- Environmental Technology Related to Coating Processes
- Recycle/Recovery Technology Design and Implementation
- Waste Minimization/Reduction Technology
- Waterborne Coatings
- Advanced Process Controls
- Conversion Coatings
- Electroless Plating/Electroplating
- Ion-Beam Assisted Deposition Techniques
- Powder Coatings
- Vacuum Coating Technologies

Advanced Distributed Learning

Using state-of-the-art technology, *CTC* develops education and training products that focus on getting the right information to the right people at the right time to enable those people to perform more productively. A spiral development approach is applied to determine education and training requirements and to build programs that meet those requirements. *CTC* offers the following specific capabilities with regard to advanced distributed learning.

- Instructional Systems Design
- Instructor-Led, Computer-Based and/or Web-Based Training
- SCORM® Conformant Content Development
- Multi-Player Gaming Technologies Development
- Videography Production
- 2-D and 3-D Animation
- Learning Management Systems
- Content Repository Development
- 508 Compliancy
- Case Study and Scenario Development
- Decision Support Technologies Development
- Legacy Content Conversion

Advanced Materials and Processes

CTC engineers and scientists work to find better ways to develop and use advanced materials such as metal matrix composites, non-metals, and alloys. *CTC* has production-sized equipment to develop, verify, and demonstrate processes, including casting, forging, rolling, wire drawing, semi-solid metalworking, powder metal processing, heat treating, quenching, machining, and joining. *CTC* offers the following specific capabilities and services with regard to advanced materials and processes.

- Process Design and Development
- Process Demonstration Factories
- Environmentally Friendly Process Technologies
- Materials Testing and Characterization
- Physical Testing and Analysis
- Metals
- Technology Demonstration, Implementation, and Operation
- Failure Analysis
- Destructive/Non-Destructive Testing and Analysis
- Alloy Development
- Metal Matrix Composites
- Nanotechnologies
- Rapid Prototyping
- Rapid Tooling
- Ceramics and Polymer Composites
- Sandwich Structures

Automation, Controls, and Data Acquisition

CTC has extensive capabilities with system automation, controls, and data acquisition. These capabilities are implemented throughout all types of projects within the organization. They range from simple to very complex integration of multiple systems. Examples vary from PC-based data acquisition and control systems to processes requiring sensors, embedded control systems, and robotics. *CTC* offers the following specific capabilities with regard to automation, controls, and data acquisition.

- Robotics Applications, Tooling, and Programming
- PC, PLC and Embedded Control Systems Development
- Data Acquisition System Design and Implementation
- Sensor Selection, Integration, and Evaluation
- Process Automation and Manufacturing Workcell Design and Implementation
- Electromechanical System Testing and Evaluation
- Prototype Design, Development, and Testing
- Manufacturing Process Optimization
- Hybrid Vehicle Design, Prototyping, and Testing
- Battery Management System Development
- Balance of Plant Design, Build, and Document
- Process Tooling Design and Prototyping

- Control System Troubleshooting and Maintenance
- Printed Circuit Board Prototyping

Command and Control Systems

A leader with regard to the emerging national Commercial/Joining Mapping Toolkit (C/JMTK) standard, *CTC* is developing sophisticated applications for viewing the common operational picture. For example, *CTC* products are helping America's warfighters achieve enhanced battlespace awareness and are providing homeland security with improved maritime domain awareness. *CTC* offers the following specific capabilities with regard to command and control systems.

- C4ISR Architectures
- Deployable Joint Command and Control System
- System of Systems Engineering
- Joint Battle Management Command and Control
- Maritime Domain Awareness
- Battlespace Visualization
- Family of Interoperable Pictures
- Single Integrated Air/Ground/Maritime Pictures
- DoD Architecture Framework

Communications and Outreach

CTC identifies clients' diverse communications and outreach needs and provides high-quality products and services that effectively convey information to target audiences. We provide a wide range of government and private sector clients with event management, graphic design, writing, editing, and production services. In addition to all aspects of event planning, *CTC* is adept at producing annual reports, brochures, catalogs, newsletters, presentations, logos, outreach campaigns, technical manuals, posters and signage, exhibit booths, and more. *CTC* has both the technical resources and managerial expertise to ensure on-time delivery in the fast-paced communications industry. *CTC* offers the following specific capabilities with regard to communications and outreach.

- Graphic Design
- Technical Writing and Editing
- Public Relations (PR)
- Event Planning and Management
- Production

Corrosion Prevention and Control

Corrosion Prevention and Control reduces clients' corrosion costs and equipment downtime. *CTC* collects and analyzes statistically valid data to characterize corrosion problems, then tests, evaluates, demonstrates, and validates the most appropriate and cost-effective commercially available corrosion prevention and control solutions. We provide corrosion sensor

development, corrosion detection and monitoring, and Web-based corrosion training. *CTC* offers the following specific capabilities with regard to corrosion prevention and control.

- Accelerated Corrosion Testing
- Flowing Seawater Corrosion Testing
- Corrosion Nondestructive Testing
- Life-cycle Corrosion Costing
- Corrosion, Degradation, and Reliability of MEMS (Microelectromechanical Systems)
- Corrosion Data Acquisition/Analysis
- Commercial Corrosion-Preventive Product Evaluation
- Corrosion Inhibitor Assessment
- Interactive Corrosion Training
- Design for Corrosion Prevention
- Corrosion Modeling
- Electrode Polarization Testing
- Coatings Characterization
- Corrosion Sensor Design
- Electrochemical Impedance Spectroscopy Testing
- Corrosion Inhibitor Application
- Materials Characterization

Environmental Technology Demonstration and Validation

From the redevelopment and reuse of underused and contaminated properties to Biological Safety Level 3 Operations and more, *CTC* is a recognized leader in environmental technology demonstration and validation. Our experience with base realignment and closure (BRAC) issues, brownfields, and unexploded ordnance location, removal and demilitarization is highly valuable to clients. *CTC* offers the following specific capabilities and services with regard to environmental technology demonstration and validation.

- Sustainability
- Pollution Prevention
- Environmental Cost Analysis Methodology (ECAM^{SM})
- Treatment and Remediation
- Unexploded Ordnance (UXO) Remediation, Detection, and Technology
- Biological Safety Level 3 Operations
- Brownfield Redevelopment
- Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives (CBRNE)

Fuel Cell Test and Evaluation

CTC has developed expertise regarding all major types of fuel cells and fuel cell applications. The U.S. Department of Defense (DoD) Fuel Cell Test and Evaluation Center (FC*Tec*), a national resource facility for the independent, unbiased testing and validation of fuel cell and fuel processor systems for both military and commercial applications, is located at *CTC* in Johnstown, Pennsylvania. The FC*Tec* was established through a collaborative effort between

CTC and the U.S. Army Engineer Research and Development Center's Construction Engineering Research Laboratory (ERDC/CERL). The FC*Tec*'s primary goal is to significantly accelerate the development and commercialization of fuel cell systems. The following specific capabilities and services are available through the FC*Tec*.

- Electrical and Thermal Load Simulation
- Altitude, Temperature, and Humidity Simulation
- Electromagnetic Interference (EMI)
- Shock and Vibration
- Electric Grid Simulation
- Gas and Liquid Fuels
- Computerized Control and Data Acquisition
- Performance and Reliability Testing
- Systems Integration
- Combined Heat and Power Analysis
- Fluid, Gas, and Water Stream Analysis
- Demonstration and Validation
- Test Protocol Development
- Life-Cycle Analysis

Information Assurance

CTC's Information Assurance (IA) core competency is based on experience in protection, reaction, and detection measures as well as in network engineering, management, modeling, and assessment activities. *CTC*'s extensive IA work includes vulnerability assessments, biometrics, multilevel security, integration of IA tools, architecture development, cyber exercises, and advanced research. *CTC* applies a defense-in-depth IA strategy that focuses on people, technology, and operations to improve all aspects of security within an organization. *CTC*'s core competency in IA can be successfully applied to improve security, facilitate certification and accreditation, increase operational performance, assure compliance with laws and regulations, and address emerging technical challenges. *CTC* offers the following specific capabilities and services with regard to information assurance.

- Vulnerability Assessments
- Network Security
- Multilevel Security
- Network Management
- Intrusion Detection and Protection Systems
- Biometrics Applications
- Data Mining/Correlation/Visualization
- Wireless Protocols
- Information Operations (IO)
- Firewall Configuration
- Antivirus Solutions
- Virtual Private Networks
- Remote Access
- Public Key Infrastructure (PKI)
- Key Management Techniques

Intelligence Analysis

CTC assists the U.S. Intelligence Community in gathering and accessing large volumes of information. *CTC* has designed and developed several key, successful programs for the Intelligence Community, including a decision support system consisting of data collection, data mining and warehousing, and reporting analysis tools. *CTC* offers the following specific capabilities and services with regard to intelligence analysis.

- All-Source Intelligence Analysis—Fusion of HUMINT, IMINT, MASINT, SIGINT, and Open Source Information
- Advanced Imagery Analysis (Multi-Sensor Imagery), B/W, Multispectral, and Hyperspectral Imagery Processing, Mosaicking, and Co-Registering
- Data Mining
- GIS Analysis, Data Generation, Transformation, Translation, Reprojection, and Validation
- Open-Source Web-based Research
- Cartographic and Imagery Processes
- Database Hardware, Software, and Network Development and Integration
- Electronic Warfare and Electromagnetic/Radio Frequency
- Geospatial Analysis
- Link Analysis (VisuaLinks) Integration and Analysis
- Oracle Database Design, Development, Implementation, and Operation
- Physical and Electronic Security
- Search, Detection, Discovery, and Characterization of New Military and Strategic Industry Facilities

Logistics Optimization

CTC assists clients by evaluating and managing the quality of logistics data and by applying appropriate data visualization technologies. *CTC* also provides assistance with legacy data, process transformation, and much more. The following specific capabilities and services are available.

- Data and Decision Support
- Legacy Data Integration
- Process Transformation
- Business Process Modeling and Analysis
- Readiness Management
- Strategic and Tactical Analysis
- Geographic Information Systems
- Legacy Data Transformation
- Statistical Forecasting
- Leveraging Synchronized Data
- Validation and Verification of Wireless Communications

Management Systems

CTC offers a wide array of training, customized consulting, and numerous implementation tools and techniques designed to assist our clients in the design, documentation, implementation, and maintenance of an effective management system. A unique combination of quality; cost; and environment, health, and safety services are available.

- ISO 14001 (Environmental Management)
- ISO 9001 (Quality Management)
- Process Improvement
- Cost Benefit/Economic/Life-cycle Analysis
- Environment, Health, and Safety

Manufacturing Improvement

From computer-aided logistics support to surface finishing technologies to robotics, *CTC* offers world-class manufacturing improvement capabilities. Through the National Center for Excellence in Metalworking Technology, operated by *CTC* since 1988, a number of industry-leading innovations have been developed to support America's civil-military industrial base. The following specific manufacturing improvement capabilities and services are available to clients.

- System Modeling and Simulation
- Manufacturing Demonstration Factories
- Clean Manufacturing Processes
- Prototype Design, Fabrication, and Testing
- Quality Management and Standards
- Computer-Aided Logistics Support
- Manufacturing Audits and Optimization
- Environment, Health, and Safety
- Rapid Prototyping of Components and Assemblies
- Material Processing Factories
- Shapemaking
- Surface Finishing
- Robotics
- Controls
- Sensors

Modeling and Simulation

In short, modeling and simulation capabilities help the U.S. military and private industry find better ways to accomplish a wide range of key tasks. Using comprehensive computer models, *CTC* provides the most sophisticated analysis available and develops world-class recommendations. *CTC* offers the following specific capabilities and services with regard to modeling and simulation.

- Virtual Reality Systems Demonstration, Implementation, and Operation

- Computer-Aided Design, Engineering, and Manufacturing
- Process Design and Development
- Product and Process Optimization
- Product Performance Simulation
- System Modeling and Simulation
- Discrete Event Simulation
- Modeling and Simulation Facilities
- Numerical Modeling
- Mathematical Modeling
- Material Process Behavior Modeling

Supply Chain Integration

Any business knows that supply chain management can mean the difference between success and failure. Supply chain integration takes on a whole new importance in modern warfare. Therefore, *CTC*, a key integrator for the U.S. Marine Corps Logistics Command, is working to optimize legacy business processes and develop and test innovative logistics solutions. *CTC* offers the following specific capabilities and services with regard to supply chain integration.

- Strategic Supply Chain Planning
- System Life-Cycle Analysis and Planning
- Business Systems Modernization
- Process Analysis and Transformation
- Diminishing Manufacturing Sources
- Catalog Standardization
- e-business Application to Supply Chain Management
- Cycle Time Reduction
- Supply Chain and Distribution Modeling
- Total Ownership Cost Modeling
- Supply Chain Management Course Development
- Leveraging Synchronized Data
- Supply Chain Operations Reference (SCOR) Model Application

Sustainability

CTC supports sustainability concepts and practices by providing services, solutions, and technologies focused on reducing the impact of the military and industry on the environment. *CTC* uses sound scientific principles to encourage technology development in a way that is conscious and responsive to emerging global trends. *CTC*'s specific services related to sustainability include the following.

- Environmental Management Systems (EMS)
- Energy Management Analysis
- Green Processes

- Land Management Analysis
- Range Management
- Sustainability of Weapon Systems

Systems Design and Analysis

CTC incorporates a design philosophy that all system and component designs consider the entire life cycle of a product. *CTC* has the ability to optimize product and process design, perform rapid prototyping, and develop high-end virtual reality workstations and room-sized Computer Aided Virtual Environments (CAVEs). The following specific capabilities and services are available to *CTC* clients.

- Product and Process Design and Optimization
- Advanced Numerical/Analytical Modeling and Simulation
- Computer-Aided Design and Manufacturing (CAD/CAM)
- Rapid Prototyping of Components and Assemblies
- Virtual Reality
- Product Performance Simulations
- Computer-Aided Engineering (CAE) Demo and Implementation
- Discrete Event Simulation
- Design for Manufacturing and Assembly

Systems Integration

CTC's systems integration capabilities serve private industry as well as military clients. For example, one project is an Internet access service designed to assist local school districts? affordably and capably. Another project, developed for the U.S. Navy, performs serial number tracking for weapon systems components. *CTC*'s wide range of systems integration capabilities includes the following.

- Enterprise Application Integration
- Knowledge Transfer Services
- Technology Investigation and Feasibility Analysis
- Legacy Systems Management and Internet Enabling Development and Implementation
- Planning, Designing, and Implementing Custom Application Systems and Information Infrastructures
- Enabling Complex Computer Networking Environments
- Integrating Software and Hardware Components
- Ongoing Systems and Applications Management and Maintenance

Systems/Software Engineering

CTC provides software development, test and evaluation, training, modeling and simulation, and life-cycle maintenance. Systems and software experts perform custom application development, full life-cycle development, and more. *CTC* has been assessed at CMMI Level 3 and is pursuing CMMI Level 4. *CTC* offers clients the following specific capabilities, services, and benefits.

- System of Systems Engineering
- Custom Application Development
- COTS/GOTS Integration
- Web Applications
- Embedded/Real-Time Systems
- Capability Maturity Model® Integration for Systems Engineering/Software Engineering (CMMI-SE/SW℠) — Assessed at Maturity Level 3
- Standards Development and Evolution
- Software/Systems Evaluation
- Visual Basic/C/C++/Java/C#
- Microsoft Access®/MS SQL/Oracle/Sybase/My SQL
- System/Software Architecture
- Rapid Application Development
- Full Life-Cycle Development
- Use Case Development
- Verification and Validation (V&V)
- Configuration Management

Technology Management

Technology management is a broad category in a day of sweeping technological advancements. One *CTC*-managed project earned the prestigious national distinction of being named a "Top 10 U.S. Army Technology for 2004." This is just one example of *CTC*'s ability and achievement in the area of technology management. The following specific technology-management capabilities and services are available to *CTC* clients.

- Management of Demonstration and Validation of Emerging Technologies to Confirm Performance, Reliability, and Life-Cycle Costs
- Technology Roadmapping to Identify Forecasted Needs; Identify Both Existing and Emerging Technologies as Well as Technology Gaps
- Database Mining to Assess Markets, Competitive Profiles, Potential Partnering Targets, Quantification of Opportunity, and Potential Paths and Threats to Commercialization
- Technology Scouting, Maturation, and Commercialization Planning, including Market Research and Intelligence Gathering
- Technology, Market, and Competitive Assessments
- Strategic and Business Planning Development
- Intellectual Property Assessment, Prioritization Planning, and Education/Training
- Regional Intelligence Gathering, Including Open Source Database Mining on Technical Capabilities Within Areas, Locales, or Industries

Visualization

CTC employs advanced visualization techniques and constantly seeks to develop new techniques and applications. *CTC* has applied advanced visualization techniques to create real-time images of battle zones for the Department of Defense and has found new ways to display essential data on hand-held, palm-sized "computers." This range of diversity is evident in the following list of capabilities and services available to *CTC* clients who are interested in visualization expertise.

- Battlespace Visualization
- Geographic Information Systems (GIS)
- Geo-Referenced Integration of Imagery, Terrain, and Domain Dependant Data
- Visual Fusion of Information
- Range of Display Environments from Hand-Held/Head-Mounted to Room-Sized
- Web-Based User Interface/Visualization
- Virtual Reality Environments
- 2-D/3-D/3-D Stereoscopic Environments
- Scientific Visualization
- Software/Display Assessments