
University of Tennessee Technical Exchange

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April 8, 2008

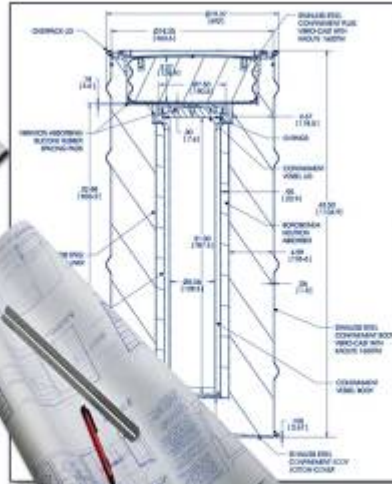


Manufacturing Process



Requirements
Definition

Design
and
Analysis



Prototype/
Development/
QA



Testing/
Analysis



First
Article



To
Full
Production

QA



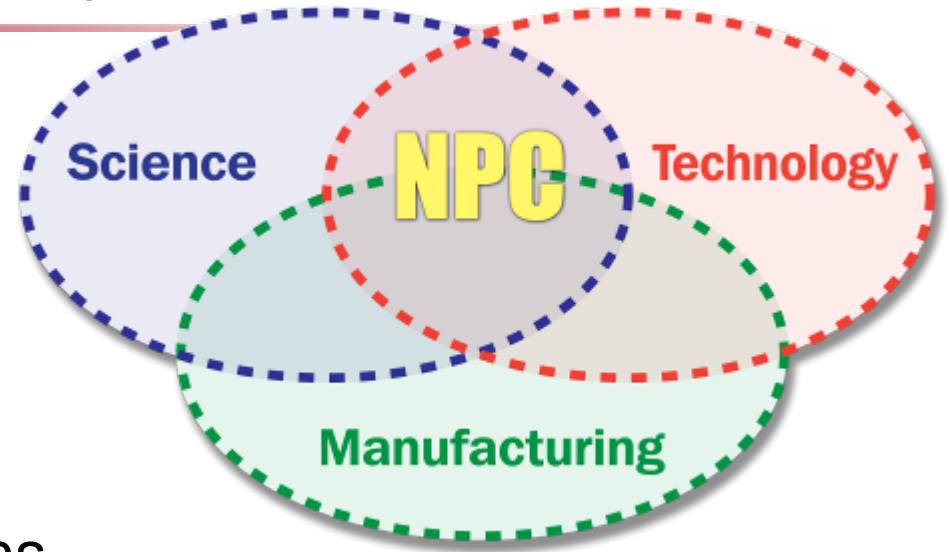
To
Outside
Production

**TECHNOLOGY
TRANSFER**



National Prototype Center

- Specializes in integration of science, technology, and manufacturing for customer-specific applications to:
 - Solve tough, high-risk manufacturing problems
 - Design and build first-of-a-kind products
 - Improve or enhance existing products
 - Develop new, innovative manufacturing processes
 - Provide a seamless transition to/from industry
 - Work in a highly secure environment governed by a project specific security plan



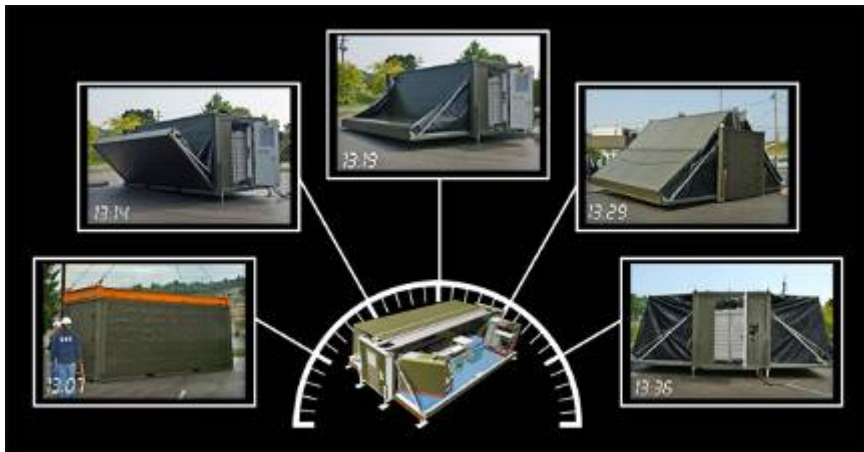
Prototypes



Moon Box



Seawolf Propulsor for Nuclear Navy



Rapid Deployment Shelter System



Airforce F-22 Fighter Jet

Prototypes



Gun Safety Clip



Access Rate Control System



Advanced Amphibious Assault Vehicle (AAAV)



Manufacturing Capabilities



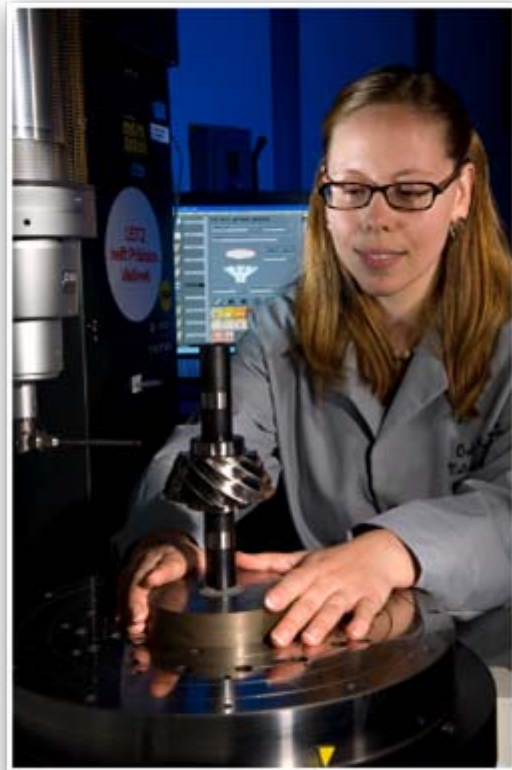
Machining and Fabrication

- Distributed numerical control multi-axis machining (3-, 4-, and 5-axis)
- Nontraditional machining (e.g. EDM)
- Welding
 - Gas tungsten arc adaptive
 - Multi-axis pulsed metal arc
- Nondestructive testing techniques
- Capabilities in machining ferrous, nonferrous, ceramics, graphite, and special materials
- Classified areas can handle sensitive programs



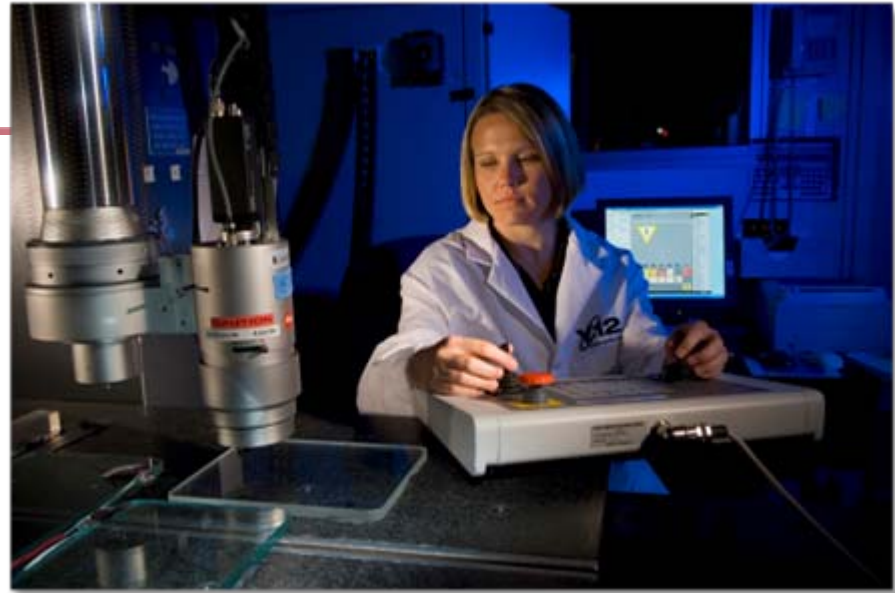
Coordinate Measurement and Reverse Engineering

- State-of-the-art coordinate measuring allows reverse engineering



Metrology

- Comprehensive Metrology Services
 - Electrical
 - Dimensional
 - Optical
 - Physical
 - Radiological
 - Dosimetric
 - Radio frequency/
microwave
 - Photo/radiometric



- Designated the National Institute of Standards and Technology (NIST) facility for certification of all length standards greater than 40 inches in length
- NVLAP accreditation for certification of grid plated, hold/ball plates, and gears

Specialized Capabilities and Equipment



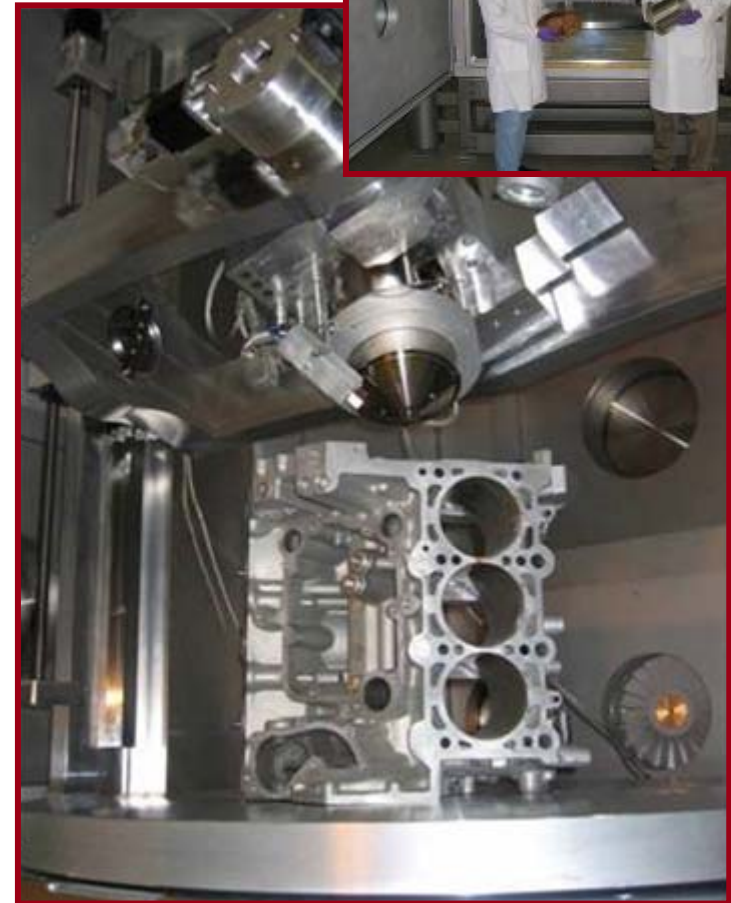
*Large-chamber Scanning Electron
Microscope*



Electron Beam Welding Machine

LC-SEM Description

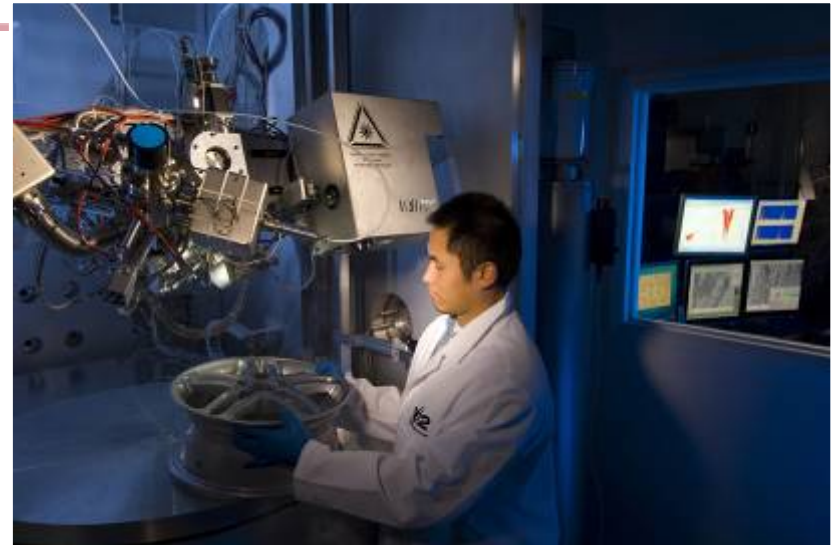
- The LC-SEM is a one of a kind instrument
 - It has all of the features of a regular SEM
 - But it can hold extremely large samples allowing investigation of components without destroying them
- Max. sample size: 40" diameter x 40" tall
 - Compared to 2" in diameter and 2" tall for conventional SEM
- Max. sample weight: 650 lbs
- Magnification from up to 50,000x (<10nm resolution)
 - Light microscope limited to 1000x



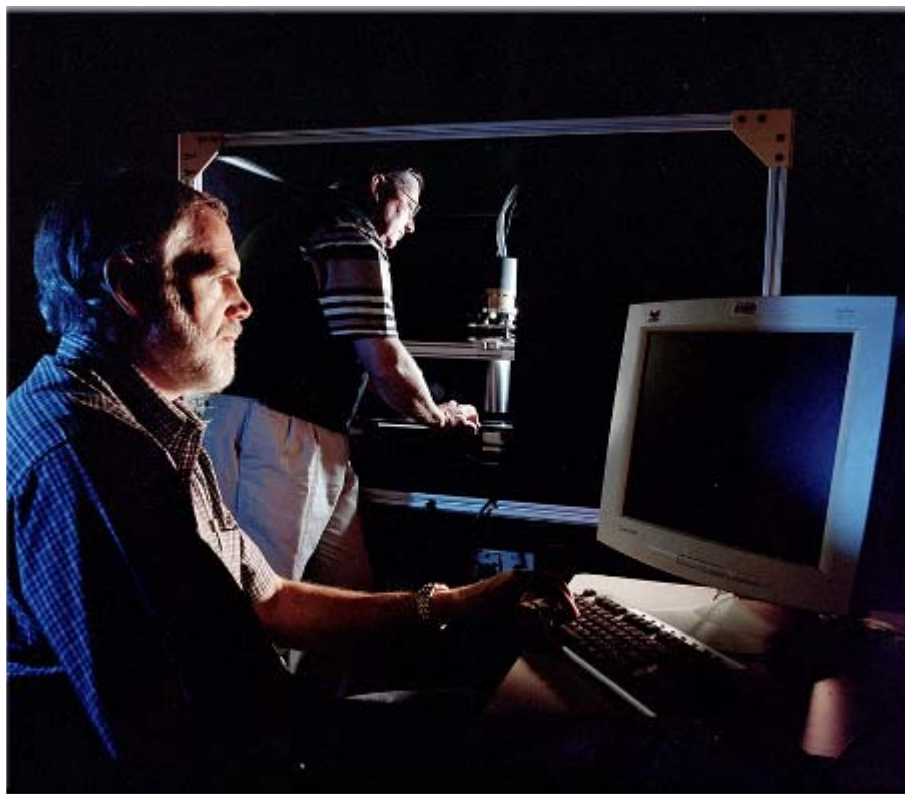
The LC-SEM easily accommodates this V-6 engine block

Benefits of the LC-SEM

- The size and flexibility of this system allows detailed nondestructive analysis of large components
- No longer have to cut samples to fit into a conventional SEM
 - Not destroying expensive materials
 - Nondestructive quality evaluations
 - Cutting can introduce anomalies into the crystal structure
- Many analytical tools all in one instrument
 - One stop shopping for complete material characterization



Special Capabilities



Digital Radiography



Microwave Processing

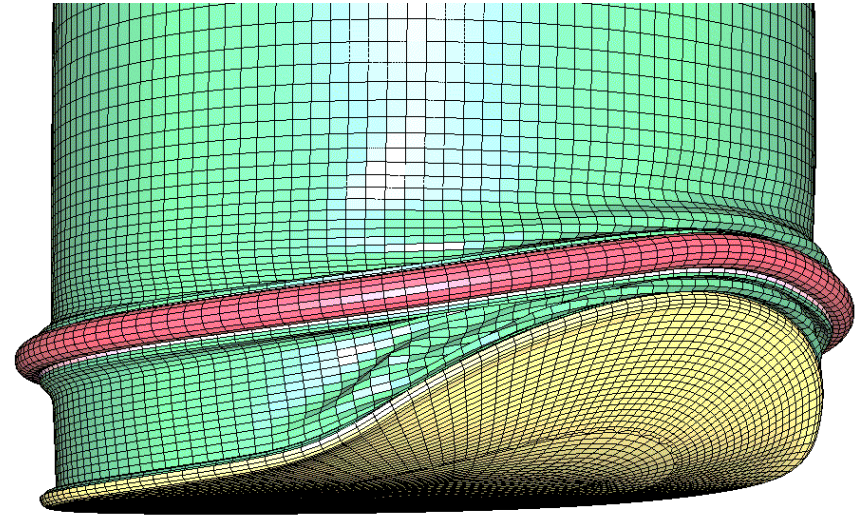
Why choose Y-12 manufacturing?

Y-12 specializes in...

- Prototype, limited production run, or one-of-a-kind items
- Machining requiring high precision and accuracy
- Classified manufacturing in a highly secure, “need to know” environment
- Machining of materials having unique properties
- Projects that are not profitable for the private sector
- Solution-oriented manufacturing processes using a multidisciplinary approach

Mechanical & Manufacturing Engineering

- Manufacturing & Process Simulation
 - Ergonomic Analysis
 - Process improvement
 - Design verification
- Engineering Analysis
 - **Structural Analysis**
 - Dynamic/shock loading events
 - Pressure vessels/systems, autoclaves, presses
 - Fracture/failure analyses
 - **Thermal, Process Analysis**
 - All modes of heat transfer
 - Chemical process analysis
 - Fluid flow & atmospheric dispersion analysis

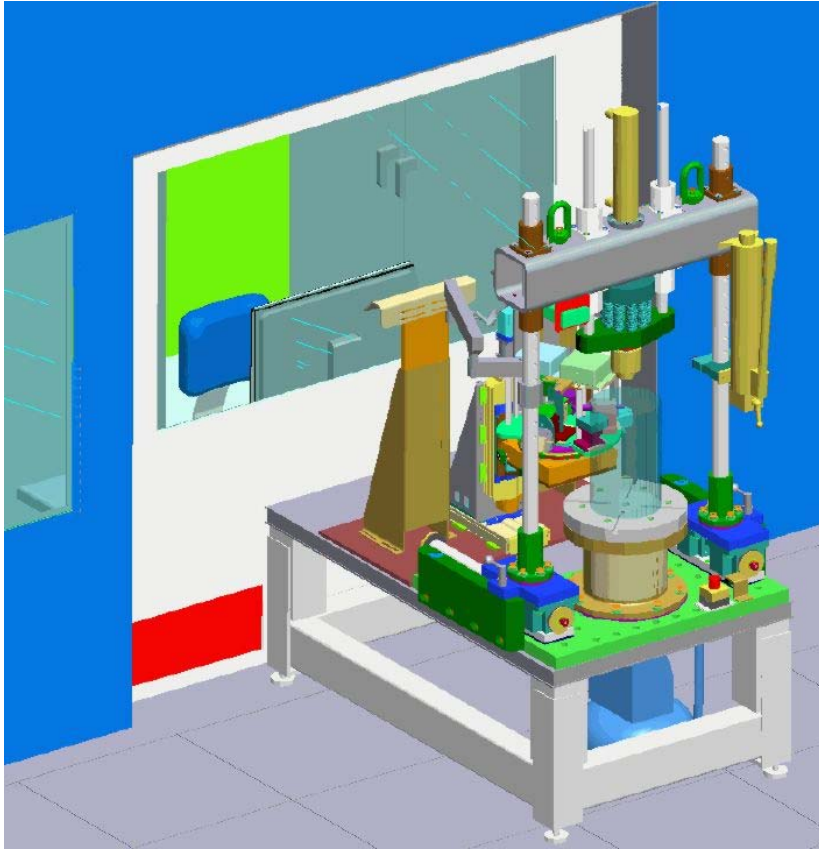


Mechanical & Manufacturing Engineering

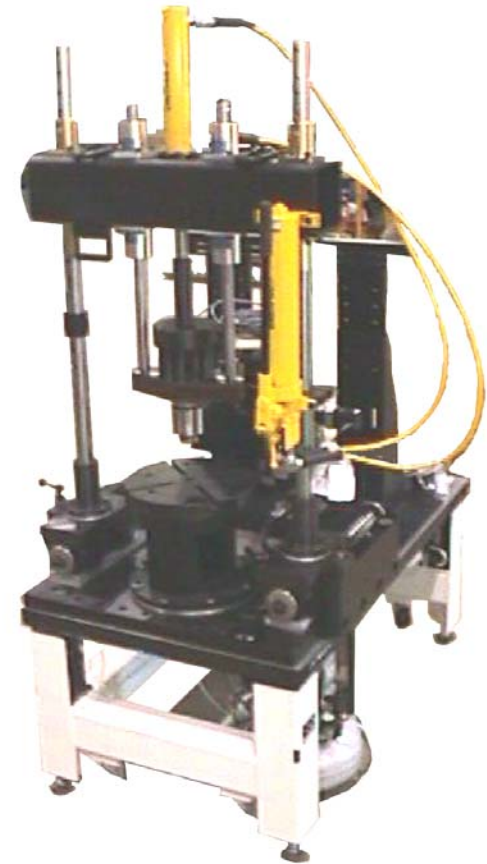
- Specialty Mechanical Equipment Design & Specification
- Administer testing requirements for product certification
 - Vibration, penetration, crush
 - Puncture, compression, impact
- Tool Design
 - Press Tooling
 - Graphite Molds
 - Machining Fixtures
 - Inspection Fixtures
 - Handling Fixtures
 - Assembly/Disassembly Fixtures
- NC Machining & NC Inspection



Use of Pro/E for Model Design



Pro/E design of EB weld inspection machine

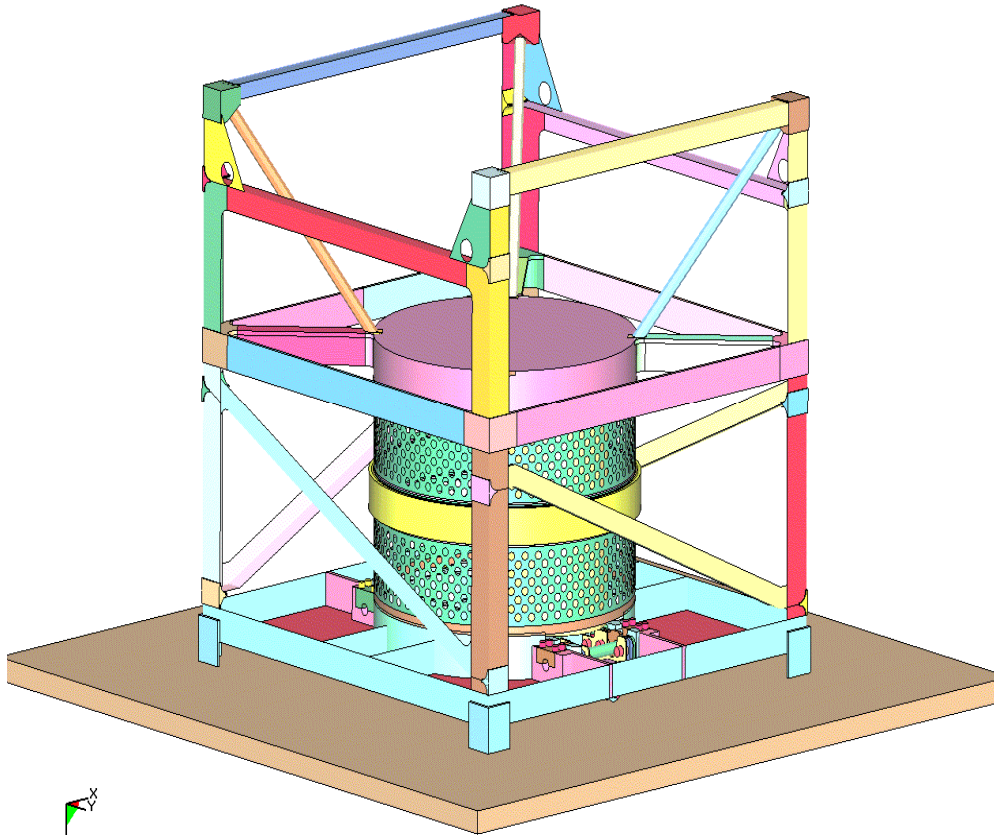


EB weld inspection machine

Model-Based Engineering Technology

Process Improvement: Machined Birdcage

24BCAGE07 07012502RUN8 KQH NB
Time = 0



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