

# Government/Industry Interactions in Composite Materials Development through the Oak Ridge National Laboratory

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- Who and What are the Department of Energy National Laboratories?
- How and Why Should the Laboratories and Industry Work Together?
- Examples of Successful Collaboration in the Composites Area



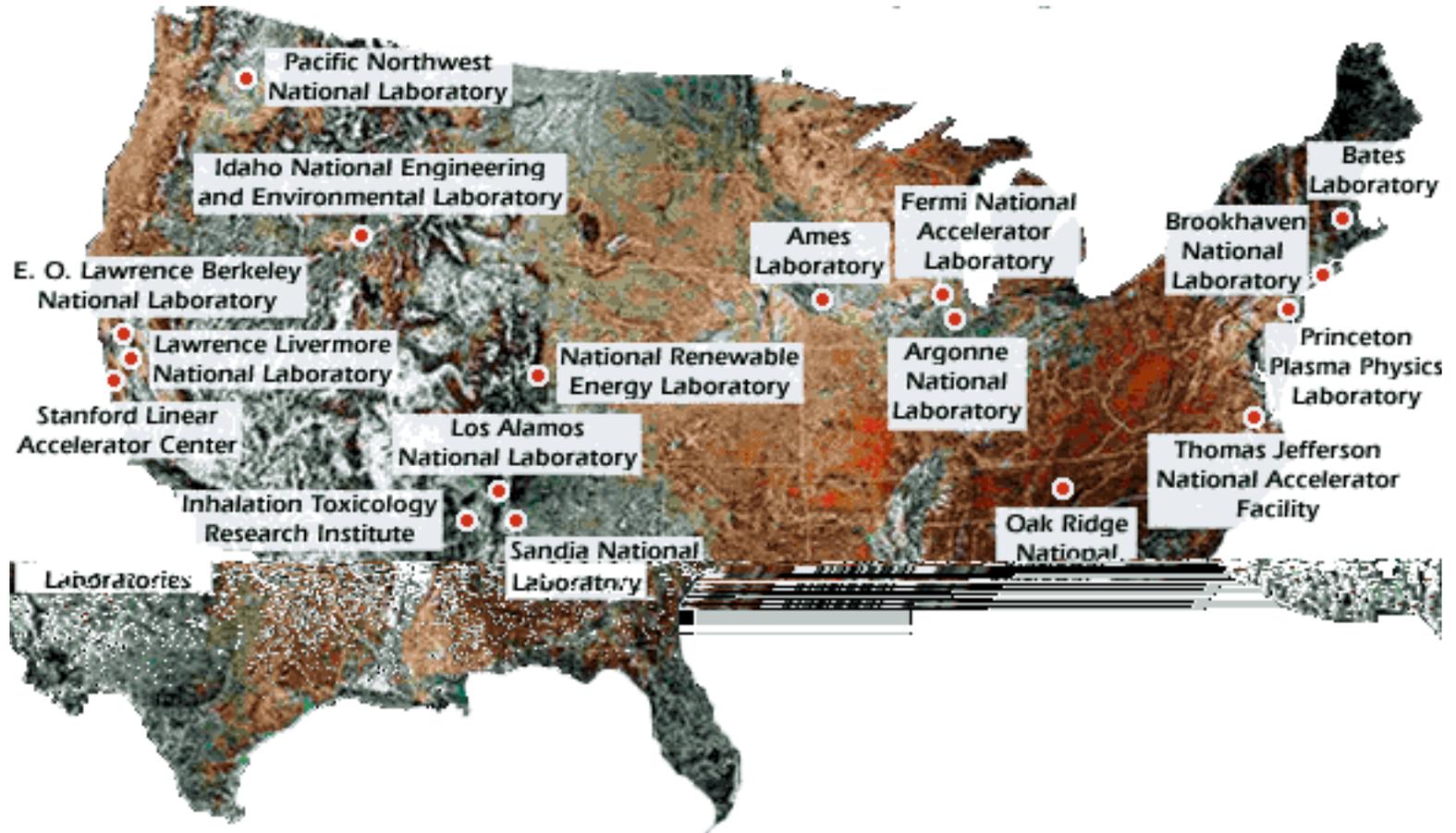
# DOE Research Program Offices

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- Science
- Fossil Energy
- Energy Efficiency and Renewable Energy
- Nuclear Energy, Science and Technology
- Defense Programs
- Environmental Management

# DOE National Laboratories





# Oak Ridge National Laboratory

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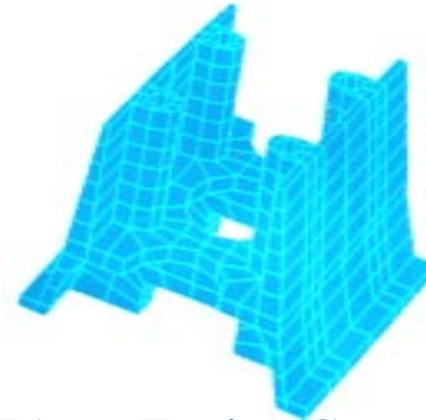


- Oak Ridge National Laboratory (ORNL) conducts basic and applied research and development to:
  - Strengthen the nation's leadership in key areas of science
  - Increase the availability of clean, abundant energy
  - Restore and protect the environment
  - Contribute to national security.
- The Oak Ridge Centers for Manufacturing Technology (ORCMT) combines the capabilities of the Y-12 Defense Production Plant and ORNL in applied research, development, design, prototyping, production, and training.

Cost Effective Application of  
Composites with Capabilities in:

- Design and Analysis
- Materials Characterization
- Materials Development
- Process Development

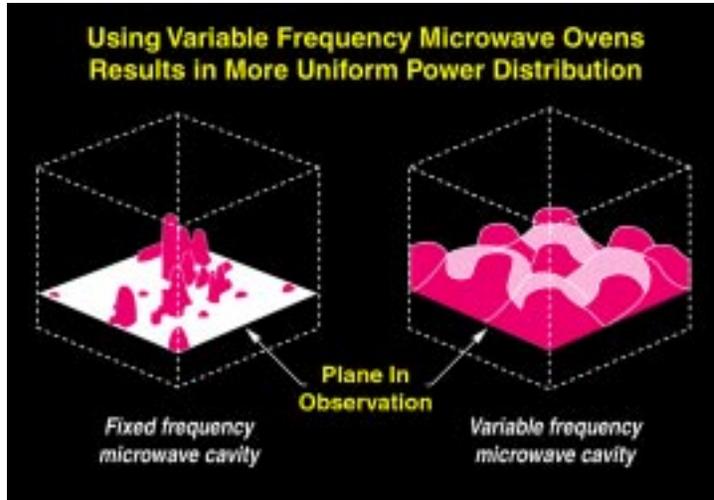
from establishing initial program  
requirements through prototype  
demonstration



FEA on Engine Components



Various Test Specimens



Advantage of Variable Frequency



Automated Testing

- Electron Beam processing of polymers and related materials chemistry
- Microwave processing of polymers and fibers
- Filament winding of high performance structures
- Design and analysis
- Unique test development and implementation



- Rich intellectual and physical resources available in a variety of arrangements
- Scientific approach to problems with commitment to both basic and applied R&D
- Integrated technologies
- Unbiased commercial position
- Capability to handle classified, sensitive, and proprietary projects

- Industry Works for the Laboratory
- Industry and Laboratory Work in Collaboration through Cooperative Research and Development Agreements (CRADAs) or other arrangements
- Laboratory Works for Industry

Formal Work Agreement and Legal Statutes Determine  
Intellectual Property Ownership

ORNL is an Active Participant in a Number of Composite Projects Supporting the Partnership for the Next Generation Vehicles (PNGV) Program \*

- Low Cost Carbon Fibers
- Adhesive Bonding of Composites
- Durability of Composites in Automotive Applications
- Composite Crashworthiness Evaluation
- Support to Automotive Composites Consortium Focal Projects

\* See presentation on this topic by C. D. Warren



Small, Light Package



Deploys in ~15 minutes



Multi-Purpose Facility

- The Advanced Surgical Suite for Trauma Casualties (ASSTC) provides a self-contained, rapidly deployable, small footprint facility capable of providing trauma management, resuscitative surgery, ancillary services, or temporary patient holding.
- Plans are to transition manufacturing from ORCMT-led development team to full production during FY2000-2001

DOE funded ORNL to support joint DOE/Gas Research Institute (GRI) objectives in:

- Enhanced Natural Gas Vehicle (NGV) Composite Fuel Tanks
  - Development of technologies for lower cost and more durable composite tanks
- Smart Tanks Technologies
  - Application of existing sensor technology for cost-effective, in-service NDE that is a reliable indicator of impending failure



Ring Test Fixture



Ruptured Tank



Part Under Accelerator

- Electron Beam Curing of Polymer Matrix Composites CRADA (1993-1996)
  - Developed breakthroughs in cationic curing chemistry and processing
- Interfacial Properties of Electron Beam Cured Composites CRADA (1999-2002)
  - Developing improved interfacial properties in EB cured composites
- ORNL/ORCMT Electron Beam Curing of Composites Workshops in 1996, 1997, & 1999

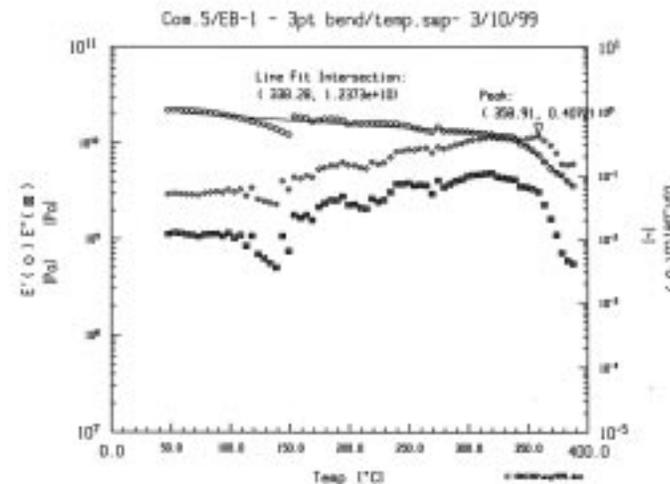
Both CRADAs include other government representatives and a significant number of small and large industrial partners

ORNL is working with Comanche PMO, Boeing, and Sikorsky on key technology challenges:

- High temperature tail rotor shaft
- Light weight ballistic protection



Shaft Fabrication



Composite DMA Data

- Foster-Miller Phase II - SBIR
  - ORNL is assisting Foster-Miller in the development of EB cured braided structures
- Aerotech Engineering Phase II - STTR
  - ORNL is assisting Aerotech in developing materials and processes for reversible bonding
- Technology Development Associates Phase II - SBIR
  - ORNL will be assisting TDA in development of EB cured rocket motor cases

ORNL participation in SBIR/STTR Programs makes government capabilities available to industry on a non-exclusive basis

- Smith and Nephew
  - ORNL is working to determine shelf life and effects of shipping and storage on anti-microbial polymeric materials for medical applications
- Metter's Industry CRADA
  - ORNL assisted Metters Industries in development of a resin transfer molded (RTM) transmission cover for a helicopter trainer



Transmission Cover

- Direct Assistance Programs (DAPs) - DOE Small Business Initiative programs provide technical assistance of a limited number of hours through ORCMT (1-800-356-4872)

- Example efforts:

#### Safe Tech

Plastic safety rounds for numerous military and personal weapons (handguns, rifles, shotguns, etc.)

#### Rauschert industries, Inc.

Plastic injection molded parts

#### Drain-All

Materials selection for valve seats

#### Howmet Corporation

Processing of ceramic filled thermosets

#### Bungee Suspension Systems

Suspension systems for boat seats.

#### Almar Molded Products Inc.

Stress analysis to support plastic part design

- Oak Ridge National Laboratory and Other National Labs are Seeking to Work More with Industry in a Variety of Arrangements
- Collaboration Typically Benefits Both the Industry and Government



# Contact Information

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