

Navy Ship and Submarine Shock Survivability

- Underwater Explosion (UNDEX), airblast, and implosion
- Finite Element Modeling (FEM) and Analysis (FEA)
- Dynamic Design Analysis Method (DDAM)
- Shock test plans and procedures
- On-site test operation, analysis, and management support
- Shock qualification by test, extension and analysis (MIL-S-901)
- Specification compliance, review and development

Structural Engineering

- Static, dynamic and transient analysis of structures
- Composite and hybrid materials
- DDAM and UNDEX analysis
- Weapons effects and extreme events analysis
- Modal analysis
- Fluid-structure interaction
- 2-D, 3-D & Super-Elements
- Hydrostatic pressure analysis
- Fatigue analysis

Fluid Mechanics

- Hydrodynamic Noise Reduction
- Appendage Flow Fields
- Fluid Structure Interaction



Shipboard Power & Energy Systems

- Surface Ship and Submarine Power System Architectures
 - Power conversion, distribution and generation systems
 - Power quality assessment and analysis
 - Energy storage systems
 - Advanced control system design and implementation
 - Technology demonstration design, testing, analysis and documentation
- Integration and Impact Assessment of Pulsed/High Energy Loads on Shipboard Power Systems
 - Electromagnetic Rail Guns
 - Directed Energy Weapons
 - Advanced Sensors

Propulsor Systems

- Design and Performance Predictions
 - Vibration and radiated noise
 - Unsteady forces
 - Near-field unsteady pressures
 - Acoustic signatures
 - Computational methods including Finite Element Modeling (FEM) and Strip Theory Analysis
- Propulsor Manufacturing Oversight

Marine Renewable Energy

- Ocean Thermal Energy Conversion (OTEC)
- Marine Energy Converters
- Survivability and Reliability
- Environmental Effects Analysis
- Offshore Wind

Our **CARDINAL** Mission

- We provide** superior, reliable and cost-effective engineering solutions
- We deliver** unbiased technical and management expertise – “Honest Broker”
- We maintain** long term relationships founded on excellence and dependability
- We apply** scientific and engineering expertise to programs of national importance

The **CARDINAL** Difference

- Personalized service**
- Innovative solutions**
- Flexibility and adaptability**
- Time-tested operational and project management expertise**
- Direct and efficient communication**



Cardinal Engineering, LLC

Headquarters
213 Duke of Gloucester Street
Annapolis, MD 21401

Washington Office
1220 12th St SE, Suite 140
Washington, DC 20003

Phone: (202) 506-3962
E-mail: Info@cardinalengineeringllc.com
Website: www.cardinalengineeringllc.com

