Government Usage Of CREATE Ships Tools – NESM + NAVYFOAM

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CREATE Ships Tools

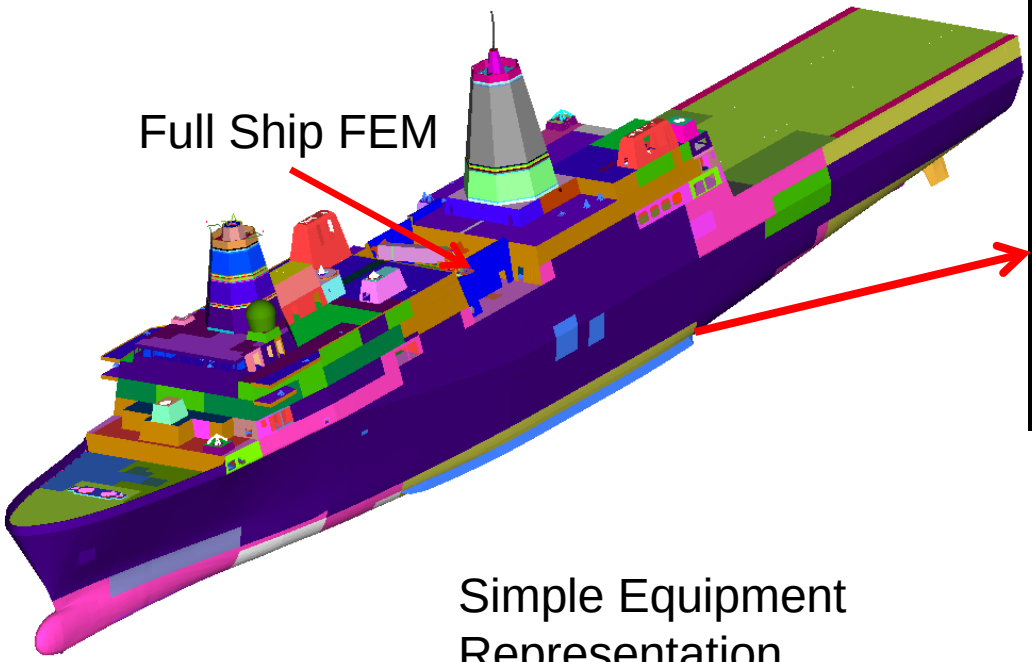
- Navy Enhanced Sierra Mechanics
  - Prediction Of Ship Shock/Damage Response Due To Weapon Engagement
- Navy FOAM
  - Reynolds Averaged Navy Stokes (RANS) Hydrodynamic Analysis
  - Large Edy Simulation (LES) Fluid Solutions

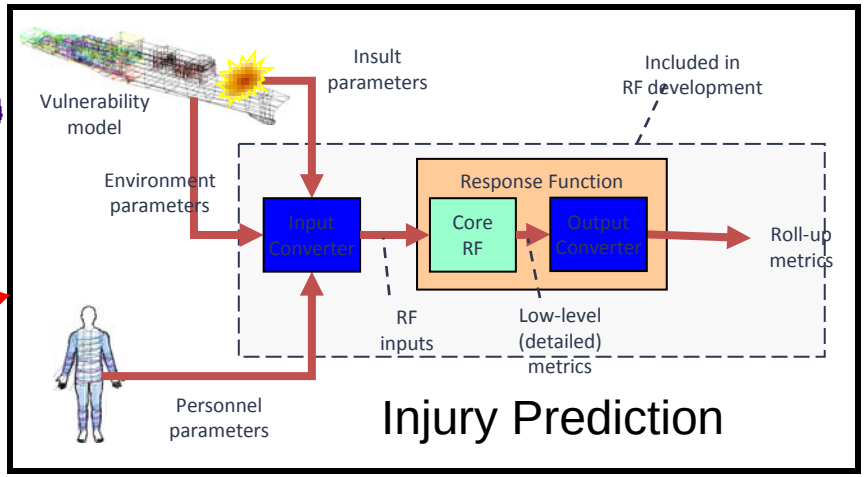
Whole Ship M&S

NAVSEA WARFARE CENTERS
Carderock Division

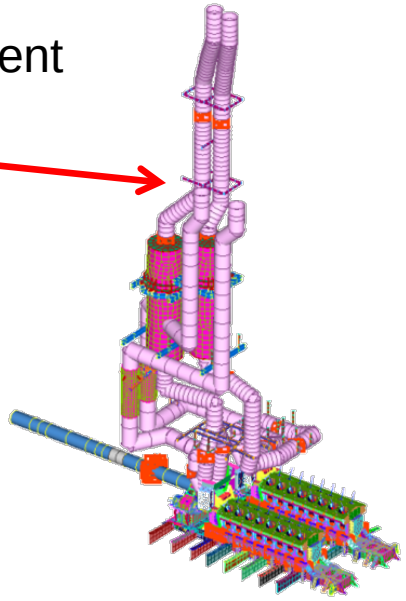
DOD HPC MODERNIZATION PROGRAM

Full Ship FEM

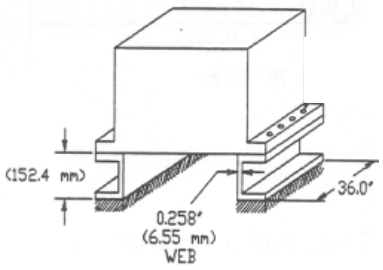


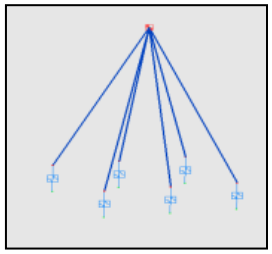


Complex Equipment Representation



Simple Equipment Representation





U.S. Navy Need For Robust Shock/Damage M&S Capability

- Design Support
  - Shock Design Requirements
  - Support Shock Qualification
  - Vulnerability Design Requirements
- LFT&E
  - Assess Ship Vulnerability To Real Threats
    - Reduce Need For Physical Testing, More Focused/Physics Based Testing
- Support Demonstration Of Total Ship Shock Hardness
  - Total Ship Mission Capability Impact Assessment Due To Shock Engagement
  - Reduce/Eliminate Requirements For Full-Scale Physical Testing

Design For Shock

- Determine Equipment Design Requirements
- Design Equipment For Shock
- Simulate Qualification Testing
- Design/Customize Shock Testing
- Support Design Of Shock Isolation Systems
- Reduce Necessity For Shock Testing

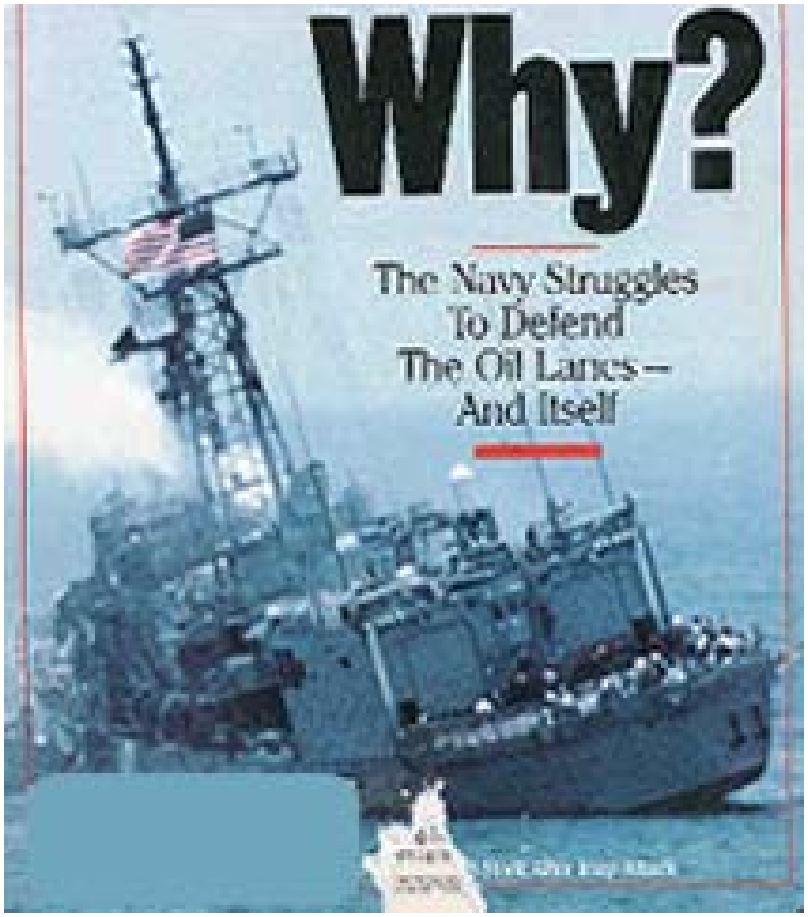
Full Ship Shock Trial/Alternatives

CVN 71 Shock Trial 1987

- FSSTs Used To Demonstrate Total Ship Shock Hardness
- Navy Is Investigating Alternatives For Reduced Cost/Ship Impact
- M&S Is Cornerstone Of Alternatives

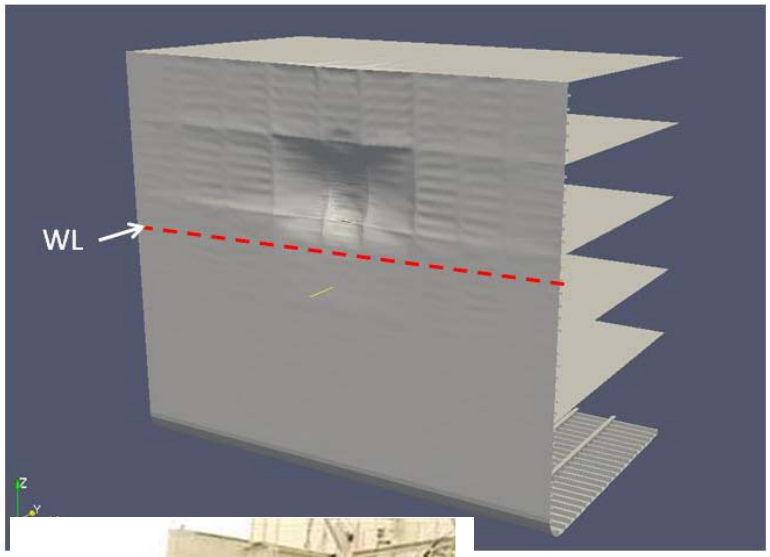
LFT&E

- Evaluate Ability Of U.S. Military Assets To Survive “Real World” Attacks
- Core Requirement Is Testing
- U.S. Navy Complies Via Waiver
  - Surrogate Testing
  - Modeling & Simulation
  - Total Ship Survivability Trials (TSSTs)
  - Full Ship Shock Trials
- M&S Allows For Assessment Of Many Scenarios
- Validated M&S Leads To Reduced Dependency On Expensive Testing



NESM Solution

- Couple Gemini To The Sierra Mechanics Suite => Navy Enhanced Sierra Mechanics
  - Interface To Sierra Using Standard Coupler Interface (SCI)
- Existing Sierra Capabilities
  - Structural Dynamics (SD)
    - Implicit Structural Dynamic Solver
  - Solid Mechanics (SM)
    - Nonlinear Lagrangian Dynamic Solver
- Enhance Sierra SD/SM & SCI For Navy Specific Intended Uses For Weapon Effects M&S

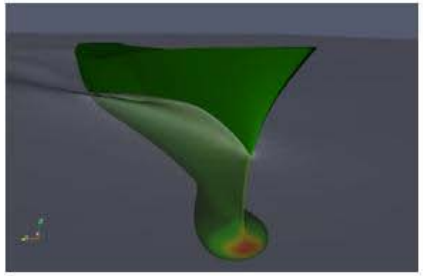
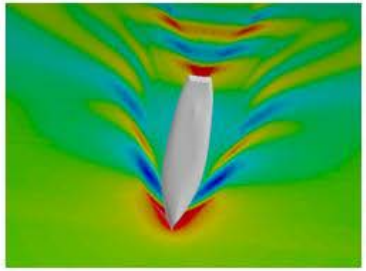
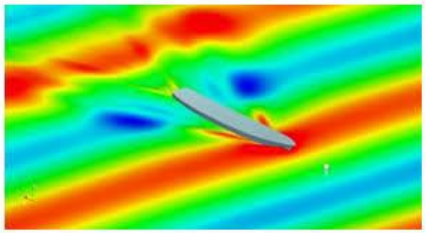
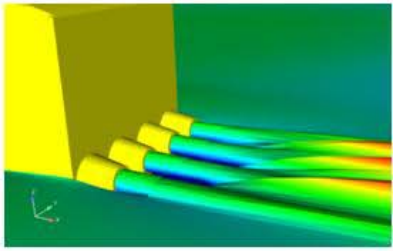
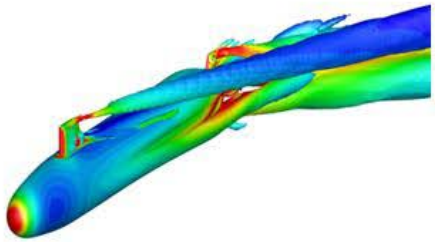
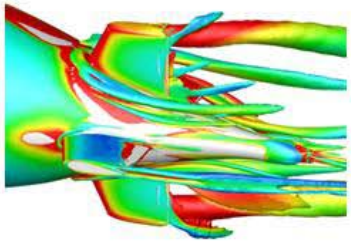
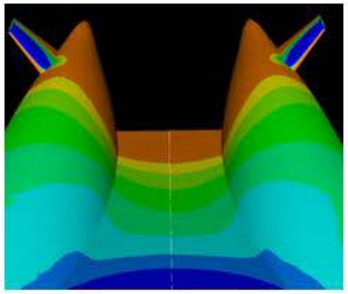
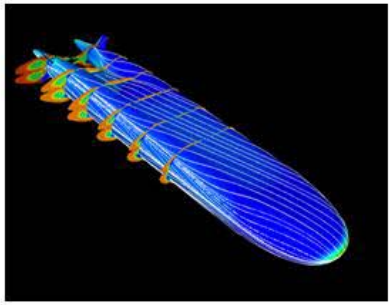
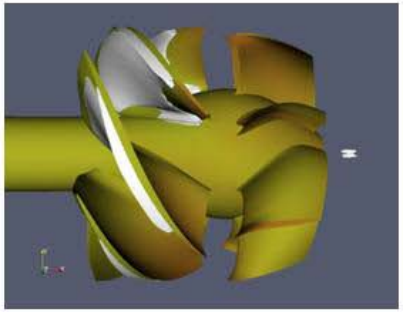
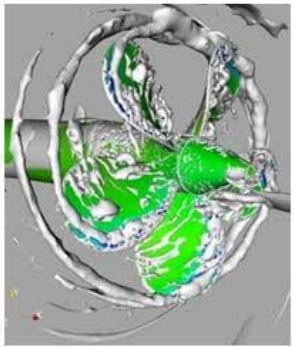
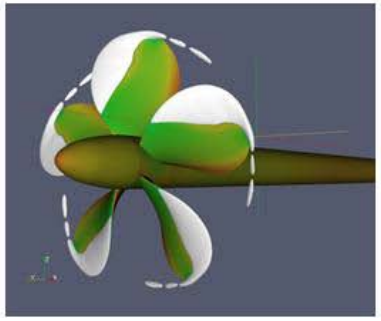


Current Applications

- Full Scale Shock Trial Alternatives
  - PEO Ships
  - PEO Carriers
- LFT&E Programs
  - DDG 1000
  - CVN 78
  - LCS

Navy FOAM

Reynolds Averaged Navier-Stokes (RANS) as well as Large Eddy Simulation (LES)
Applicable to Surface Ships, Submarines, Marine Vehicles and their Propulsors
Has been used for the DDG-1000 and Ohio Replacement Programs

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Computational Research & Engineering for Acquisition Tools & Environments