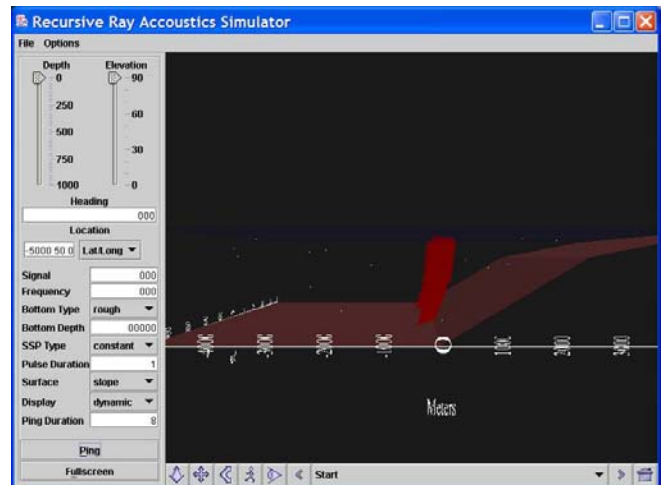


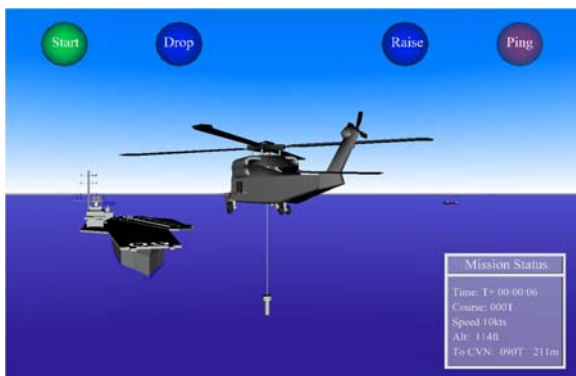
## X3D Sonar Visualization and Tactical Web Services for Undersea Warfare (USW)

1. The NPS Sonar Visualization Project merges physics-based sonar-modeling algorithms, 3D graphics visualization tools and Web-based technologies to provide warfighters with relevant real-time sonar analysis. Tactical decision aids utilize Extensible 3D (X3D) models for composable rendering, Web Services messaging and XML Schema-Based Compression (XSBC) for reliable transmission. Special effort is being devoted to viewing extended echo ranging (EER) geometries in tactical scenarios.
2. The Recursive Ray Acoustics (RRA) Algorithm by Dr. Lawrence Ziomek of NPS provides a general and rapid ray-tracing algorithm which can accurately predict sonar propagation through seawater, under a wide variety of surface, water-column and ocean-bottom environmental conditions.  
<http://web.nps.navy.mil/~brutzman/vrtp/rra/rra.html>.

- Environmental effects are processed in real-time by distributed sonar servers. Inputs will be updated via Web Services using XML SOAP (Simple Object Access Protocol) messaging.
- New 3D visualization schemes provide intuitive and useful ways to describe multipath sonar propagation results to USW operators.
- Animated X3D results are shown in a deployable real-time tactical application. 3D collision detection aids evaluation of bottom interactions, surface reflections, and threat contacts.



3. Current work includes connecting high-fidelity sonar computational models, at high-performance computing centers ashore and mid-scale PC clusters afloat. Grid computing and Web Services will be used for consistent data exchange. To do this, we are developing a common XML tagset to describe acoustic, environmental and sonar path data. This will allow a deployed client to access varying levels of environmental data and processing power, as available, to support specific mission needs. Architectural design follows the Extensible Modeling & Simulation Framework (XMSF) approach.



- A single XML schema for sonar path data will map outputs from different sonar modeling servers, then generate consistent X3D models.
- Open-standard X3D scenes are viewed interactively in Web browsers. 3D sonar plus full mission scenarios are easily shared by deployed units.
- Linking high-performance physics and 3D acoustic visualization brings new capabilities to the warfighter.

4. Sponsors include Sonalysts Inc., NAVAIR Patuxent River, and Fleet Numerical and Meteorological Oceanographic Center (FNMOC). For more information, please contact LT Scott Rosetti USN ([sarosett@nps.navy.mil](mailto:sarosett@nps.navy.mil)) and Dr. Don Brutzman ([brutzman@nps.navy.mil](mailto:brutzman@nps.navy.mil)) at the Naval Postgraduate School, Modeling Virtual Environments and Simulation (MOVES) Institute, Monterey California.