

Conference Program

The 73rd Shock & Vibration Symposium



**November 18-22, 2002
Newport, Rhode Island**

HOTEL ACCOMMODATIONS

The Symposium, including the unclassified sessions, will be held at the Hotel Viking. A block of rooms have been reserved at the rate of \$111.00 per night. Reservations must be made by October 27th, so please make your reservations early! Rooms not reserved by October 27th will be released to the public by the hotel. After that date you will no longer be eligible to receive the negotiated rate and you may not be able to reserve a room. When making your reservation identify yourself as an attendee of the Shock and Vibration Symposium. Please note that the room rate is the same for US Government and private sector employees. For reservations, please contact:

The Hotel Viking
One Bellevue Avenue
Newport, R.I. 02840
(401) 847-3300
(401) 848-4827 Fax

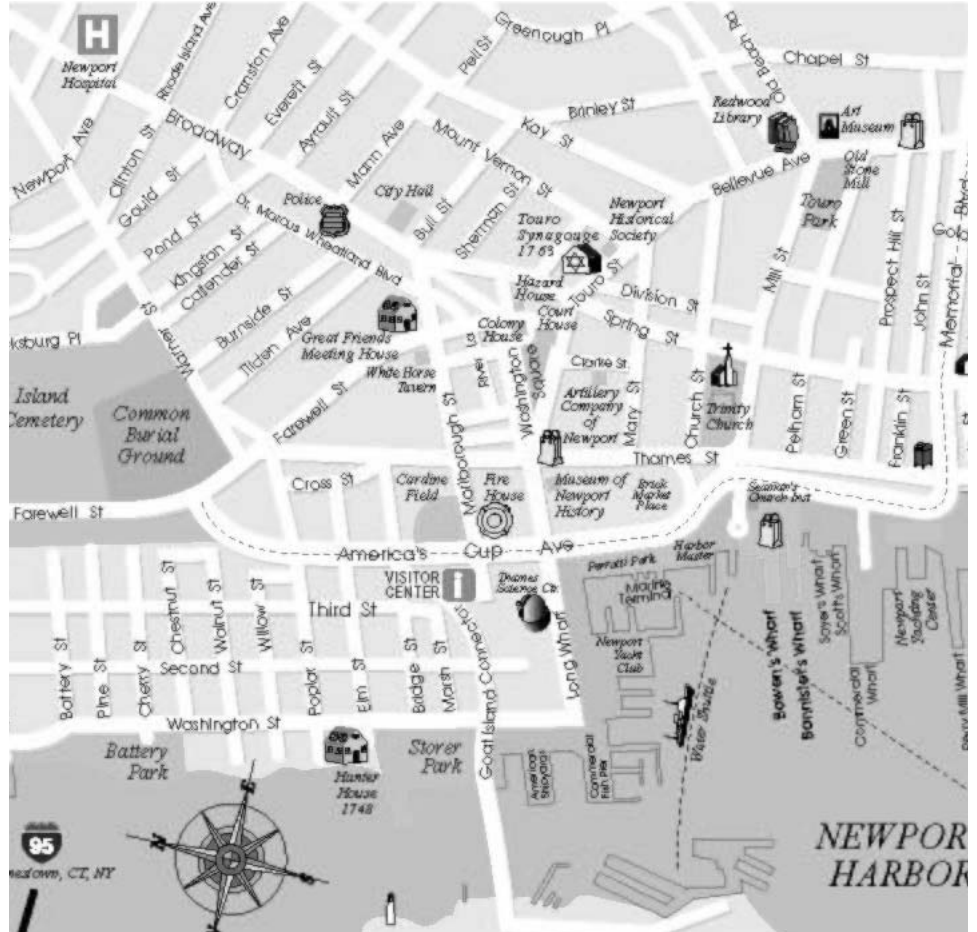
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TRANSPORTATION

The Providence, R.I. airport is approximately 25 miles outside of Newport and is serviced by all major airlines and car rental agencies. Parking at the Hotel Viking is complimentary for symposium attendees. For shuttle transportation between the airport and the hotel, call The Cozy Cab Company at (401) 846-2500.

DIRECTIONS TO THE HOTEL VIKING

Follow I-95 and take the exit for RI-4 South. Follow Rt. 4 South, which will become Rt. 1 South, to Rt. 138 East over the Jamestown and Newport bridges. Take the first exit, RI 238-South, towards Scenic Newport. At the end of the exit, take a right onto JT Connell Hwy. Follow this to the second light, then turn left onto Farewell Street. At the stop sign, take a slight right onto Thames Street. Follow this to the first stoplight, then turn left onto Touro Street. Touro will become Bellevue Avenue, and at the 2nd stoplight the Hotel Viking will be on your right.



Many Thanks to this year's Corporate Supporters:

General Dynamics Electric Boat Corporation - Gold Level
Endevco Incorporated - Bronze Level
PCBPiezotronics Incorporated - Donation

Introduction

Since the first meeting in 1947, the Shock and Vibration Symposium has become the oldest, continual meeting dealing with specialized engineering problems and effects of dynamic environments on vehicles, structures, equipment, components and humans. The symposium was created as a mechanism for the exchange of information among government agencies concerned with design, analysis and testing. It provides a valuable opportunity for the technical community in government, private industry and academia to meet and discuss problems of mutual interest. This year's symposium features the Naval Undersea Warfare Center and General Dynamics Electric Boat Corporation. Representing these organizations on the Program Committee are Ms. Christa Reise and Mr. Austin Alvarez respectively.

Program Committee Members

Co-Chair: Ms. Christa Reise - Naval Undersea Warfare Center
Co-Chair: Mr. Austin Alvarez - General Dynamics Electric Boat

Mr. Ed Alexander - United Defense LP
Mr. Kevin Arden - Newport News Shipbuilding
Mr. George Camp - Bath Iron Works
Dr. Jeff Cipolla - HKS, Inc./ ABAQUS
Dr. Raymond Daddazio - Weidlinger Associates, Inc.
Mr. Bob Fogg - SPAWAR
Mr. Jamie Howell - NSWC/DD
Dr. Eric Kathe - Army-TACOM-ARDEC Benét
Mr. Bob Keen - NSWC/DD
Ms Mary Kerns - Enidine, Incorporated
Mr. Joel Leifer - SAVIAC/HI-TEST Laboratories, Inc.
Mr. Eric Luft - NSWCCD/UERD
Mr. Jeffery A. Morris - HI-TEST Laboratories, Inc.
Dr. Fred Nelson - Tufts University
Mr. David Smallwood - Sandia National Laboratories
Mr. John Walker - SPAWAR
Dr. Charles Robert Welch - SAVIAC/USACE
Mr. Dan Worth - NASA/GSFC
Ms. Lauren Yancey - SAVIAC/HI-TEST Laboratories, Inc.
Mr. William Yancey - HI-TEST Laboratories, Inc.

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Schedule of Events

Hotel Tutorials

Monday 7:30 a.m. - 7:00 p.m.

Sessions

Tuesday Morning

* * * * * * * * * **Opening Session** * * * * *

Track One
(Unclassified)

Track Two
(Unclassified)

Track Three
(Unclassified)

Track Four
(Classified)

Track Five
(Classified)

Tuesday Afternoon

S&V Req'ts for New Acquisitions Panel Shock Qualification Approval Process & Case Study	Analytical Techniques DDAM vs Transient Analysis Panel UNDEX Discussion Group	Manufacturer's Panel Data Acquisition Discussion Group Pyroshock Discussion Group	Blast I Blast II	Test & Evaluation I Test & Evaluation II
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Wednesday Morning

Experimental Measurements & Data Analysis I Experimental Measurements & Data Analysis II	Steel Buildings Subjected to Blast Physical Protection Considerations in a Civilian Environment Panel	Testing Erroneous Test Data, Data Cheating & Acceptable Data Correction Panel	Shock Qualification & Testing COTS Panel	Numerical Applications I Numerical Applications II
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Wednesday Afternoon

UNDEX	Numerical Apps I Numerical Apps II Code Validation Needs & Precision Testing Support DG	S&V Standards S&V Standards Panel Proposed Development of a Data Storage Standard DG	Isolation	Advanced Studies I Advanced Studies II
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74th Shock & Vibration Symposium Planning Discussion

Wednesday Night: Social Event

Thursday Morning

Shock Qualification Numerical Methods	Isolation/Control I Isolation/Control II	Modeling & Simulation I Modeling & Simulation II		
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Thursday Afternoon: TAG Meeting

Friday Morning: Tour of NUWC & Quonset Point

73rd Shock and Vibration Symposium

Conference Program

Monday, November 18

Tutorial		Instructor	Time
<i>Introduction to Vibration Testing</i>	Ballroom A	Jon Wilson	8-11:00 a.m.
<i>Naval Shock Analysis & Design</i>	Ballroom B	Rudy Scavuzzo	8-11:00 a.m.
<i>Explosion Effects and Blast Resistant Structural Design</i>	Ballroom C	Sam Kiger & Stan Woodson	8-11:00 a.m.
<i>Overview of Underwater Shock and DDAM</i>	Ballroom D	Young Shin	8-11:00 a.m.
<i>The Measurement of Meaningful Shock & Vibration Data</i>	Collonade	Patrick Walter	7:30 -11:00 a.m.
<i>Application of the USA Code to Underwater Shock Problems</i>	Ballroom A	John DeRuntz	12-3:00 p.m.
<i>An Introduction to ABAQUS</i>	Ballroom B	Jeff Cipolla	12-3:00 p.m.
<i>The Navy Shock Qualification Process</i>	Ballroom C	NAVSEA Phila Code 623	12-3:00 p.m.
<i>Data Acquisition for Shock & Vibration Measurements</i>	Ballroom D	Strether Smith	12-3:00 p.m.
<i>Structural Detailing for Blast Resistance</i>	Collonade	Ted Krauthammer	12-3:00 p.m.
<i>Beyond the Shock Response Spectrum – Temporal & Frequency Moments, the Product Model, & Uncertainty</i>	Ballroom A	Dave Smallwood	4-7:00 p.m.
<i>UNDEX and Acoustics Analysis Using ABAQUS</i>	Ballroom B	Jeff Cipolla	4-7:00 p.m.
<i>Validation and Editing of Shock & Vibration Data</i>	Ballroom C	Allan Piersol	4-7:00 p.m.
<i>Substructure Coupling and Structural Modification for Shock & Vibration</i>	Ballroom D	Joshua Gordis	4-7:00 p.m.

Tuesday Morning, November 19

Chair/Presenter Meeting (All Tuesday Chairs & Presenters Must Attend)
7:00 - 7:30 a.m. (Ballroom E)

Opening Session (Ballroom ABCD)

8:00 am	Call to Order: Mr. Joel Leifer, SAVIAC Program Manager
8:05 am	Welcome: Dr. Richard Nadolink, Director Of Science and Technology Department, Naval Undersea Warfare Center
8:15 am	Welcome: Mr. Raymond Williams, Jr., Director Naval Architecture, General Dynamics Electric Boat Corporation
8:25 am	Symposium Highlights: Mr. Joel Leifer, SAVIAC Program Manager
8:45 am	Henry Pusey Award Presentation: Ms. Christa Reise, Naval Undersea Warfare Center & Mr. Austin Alvarez, General Dynamics Electric Boat Corporation
8:55 am	Mel Baron Award Presentation: TBD
9:05 am	SAVIAC Supporters Recognition - Dr. Charles Robert Welch, USAE Research and Development Center, Mr. Joel Leifer, SAVIAC Program Manager
9:15 am	Special Invitation to Attend the 74th S&V Symposium: NSWC/Crane, SPAWAR, Endevco
9:20 am	Director's Remarks: Dr. Charles Robert Welch, USAE Research and Development Center
9:30 am	Smartship Program Announcement: Mr. Glen Sturtevant, PMS400S
9:40 am	Break
10:15 am	Keynote Address: "Common Sense Shock", Dr. Millard Firebaugh, Vice President - Innovation & Chief Engineer for the Corporation, General Dynamics Electric Boat Corporation
11:00 am	Elias Klein Memorial Lecture: "Testing and Lessons Learned", Dr. Eric Rinehart, Chief Scientist for Test Division, Defense Threat Reduction Agency
11:30 am	Break

Exhibitors Luncheon

Tour the exhibits as you enjoy lunch in the exhibit area from 11:30 - 1:00

Tuesday Afternoon, November 19

Track One

Shock & Vibration Requirements for Future Procurements Panel 1:00 - 3:00 PM (Ballroom C) **Moderator: Dr. Robert Sierakowski, Chief Scientist, Air Force Research Laboratory for Munitions**

This panel will examine current specifications used to design equipment and platforms to withstand Shock & Vibration environments. The discussion will explore the move towards commercial standards, use of COTS equipment, the proper role of M&S tools, and testing. The focus of the panel will be to explore the integration of these efforts to develop procedures to enable the shipyards to reduce costs and the Navy to demonstrate appropriate use of public funds and proper care of the environment. Members of the panel include Mr. Richard Taddeo, Director, Acoustic, and Standards Division, NAVSEA 05T, TBD (to address shock) NAVSEA, Dr. Millard Firebaugh, Vice President of Innovation & Chief Engineer, General Dynamics Electric Boat Corporation, and Dave Williams, Vice President, Engineering, Northrup Grumman Ship Systems.

Overview of CG47 Class Smartship Component Shock and Vibration Test Series (Ballroom C) **Chair: Robert Krezel, L&L Engr** **Co-Chair: Barry Gartman, Anteon**

- 3:20 **Overview of CG47 Class Smartship Shock and Vibration Program** - Barry Gartman, Shawn McPartland, Paul Holifield; Anteon Corporation, George Botto; NSWCCD
- 3:40 **Overview of determining which Item to Shock test in order to Extend the Remaining Items** - Kurt Hartsough, NSW/CD Philadelphia
- 4:00 **Risk Assessment and Assurance of Shock Mount Selections for Systems Supporting the Smartship Program** - Michael Talley; Shock Analysis & Testing, Glen Sturtevant; PMS400S, George Botto; NSWCCD, Barry Gartman; Anteon
- 4:20 **Vibration Qualification Testing, CG-47 Class Smartship Electronics** - Shawn McPartland; Anteon Corporation
- 4:40 **Break**
- 5:00 **Shock Qualification by Extension, CG-47 Smartship Electronics** - Shawn McPartland; Anteon Corporation
- 5:20 **Smartship Shock Design Lessons Learned** - Kurt Hartsough, NSW/CD Philadelphia
- 5:40 **Shock Design Qualification Program** - Kurt Hartsough, NSW/CD Philadelphia
- 6:00 **Risk Reduction Efforts of USS Monterey** - Kurt Hartsough, NSW/CD Philadelphia

Track Two

Analytical Techniques (Ballroom D) **Chair: Dr. Robert Koch, NUWC**

- 1:00 **Free Vibration Solution for a Cantilevered Timoshenko Beam with an Attached Point-Connected General Vibratory System** - Dr. Robert Koch, NUWC/Newport
- 1:20 **Nonlinear System Technique for Application to a Geometrically Nonlinear Cylindrical Shell** - Dr. Ronald Merritt, NAVAIR Warcenter
- 1:40 **Parametric Analysis and Synthesis of Random Shock and Non-Stationary Vibration** - Tim Edwards, NSW/CD
- 2:00 **FlightDataAn - A Computer Program for the Analysis of Flight Test Measured Data** - Zeev Sherf, Abraham Manor, Philip Hopstone, Rafael
- 2:20 **A Generic Metric for the Comparison of Vector and Matrix System Characteristics** - Dr. Norman Hunter, Los Alamos National Laboratories, Dr. Thomas Paez, Angel Urbina, Sandia National Laboratories
- 2:40 **Implementation of Nearly H1-optimal Finite Element Method for Solving 2-D Helmholtz Equation**, Wenyan Chen, Paul Barbone, Boston University

DDAM vs Transient Analysis Panel**3:20-5:20 (Ballroom D)****Chair: Kevin Arden, Northrup Grumman Newport News**

This panel will discuss DDAM and transient analyses. One question often raised is why does anyone do DDAM anymore? DDAM and transient analyses are not mutually exclusive, there are legitimate reasons to use one or the other. This panel will debate when to use DDAM and when to use transient analyses. Topics to be covered include: the reasons each analysis method is used; the advantages of one over the other; the limitations of DDAM and how is the decision to use DDAM or transient analysis made; is DDAM conservative, if it is how does transient analyses help eliminate the conservatism or stated another way; is transient or DDAM inherently a better analysis/design tool than the other; does the availability of powerful computer codes, advances in computer technology and analytical correlation studies changed the credibility of DDAM; and are more transient analyses performed on submarines than surface ships?

UNDEX Discussion Group**5:40-6:40 (Ballroom D)****Leader: Dr. Jeff Cipolla, Hibbit, Karlson & Sorensen**

Modeling of the loads on ships produced by an underwater explosion has been of intense interest in the naval shock community for many years. This discussion session provides a forum for the exchange of ideas and experiences with the various non-contact UNDEX models in current use and development for shock simulations. Recently, there has been a renewal of activity in explosion bubble dynamic models, and several new models have been proposed. However, a clear consensus has yet to emerge regarding the various strengths and weaknesses of the various models and, in particular, their relative utility in describing the actual pressure and acceleration fields in the vicinity of the ship structure.

Track Three**Manufacturer's Panel****1:00-3:00 (Ballroom AB)****Chair: Jon Wilson, The Dynamic Consultant LLC**

Instrumentation manufacturers will present different aspects of shock and/or vibration measurement, control or analysis. Audience participation will be encouraged, allowing customers an opportunity to air their problems and possibly receive answers from knowledgeable technical representatives. Panel members are Tony Keller, Spectral Dynamics, John Kubler, Kistler Instruments, and Greg Hoshal, IST Instruments.

Data Acquisition Discussion Group**3:20-4:20 (Ballroom AB)****Leader: Strether Smith, DSPCon**

The data acquisition and signal conditioning vendors will be invited to describe what is new and wonderful in their product lines. Then, the vendors and attendees will participate in a discussion of these developments and what the users would like to see in future offerings.

Pyroshock Discussion Group**4:40-5:40 (Ballroom AB)****Leader: Dr. Vesta Bateman, Sandia**

The Pyroshock Working Group will meet to discuss topics such as concepts of near-field, mid-field and far-field pyroshock, pyroshock specifications and instrumentation, and simulation of near-field, mid-field and far-field pyroshocks. Group members are encouraged to participate in a general discussion of recent experiences and problems in pyroshock testing.

Track Four (Classified)**Blast I (Classified)****(NUWC, Chaffee Auditorium)****Chair: Dr. Reed Mosher, USAERDC****Co-Chair: Denis Rickman, USAERDC**

- 1:00 **Initial Experience with Adapting the MEVA Airburst Methodology to STMG Target Models** - Atris Ray, Bob Britt, SAIC, Dr. Alan P. Ohrt, AFRL/MN
- 1:20 **Blast Model Improvements in BlastX Code** - James Britt, SAIC, Charles E. Joachim, U.S. Army Engineer Research and Development Center
- 1:40 **Evaluation of Blast Vulnerability of a Complex Wall System** - Dr. James Baylot, Dr. Thomas Slawson, Dr. James O'Daniel, US Army Engineer Research and Development Center
- 2:00 **Mechanical Shock and Non-Linear FEA of Air Combat Maneuvering Instrumentation (ACMI)** - Benjamin Moates, IDT-Metric, Eric Nelson, Altair Engineering
- 2:20 **Vulnerability of Computers Due to Blast From Internal Detonations** - Lt. Robert J. Beal, Air Force Research Laboratory, Munitions Directorate

Track 3 continued

**Blast II (Classified)
(NUWC, Chaffee Auditorium)**

**Chair: Dr. Paul Mlakar, USAERDC
Co-Chair: Dr. James O'Daniel, USAERDC**

- 3:00 **Airblast Field From an Explosive Charge Surrounded by Casing of High Mass but Low Mechanical Strength** - Dr. Alan Ohrt, Edward Blaney, AFRL/MNAL
- 3:20 **Measured Airblast Fields from Cased Explosive Charges Having Different Explosive Fills** - Dr. Alan Ohrt, Edward Blaney, AFRL/MNAL
- 3:40 **Hydrocode Analysis of Measurements from Pentolite-Filled Pipe Bombs and Sub-Scale Penetrators** - Dr. Alan Ohrt, AFRL/MNAL, Robert Britt, SAIC
- 4:00 **Sympathetic Detonator for Replacement of Det Cord in Air and Water** - Walter Dence, Jr., NSWC Coastal Systems Station, Donald Albert, US Army

Track 4 (Classified)

**Test & Evaluation I (Classified)
(NUWC, Integrated Display Center)**

Chair: Dr. Alan Ohrt, AFRL/MN

- 1:00 **Observations and Analyses from Thermobaric Tests** - Dr. Eric Rinehart, Defense Threat Reduction Agency, Jeff Thoen, Jim Rocco, Applied Research Associates
- 1:20 **Using a Bar Gage to Measure Airblast from Tungsten-Laden Explosives** - Dr. Alan Ohrt, Edward Blaney, AFRL/MN
- 1:40 **The Effects of Case Mass on a Munition's Blast Field** - Edward Blaney, Dr. Alan Ohrt, AFRL/MN

**Test & Evaluation II (Classified)
(NUWC, Integrated Display Center)**

**Chair: Dr. Eric Rinehart, DTRA
Co-Chair: Dr. Robert Hall, USAERDC**

- 2:20 **Results From Subscale Experiments to Define Cratering in Layered Concrete/Soil Profiles** - Dr. J. Donald Cargile, Jon E. Windham, U.S. Army Engineer Research and Development Center
- 2:40 **Results From 1/4-Scale Non-Symmetric Loading Structure-Medium-Interaction Experiments** - Dr. Jon Windham, Bruce R. Phillips, Denis D. Rickman, Dr. J. Donald Cargile, US Army ERDC
- 3:00 **Small-Scale Studies of Airblast Shielding of Structures: Preliminary Results** - D. W. Murrell, Denis Rickman, US Army ERDC
- 3:20 **Predicting Fragment Penetration of Urban Construction Materials** - Rayment Moxley, Dr. J. Donald Cargile, Robert J. Dinan, USAE Research and Development Center
- 3:40 **Comparison of Airblast Phenomenology: Thermobaric and Conventional High Explosive Detonations** - G. W. McMahon, C. E. Joachim, S. L. Kinnebrew and J. H. Weathersby, U.S. Army Engineer Research and Development Center, Lane Kjellson, U.S. Army

Wednesday Morning, November 20

**Chair/Presenter Meeting (All Wednesday Chairs & Presenters Must Attend)
7:00 - 7:30 a.m. (Ballroom E)**

Exhibits Open

**7:00 am-5:00 pm
7:00 pm-9:00 pm**

Track 1 - Sponsored by The International Institute of Acoustics and Vibration

**Experimental Measurements & Data Analysis I
(Ballroom C)**

**Chair: Dan Worth, NASA/GSFC
Co-Chair: Tim Edwards, NSWC/DD**

- 8:00 **A Mechanical, Pneumatic System to Perform In Situ Calibration of Blast Pressure Transducers** - Vincent Chiarito, Dr. Stanley Woodson, US Army ERDC, Dr. Patrick Walter, Stephen Weis, Texas Christian University
- 8:20 **Electronic Signal Transmission System Analysis and In Situ Calibration for Blast Measurements** - Vincent Chiarito, US Army ERDC, Edward Kolesar, Dr. Patrick Walter, Texas Christian University
- 8:40 **Use of Thermoelastic Measurements for the Detection of Damage and its Accumulation** - Dr S. Olutunde Oyadiji, Maina Maringa, University of Manchester School of Engineering
- 9:00 **Tension-Tension Cyclic Dynamic Testing of SMC Specimens** - Dr S. Olutunde Oyadiji, Maina Maringa, University of Manchester School of Engineering

**Experimental Measurements & Data Analysis II
(Ballroom C)**

**Chair: Dr. Jack Simonis, SWRI
Co-Chair: Ed Alexander, UDLP**

- 9:40 **Facility for Aircraft Sensors System Test (FASST)** - Dr. Michael Hale, William Barber, Redstone Technical Test Center
- 10:00 **Multi-Platform versus Single Platform Designs for Dynamic Alignment Simulation** - Dr. Norman Fitz-Coy, Sveta Gladun, University of Florida, Dr Michael Hale, US Army Redstone Technical Test Center
- 10:20 **Use of Shock and Acoustic Measurements to Investigate an Antenna Tracking Problem** - Ed Brennan, Lockheed Martin, Rick Sasse, NSWCCD/UERD
- 10:40 **Probabilistic Assessment of Loss of Life Downstream of Embankment Due to Blast-Induced Flood** - Dr Luis de Bejar, US Army Engineer Research and Development
- 11:00 **About Method of Measurements Quickly-Proceeding Processes (Problem, Task, Decision)** - Dr. George Abramchuk, Consultant

Track Two - Co-Sponsored by the American Institute of Steel Construction

**Steel Buildings Subjected to Blast
(Ballroom D)**

**Chair: Dr. Ted Krauthammer, Penn State
Co-Chair: Dr. Jim Harris, J. Harris & Co.**

- 8:00 **Addressing Progressive Collapse in Multi-Story Steel Buildings** - Hyung-Jin Choi, Dr. Ted Krauthammer, Penn State
- 8:20 **Design Aspects of Blast Resistant Steel Buildings** - Dr. Jim Harris, J. Harris and Co.
- 8:40 **Three-Dimensional Steel Frame Connections Under Blast Loads** - Dr. Ted Krauthammer, Penn State
- 9:00 **Side Plate(tm) Steel Connection Technology for Blast Resistance** - David Houghton S.E., Jesse E. Karns, S.E., Myers, Houghton & Partners, Inc.
- 9:20 **Design & Analysis of Structural Steel Components** - Dr. Mohammed Ettouney, Weidlinger Associates, Inc.
- 9:40 **Blast Effects on Steel Buildings** - John Crawford, Karagozian and Case Structural Engineers

**Physical Protection Considerations in a Civilian Environment Panel 10:00-12:00 (Ballroom D)
Moderator: Dr. Ted Krauthammer, Penn State**

This panel will discuss issues (Threat Assessments, Load Definition, Performance Requirements, Planning, Design, Construction, Retrofit & Operations Life Cycle) related to buildings that need to perform under terrorist attack conditions. Panel members include Dr. Jim Harris, J. Harris and Co., Dr. Stan Woodson, US Army ERDC, John Crawford, Karagozian and Case Structural Engineers, Prof Ted Krauthammer, Penn State University, David Houghton, Myers, Houghton & Partners, Inc., Dan Arana, dba Dick Corporation, and Dr. Mohammed Ettouney, Weidlinger Associates, Inc.

Track Three

**Testing
(Ballroom AB)**

Dr. Michael Hale, RTTC

- 8:00 **The Use of Current and Voltage Limits to Maximize the Transient Capabilities of Electrodynamic Shaker Testing** - David Smallwood, Ronald Coleman, Dan Gregory, Sandia National Laboratories
- 8:20 **Design Techniques for Machinery Emulators** - Prof. Pierre Dupont, Wenyuan Chen, Sudeep Deshpande, Boston University
- 8:40 **Pipe Valve Vibration** - Dr. Andrej Predin, University of Maribor
- 9:00 **Variability of the Vibration and Shock Environment in Tracked Vehicles** - Dr. Giles Clark, MOD

**Erroneous Test Data, Data Cheating, and Acceptable Data Correction Panel 9:40-11:40
Moderator: Dr. Patrick Walter, Endevco Corporation & Texas Christian University (Ballroom AB)**

This session will deal with the topics of data correction and manipulation, when does manipulation become "cheating", and erroneous data being accepted as valid. Panel members include Mr. David Smallwood, Sandia National Laboratories, Mr. Strether Smith, DSPCon, Mr. Vincent Chiarito/(ERDC/GSL) U. S. Army - Waterways Experiment Station, and Mr. Scott Walton/U.S. Army Aberdeen Test Center

Track Four (Classified)**Shock Qualification & Testing (Classified)
(NUWC, Chaffee Auditorium)****Chair: Rick Dugan, Electric Boat
Co-Chair: Roy Javier, NSWC/CD**

- 8:00 **A VLS Weapon System Perspective on Shock Testing Cost and Conservatism** - Kenneth Lussky, United Defense, LP, Jamie Howell, NSWC/DD
- 8:20 **A VLS Data Evaluation from the DDG81 Ship Shock Trial** - Kenneth Lussky, United Defense, LP
Frame Mounted Equipment; Shock Environment on the Medium-Weight Shock Machine - David Martin;
Electric Boat Corp.
- 8:40
- 9:00 **VIRGINIA Class Advanced Sail Shock Qualification Approach** - Thomas Walther, Electric Boat Corp
- 9:20 **VIRGINIA Class Main Thrust Bearing Shock Qualification** - Jonathan Webster, Electric Boat Corporation

COTS Acceptance Breakout Session (Classified)**10:00-12:00****Moderator: Ms Mary Kerns, Enidine, Incorporated****(NUWC, Chaffee Auditorium)**

How can we identify and define commercial practices or standards that can be adopted by system integrators and component suppliers to facilitate the utilization of COTS for military systems, thus providing the availability and survivability of state of the art electronics and systems for scheduled technology refresh cycles. What steps need to be taken to provide the environment to make this possible? The challenges facing both the Navy and commercial companies regarding COTS technology are well known. Basically we have similar goals. ..to be able to provide state of the art electronics and equipment to ensure our military has leading edge capabilities. In light of recent events, this has become even more critical. We would like to explore some options and approaches for achieving these goals. The presenters will give some historical perspective and concepts for meeting these challenges. We would then like to open up the forum for constructive suggestions from you. What are your experiences? What do you think of the options presented? Do you have other suggestions? As a group, what can we do to improve the situation? Panel members are Kevin E. Castanien, Engineering Manager, SPAWAR Consolidated Production Facility, SAIC, Information Technologies Integration Group, Jennifer Marr, Structural Engineer, NSWCCD/UERD, Ray Crandall, Hardware Technical Director for the LPD17 program, Contractor Furnished Equipment (CFE) designs., Raytheon Company, Robert L. (Andy) Anderson, Project Test Engineer, United Defense L.P, and Robert E. Bowser, Head, NAVSEA 05P3, Shock Group, NAVSEA.

Track Five (Classified)**Numerical Applications I (Classified)
(NUWC, Integrated Display Center)****Chair: Robert Doleski, NUWC**

- 8:00 **An Evaluation of Alternative Underwater Shock Analysis Codes** - Dr. Gale Mulligan, Electric Boat Corporation
- 8:20 **Shock Analysis for Computing Component Coupling Offsets Resulting from Ship Foundation Modal Behavior** - Dr. Timothy Coats, Kevin Arden, Robin Lawson, Northrop Grumman Newport News
- 8:40 **UNDEX Shock Analysis of the AN/BLQ-11 Deployed Recovery Arm and Attached Bearing Plate** - Dr. Robert Koch, NUWC/Newport
- 9:00 **An Investigation of the Influence of Podded Propulsion on Hull Girger UNDEX Whipping Response Characteristics** - George Camp IV Bath Iron Works
- 9:20 **Shock Response Characteristics of a Submarine Sail** - Dr. Robert Haberman, Fred Burke, BBN Technologies

**Numerical Applications II (Classified)
(NUWC, Integrated Display Center)****Chair: Rhonda Ingler, NSWC/CD
Co-Chair: Tim Coats, Newport News**

- 10:00 **SSGN Lock Out Compartment and Transfer Trunk - Simplified Shock Approach** - Marc Enright, General Dynamics Electric Boat Corp.
- 10:20 **Transient Dynamic Shock Analysis of the LS UUV In Submarine Rack Stowage Environments** - Jose Arteiro, NSWC Newport
- 10:40 **Payload Interface Module/Payload Module Shock Environment** - Dawn Barrasso, A. White, Electric Boat Corp
- 11:00 **Uses of Transient Shock Analysis for VIRGINIA Class Full Ship Shock Test** - Laurence Potter, Steven Ollhoff, Electric Boat Corp.
- 11:20 **Experimental and Analytical Correlation Issues for SEAWOLF Wide Aperture Array (WAA) System** - Fred Burke, Dr. Robert Haberman, Daniel Hamel, BBN Technologies
- 11:40 **Lightweight Torpedo Shipboard Stowage Shock Evaluation** - Frank McNeilly, Naval Undersea Warfare Center

Wednesday Afternoon, November 20

Track One

UNDEX (Ballroom C)

**Chair: Dawn Barrasso, Electric Boat
Co-Chair: James Murray, Newport News**

- 3:50 **Assessment of a Sparse DAA Implementation for Large USA Applications** - Thomas S. Littlewood and Dr. David Kring, Anteon Corporation
- 4:10 **Recent Enhancements to USA for Surface Ship Modeling** - Thomas S. Littlewood, Anteon Corporation, Dr. John A. DeRuntz, Jr., Unique Software Applications, Inc.
- 4:30 **A Simplified Fluid-Structure Interaction Model For Underwater Shock Loading Of Naval Vessels** - Willem Trouwborst, TNO Building and Construction Research, Theo Bosman, Royal Netherlands Navy
- 4:50 **A Comparison of Numerical Simulation with Experiment on Bubble-Structure Interaction** - K.C. Hung, C. Wang, E. Klaseboer, Institute of High Performance Computing, B.C. Khoo, National University of Singapore, P. Boyce, S. Debono, Centre Technique Des Systemes Navals, C.C. Ho, DSO National Laboratories
- 5:10 **Numerical Simulation of the MIL-S-901D Shock Test of the Nonlinear Double Resiliently Mounted Main Engine Module of a Naval Ship** - Dr. Sang-Gab Lee, Jeong-Il Kwon, Dr. Jung-Hoon Chung, Korea Maritime University
- 5:30 **Effects of Fluid Modeling Parameters on the Shock Response of Floating Structures subjected to Underwater Explosion** - Dr. Sang-Gab Lee, Jeong-Il Kwon, Dr. Jung-Hoon Chung, Korea Maritime University
- 5:50 **Shocking News About Podded Electric Ship Propulsion** - Donald M. Lund and Thomas A. Giacofci, Computer Sciences Corporation / Advanced Marine Center

Track Two - Co-Sponsored by the American Institute of Steel Construction

Numerical Applications I (Ballroom D)

**Chair: Dr. James Baylot, USAERDC
Co-Chair: Dr. Andrew Whittaker, University of Buffalo**

- 1:00 **Modeling & Analysis of a Mine-blast Deflector Plate Due to Mine Buried in Dry vs. Wet Sand** - Dr. Aaron Gupta, Army Research Laboratory
- 1:20 **Zapotec: A Coupled Euler-Lagrange Program for Modeling Earth Penetration** - Dr. Greg Bessette, Dr. Courtenay Vaughan, Raymond Bell, Sandia National Laboratories
- 1:40 **Blast Response of Glass-Fiber Composite Plates with Progressive Material Damage Model** - Dr. Ki Kim, Joseph Fries, US Army Research Laboratory
- 2:00 **Concrete Modeled as an Inhomogeneous Material -- Part 1: Quasi-static Mechanical Behavior of Aggregate** - Stephen Akers, Paul Reed, Bruce Phillips, US Army ERDC

Numerical Applications II (Ballroom D)

Chair: Charles Joachim, USAERDC

- 2:40 **Contact Detonation Validation Using ALE Generated Loadings** - Dr. James O'Daniel, USACE/ERDC
- 3:00 **Probability of Liquefaction of Saturated Silty Sands Under a Surface Point Explosion** - Dr. Luis de Bejar, US Army Engineer Research and Development Center
- 3:20 **Modeling and Analysis of Transient Response and Failure in a Multi-layered Composite Panel Subjected to an Explosive Blast** - Dr. Aaron Gupta, Army Research Laboratory

Code Validation Needs & Precision Testing Support Discussion Group 4:00-5:00 (Ballroom D) Leader: Dr. James O'Daniel, US Army ERDC

This session will discuss the topics and interrelations of code validation and precision testing, including the following questions and issues. What role does precision testing play in code validation? What are the roles of the modeler and the experimentalist in the design of precision tests? What is needed for a code to be validated? How much and what kinds of data are needed from a precision test? What needs to be done in precision tests to produce credible data? The importance of precision test characteristics, including geometry, boundary conditions, and material properties, and their importance to code validation will also be discussed.

**Don't forget to pick up your ballot for the
Henry Pusey Award
at the Registration Desk and cast your vote for the
Best Paper Presented**

Track Three - Co-Sponsored by the Acoustical Society of America

**Shock & Vibration Standards
(Ballroom AB)**

Chair: Richard Taddeo, NAVSEA 05T

- 1:00 **Military and Commercial Standards for Ship Vibration** - Richard F. Taddeo, NAVSEA 05T, Arthur F. Kilcullen, Consultant, Paul C. Shang, NSWCCD
- 1:20 **SNAME Vibrations Panels Consider New Approach To Vibration Standards** - Gary Antonides, Member, Panels HS-7 and M-20
- 1:40 **A Review of International Standards on Machine Vibrations** - Dr. Ron Eshleman, Vibration Institute
- 2:00 **The National and International Standardization Process in Mechanical Vibration and Shock** - Dr. David Evans, NIST, Susan Blaeser, Acoustical Society of America

Shock & Vibration Standards Panel

2:40-4:40 (Ballroom AB)

Moderator: Richard Taddeo, NAVSEA 05T

The ASA Standards Secretariat is administratively responsible for ANSI S2 on Mechanical Vibration and Shock and for International Standards Organization (ISO) Committee TC108 and many of its sub committees. Several of the S2 and TC108 standards already published, as well as those in various stages of preparation by the Working Groups (WGs) are of significant value to the SAVIAC community. Panelists will present overviews of activities and published standards of S2 and TC108 in areas of special interest to the SAVIAC audience. These include but are not limited to Ship Vibration, Machinery Vibration, Transducers and Measurement, Signal Analysis, Modal Testing and more. Panelists are Gary Antonides, Member, Panels HS-7 and M-20, Dr. Ron Eshleman, Vibration Dr. David Evans, NIST, and Andy Anderson, United Defense, LP.

Data Storage Standard Discussion Group

Leader: Dan Worth, NASA/GSFC

5:00-6:00

Co-Sponsored by The International Institute of Acoustics and Vibration

(Ballroom AB)

The price of storage media continues the decrease while the density of storage continues to increase making it so much easier to record large amounts of time-history data. Even though each manufacturer of acquisition and analysis systems has a proprietary binary format for time-history data, they usually provide a means of importing or data in text-based formats. Conversion to text format increases file sizes by an order of magnitude. Maybe it is time once again to revisit the establishment of a standard binary file format.

Track Four (Classified)

Isolation (Classified)

(NUWC, Chaffee Auditorium)

Chair: Brian Detwiler, Bath Iron Works

Co-Chair: John Przybysz, NSWC/CD

- 1:00 **Effect of Deck Frequency on Shock Response for Navy Standard and Wire Rope Mounts** - Dr. Robert DeWoody, J.M. Giles, Northrup Grumman Ship Systems
- 1:20 **Noise/Shock Mounting System for COTS Pump/Motor on Navy Combat Ships** - Dr. Robert DeWoody, B.L. Stephens, Northrup Grumman Ship Systems
- 1:40 **Development of a Shock Characterization for a Full Scale Isolator** - Dr. David Russell, Electric Boat Corp
- 2:00 **Data Processing for the Parsing Demonstration Test** - Kathleen A. Lincoln, Dr. David M. Russell, General Dynamics Electric Boat Corp.
- 2:20 **Advanced Machinery Support System Shock Assessment and Benefit** - Richard Dugan, Electric Boat Corp
- 2:40 **Shock Mounting System for COTS PC Data Acquisition System** - Dr. Robert DeWoody, J.M. Giles, Northrup Grumman Ship System
- 3:00 **Improved Shock Data Acquisition and Display System** - Paul Japp, General Dynamics Electric Boat Corp.
- 3:20 **Optimization of the WSN-7B Sensor Platform Shock Isolation System Utilizing Bi-elastic, Viscous Damped, Shock Struts within MIL-S-901D MWSM and FSP (with various deck frequency fixtures) Shock Environments** - Dr. D. Christopher Merrill, Lawrence E. Rainey, Sperry Marine Systems

Track Five (Classified)

Advanced Studies I (Classified)

(NUWC, Integrated Display Center)

Chair: Eric Luft, NSWC/CD

Co-Chair: Robert Keen, NSWC/DD

- 1:00 **Analytical Determination of the Shock Environment on the SSN23 Forward Decks** - Kevin O'Neal, Joel Griffin, Northrup Grumman Newport News
- 1:20 **Experimental Studies of the Interaction of Multiple Underwater Explosion Bubbles** - Gregory Harris, David Hagar, Kent Rye, NSWC/Indian Head
- 1:40 **Numerical Studies of the Interaction of Multiple Underwater Explosion Bubbles** - Georges Chahine, Dynaflo,
- 2:00 **Dynamic Structural-Acoustic-Piezoelectric Element Analysis of a Sonar Array for Underwater Vehicle** - Adam Akif, NSWC Newport

Wednesday Afternoon

Track Five (Classified) continued

**Advanced Studies II (Classified)
(NUWC, Integrated Display Center)**

**Chair: George Camp IV, Bath Iron Works
Co-Chair: James Howell, NSWC/DD**

- 2:40 **Cavitation Modeling** - Dr. Andrew Wardlaw, Roger Ilamni, Jr., NSWC/Indian Head
3:00 **A Statistical Approach to the UNDEX Analysis of COTS Equipment** - Russel D. Miller and Thomas S. Littlewood, Anteon Corporation
3:20 **An Adaptive Time Stepping Algorithm for Implicit Transient Analyses of Systems with Local Nonlinearities** - Christopher J. Abate, General Dynamics Electric Boat Corp.
3:40 **Axisymmetric Bulk Cavitation Calculation with First Order Barge Effects** - Christopher J. Abate, General Dynamics Electric Boat Corp.

Wednesday Evening, November 20

74th Shock & Vibration Symposium Planning Discussion

6:00-7:00 (Ballroom E)

Leaders: Allen Parkes, NSWC/Crane, John Walker & Bob Fogg, SPAWAR, Anthony Chu, Endevco

The 74th Shock & Vibration Symposium will take place the week of October 27-31, 2003 at the Red Lion Hanalei Hotel in San Diego California. The Government Featured Agencies are NSWC/Crane (poc Allen Parkes) and SPAWAR (poc John Walker & Bob Fogg). The Commercial Featured Company is Endevco (poc Danny Uehara). All three have put together planning teams to make this Symposium the biggest and best ever. All attendees are invited to join us for a lively discussion on programming for this event. Following the discussion we will move to the Social Event.

Social Event - All are invited to the exhibit area to enjoy a buffet in the Exhibit Area 7:00-9:00 pm

Thursday Morning, November 21

Chair/Presenter Meeting (All Thursday Chairs & Presenters Must Attend)

7:00 - 7:30 a.m. (Ballroom E)

Track One

**Shock Qualification & Testing
(Ballroom C)**

**Chair: Mike Winnette, NSWC/CD
Co-Chair: Joel Griffin, Newport News**

- 8:00 **Shock Qualification Approval Process** - Kurt Hartsough, NSWC/CD Philadelphia
8:20 **Lessons Learned During the Last Year in Shock Qualification Testing** - Kurt Hartsough, NSWC/CD Philadelphia
8:40 **Navy Surface Combatants Temporary Test Installation Design Requirements** - Jefferey Giesecke, James Gentry, Jr., Lockheed Martin
9:00 **Combined Shock and Vibration Isolation Through the Optimal Control of a Hybrid "Smart" Mount** - Troy Tanner, NNS
9:20 **Chirp Machine Performance Optimization for Improved Test Utility** - Troy Tanner, NNS

**Numerical Methods
(Ballroom C)**

**Chair: Joe Venne, NSWC/CD
Co-Chair: Dr. Paul Franklin, Bath Iron Works**

- 10:00 **CFD Modeling of Close Proximity Underwater Explosions** - Dr Richard Link, Dr. Frank Lin, David Whitehouse, Dr. John Slater, Martec Limited
10:20 **The Applicability of Fluid-Structure Interaction Approaches to the Analysis Floating Targets Subjected to UNDEX Loading** - Kenneth Stultz, Dr. Raymond Daddazio, Weidlinger Associates, Inc.
10:40 **Multicontinuum Failure Analysis of Woven Fabric Composite Structures Under Shock Wave Loading** - Dr. Jim Lua, Jeff O'Brien, Anteon Corporation
11:00 **Dynamic Responses of Submarine to Underwater Explosion** - Dr Jian-Hu Liu, You-Sheng Wu, China Ship Scientific Research Center

**Isolation/Control I
(Ballroom D)**

**Chair: Fred Costanzo, NSW/CD
Co-Chair: Troy Tanner, Newport News**

- 8:00 **Damper Retrofit of the London Millennium Footbridge - A Case Study in Biodynamic Design** - Douglas Taylor, Taylor Devices, Inc.
- 8:20 **Smart Vibration Isolation System** - Odilo Vazquez, FFF Engineering, Albert Jenab, Potomac Engineering
- 8:40 **A Workable Procedure for COTS Modeling** - Dr. Ka Kin Chin, David Ranlet, Kenneth Stultz, Dr. Raymond Daddazio, Weidlinger Associates, Inc
- 9:00 **Experimental Measurement of the Response of Viscoelastic Mounts Subjected to Large Initial Deformation and Half-Sine Shock Impact** - Dr S. Olutunde Oyadiji, Alexander Kazakoff, University of Manchester School of Engineering
- 9:20 **Finite Element Analysis of Viscoelastic Mounts Subjected to Large Amplitude Half-Sine Shock Loading** - Dr S. Olutunde Oyadiji, Alexander Kazakoff, University of Manchester School of Engineering

**Isolation/Control II
(Ballroom D)**

**Chair: Doug Taylor, Taylor Devices
Co-Chair: Bob Marshall, Newport News**

- 10:00 **Six Degree of Freedom Simulation Software for Shock Isolation Mount Predictions & Loading Estimates** - Michael Talley, Shock Analysis & Testing, Bob Krezel, L&L Engineering
- 10:20 **Development of an Internally Isolated COTS Electronic Equipment Enclosure** - Herbert LeKuch, Shock-Tech, Inc.
- 10:40 **Optimal Utilization of Damper Capacities for Seismic Protection of Building** - Dr. Shubin Ruan, Enidine, Inc. Dr. Mike Tong, MCEER, Dr. Wei Liu, University at Buffalo, Dr. George Lee, MCEER
- 11:00 **Development and Testing of a Shock Isolator Consisting of Gas Springs with Rigid-elastic Characteristic and a Oil Damper with Bi-liner Characteristic** - Katsuya Umemoto, Keisuke Suzuki, Yoshito Saito, Fumihiko Ohkubo, Kawasaki Heavy Industries, Ltd.
- 11:20 **Design and Analysis of Fibre Reinforced Plastic Maruthi Leaf Spring** - Viswanath Rangubhatla, Student

Track 3

**Modeling & Simulation I
(Ballroom AB)**

**Chair: Dr. Carl Sisemore, NSW/DD
Co-Chair: Travis Kerr, NNS**

- 8:00 **Pressure and Velocity Fields Produced by an Underwater Explosion Bubble** - Dr. Kendall Hunter, Dr. Thomas Geers, University of Colorado
- 8:20 **A High Order Infinite Element for Time-Harmonic and Transient Acoustic and Shock Applications** - Dr Jeff Cipolla, Hibbit Karlsson & Sorensen
- 8:40 **Benchmarking an Explicit Finite Element Code for Underwater Shock Applications** - Karl D'Souza, David Palmer, Dr. Jeff Cipolla, Hibbit Karlsson & Sorensen
- 9:00 **A Method to Determine the Mass Participation of One Mass in a Multi-Mass System** - Kevin Arden, NNS
- 9:20 **A Coupled Spectral-Element/Finite-Element Method for Treating Fluid-Structure Interaction with Cavitation** - Dr. Michael Sprague, Dr. Thomas Geers, University of Colorado

**Modeling & Simulation II
(Ballroom AB)**

**Chair: Ami Frydman , Army Research Laboratory
Co-Chair: Mike Campbell, NSW/CD**

- 10:00 **Design of Laminated Composites Against Impact Loading** - Dr. Gerard Vanderborck, Thales Underwater Systems, Dr. Amine Hassim, INRIA
- 10:20 **Model Submerged Structures Loaded by Underwater Explosions with ABAQUS/Explicit** - David Woyak, ABAQUS Solutions Northeast, LLC
- 10:40 **Comparison of Shock Simulations for Single and Multiple Degrees of Freedom** - Jeff Weisbeck, Enidine, Inc
- 11:00 **Development and Verification of Structural Model of Guided Artillery Projectile: Key Issues** - Dr. Mostafiz Chowdhury, Ami Frydman; U.S. Army Research Laboratory, Lyonel Reinhardt, Dr. Don Carlucci; ARDEC
- 11:20 **Effect of Imperfections on the Underwater Explosion Damage of Ring Stiffened Cylindrical Shell** Dr K Ramajey Athilagam, Daniel Prasad, NSTL Shock & Vibration Centre
- 11:40 **Investigations on the Shock Wave Propagation in a Confined Shock Tank for Small Explosive Charge** - Dr K Ramajey Athilagam, K. Venkateswara Rao, B. Vasanthakumari, NSTL Shock & Vibration Centre

Thursday Afternoon, November 21

**SAVIAC Technical Advisory Group Meeting
(Collonade)**

2:00-4:00

Friday Morning, November 22

Tour of Naval Undersea Warfare Center

&

General Dynamics Electric Boat Corporation's Quonset Point Facility

0800 Bus Leaves Hotel Viking, Newport, RI

0810 Bus Arrives NUWC for badging and tour

0830 NUWC Tour Overview

0900 NUWC Visit of Labs & Demo TBD

1000 Bus Leaves NUWC for Hotel Viking

1015 Individuals Leave Hotel Viking for Electric Boat, Quonset Point Facility (Must Provide Own Transportation)

1045 Arrive QP for badging and tour

1130 Overview of EB QP Tour

1200 Bus or Van Tour of EB QP Facility & Demo TBD

1300 End Tour - Individuals Leave for Viking Hotel, Newport, R. I.

1330 Arrive at Hotel Viking, Newport, R. I.

Guest Program

Tuesday, November 19, 2002: Newport..."America's First Resort"

An overview of this exciting city-by-the-sea, rich in history and spectacular "summer cottages", is provided through a narrated driving tour. See stunning Ocean Drive and Bellevue Avenue with homes of the rich and famous. A guided tour of the famous Cornelius Vanderbilt mansion, The Breakers is included. Price per person is \$21.00 which includes mini-coach transportation, tour guide, mansion admission and gratuity for driver and guide. Depart the hotel at 9:00 a.m. and return at 12:00 p.m.

Wednesday, November 20, 2002: Rhode Island History and Winery Tour

Experience the "Gilded Age" of the 1890's through a living history tour of the Astors' Beechwood where the tour guides play the roles of Mrs. Astor's family, friends and servants. The mansion is festive and ready for the holidays as you will see on this Christmas tour. Then, drive along country roads to Little Compton, Rhode Island for a tour and tasting at Sakonnet Vineyards. Price per person is \$22.00 which includes mini-coach transportation, tour guide, mansion admission, tour and tasting at winery and gratuity for driver and guide. Depart the hotel at 11:30 a.m. and return at 4:00 p.m.

Many thanks to Carol Alvarez for arranging this program and to General Dynamics Electric Boat Corporation for their contribution to defray part of the cost. Note that the cost of the Tuesday event is higher than what is shown on the Registration Form in the Preliminary Program. This is due to the addition of the Conelius Vanderbilt mansion guided tour.

Please check at the Registration Desk for availability if you have not yet signed up. Please meet in the lobby 30 minutes before the scheduled departure time.

Tutorial Descriptions

Introduction to Vibration Testing

This tutorial introduces the novice to vibration testing and provides a comprehensive review for the experienced practitioner. It concentrates on conceptual understanding and minimizes mathematics. It is recommended for technicians, engineers, program managers and others who need a basic understanding of the fundamentals of vibration testing. Topics covered include the definition and nature of vibration, fundamental structural dynamics, sine, complex and random vibration, spectra, vibration measurement and different measurement systems, shakers and shaker system characteristics and fundamental fixture design and analysis. Student participation and questions are encouraged. Numerous references are cited.

Naval Shock Analysis and Design

First an overview of content of SVM-17, Naval Shock Analysis and Design, by Rudy Scavuzzo and Henry Pusey will be presented. The monograph briefly covers naval shock testing machines and vehicles, a detailed treatment of normal mode theory and its relationship to the Dynamic Design Analysis Method (DDAM); special considerations of DDAM including allowable stresses are covered in Chapter 3. Whole ship shock analyses including fluid-structure interaction and shock analyses in the plastic regime are presented in Chapters 4 and 5, respectively. Emphasis in the tutorial will Chapter 5, shock analyses in the

plastic regime. Energy in the modes of vibration can be directly related to the shock spectrum. This concept is very important because it means the energy in a system is bounded. Thus, plastic deformation or plastic work from shock in an equipment structure is also bounded. After considering the energy in shock, plastic analyses in piping and foundations from shock inputs will be presented. Analytical results will be compared to test data.

Explosion Effects and Blast Resistant Structural Design

This 3 hour tutorial will provide an overview of similarities and differences between earthquake and blast resistant design philosophy, a brief overview of airblast phenomena, and an overview of references and computational codes used to compute explosion effects and design structures to resist explosions.

Overview of Underwater Shock and DDAM

This three hour short course on naval ship shock analysis and design will be presented by Dr. Young Shin, Professor of Mechanical Engineering at the Naval Postgraduate School. It will provide engineers, scientists, and naval architects a general overview of underwater explosion phenomena, structural response analysis, fluid-structure interaction, shock spectrum and the Dynamic Design Analysis Method. It will cover the free-field problem, the drystructure problem, the fluid-structure interaction and shock spectra problem, shock qualification of internal equipment using DDAM and Hopkinson's scaling problem.

The Measurement of Meaningful Shock & Vibration Data

Significant focus is often provided to applying sophisticated analysis techniques to the data resulting from shock and vibration tests. Conversely, inadequate focus is often provided to assuring that meaningful shock and vibration data are acquired in the first place. This tutorial attempts to correct this deficiency. For the instrumentation novice it will provide an introduction to shock and vibration measurements and the physics of piezoelectric and silicon based accelerometers. For the experienced test technician or engineer it will provide additional insight into topics such as modification of structural response by the presence of the accelerometer, accelerometer and measurement system calibration, optimization of measurement system design, analog filtering, data validation during test, data utilization, and more. For the analyst or designer it will provide a series of simple observations and back of the envelope calculations that they can make on received data to validate its credibility before using it in product development. The tutorial is routinely updated to remain current with evolving technology. Endevco will provide a complimentary copy of the Handbook of Dynamic Force, Pressure and Acceleration Measurement, written by Dr. Walter, to tutorial registrants.

Application of the USA Code to Underwater Shock Problems

The purpose of this course is to provide engineers, scientists and naval architects a working knowledge of the theoretical foundations and practical details of the Underwater Shock Analysis code for usage in design and analysis problems of submerged and semisubmerged structures in an explosive environment. The tutorial will include an introduction and brief history of USA, the physics of underwater shock, fluid-structure interaction, fluid mass matrix development, overview of the USA Code, cavitating fluid analysis, recent enhancements and work in progress, problem areas where scientists and naval architects working on the design and analysis of submerged and semisubmerged structures in an explosive environment.

AN Introduction to ABAQUS

ABAQUS is a family of general purpose finite element analysis tools for the analysis of complex engineering problems. ABAQUS/CAE is an interactive application for constructing, analyzing, and visualizing finite element models and results. ABAQUS/Standard is a general purpose finite element code, which handles a wide variety of linear and nonlinear analyses. ABAQUS/Explicit uses explicit time integration for linear and nonlinear problems, and is especially suited for modeling transient effects. This tutorial provides an overview of ABAQUS, its capabilities, and examples of applications. The tutorial is suitable for beginners in finite element analysis, experienced users of other software, and those interested in a survey of recently added features.

The Navy Shock Qualification Process

This proposed class will be taught by NAVSEA 05P3 Delegated Approval Authority (DAA), NSWCCD Philadelphia Code 623. The class will cover a detailed description of NAVSEAINST 9072.1a, MIL-S-901D, and the OPNAVINST 9072.2. There is typically a class taught concerning MIL-S-901D Shock Qualifications, however, it covers more about shock phenomena and underwater explosions. The purpose for this new class is to educate individuals on the shock qualification process beginning with the OPNAVINST (9072.2) and how the Navy proposes to address the requirements set in the instruction. Next, it will cover NAVSEAINST, 9072.1a, which outlines and assigns responsibilities for meeting the requirements of the OPNAVINST. Finally, it will cover the requirements for shock testing as stated in MIL-S-901D and how NAVSEA 05P3 and its DAA interpret and enforce the requirements.

Data Acquisition for Shock & Vibration Measurement

Digital data acquisition has become the standard method of recording the shock and vibration measurements. The advantages of this approach in cost, accuracy, and convenience are enormous but there are traps set to catch the unwary investigator. One of the worst "features" of digital data acquisition is, if the system is not properly designed, it may produce data that looks good

but is completely wrong. The primary aim of the course is to avoid this fatal result. The three-hour course discusses the hardware and software strategies required to assure good data is acquired. Sampling (aliasing) and digitalizing theory are emphasized and modern hardware solutions are discussed. The reasons for using, or not using, the new generation of sigma-delta data acquisition systems is featured and a fast and easy method of evaluating candidate hardware systems is described. This course is a must for those who want to assess the quality of the data they are acquiring or those who are fortunate enough to be buying/building a new system.

Structural Detailing for Blast Resistance

This tutorial will build on the material presented in the "Explosion Effects and Blast Resistant Structural Design" tutorial. The issue of structural design and the critical importance of paying attention to structural details will be discussed. How this has been studied, what the observations are, and recommended implementation in practice will be presented.

Beyond the Shock Response Spectrum - Temporal & Frequency Moments, the Product Model, & Uncertainty

The tutorial will show how the first few bandlimited temporal moments can be used to characterize shock. This information can be used independently of the Shock Response Spectrum (SRS), or used to supplement the SRS of a shock. The tutorial will introduce the temporal moments and discuss the theoretical implications. The uncertainty theorem will be discussed, and it will be shown how this theorem limits the available information about a shock. For a shock with a given rms duration, defined by the temporal moments, the uncertainty theorem limits the frequency resolution, as defined by the rms bandwidth. A demonstration will be given on how the product model can be used to synthesize realizations of a shock, which match the temporal moments. Examples will be provided which suggest, if the bandlimited temporal moments are matched, the SRS will also be matched. The realizations can be used for some tests, for example, shaker shock, or can be used as inputs to analytical models to estimate response. It will also be shown if the product model is assumed, that for estimates of the temporal moments, estimates of the mean is unbiased and estimates of the variance of the mean estimate can be found. This is useful in establishing the uncertainty in moment estimates from measured data. Several examples using real data will be used to illustrate the moments and the application.

UNDEX and Acoustics Analysis Using ABAQUS

This tutorial describes the analysis of problems of particular interest to the Shock and Acoustics community using the general purpose finite element code, ABAQUS. In shock and acoustic analysis, it is useful to distinguish between 'heavy fluid' problems, in which the mass and stiffness of the fluid is an important factor in the structural motion, and 'light fluid' problems, in which parts of the fluid-solid interaction effect may be neglected. 'Heavy fluid' applications include underwater shock and acoustics, and some geotechnical problems. 'Light fluid' problems include metal structures in air. In either case, modal analysis, steady-state dynamic (time-harmonic) analysis, and transient problems are of interest. The use of ABAQUS/Standard for general steady state and modal acoustic analysis is described, including problems with heavy fluid, light fluid, solid structures, and infinite exteriors. ABAQUS/Explicit is particularly well-suited to UNDEX problems, which are characterized by rapid transient loads due to incident waves, as well as fluids of infinite extent. Modeling issues for each class of problem will be discussed.

Validation and Editing of Shock & Vibration Data

This short course surveys the most common errors that occur during the acquisition of shock and vibration data, including signal clipping, transducer and/or amplifier saturation, excessive background noise, intermittent noise spikes and wild points, power line pickup, spurious trends and signal dropouts. Practical procedures to detect such errors and wild points, power line pickup, spurious trends and signal dropouts. Practical procedures to detect such errors by visual inspections of the data signals and/or simple analysis of the signals are detailed. For those cases where the resulting anomalies can be removed from the data, appropriate data editing techniques are discussed. Emphasis is given to pyroshock data, which is particularly vulnerable to data acquisition errors. The presentation concentrates on graphical illustrations of the detection and editing procedures rather than an analytical treatment of the problem. This short course is intended for all engineers and scientists that are engaged in the acquisition and analysis of all types of analog data. The material is presented at a level appropriate for entry level engineers and technicians, but should also be beneficial to more experienced laboratory engineers and managers of data acquisition and analysis facilities.

Substructure Coupling and Structural Modification for Shock & Vibration

Substructure coupling and structural modification refer to techniques for the efficient analysis of large and/or complex structural dynamics, vibration and shock. By treating structural systems as assemblages of components or substructures, structural design "what if" calculations can be performed quickly. This tutorial will review the background necessary in order to introduce several general approaches to substructuring and modification, in modal and physical coordinates and in the frequency and time domains. Included will be Component Mode Synthesis (e.g. NASTRAN superelements), model modifications, frequency domain coupling/modifications and time domain coupling/modification. The background review will include finite element structural matrices, decoupling, mode superposition (mode displacement and mode acceleration data recovery), frequency and impulse response functions and model reduction. Examples will be used throughout to illustrate the concepts covered.

Call For Papers

74th Shock and Vibration Symposium

**October 27-31, 2003
Red Lion Hanalei Hotel
San Diego, CA**

Planning for the 74th Shock and Vibration Symposium is underway, with the selection of NSWC/Crane and SPAWAR as the Government Featured Organizations, Endevco as the Commercial Featured Organization, and the Red Lion Hanalei Hotel in San Diego as the location.

The Shock & Vibration Symposium is the oldest continuously held meeting dealing specifically with the structural dynamic behavior of air, sea, space, and ground vehicles and structures. The Symposium was established as a mechanism for the exchange of information among Government activities, private industry, and academia on current work and new developments. Presentations on work in progress are encouraged. Separate sessions are held for presentation of classified or limited-distribution material.

Presentations in the following subject areas are welcomed: Active Vibration Control; Ballistic Shock; Biodynamics; Blast Design; Combined Environments; Computational Structural Dynamics; Crash Dynamics; Damage Identification; Damping; Data Analysis; Dynamic Analysis Methods; Dynamic Measurement; Dynamic Scale Modeling; Dynamic Testing; Environmental Databases; Finite Element Analysis; Fluid-Structure Interaction; Ground Shock; Seismic Shock; Impact/Penetration Mechanics; Instrumentation; Isolation Systems; Large Structures; Live Fire Testing; Machinery Diagnostics; Machinery Vibration; Material Dynamic Properties; Modal Analysis and Testing; Product Announcement/Facility Description; Pyrotechnic Shock; Shock Characterization; Shock Hardening; Simulation Methods; Specifications and Standards; System Identification; Test Criteria; Test Tailoring; Underwater Shock Testing; and Vibroacoustics.

Two categories of presentations will be accepted: full papers, suitable for publication in the Symposium Proceedings; and short discussion topics, consisting of viewgraphs with no written paper. Full papers will have a 15 minute technical presentation time plus 5 minutes for questions, while short discussion topics will have a 10 minute presentation time with no question period.

Presentations will be accepted on the basis of their abstracts, which must be submitted by April 30, 2003. You are encouraged to submit online at www.saviac.org, click on 74th S&V Symposium Abstract Submittal. The Program Committee will review the abstracts during the May Program Committee meeting and authors will be notified of acceptance by June 12, 2003. The full paper presentations must meet the following standards: They must be previously unpublished and unrepresented, must be appropriate to community interests and must not be overtly commercial, except for papers in the Product/Facility session. Standards for short discussion topics are similar except that they may include previously presented or published material.

The Proceedings will be published on CD-ROM. The paper due-date is October 17, 2003. Questions should be directed to Joel Leifer, 301.596.0100 or joel.leifer@saviac.org.



MONOGRAPHS

QUANT.	PRICE	ITEM
___	\$25.00	SVM-1 <u>Random Noise & Vibration in Space Vehicles</u> by R.H. Lyon - Published 1967 (P) **Photograph Only
___	\$25.00	SVM-2 <u>Theory & Practice of Cushion Design</u> by G.S. Mustin - Published 1968 (P)
___	\$25.00	SVM-3 <u>Programming & Analysis for Digital Time Series Data</u> by L.D. Enockson & R.K. Otnes - Published 1968 (P)
___	\$25.00	SVM-4 <u>Dynamics of Rotating Shafts</u> by R.G. loewy and V.J. Piarulli - Published 1969
___	\$25.00	SVM-5 <u>Principles & Techniques of Shock Data Analysis</u> by R.D. Kelly & D. Richman - Published 1969
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