

Conference Program

The 74th Shock & Vibration Symposium



October 26-31, 2003
San Diego, CA



would like to say thank you to the following contributors who have helped to make great things happen in SAVIAC during 2003:

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February S&V Seminar

Instructors

Dr. Eric Kathe
Mr. Dan Gregory
Mr. Kurt Hartsough
Mr. Gary Gonzales
Mr. Don Hatfield
Mr. Bill Huxhold
Dr. Rudy Scavuzzo
Mr. Jeff Blankenship
Mr. Tony Abbey

June S&V Seminar

Instructors

Prof. Ted Krauthammer
Mr. Allen Parkes
Dr. Rudy Scavuzzo
Dr. Vesta Bateman
Dr. Tom Paez
Dr. Young Shin
Mr. Anthony Chu
Mr. Chuck Wright
Mr. Dennis Booth
Mr. Dave Weinburg

74th S&V Symposium

Session Developers

Dr. Walter Pilkey
Prof. Pat Walter
Dr. Jeff Cipolla
Dr. Tim Coats
Dr. Ron Peterson
Mr. Philip Bell
Mr. Dick Taddeo
Mr. Jamie Howell III
Ms. Dawn Barrasso
Dr. Young Shin
Mr. Charles Joachim
Dr. G. Will McMahon
Dr. Reed Mosher

74th S&V Symposium
Discussion Group Leaders

Mr. Austin Alvarez
Mr. Robert Bowser
Mr. Dan Worth
Mr. Strether Smith
Dr. Vesta Bateman
Mr. Ed Alexander
Ms. Jennifer Marr
Mr. Dana Johansen
Mr. Andy Anderson

74th S&V Symposium

Panel Developers

Mr. Kurt Hartsough
Dr. Tim Hasselman
Mr. Jon Wilson
Ms. Mary Kerns
Mr. Allen Parkes
Dr. Robert Sierakowski
Mr. Mark O'hair
Mr. Jamie Howell III

74th S&V Symposium

Training Instructors

Dr. Tom Paez
Mr. Scott Walton
Dr. Andrew Littlefield
Mr. Dan Cler
Dr. Jim Newill
Mr. Dan Worth
Prof. Fred Nelson
Dr. Joshua Gordis
Dr. Rudy Scavuzzo
Dr. Howard Gaberson
Prof. Ted Krauthammer
Prof. Tom Geers
Mr. Doug Taylor
Dr. Eric Kathe

SAVIAC Block Funding Organizations

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Defense Threat Reduction Agency - FC
Defense Threat Reduction Agency - HQ
Engineer Research Development Center - GSL
Engineer Research Development Center - ITL

Naval Surface Warfare Center/Carderock
Naval Surface Warfare Center/Dahlgren
Naval Surface Warfare Center/Crane
Space and Naval Warfare System Command
Sandia National Laboratories

Introduction

Since the first meeting in 1947, the Shock and Vibration Symposium has become the oldest, continual meeting dealing with the transient response of structures and materials to vibration and shock. 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 Surface Warfare Center, SPAWAR Systems Center San Diego, and Endevco Corporation. Representing these organizations are our Co-Chairs.

Program Committee Members

Co-Chair: Mr. Allen Parkes - Naval Surface Warfare Center, Crane Division

Co-Chair: Mr. Don Peckinpaugh - Naval Surface Warfare Center, Crane Division

Co-Chair: Mr. John Maltby - SPAWAR Systems Center San Diego

Co-Chair: Ms Wendy Smidt - SPAWAR Systems Center San Diego

Co-Chair: - Mr. Jeff Dean - Endevco Corporation

Honorary Co-Chair: Mr. John Walker - SPAWAR

Honorary Co-Chair: Mr. Bob Fogg - SPAWAR

Mr. Najib Abboud - Weidlinger Associates, Inc.

Mr. J. Edward Alexander - United Defense LP

Mr. Austin Alvarez - General Dynamics Electric Boat

Mr. Jeff Blankenship - NAVSEA-NSWC/Coastal Systems Station

Mr. Kevin Castanien - SAIC

Dr. Jeff Cipolla - HKS, Inc./ ABAQUS

Dr. Raymond Daddazio - Weidlinger Associates, Inc.

Mr. Kirk Doughty - NUWC Keyport

Mr. Ami Frydman - ARL/Weapons & Materials Research Directorate

Mr David Guitas - SPAWAR Systems Center San Diego

Mr. Jamie Howell - NSWC/DD

Dr. Eric Kathe - US Army, RDECOM - Benét Laboratories

Captain Stuart Kendrick - SPAWAR Headquarters

Ms Mary Q. Kerns - Enidine, Incorporated

Mr. Travis Kerr - Northrop Grumman Newport News

Dr. Ted Krauthammer - Penn State Protective Technology Center

Mr. Joel Leifer - SAVIAC/HI-TEST Laboratories, Inc.

Dr. Andrew Littlefield - US Army, RDECOM - Benét Laboratories

Mr. Eric Luft - NSWCCD/UERD

Mr. Jeffery A. Morris - HI-TEST Laboratories, Inc.

Mr. John Pooley - AMTEC Corp

Mr. Henry Pusey - SAVIAC/MFPT

Dr. Rudy Scavuzzo - University of Akron

Dr. Young Shin - Naval Postgraduate School

Dr. Charles Robert Welch - SAVIAC/USACE

Ms. Lauren Yancey - SAVIAC/HI-TEST Laboratories, Inc.

Mr. William Yancey - HI-TEST Laboratories, Inc.

Mr. Gary Zook - NUWC Keyport

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Schedule of Events

Tutorials

Sunday and 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 (Unclassified)	Track Five (Unclassified)	Track 5 1/2 (Unclassified)	Track Six (Classified)	Track Seven (Classified)
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Tuesday Afternoon

<i>Gene Sevin</i>	<i>Hi-G Shock</i> <i>ASME Panel</i>	<i>Products & Facilities</i> <i>Manufacturers Panel</i>	Training	<i>Fluid Structure Interaction</i> <i>Tech Trnfr DG</i> <i>Data Arch DG</i>		<i>COTS Panel</i> <i>Shock DG</i> <i>MIL-S-901 DG</i>	
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Wednesday Morning

<i>Acoustic - Numerical Methods</i> <i>Acoustic Apps</i>	<i>UK Weapons Clearance Philosophy - Shock and Vibration</i>	<i>Shock Isolation</i> <i>Shock Mitigation</i>	Training	<i>Data Acq DG</i> <i>Pyroshock DG</i> <i>SRS DG</i>		<i>Anti-Terrorist I</i> <i>Anti-Terrorist II</i>	
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Wednesday Afternoon

<i>Underwater Acoustics</i> <i>901 Extension Panel</i>	<i>DoD Acquisition Processes</i> <i>UAVs</i>	<i>Human Shock Mitigation</i> <i>Concrete Design</i>	<i>Homeland Defense Technologies</i> <i>Military Applications</i>	Training <i>Composite Response</i>	<i>IEST WG Meetings</i>	<i>Payloads & Sensors</i> <i>UNDEX Bubble</i>	UNDEX I UNDEX II
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Wednesday Night: SAVIAC Open TAG Meeting Social Event

Thursday Morning

<i>901 Subsid Comp Panel</i> <i>Shock Test Methods</i>	<i>Ship Shock Simulation I</i> <i>Ship Shock Simulation II</i>	<i>Vibration - Num Methods Test</i> <i>Methods/Requirements</i>	<i>Vibration - Test & Appl I</i> <i>Vibration - Test & Appl II</i> <i>ASA DG</i>	<i>Damping & Isolation</i>		<i>Military Blast I</i> <i>Military Blast II</i>	<i>Homeland Security</i> <i>Intunnel Blast</i>
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Thursday Afternoon: Closed TAG Meeting

Friday: Tour of Endevco

74th Shock and Vibration Symposium

Conference Program

Sunday, October 26

Registration

7:00 am - 7:00 pm
Conference Center Lower Level

Tutorials

Instructor	Room	Time
Strether Smith	Maui	8-11 AM
Bart McPheeters	Kauai	8-11 AM
Kurt Hartsough	Pacific	9-12 AM
Chuck Wright	Bay	12-3 PM
Dave Weinberg	Pacific	12-3 PM
Kurt Hartsough & Domenic Urzillo	Lahaina	1-4 PM
Jon Wilson	Bay	4-7 PM
Jeff Cipolla	Pacific	4-7 PM

Monday, October 27

Registration

6:30 am - 7:00 pm
Conference Center Lower Level

Tutorials

Instructor	Room	Time
Pete Stein	Lahaina	7:30-11 AM
Jeff Cipolla	Tropic	8-11 AM
Young Shin	Bay	8-11 AM
Ted Krauthammer	Pacific	8-11 AM
B. Christopher Grunau & Jeffery A. Morris	SPAWAR	8-12 PM
Patrick Walter	Lahaina	12-3 PM
Dave Weinberg	Tropic	12-3 PM
John DeRuntz	Bay	12-3 PM
Joshua Gordis	Pacific	12-3 PM
Allan Piersol	Bay	4-7 PM
Wayne Tustin	Pacific	4-7 PM
Rudy Scavuzzo	Tropic	4-7 PM
Dave Smallwood	Surf	4-7 PM
Paul Medeiros & Kurt Hartsough	Lahaina	4-7 PM

Tuesday Morning, October 28

Registration

Conference Center Lower Level

6:00 am - 6:00 pm

Chair/Presenter Meeting (All Tuesday Chairs & Presenters Must Attend)
Chair: Jeff Morris, HI-TEST Laboratories

7:00 - 7:30
Tropic Room

Opening Session

Pavilion

Call to Order: <i>Mr. Joel Leifer, SAVIAC Program Manager</i>	8:30 am
Welcome: <i>Captain Daniel M. Wise, Commanding Office, Naval Surface Warfare Center, Crane Division</i>	8:35 am
Welcome: <i>Captain Stuart Kendrick, Director FORCENet Integrated Prototype Demonstrations, Space and Naval Warfare Systems Command</i>	8:40 am
Welcome: <i>Mr. Francisco Palop, General Manager of Aerospace and Defense, Endevo</i>	8:45 am
Symposium Highlights: <i>Mr. Joel Leifer, SAVIAC Program Manager</i>	8:50 am
Henry Pusey Award Presentation: <i>Mr. Allen Parkes & Mr. Don Peckinpaugh, Naval Surface Warfare Center, Crane Division, Mr. John Maltby & Ms Wendy Smidt, Space and Naval Warfare Systems Command, Mr. Jeff Dean & Mr. Anthony Chu, Endevo</i>	9:10 am
Mel Baron Award Presentation: <i>Mr. Doug Bruder, Defense Threat Reduction Agency</i>	9:20 am
Director's Award - <i>Mr. Dave Schulte, Director Ordnance Engineering Directorate, Naval Surface Warfare Center, Crane Division</i>	9:35 am
Director's Remarks: <i>Dr. Charles Robert Welch, USAE Research and Development Center</i>	9:50 am
Break	10:00 am
Keynote Address: "TBD", <i>Mr. Gregg Hagedorn, Executive Director for NAVSEA's Ship Design, Integration and Engineering Directorate, NAVSEA 05B</i>	10:15 am
Elias Klein Memorial Lecture: <i>"The Antiquity of Vibration (A lighthearted review of our early understanding of vibration)", Phillip Bell, Project & Business Development Manager, Environmental Sciences Cranfield Aerospace Ltd</i>	11:00 am
Break	11:30 am

Exhibitors Luncheon

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

Tuesday Afternoon, October 28

Exhibits

11:30 - 6:00
Pavilion

Track One

Gene Sevin Session - Opening and Highlights of Gene Sevin's Career Up to the Present

Chair: Prof Walter Pilkey, UVA

Lahaina Room

1:00	Optimum Shock Isolation and Bounds on the Response of Mechanical Systems - <i>Prof Walter Pilkey, University of Virginia</i>
1:10	Contributions to Counterterrorism - <i>Weidlinger Associates, Inc.</i>
1:20	Gene Sevin's Lifetime Contributions to Weapons Effects - <i>Doug Bruder, Defense Threat Reduction Agency</i>

Gene Sevin Session - Mitigating The Terrorist Hazard - Addressing Risk Through Design

Chair: Prof Walter Pilkey, UVA

Lahaina Room

1:30	Composite Retrofits of Reinforced Concrete Slabs to Resist Blast Loading - <i>Darell Lawver, Raymond Daddazio, Gwang Jin Oh, Allen Pifko, Weidlinger Associates; Michael Stanley, New Mexico Institute of Mining and Technology</i>
1:50	Concrete Modeled As An Inhomogeneous Material: Quasi-Static Mechanical Behavior Of Concrete, Mortar, And Aggregate - <i>Dr. Stephen Akers, Paul Reed, US Army Engineer Research And Development Center</i>

Tuesday Afternoon Continued

- 2:10 **Blast Mitigation Of Existing Structures Using Fiber Reinforced Polymer Composite Systems** - Peter Milligan, Edward R. Fyfe, Edward Donnelly, Fyfe Co.; John Crawford, Karagozian & Case
- 2:30 **Comparison Of Dynamic Finite Element Analysis Model To Single Degree Of Freedom Method For Blast Analysis Of Multi-Story Steel Frame** - Matthew Edel, Michael Polcyn, Dr. Charles Oswald, Baker Engineering & Risk Consultants
- 2:50 **Development of Design Tools for Blast Loading on Structures** - Raymond Daddazio, Darell Lawver, Mohammed Ettouney, Felix Wong, Kenneth Stultz and David Rubin, Weidlinger Associates
- 3:10 **Protection From Terrorism Through Precision Impact Tests For Computer Code Validation** - Prof Ted Krauthammer, Protective Technology Center, The Pennsylvania State University

Gene Sevin Session - Dynamic Analysis
Chair: Prof Walter Pilkey, UVA

Lahaina Room

- 3:30 **Combination Vibration Control Systems For Sensitive Equipment** - Dr. Vyacheslav Ryaboy, Newport Corporation
- 3:50 **Computational Approximations of the Hendron-Aiyer Problem: Varying the Third Invariant** - Don Simons, Tom Pucik, Northrop Grumman Information Technology
- 4:10 **Augmentation of Doubly Asymptotic Approximations In Underwater Shock Problems For Singular Structural Mass Matrices** - John A. DeRuntz, Jr., Unique Software Applications
- 4:30 **The World's Worst Roads - What are Their Profiles?** - Herbert Lindberg, LCE Science/Software

Gene Sevin Reception (Ohana Room 5:00 - 6:00) and Dinner (LaHaina Room, 6:00 - 8:00)
Master of Ceremonies: Dr. Nicholas Perrone

Upon completion of the technical sessions, there will be a reception and dinner to honor Gene. The cost to attend the reception and dinner is \$35 per person and will include hors d'oeuvres and a cash bar before the meal. After dinner, there will be a talk on "The Forensic Analysis of the World Trade Center" by Najib Abboud of Weidlinger Associates and an opportunity to review Gene's career. You must register in advance for this event by checking the box on the registration form.

Track Two

Hi-G Shock

Chair: Prof Patrick Walter, Endevco & TCU, Co-Chair: Jeff Dean, Endevco

Bay Room

- 1:00 **Lessons Learned In Applying Accelerometers To Nuclear Effects Simulation Testing** - Dr. Patrick Walter, Endevco & Texas Christian University
- 1:20 **Intense Shock In Armored Combat Vehicles** - W. Scott Walton, US Army Aberdeen Test Center
- 1:40 **Shear Mode Shock Accelerometer** - John Kubler, Kistler Instrument Corp
- 2:00 **Advanced MEMS Shock Accelerometer** - Tom Connolly, Endevco Corp.
- 2:20 **Shock Instrumentation Saturation Effects And Compensation** - Strether Smith, DSPCon
- 2:40 **Shock Sensor Performance Evaluation** - Bruce Martha, PCB Piezotronics, Inc.
- 2:50 **An Historical Review Of Theoretical And Practical Investigations Of Bars As A Source Of Mechanical Shock** - David Evans, National Institute of Standards
- 3:10 **High-G Testing For Fuze Research** - Dr. Howard White, Timothy Tobrik, Richard Mabry, AFRL/MNMF

Progress Report from the ASME PTC 60 Committee on Verification & Validation
of Computational Solid Mechanics, Chair: Dr. Tim Hasselman, ACTA

3:50-5:50
Bay Room

This panel will provide a progress report on the ASME V&V committee's activities. Each panel member will give a ten minute summary on the following topics, consistent with the organization of their Summary Guide : Introduction (Hans Mair, IDA, Committee Co-chairman); V&V definitions (John Cafeo, GM); Role of nondeterminism in V&V (Ben Thacker, Southwest Research Institute); Model development (Scott Doebling, Los Alamos National Laboratory); Verification (Francois Hemez, Los Alamos National Laboratory); Validation (Paul Senseny, Factory Mutual).

Track Three

Products And Facilities

Chair: Andy Anderson, United Defense, LP

Pacific Room

- 1:00 **Primary Calibration Of Accelerometers By Laser Interferometer** - Dr. Jeffrey Dosch, Bruce Martha, PCB Piezotronics, Inc.

Tuesday Afternoon Continued

- 1:10 **Multi Channel, Cost Effective, User Friendly Data Acquisition System In The Environmental Testing Laboratory** - D. Lehman, D. Ben Yehuda, RAFAEL
- 1:30 **NSWC Crane Division T&E Capabilities** - Jim Parsch, Naval Surface Warfare Center Crane Division
- 1:50 **Lithium Battery Environmental Testing** - Denis Kristler, Naval Surface Warfare Center Crane Division
- 2:10 **Electrodynamic Shaker Performance Breakthroughs: Extreme Random And SRS Shock Testing** - Phillip Rogers, Unholtz-Dickie Corporation
- 2:20 **Exceeding Mother Nature's Limits** - Brian O'Keefe, ESI North America
- 2:30 **Statistical Energy Analysis With Autosea2 Software For High Frequency Structural Acoustic Simulation Enhanced By Virtual Mode Synthesis For Shock Modeling** - Marshall Loewenstein, ESI North America
- 2:40 **Shock Mitigation for High Speed Surface Craft** - Mark Massman, Skydex Technologies, Inc.

Manufacturer's Panel

Chair: Jon Wilson, The Dynamic Consultant

**3:20 - 5:20
Pacific Room**

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 include Anthony Chu, Endevco; Dave Galyart, Dactron; John Kubler, Kistler; and Strether Smith, DSPCon.

Track Four

Training

Chair: Joel Leifer, HI-TEST Laboratories

Surf Room

- 1:00 **Isolation & Dissipation** - Doug Taylor, Taylor Devices
- 2:00 **Transient Acoustic Fluid-Structure Interaction** - Prof. Thomas Geers, University of Colorado
- 3:00 **Large Caliber Gun Blast, Recoil, and Dynamics: A Case Study in Shock and Vibration** - Dr. Eric Kathe, Dr. Andrew Littlefield, Dan Cler, Jim Newill, US Army, RDECOM - Benét Laboratories
- 4:00 **Random Vibrations - 1905 Through The Present** - Dr. Thomas Paez, Sandia National Laboratories

Track Five

Fluid Structure Interactions

Chair: John Przybysz, NSWC/CD/UERD

Tropic Room

- 1:00 **Modification Of The Geers-Hunter Underwater-Explosion Bubble Model For Close Correlation With Snay Data** - Dr. Thomas Geers, Chung-Kyu Park, University Of Colorado
- 1:20 **Analysis Of The Loading And Response Of Flat Plate Targets Subjected To Close-Proximity Underwater Explosions** - Dr. Richard Link; Laura Donohue, Merv Norwood, R. Ripley, T. Josey, Martec Ltd; Dr. John E Slater, Defence R&D Canada
- 1:40 **Underwater Explosion Damage Of Thin Rectangular Plates** - Dr. K Ramajeyathilagam; Dr. K. Daniel Prasad, M Suryanarayana, NSTL Shock & Vibration Centre
- 2:00 **Prediction Of Maximum Acceleration Of Equipments On Ships By Underwater Explosion Loading** - Kazuo Shimamura, Ishikawajima-Harima Heavy Industries Co.,Ltd.; Miki Arami; Yuichiro Noma, IHI Marine United Inc.
- 2:20 **A Method For Analyzing Interactions Between Underwater Shock Wave And Acoustic Structure** - Dr. Jian-Hu Liu; Prof You-Sheng Wu, China Ship Scientific Research Center
- 2:40 **Utilizing A Single Finite Element Model For Shock And Acoustic Radiation Analysis Of A Submarine** Karl D'Souza, Dr. Cristian Ianculescu, Dr. Jeffrey Cipolla, ABAQUS, Inc.

Formation of a Tech Transfer/Education Committee Discussion Group

Leader: Andy Anderson, United Defense, LP

**3:20 - 4:20
Tropic Room**

A lot of S&V technology is unknown to the new people entering the field due to a lack of available documentation and the retirement of many senior practitioners. SAVIAC has received a number of inquires from young engineers who are trying to solve S&V problems that were successfully solved a long time ago. At present the only resource SAVIAC has to offer are the SVIC/SAVIAC symposium bulletins or monographs but these sources are not always specific enough for them or often do not represent the best current practice. This committee would be charged with producing a series of S&V best practice documents that can be easily and regularly updated.

Development of a Data Storage Standard Discussion Group
Leader: Dan Worth, NASA/GSFC

4:40 - 6:40
Tropic Room

A new IEST working group (WG-DTE042) on Vibration and Shock Data Storage has been established to develop a standard for the storage of large binary files used mainly in structural dynamic testing. This will allow time-history data to be efficiently transferred between the various acquisition and analysis packages that are available. All interested parties are welcome to attend the working group discussion and meeting.

Track Six (Classified)

COTS Panel (Confidential)
Co-Chairs: Fred Costanzo, NSWC/Carderock, Mary Kerns, Enidine

1:00 - 3:00
Bldg A-33 Auditorium

Over the past four years we have utilized the COTS panel to identify and bound some of the issues and address the concerns of the naval shock community, ship designers, ship builders, ship integrators, COTS and shock & vibration mount manufacturers. As a result of these interactions, we felt that the community was looking for direction, guidance, and clarification. In the 2003 COTS Panel the NAVSEA Directors that represent the Navy Technical Authority for Shock and Vibration will present the Directorates vision for the future to the community. Panel members are Michael R. Riley, Director, Ship Survivability & Structural Integrity, NAVSEA 05P and Gary M. Jebsen, Director, Ship Signatures NAVSEA 05T.

Discussion Group on a Balanced Approach for Shock Design & Qualification for Submarines (LD)
Co-Leaders: Austin Alvarez, Electric Boat Corp., Bob Bowser, NAVSEA 05P3

3:20 - 4:20

At the 73rd Shock & Vibration Symposium, Dr. Millard Firebaugh, Electric Boat Vice President for Innovation and Chief Engineer, in his Keynote Address on "Common Sense Shock," challenged attendees to emphasize a practical approach to shock design and qualification. Dr. Firebaugh stated that there is an opportunity to drive major cost and cycle time out of the business by applying a balanced approach to shock. Simplified tools, however, are lacking. The problem is that current design, analysis, test and extension processes are too complex and expensive, often being driven by precise, scientific approaches. The shock process must be re-baselined by integrating a balanced approach early in the design. The design community must apply the right tool that is commensurate with the problem being solved. In this way, a robust shock design can be developed and maintained at a reasonable cost. A balanced approach can be implemented by convening a Blue Ribbon Panel of experts from the shock community to develop a set of practical guidelines to complement state-of-the-art scientific approaches. Following an update of the status of the Balanced Shock initiative, comments will be solicited from attendees on how to develop and implement the practical, efficient and timely shock design and qualification approaches.

MIL-S-901 Revision Discussion Group (Limited Distribution)
Leader: Dana Johansen, NAVSEA 05P3

4:40 - 5:40
Bldg A-33 Auditorium

NAVSEA is initiating a new revision to MIL-S-901. Current plans and status will be presented. NAVSEA seeks your input on what needs to be included. Please attend and present your ideas. If you can provide a hardcopy of your ideas, it will be appreciated.

Wednesday Morning, October 29

Registration

7:00 am - 6:00 pm
Conference Center Lower Level

Exhibits

7:30 am - 5:00 pm
Pavilion

Chair/Presenter Meeting (All Wednesday Chairs & Presenters Must Attend)
Chair: Jeff Morris, HI-TEST Laboratories

7:00 - 7:30 a.m.
Tropic Room

Track One

Acoustics - Numerical Methods

Chair: Dr. Jeff Cipolla, Hibbitt Karlsson & Sorensen

Lahaina Room

- 8:00 **Calculation Of Buckling Limits For Alignment Critical Foundations Using Finite Element Analysis And DDS 100-4** - Robin Lawson, Northrop Grumman Newport News
- 8:20 **State-Of-The-Art Infinite Element Methods For The Efficient Simulation Of Exterior Acoustics** - Daniel Dreyer, Prof Otto Von Estorff; Technical University Hamburg-Harburg
- 8:40 **An Approach To Aero-Acoustics Modeling: Linking CFD And Computational Acoustics To Implement The Acoustic Analogy** - Scott Bergeon, LMS North America; Dr. Michel Tournour, Zoubida El-Hachemi, Colin Mcculloch: LMS International
- 9:00 **Energy Finite Element And Boundary Element Formulations For Computing High Frequency Vibration And Noise Of Submersible Structures** - Nickolas Vlahopoulos, Aimin Wang, Univeristy Of Michigan; Kuangcheng Wu, Richard Shaw, Northrop Grumman Newport News
- 9:20 **Modeling Viscoelastic Laminate Sections In Statistical Energy Analysis** - Phil Shorter, Bryce Gardner, Vibro-Acoustic Sciences/ESI North America
- 9:40 **Prediction Of Vibration Energy Flow Variability In Random Built-Up Structures** - Sonjoy Das, Johns Hopkins Univeristy; Prof C.S. Manohar, Indian Institute Of Science

Acoustics Applications

Chair: Dr. Najib Abboud, Weidinger Associates

Lahaina Room

- 10:20 **Analysis Of Probability Density Functions Of CMC Plate Strain Responses To Acoustic Excitation In Progressive Wave Tube** - Dr. Alexander Steinwolf, University Of Aukland; Michael Spottswood; Air Force Research Laboratory, WPAFB
- 10:40 **Using Acoustic Intensity Measurements In Acceptance Tests In The Manufacturing Line** - D. Lehman, Z. Sherf, RAFAEL
- 11:00 **Damage Monitoring By Means Of Acoustic Spectroscopy** - Dr. Gerard Vanderborck, Thales Underwater Systems; Dr. Amine Hassim, Inria
- 11:20 **Recent Advancements In Particle Impact Noise Detection (PIND)** - Stewart Slykhous, Spectral Dynamics, Inc.
- 11:40 **COTS Structureborne Noise Isolation Survey For Future Submarine Installations** - John Nagurny, Lockheed Martin; Stephen Zajkowski

Track Two

UK Weapons Clearance Philosophy - Shock and Vibration

Bay Room

Chair: Ian Carr, Defense Procurement Agency, Co-Chair: Philip Bell, Cranfield Aerospace Ltd

- 8:00 **Session Keynote Address: UK Philosophy For Weapons Clearances Programmes** - Ian Carr, Defense Procurement Agency
- 8:15 **UK Approach to Munitions Trials Programmes** - Ian Carr, Defense Procurement Agency
- 8:45 **Vibration Assessment of C130J Mk4 and Mk5 Aircraft** - Darrel Charles, Cranfield Aerospace Ltd
- 9:15 **Gunfire Shock - Part I: WAH64 Apache GFS Safety and Suitability for Service (S3) Testing of CRV7 & Hellfire II Missiles** - Ian Carr, Defense Procurement Agency
- 9:25 **Gunfire Shock - Part II: The Development of Test Specifications for Gunfire Shock - UK Apache AH MK1** - Philip Bell, Cranfield Aerospace Ltd
- 9:45 **Gunfire Shock - Part III: GFS Testing of CRV7 Missile System When Deployed on WAH64 Apache** - Barry Gasper, Kent Engineering Services, Ltd
- 10:30 **Vibration and Shock Environments in Tracked Vehicles** - Dr. Giles Clarke, Defense Procurement Agency
- 11:00 **Vibration of Milan during Transportation in the Warrior Tracked Vehicle** - Dr. Giles Clarke, Defense Procurement Agency
- 11:30 **Munition Condition Monitoring Issues** - Barry Gasper, Kent Engineering
- 12:00 **Vibration and Shock Data Logging Requirements for Munitions** - Dr. Giles Clarke, Defense Procurement Agency

Track Three

Shock Isolation

Chair: Brian Detwiler, Bath Iron Works

Pacific Room

- 8:00 **Evaluation Of Shock Isolating Heavy Machinery For Deck And Hull Mounted Applications Aboard A Typical Carrier Platform** - Kevin Arden, Sarah Stagers, Northrop Grumman Newport News
- 8:20 **Shock Isolation System Selection For Successful MIL-S-901 Qualification** - Rick Griffen, Northrop Grumman Newport News
- 8:40 **Successful Shock Isolation Of Naval Enclosures** - Dr. Robert Monson, Dr. Jianhua Yan, Lockheed Martin Tactical Systems
- 9:00 **Shock Response Analysis Of Marine Floating Raft Shock-Resistant System By Finite Element Method** - YL Zhao, Naval University Of Engineering
- 9:20 **Dynamic Analysis and Design System Modeling of the Experimental Unmanned Vehicle** - Peter Fazio, Army Research Laboratory

Shock Mitigation

Pacific Room

Chair: Dr. Tim Coats, NSWC Carderock, Co-Chair: Jennifer Speirs, NSWC Carderock

- 9:50 **Shock Mitigation - A Familiar Topic In High-Speed Planing Boat Design** - Dr. Timothy Coats, Jennifer Speirs, Richard Wilson, Naval Surface Warfare Center, Carderock Division
- 10:10 **High Speed Craft Motions: A Case Study** - Kelly Haupt, Naval Surface Warfare Center, Carderock Division
- 10:30 **Design Methods For High Speed Combatant Craft** - Jenny Speirs, Jason Marshall, Andrew Speirs, Naval Surface Warfare Center Carderock Division
- 10:50 **Considerations For Data Acquisition, Analysis, And Interpretation For High Speed Craft Motions** - Kelly Haupt, Naval Surface Warfare Center Carderock Division
- 11:10 **Mitigating Severe Shock To The Crews Of Naval Craft** - Capt Theodore Grabowsky, USN Ret, Vibration & Sound Solutions Limited
- 11:30 **Shock Mitigation Through Motion Control** - Chris Swanton, Maritime Dynamics

Track Four

Training

Chair: Joel Leifer, HI-TEST Laboratories

Surf Room

- 8:00 **Normal Mode Theory** - Dr. Rudy Scavuzzo, University of Akron
- 9:00 **Using The Velocity Shock Spectrum For Shock Damage Potential** - Dr. Howard Gaberson, Consultant
- 10:00 **A Brief Introduction to Protective Structures** - Prof. Ted Krauthammer, The Penn State University
- 11:00 **Introduction to Data Acquisition - Part I** - Prof. Joshua Gordis, Naval Postgraduate School

Track Five

Data Acquisition Discussion Group

Leader: Strether Smith, DSPCon

8:00 - 9:00

Tropic Room

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

Leader: Dr. Vesta Bateman, Sandia National Labs

9:20 - 10:20

Tropic Room

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.

Formation of a Shock Response Spectrum Committee Discussion Group
Leader: Ed Alexander, United Defense, LP

10:40 - 11:40
Tropic Room

A draft charter for the SRS committee will be presented and discussed. Does an SRS committee make sense, if yes, what should be the breadth of scope of an SRS committee (just SRS, or related areas such as mode superposition with SRS, etc.) and the breadth of applications of the committee (naval shock, earthquakes and buildings, pyroshock, vehicle blast, others). The duties of the committee, the membership and chairperson will be discussed.

Track Six (Classified)

Anti-Terrorist I (Limited Distribution)

Chair: Dr. Paul Mlakar, USAERDC

Bldg A-33 Auditorium

- 8:00 **SDOF Analysis Of CMU Wall Response To Blast Load** - *Dr. Thomas Slawson, Carol Johnson, US Army Engineer Research & Development Center; Dr. Mary Beth Hueste, Texas A&M University*
- 8:20 **Finite Element Predictions Of Air-Backed Reinforced Concrete Wall Response To Cased Munitions** - *David Bogosian, Karagozian & Case; Frank Dallriva, US Army Engineer Research And Development Center*
- 8:40 **An Enhanced Methodology For Predicting Loads Behind Blast Barriers** - *David Bogosian; Dr. Yongjiang Shi, Karagosian & Case*
- 9:00 **Retrofit Techniques For Strengthening Stud Walls Subjected To Nearby Blast Loads** - *Ken Morrill; J.E. Crawford, Karagosian & Case*
- 9:20 **A Comparison Of Predicted And Measured Response Of Steel Double-Leaf Blast Doors Subjected To Combined Airblast And Fragment Loadings** - *Darren Tennant, Dr. Weihong Yang, Dr. Howard Levine, Weidlinger Associates, Inc.*

Anti-Terrorist II (Limited Distribution)

Chair: Ron Hunt, AFRL

Bldg A-33 Auditorium

- 10:00 **Effects Of A Neighboring Structure On Loads On A Structure** - *Dr. James Baylot, Byron Armstrong, Denis Rickman, US Army Engineer Research & Development Center*
- 10:20 **Effects Of Inclusion Of Compressed Gas Bottles In A TNT Explosive Charge:Results From The CANNED HEAT Experiments** - *Denis Rickman, US Army Engineer Research & Development Center*
- 10:40 **Assessment Of Meshfree Methods For Fragment Impact And Penetration** - *Dr. Leonard Schwer, Schwer Eng & Consulting Services*
- 11:00 **Risk Assessment Of Damage Effects On Structures Due To Unconventional Explosives** - *Dr. Young Sohn, DTRA; Chuck Allen, Andrew Prinaris, Thomas Rosener, Mark Swanson; Northrop Grumman, Dave Herman, URS*

Wednesday Afternoon, October 29

Track One

Under Water Acoustics

Chair: Richard Taddeo, NAVSEA 05T

Lahaina Room

- 1:00 **Overview Of The Target Strength Predictive Model** - *Thomas Yates, Jan Niemiec, Carderock Division NSWCCD*
- 1:20 **Radiation Efficiencies For Plates In Water** - *Melvyn Rumerman, Carderock Division NSWCCD*
- 1:40 **Acoustic Returns From Impedance-Coated Submerged Objects, With Applications** - *R. Hughes, H. Uberall, Carderock Division NSWCCD*
- 2:00 **An Approximate Solution For The Response Of Two Joined, Semi-Infinite, Fluid Loaded Plates Due To A Line Drive** - *Daniel Diperna, Carderock Division NSWCCD*
- 2:20 **Efficient Use Of A Parallel Domain Decomposition Approach For Large-Scale Structural Acoustic Predictions Using SARA3D Finite Element Code** - *Robert Dees, Thomas McCormick, BBN Technologies*
- 2:40 **Experimental And Analytical Investigation Of Surface Ship Hull Structural Acoustics Using 1/8th - Scale Physical Models** - *Mathew Craun, Gerald Carrill, William Martin, NSWCCD; Charles Corrado, Applied Physical Sciences, Inc.*
- 3:00 **Development Of An On-Surface Pressure-Velocity Relationship For Planar And Cylindrical Structural Acoustic Radiators** - *David Feit, Ronald Hughes, Carderock Division NSWCCD*
- 3:20 **Dynamics and Acoustic Signature of Non-Spherical Underwater Explosion Bubbles** - *J. Krieger, G. Chahine, Dynaflo, Inc.*

MIL-S-901 Shock Extension Case Studies & Panel
Co-Chairs: Allen Parkes, NSWC/Crane, Kurt Hartsough, NSWCCD

4:00 - 6:00
Lahaina Room

The panel shall present MIL-S-901 Shock Extension case studies that compare items that are identical or similar to previously shock tested and approved items, and to items identical to those previously approved on the basis of shock extension. In addition, the MIL-S-901 extension justification shall be discussed in depth to further enhance the knowledge base of this unique cost savings method for MIL-S-901 shock qualification.

Track Two

DoD Acquisition Processes
Chair: Jamie Howell, NSWC/DD

1:00 - 3:00
Bay Room

The new Department of Defense (DoD) 5000 series documents establish management policies with a simple and flexible approach for managing all DoD acquisition programs. They establish a flexible process that focuses on improved integration of requirements and acquisition processes, evolutionary acquisition strategies, disciplined technology development, interoperability, supportability, and affordability. The objective is to acquire quality products that satisfy user needs with measurable improvements to mission capability and operational support, in a timely manner, and at a fair and reasonable price. Mr. Kevin Ross Carman, Associate Dean for Outreach and Performance Support of the Defense Acquisition University, West Region will be the guest speaker for this session. In addition, a brief overview of the Navy's strategic vision - Sea Power 21- will be presented. In collaboration with the fleet and our nation's defense, the NAVSEA Team is currently applying the goals of Sea Enterprise resulting in necessary changes in ship system development and acquisition to better support joint and combined forces in the battlespace. These goals and anticipated changes are planned to be discussed. Mr. James E. Howell, III, of NSWCCD will provide this overview. The overall purpose of this session is to inform the Shock & Vibration community of current changes underway in the DOD acquisition process.

UAV's: New Requirements and Challenges for the S&V Community Panel
Chair: Dr. Robert Sierakowski, AFRL

3:20 - 5:20
Bay Room

This technical panel will discuss the potential role of unmanned aerial vehicles (UAV's) as a response to the modern asymmetric threat. An overview of UAV technology will be provided along with the requirements from the different services. The discussion will highlight technical challenges for UAV development and testing with an emphasis on shock and vibration issues. The panel discussions will include topics such as the use of UAV's in urban environments, micro aerial vehicles, scaling effects, mobility, fabrication, communications, power sources, swarms, etc.

Track Three

Human Shock Mitigation For High Speed Surface Craft
Chair: Dr. Ron Peterson, NSWC CSS

Pacific Room

- 1:00 **Human Shock Mitigation For High Speed Surface Craft** - Dr. Ron Peterson, Eric Pierce, NSWC/CSS
- 1:20 **Human Biodynamic Response To High Speed Craft Shock Loading** - Dr. Cameron Bass, Dr. Robert Salzar, Scott Lucas, Dr. L van Rooij, Dr. Walter Pilkey, University Of Virginia
- 1:40 **Analysis, Optimization, And Development Of A Specialized Passive Shock Isolation System For High Speed Planing Boat Seats** - Alan Klembczyk, Taylor Devices, Inc.; Michael Mosher, Tayco Developments, Inc.
- 2:00 **Shock And Vibration Data Collection And Analysis For Special Operations Craft** - Brian Price, Eric Tuovila, Jeff Blankenship, Coastal Systems Station, NSWC; Suzanne Hoffman, University of Michigan
- 2:20 **Shock Mitigation Tests On The MK V Special Operations Craft** - Jeff Blankenship, Pedro Braco, Brian Price, Dr. Ron Peterson, Coastal Systems Station, NSWC
- 2:40 **Biochemical Markers Of Musculoskeletal Status Associated With Shock Loading On Special Operations Craft** - Dr. James Hodgdon, Dr. Brandon Walsh, Naval Health Research Center; Dr. Anthony Hackney, University of North Carolina
- 3:00 **Shock Mitigation Of Small Craft Seat Occupants Utilizing Semi-Actively Controlled Dampers** - Bill Larkins, John LaPlante, Active Shock, Inc.

Concrete Design
Chair: Dr. Robert Hall, ERDC, Co-Chair: Denis Rickman (ERDC)

Pacific Room

- 3:40 **Mechanical Properties Of White Masonry Concrete** - Erin Williams; Dr. Stephen Akers, Paul Reed, US Army Engineer Research And Development Center

Wednesday Afternoon Continued

- 4:00 **Reinforced Concrete Slabs Subjected To Localized Impact** - Prof Ted Krauthammer, M. Zineddin, Protective Technology Center, The Penn State University
- 4:20 **Reinforced Concrete Shear Behavior Under Blast And Impact** - Prof Ted Krauthammer, R. M. Schoedel, M. Seltzer, Protective Technology Center, The Penn State University
- 4:40 **Effect Of Material Properties On Projectile Deceleration** - Dr. James O'Daniel; Dr. Donald Cargile, US Army Engineer Research And Development Center
- 5:00 **Shock Loading Experiments On Concrete** - Dr.-Ing. Nico Herrmann; Prof Josef Eibl; Prof Lothar Stempniewski, University of Karlsruhe

Track Four

Homeland Defense Technologies

Chair: Dr. Andrew Whittaker, State University of NY

Surf Room

- 1:00 **Hardening Facilities** - Gary Kehoe, Chief Security and Law Enforcement, North Atlantic Division, US Army Corps of Engineers
- 1:20 **SDOF Code Development For Analyzing Structural Systems Under Blast And Impact Loads** - Prof Ted Krauthammer, M. Frye, T. R. Schoedel, M. Selzer, Protective Technology Center, The Penn State University
- 1:40 **Macro And Micro Nonlinear Analysis Methods To Assess Progressive Collapse Potential In High-Rise Steel Frame Buildings As A Function Of Beam-To-Column Connection Behavior** - David Houghton, Jesse Karns, Myers, Houghton & Partners, Inc.
- 2:00 **Cladding-Structure Interaction Under Impact Loads** - Craig Starr, Prof Ted Krauthammer, Stacy Worley, Protective Technology Center, The Penn State University
- 2:20 **Performanced-Based Engineering of Building Structures** - Prof Andrew Whittaker, State University of New York; Ronald Hamburger, Simpson, Gumpertz and Hager; Craig Comartin; Comartin-Reis; Robert Bachman; Consultant; Christopher Rojahn, Applied Technology Council
- 2:40 **Modeling Air Blast on Thin-Shell Structures with Zapotec** - Dr. Greg Bessette, Dr. Courtenay Vaughan, Ray Bell, Sandia National Laboratories

Military Applications

Chair: Dr. Eric Kathe, US Army, RDECOM - Benét Laboratories

Surf Room

- 3:20 **Design Of Soldier's Protective Equipment: Recent Trends In Biomechanical Models And Comfort** - Alain Trameçon; Etienne Gai, ESI North America
- 3:40 **Development Of Mineblast Attenuating Seat For Military Ground Vehicle Applications** - Dr. Ken-An Lou; William Perciballi, Dick Zimmermann, Armorworks, Inc.
- 4:00 **Structural Response To Land Mines** - Laura Donohue; Dr. Rick Link, Martec, Ltd; Sheri Hlady, DRDC Suffield; Capt. Robert Durocher, DCDC Valcartier
- 4:20 **Air Explosion Analysis Of Naval Ship Considering Survivability** - Jae Hyun Kim, Dr. Hyung Chul Shin, Hyundai Heavy Industries Co., Ltd.; Dr.Myeong Gyu Park, Korea Maritime University
- 4:40 **Utilizing Computational Fluid Dynamics To Determine Blast Pressure Loading On Large Caliber Gun Systems** - Daniel Cler, US Army, RDECOM - Benét Laboratories
- 5:00 **AGS Barrel Motion During Firing: Experimental And Modeling Results** - Eric Petersen, United Defense LP
- 5:20 **Gun-Ride Simulation of a Surrogate 155 mm Guided Excalibur Artillery Projectile Using 3D Finite-Element Approach** - Dr. Mostafiz Chowdhury, Ami Frydman, US Army Research Laboratory

Track Five

Training

Chair: Joel Leifer (HI-TEST Laboratories)

Tropic Room

- 1:00 **Introduction to Data Acquisition - Part II** - Prof. Joshua Gordis, Naval Postgraduate School
- 2:00 **Force-Limited Random Vibration Testing** - Dan Worth, NASA/GSFC
- 3:00 **The Origins and Current Status of Rotor Dynamics** - Prof. Frederick Nelson, Tufts University
- 4:00 **Tutorial on Ballistic Shock in Armored Vehicles** - W. Scott Walton, US Army Aberdeen Test Center

Composite Response

Chair: Dr. James Baylot (ERDC)

Tropic Room

- 5:00 **Application Of The DYCOSS Failure Prediction Tool To Bonded Steel-GRP Joints Of An Integrated Mast** - Wim Trouwborst, TNO Building and Construction Research, Center For Mechanical and Maritime Structures

Wednesday Afternoon Continued

- 5:20 **Dynamic Analysis Of Glass-Fiber Composite Panel Under Blast Wave Loading, Including Progressive Material Damage Effects** - *Dr. Ki Kim, Joe Fries, US Army Research Laboratory*
- 5:40 **Firing Test Of A Composite Gun Tube Support For The Multi-Role Armament And Ammunition System** - *Dr. Andrew Littlefield, US Army, RDECOM - Benét Laboratories*
- 6:00 **Blast Resistant Characteristics of a New Laced-reinforcement Foam Core Sandwich Panel** - *Dr. Zhimin Tian, Technical Institute of Hydraulic Engineering; Prof Charles Dowding, Northwestern University*

Track Five & 1/2

IEST Working Group Meetings

**1:00 - 5:00
Ohana Room**

Working Groups sponsored by IEST are active Committees which are tasked with publishing and disseminating up-to-date reliable, technical information. These groups typically work towards publishing a Recommended Practice on a particular subject involving Dynamic Testing and Measurements. These groups include Industry, Government and Academic representatives and their work may result in improved ISO Standards. Your participation in these Working Groups is encouraged and solicited. A list of Working Group meetings to be held in conjunction with the 74th Shock and Vibration Symposium is shown below. Please plan to join us.

- 1:00 WG-DTE019: Vibration Controller Selection – Tony Keller, Chairman
- 2:00 WG-DTE022: Multi-shaker Testing and Control – Alan Kenny, Chairman
- 3:00 TBD
- 4:00 TBD

Track Six (Classified)

Payload & Sensors: Flexible Payload Module (Confidential)

Chair: Dawn Barasso, Electric Boat

Bldg A-33 Auditorium

The following six Flexible Payload Module (FPM) papers will be presented from 1:00 to 3:00, in a continuous manner. Each presentation will not necessarily be 20 minutes long. Since each presentation builds on the previous presentation, the audience is encouraged to attend the entire session. Limited clarification questions will be addressed following each presentation, with the majority of questions reserved for the final "discussion" presentation.

Flexible Payload Module (FPM) Overview - Dawn Barrasso, Electric Boat Corp.

Flexible Payload Module (FPM) - Concept Development - George Schmeelk, General Dynamics - Electric Boat

Flexible Payload Module (FPM) Material Characterization - David Russell, Electric Boat Corp.

Flexible Payload Module (FPM) Medium Weight Shock Testing - Roland Traylor, Jr., Electric Boat Corp.

Flexible Payload Module (FPM) Shock Isolation - George Schmeelk, General Dynamics - Electric Boat

Flexible Payload Module Summary Discussion - Dawn Barrasso, Electric Boat Corp.

Payload Interface Module/Payload Module Shock Environment Analysis Studies - Dawn Barrasso, Electric Boat Corp.

UNDEX Bubble Analysis (Confidential)

Chair: Dr. E Thomas Moyer, Northrop Grumman

Bldg A-33 Auditorium

- 3:40 **Use Of Bubble Jetting For Antitorpedo Ship Defense** - *Dr. Kit-Keung Kan, Dr. Philemon C. Chan, Jaycor/Titan*
- 4:00 **Evaluation Of UNDEX Bubble Models For Submarine Applications** - *Christopher Abate, Electric Boat Corp.*
- 4:20 **Another Look At UNDEX Bubble Loads** - *Dr. E. Thomas Moyer Jr., Sean Murphy, Northrop Grumman Ship Systems*
- 4:40 **Simulations of The Response Of Thin-Walled Structures To UNDEX Shock And Bubble Jet Loading** - *Dr. J. Alan Luton, Dr. Andrew Wardlaw, NSWC/Indian Head*
- 5:00 **Computational And Experimental Results For A Divided Hopkinson Bar** - *Dr. Vesta Bateman; Fred Brown, Michael Nusser, Kenneth Gwinn, Sandia National Laboratories*
- 5:20 **Scaling of the Re-Entering Jet Parameters of an Underwater Explosion Bubble below Floating and Submerged Structures** - *Dr. G. L. Chahine, R. Annasami, C-T. Hsiao, Dynaflo, Inc.; Greg Harris, NSWC/IH*

UNDEX I (Confidential)

Chair: George Camp, Bath Iron Works

Bldg A-33 Conference Center

- 2:00 **MIL-S-901D Extension Of Shock Qualification For A Ship Mounted Non-Isolated Structure** - Brett Werner, NSWC/Crane; Mark Steudel, Jens Ortendahl, Raytheon; Stanley Williams, NSWC/Crane
- 2:20 **Test and Simulation of Underwater Shockwave Propagation of Surface and Near Surface Explosions** - Yungchia Chen, Wayne Thomas, Morgan Eash, NSWC/CD
- 2:40 **Shock Analysis of Aircraft Carrier Composite Mast Structure** - Chris Rodgers, Northrop Grumman Newport News
- 2:50 **Method for Determining Survivability of a Fluid Filled Tank** - Jim Gardner, Northrop Grumman Newport News
- 3:00 **Carrier Whole Ship Modeling Efforts** - Kevin Arden, Northrop Grumman Newport News

UNDEX II (Confidential)

Chair: Bob Marshall, Northrop Grumman Newport News

Bldg A-33 Conference Center

- 3:30 **An Acceleration Based Energy Model for Fragility of Rafted COTS Electronics Under Navy Specific Shock Loading** - Eric Luft, William Richardson, NSWC/ Carderock
- 3:50 **Composite Structure Static and Underwater Shock Analyses: A Comparison of Finite Element Code Performance Capabilities** - Jennifer Marr, Steven Rutgerson, NAVSEA Carderock; Dr. K.K. Chan, Kenneth Stultz, Dr. Raymond Daddazio, Weidlingers Associates
- 4:10 **Method of Determining Shock Continuity through Platform Structure Supporting Large Foundations** - Sarah Staggers, Northrop Grumman Newport News
- 4:20 **Technology Needs Assessment For Integrating External Implodable/Explodable Volumes In Submarine Design** - Alan White; Christopher Abate, Electric Boat Corp
- 4:40 **Development Of A Shock Characterization For A Full Scale Isolator Using Parsing** - Dr. David Russell, Electric Boat Corp.
- 5:00 **Data Processing For The Parsing Demonstration Test** - Kathleen Lincoln; Dr. David Russell, Electric Boat Corp.

Wednesday Evening, October 29

SAVIAC Technical Advisory Group Open Meeting

6:00 - 7:00

Bay Room

This is your opportunity to provide feedback to the SAVIAC leadership on items of importance to you. If you have an idea of a new product or service SAVIAC should provide or just want to comment on the Symposium programming, you will find a platform here. Join us prior to the Social event for an hour of spirited discussion. This meeting replaces the Thursday afternoon open TAG meeting of past Symposia. The TAG meeting is by invitation only. See Joel Leifer if you are interested in becoming a member of the TAG.

Social Event - All are invited

7:00 - 9:00

Pavilion

Thursday Morning, October 30

Registration

7:00 - 12:00

Conference Center Lower Level

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

Chair: Jeff Morris, HI-TEST Laboratories

7:00 - 7:30 a.m.

Tropic Room

Track One**MIL-S-901D Subsidiary Component & Alternate Test Vehicle
Co-Chairs: Jamie Howell, NSWCCD & Kurt Hartsough, NSWCC****8:00 - 10:00
Lahaina Room**

The panel will discuss machines and methods to test subsidiary components. Subsidiary components are items which are the major parts of a principal unit. The shock response of the subsidiary component is significantly affected by that of the associated principal unit and all associated subsidiary components. The shock response of the associated principal unit and all associated subsidiary components are significantly affected by that of the subsidiary component. Examples are the diesel engine of a diesel-generator set, the electric motor of an air conditioning unit, or the power supply section of a radio transmitter. The panel will discuss subsidiary component shock test vehicles and methods. The pros and cons of test vehicles will be discussed as well as limitations of the test vehicles. Subsidiary component test environments will also be discussed. Subsidiary components are items which are the major parts of a principal unit. The shock response of the subsidiary component is significantly affected by that of the associated principal unit and all associated subsidiary components.

Shock Test Methods**Chair: Rick Griffen, NGNNS, Co-Chair, Joe Venne, NSWC/Carderock****Lahaina Room**

- 10:20 **A Comparison of Shock Analyses of a COTS Cabinet on an FSP Deck Simulator** - James Patterson, Dr. Rudolph Scavuzzo, University of Akron
- 10:40 **Barge Shock Simulator** - John Maltby, SPAWAR Systems Center
- 11:00 **Fixture Design Examples and Evaluation** - Dennis Harshman, NSWC Crane Division
- 11:20 **Barge Rolling Motion Effects On Floating Shock Platform Using Multi-DOF Analysis** - Mark Ott, Enidine, Inc.
- 11:30 **MCE Shock Pedigree - The Origin, the Foundation, the Result** - Roger Smith, NSWC Crane Division
- 11:40 **Excitatory Potential Density, A Time Domain Metric For Assessing Shock Tests** - Rick Griffen, Northrop Grumman Newport News
- 12:00 **The Intermediate Capacity Floating Shock Platform (IFSP)** - B. Christopher Grunau, HI-TEST LABORATORIES, INC.

Track Two**Ship Shock Modeling And Simulation I****Bay Room****Chair: Prof Young Shin, Naval Postgraduate School, Co-Chair: Steve Rutgeron, NSWC/CD**

- 8:00 **Shock Trial Simulation For Naval Ships** - CAPT David H. Lewis, USN, Constantine Constant, CDR Jeffery S. Riedel, USN, NAVSEA
- 8:40 **Development of the DDG 81 Full Ship Shock Simulation Model** - M. J. Harrington, T. R. Zimmerman, Gibbs & Cox
- 9:00 **Ship Shock Trial Simulation Of USS Winston S. Churchill (DDG81): Modeling And Simulation Strategy** - Prof Young Shin, Lt Nathan Schneider, Naval Postgraduate School
- 9:20 **Ship Shock Trial Simulation Of USS Winston S. Churchill (DDG81): Parametric Studies Of Surrounding Fluid Volume** - Lt Nathan Schneider, Prof Young Shin, Naval Postgraduate School
- 9:40 **Uncertainty Analysis In Ship Shock Modelling And Simulation** - Prof Roger Ghanem, Sonjoy Das, Johns Hopkins Univ

Ship Shock Modeling And Simulation II**Bay Room****Chair: Prof Young Shin, Naval Postgraduate School, Co-Chair: Steve Rutgeron, NSWC/CD**

- 10:20 **An Investigation of Shipboard Structural Damping in DDG 81 Using Full Ship Shock Trial Data** - Steve Rutgeron, NSWC/CD/UERD
- 10:40 **Damping Modeling Strategy For Naval Ship System** - Prof Young Shin, Naval Postgraduate School
- 11:00 **Infinite Elements Using Explicit Time Integration For Undex Simulations** - Dr. Jeff Cipolla, Dr. Arghya Deb, Dr. Joop Nagtegaal ABAQUS, Inc.
- 11:20 **Modeling And Simulation Of Explosion Bubble Dynamics And Its Effect On Submerged Structure** - Kin Chew Hung, C. Wang, E. Klaseboer, Institute Of High Performance Computing, B. C. Khoo, National University of Singapore
- 11:40 **Digital Filtering Scheme For Transient Response Data** - Prof Young Shin, I. B. Ham, Naval Postgraduate School

Track Three

Vibration - Numerical Methods

Chair: Ami Frydman, ARL, Co-Chair: Dr. Paul Franklin, BIW

Pacific Room

- 8:00 **Frequency Domain Nonlinear System Identification For A Two Degree Of Freedom System** - *Dr. Ronald Merritt, NAVAIR Warcenter*
- 8:20 **A Procedure For The Analysis Of Flight Vibration Data** - *Jerome Cap, John C De Baca, Sandia National Labs*
- 8:40 **On The Use Of Digital Filters For Mechanical System Simulation** - *Prof Kjell Ahlin, Blekinge Institute Of Technology*
- 9:00 **An Approximation For The Generation Of A Nonstationary Random Transient From A Two Dimensional Time-Frequency Spectrum** - *David Smallwood, Consultant; Dr. Thomas Paez, Sandia National Laboratories*
- 9:20 **Shock And Vibration Testing Using A High Frequency 6-Dof Hydraulic Shaker Table** - *Filip De Coninck, Prof. Wim Desmet, Prof Paul Sas, Davis Vaes, Kuleuven*
- 9:40 **Output-Only Damage Detection Using Forward Prediction Error** - *Tim Edwards, NSWC/Dahlgren*

Test Methods/Requirements

Chair: Mike Campbell, NSWC/CD/UERD

Pacific Room

- 10:20 **Seismic Equipment Qualification: Translating Lateral Force Procedures Into Dynamic Testing Protocols** - *Jeff Gatscher, ; Phillip Caldwell, Square D/Schnieder Electric; Robert Bachman, Past Chair, BSSC TC8*
- 10:40 **Navy Surface Combatants Temporary Test Installation Design Requirements** - *Jefferey Giesecke, James Gentry, Lockheed Martin*
- 11:00 **Dynamics Of Structures And Development Of Measurement Technique Of Quickly Proceeding Processes In A Changing Centrifugal Field.Part I: About Measurements Impulsive Deformations In Elastic Waves** - *Dr. George Abramchuk, Consultant; Kristina Abramchuk, University of Toronto*
- 11:10 **Simulating The Dynamic Environment Of A Medical System Component** - *Zeev Sherf, A. Katz, P. Hopstone, A. Manor: RAFAEL; S. Bros, Y. Kanfi: ELGEMS*

Track Four

Vibration-Test And Application I

Chair: Dr. Andrew Littlefield, US Army, RDECOM - Benét Laboratories

Surf Room

- 8:00 **Pendulum Testing In Support Of Guidelines For Airfield Frangibility Zones** - *Sharon Garner; Vincent Chiarito; James Ray, US Army ERDC*
- 8:20 **Applying Coordinate Transformations To Multi Degree Of Freedom Shaker Control** - *Dr. Marcos Underwood; Tony Keller, Spectral Dynamics, Inc.*
- 8:40 **Multi-Shaker Control To Create A Six Degrees-Of-Freedom Vibration Environment** - *Dr. Bart Peeters, Ir. Jan Debille, Ir. Filip De Coninck, LMS International*
- 9:00 **Operational Ground Test - A New Approach to Munitions Testing** - *Rebecca Lenz, Chicken Little Joint Project Office*

Vibration-Test And Application II

Chair: Jennifer Marr, NSWC/Carderock

Surf Room

- 9:30 **Improvements in Accelerometer Calibration Using Fringe Counting and Minimum Point Methods** - *Bev Payne, National Institute of Standards and Technology*
- 9:50 **Microwave Component Repair Environmental Stress Screening** - *Randall Wood, Allen Parkes, NSWC Crane Division*
- 10:10 **Detrimental Chemical Interaction between Materials during High Frequency Vibration** - *Dr. Nancey Maegerlein, John Fassino, NSWC/Crane Division*
- 10:30 **Review of Flight and Ground Vibration Test Data in Support of the MK-84 Air and GBU-10 Fin Failures When Carried On the PIDS/3 Pylon** - *Roque Salas, Avionics Test and Analysis Corporation*
- 10:50 **The Calculation of Random Dynamic Loads in Rocket Engine Systems** - *Dr. Eric Christensen, Jeff Oliver, SAIC, Greg Frady, Dr. Andy Brown, Karen Oliver, NASA/MSFC*

ASA Sponsored Session: **11:30 - 12:30**
Development of a Standard for Equipment in a Rugged Shock Environment Discussion Group
Leader: Jennifer Marr, NSWC/Carderock **Surf Room**

Accredited Standards Committee S2, Mechanical Vibration and Shock, has approved the formation of a new working group to begin working to develop a new American National Standard dealing with shock test requirements for equipment, electronic and non-electronic. The goal is to develop a standard to define minimum qualification test requirements for rack and shelf mounted electronic systems and other systems such as personal computers, data analyzers, and similar equipment purchased by industrial and government customers who require a predefined level of shock ruggedness for their applications. This standard is to be widely applicable, therefore, experts from all related fields are encouraged to participate in the working group. This session will 1) discuss the goals of a new commercial shock standard for rugged environments, and 2) recruit members of the working group that will contribute to the standard development. Topics of discussion will include: potential common ruggedized environments given current shock isolation technology; potential challenges in bridging shock environments to testing capabilities/limitations (including cost, common machine capability/availability); and bridging user requirements (ex. acceptance criteria) to common vendor level specifications. Those interested in this standard are strongly encouraged to attend, if not to join the working group, then to contribute their industry expertise to the discussion.

Track Five

Damping And Isolation **Tropic Room**
Chair: Dr. Ray Daddazio, Weidlinger Associates

- 8:00 **Modal Evaluation Of A Typical Lower Heavy Machinery Deck Supporting A Shock Isolated System** - Sarah Stagers, Northrop Grumman Newport News
- 8:20 **Damping Estimation Of A Cast Aluminum Structure** - Fadil Mert Sasoglu, Tennessee Technological University; Dr. Caner Demirdogen, Fleetguard; Dr. Sally Pardue, Tennessee Technological University
- 8:40 **Mega Brace Seismic Dampers For The Torre Mayor Project At Mexico City** - Douglas Taylor, Taylor Devices, Inc.
- 9:00 **An Application Of Active Control Theory To A Passive Isolation System: Launch Boom Retraction Mechanism** - Michael Mosher, Taylor Devices, Inc.
- 9:20 **Crusader Platform Stability Analysis For The 40 Ton Self-Propelled Howitzer (SPH)** - Jerry Chang, United Defense, L.P.

Track Six (Classified)

Military Blast I (Limited Distribution) **Bldg A-33 Auditorium**
Chair: Dr. Eric Rinehart, DTRA

- 8:00 **Effect Of Vehicle Bottom Floor Shapes On Mine-Blast Loading** - Dr. Aaron Gupta, Army Research Laboratory
- 8:20 **Airblast Field From An Explosive Charge Surrounded By Casing Of High Mass But Low Mechanical Strength** - Dr. Alan Ohrt, Wayne Richards, Air Force Research Lab
- 8:40 **Measured Airblast Fields From Sub-Scale Cased Munitions Of Different L/D Ratio** - Robert Britt, SAIC; Dr. Alan Ohrt, Air Force Research Lab
- 9:00 **Results From 1/4-Scale Structure-Medium-Interaction Experiments On Damaged And Undamaged Structures** - Dr. Jon Windham; Bruce Phillips; Denis Rickman; Dr. Donald Cargile, US Army Engineer Research & Development Center

Military Blast II (Limited Distribution) **Bldg A-33 Auditorium**
Chair: Dr. Reed Mosher, USAERDC

- 9:40 **Application Of Structural Failure Methodologies To STMG Targets Using The Airburst Module** - Atris Ray, Robert Britt, Van Le, SAIC; Dr. Alan Ohrt, Air Force Research Lab
- 10:00 **Fragment Velocities For A Scaled Charge: A Comparison Of Test Data And Conwep Predictions** - Paul Graham, US Army Engineer Research & Development Center; Leo Stockham, Northrop Grumman Information Technology; Dirk Plante, Defense Threat Reduction Agency
- 10:20 **Penetration Of Urban Construction Materials By Indirect Fire Weapons** - Rayment Moxley; Dr. Donald Cargile, US Army Engineer Research And Development Center
- 10:40 **Computer Network Response To Blast From Internal Detonations** - Ernest Staubs, Air Force Research Laboratory

Thursday Morning Continued
Track Seven (Classified)

Homeland Security For Civil Infrastructure (Limited Distribution) Bldg A-33 Conference Center
Chair: Dr. G. Will McMahon, USAERDC, Co-Chair: Charles Joachim, USAERDC

- 8:00 **Results Of Water Shock Tests On Model-Scale Tainter And Miter Gates** - Charles Joachim, C. T. Sullivan, G. W. McMahon, US Army Engineer Research & Development Center; R. E. Walker, Alpha to Omega
- 8:20 **Blast Effects On Dams, Historical Perspective** - L.K. Davis, US Army Engineer Research & Development Center
- 8:40 **Mitigation Of Embankment Cratering From Truck Bombs** - Denis Rickman, US Army Engineer Research & Development Center
- 9:00 **Modeling Explosion Near The Water Surface With Experiments And REFMS And SAGE Codes** - James Britt, SAIC, C. E. Joachim, C. T. Sullivan, US Army Engineer Research & Development Center
- 9:20 **Computational Analysis Of Explosive Damage To Steel Gates** - Dr. James O'Daniel, US Army Engineer Research & Development Center
- 9:40 **AT Planner For Dams** - William H. Hossley, US Army Engineer Research & Development Center

Intunnel Blast (Limited Distribution)

Chair: Dr. Al Ohrt, AFRL

Bldg A-33 Conference Center

- 10:20 **In-Tunnel Pressure Measurements For A Sub-Scale Tunnel Test Facility** - Dr. Susan Babcock, Applied Research Associates; Dr. Edward Tremba
- 10:40 **Blast Door Response In Tunnels From Portal Detonations** - Dr. Will McMahon, US Army Engineer Research & Development Center; Bruce Patterson, Air Force Research Lab
- 11:00 **In-Tunnel Airblast From Near Portal Detonations** - Charles Joachim; Charles Ertle, Byron Armstrong, US Army Engineer Research & Development Center; Robert Britt, SAIC

Thursday Afternoon, October 30

SAVIAC Technical Advisory Group Meeting

Friday Morning, October 31

Tour of Endevco

This tour will last approximately 8:30 a.m. - 2 p.m., including travel time. Buses will be provided for transportation to and from the hotel, or you can drive yourself. A mexican-style lunch will be available at the end of the tour, compliments of Endevco Corp. Tour attendees will be able to take a look at Endevco's calibration laboratory, sensors, MSA - MAG, PE - cables, medical, electronics, VC, and pressure facilities. Pre-registration is required to assure space, so please sign up for this tour on your Registration Form.

Guest Program

CITY TOUR - SAN DIEGO OLD & NEW - Tuesday, 10:00 AM - 3:00 PM, Cost \$45.00 - Drive through of Gaslamp Quarter, etc. (Mini City Tour), visit Seaport Village (Free time to shop), Balboa Park, Lunch at The Prado in Balboa Park, arrive at B Street Pier for a (1) Hour public harbor cruise, return to Hotel, Cost includes cruise, bus transportation and lunch.

LA JOLLA - JEWELS BY THE SEA - Wednesday, 10:00 AM - 3:00 PM, Cost \$50.00 - Visit Birch Aquarium at Scripps, Narration of La Jolla during drive, stop at Children's Pool area to see the sea lions, Lunch at Azul, free time to shop and explore La Jolla, Return to Hotel. Cost includes aquarium, bus transportation and lunch.

Tutorial Descriptions

Sunday, October 26

Basic Concepts of Digital Data Acquisition for Shock and Vibration Testing

Strether Smith

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.

Performing DDAM Analysis Using MSC.Software products

Bart McPheeters

A short primer showing both the basics and advanced procedures for using MSC.Nastran to perform DDAM analyses. This will include basic run procedures and setting up an input deck, Nastran options, and more advanced capabilities such as mode-by-mode output, specific modal selection, and single run capability. We will talk about using the intermediate Fortran program, and some of the options available there, including metric units and user-defined spectra. There will be a discussion of post-processing Nastran results, including some of the common pitfalls, and ways to effectively visualize the output data. It will also include a section on setting up the model to run using the new MSC.FEA+DDAM capability.

The Navy Shock Qualification Process

Kurt Hartsough

The Naval Surface Warfare Center Carderock Division Philadelphia (NSWCCD SSES) Code 623 is NAVSEA 05P3's Delegated Approval Authority (DAA) for MIL-S-901D Surface Ship Shock. As the DAA, Code 623 is responsible for review and approval of all Government Furnished Equipment and all Heavyweight tested equipment. In addition, NSWCCD SSES Code 6202 is the NAVSEA 05P3 DAA for all analysis and DDAM approvals. NSWCCD SSES Codes 623 and 6202 will be presenting the Navy's Shock Qualification Process as detailed in NAVSEAINST 9072.1A. This course will cover in detail the responsibilities of all Navy organizations. It will cover in detail the documentation requirements for a successful shock qualification program. This includes technical policy requirements, the requirements for waivers, deviations and deficiencies and a detailed explanation of the shock qualification approval process. This is an expanded version of what was covered in the Navy Shock Qualification Approval Process course last year without covering MIL-S-901D. Who should attend? Attendees should include anyone involved in the acquisition, specification, review and approval of Navy shipboard equipment including PARMs and LCMs and contracting officers, contractors having to deal with the Navy and wishing to supply shock qualified equipment to the Navy, Ship Program Managers and Ship Logistic Managers responsible for the acquisition and maintenance of shock hardened Navy ships and shock qualification test facilities.

Designing Measurement System Transfer Functions for Dynamic Testing

Chuck Wright

This tutorial is for working engineers and managers whose job is to deliver or assess structural dynamics test data to assure validity. Topics covered include: Simple and more complex system components; the amplitude portion of the transfer function; the often neglected phase portion; step responses; using resonant components; real world examples; building system level transfer functions from components with examples; system linearity; design rules for both waveshape and spectral reproduction; proper acceptance and interval testing of data acquisition systems.

Dynamic Design Analysis Method (DDAM)

Dave Weinberg

A technical discussion reviewing normal modes analysis, modal effective mass, traditional shock spectrum methods, and background to Dynamic Design Analysis Method. Simple and complex examples will be covered.

MIL-S-901D Shock Qualification Testing and Extensions

Kurt Hartsough & Domenic Urzillo

The Naval Surface Warfare Center Carderock Division Philadelphia (NSWCCD SSES) Code 623 is NAVSEA 05P3's Delegated Approval Authority (DAA) for MIL-S-901D Surface Ship Shock. As the DAA, Code 623 is responsible for review and approval of all Government Furnished Equipment and all Heavyweight tested equipment. In addition, NSWCCD SSES Code 6202 is the NAVSEA 05P3 DAA for all analysis and DDAM approvals. NSWCCD Codes 623 and 6202 will be presenting the requirements for Shock Qualification Testing and Analysis as detailed in NAVSEAINST 9072.1A, MIL-S-901D and NAVSEA 0908-LP-

000-3010 Rev 1. This course will concentrate on MIL-S-901D test requirements and how the DDAM requirements in NAVSEA 0908-LP-000-3010 fit into the shock qualification process of equipment. This course will include a detailed explanation of the test requirements as stated in MIL-S-901D and as interpreted by NAVSEA 05P3. Shock qualification testing of principal units, shock qualification by extension of principal units and shock testing of subsidiary components will be covered. This is an expanded version of what was covered in the Navy Shock Qualification Approval Process course last year without covering NAVSEAINST 9072.1A. Who should attend? Attendees should include anyone involved in the acquisition, specification, review and approval of Navy shipboard equipment including PARMs and LCMs and contracting officers, contractors having to deal with the Navy and wishing to supply shock qualified equipment to the Navy, Ship Program Managers and Ship Logistic Managers responsible for the acquisition and maintenance of shock hardened Navy ships and shock qualification test facilities.

Introduction to Vibration Testing

Jon Wilson

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.

An Introduction to ABAQUS

Jeff Cipolla

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.

Monday, October 27

Bad Data Look Just As Believable As Good Data: Plan Your Measurement System To Tell The Difference

Pete Stein

During the measurement of static or dynamic quantities, well calibrated measurement systems may produce believable outputs that are, in fact, total, certified, unadulterated garbage as will be illustrated by demonstrations and numerous case studies drawn from real life. It is possible to design and plan measurement systems and procedures to validate acquired data during the data acquisition process. The Unified Approach to the Engineering of Measurement Systems, developed by the lecturer, is such a procedure.

UNDEX and Acoustics Analysis Using ABAQUS

Jeff Cipolla

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.

Overview of Underwater Shock and DDAM

Young Shin

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.

Structural Detailing for Blast Resistance

Ted Krauthammer

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.

Calibration, Maintenance, and Operation of the Lightweight and Medium Weight Shock Machines

B. Christopher Grunau & Jeffery A. Morris

This course provides a detailed, hands-on overview of the calibration, maintenance, and operation of the Lightweight Shock Machine and the Medium Weight Shock Machine. This class is tailored for those who are technical operators of the lightweight and medium weight shock machines. The course covers the rules and guidelines of machine operation, according to MIL-S-901D(NAVY) standards, routine maintenance procedures, and required machine calibration procedures.

The Measurement of Meaningful Shock & Vibration Data

Patrick Walter

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.

Using Contact Surface Elements in FEA

Dave Weinberg

A technical discussion on advantages of general 3D contact, general background to surface contact in NE/Nastran, setup of simple contact analysis in NE/Nastran and FEMAP, impact analysis using contact, forming analysis using contact, and usage of contact surfaces in static analysis.

Application of the USA Code to Underwater Shock Problems

John DeRuntz

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.

Substructure Coupling and Structural Modification for Shock & Vibration

Joshua Gordis

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.

Validation and Editing of Shock & Vibration Data

Allan Piersol

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.

Vibration And Shock Test Fixture Design, Fabrication And Evaluation

Wayne Tustin

Usually fabricated from magnesium or aluminum for lightness with rigidity, a fixture adapts the mounting provisions of a device under test (DUT) to the armature of a shaker (for vibration testing) or to the table or anvil of a shock test machine (for shock testing). In a sense, the DUT side of the fixture attempts to "represent" the hardware to which the DUT will attach in service. This tutorial will examine that goal and various design and fabrication approaches to achieving that goal. Prior to first use, a new fixture should be evaluated experimentally. During use, DUT-fixture and fixture-shaker or fixture-shock test machine bolting is critical. Between tests, the fixture should be stored properly.

Naval Shock Analysis and Design

Rudy Scavuzzo

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 be on 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.

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

Dave Smallwood

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.

Navy Shock Database User Certification

Paul Medeiros & Kurt Hartsough

The Navy Shock Data Base (NSDB) is mandated by NAVSEAINST 9072.1A. In accordance with NAVSEAINST 9072.1A, it is managed by NAVSEA 05P3 and maintained by Naval Surface Warfare Center Carderock Division Philadelphia (NSWCCD SSES) Code 623. The NSDB is a compilation of shock hardness requirement by ship or ship class and a compilation of equipment shock qualification status for both Contractor Furnished Equipment and Government Furnished Equipment. Recent security issues and data integrity issues were the caused of a major overhaul of the NSDB. In order to maintain security and data integrity of the NSDB, this course will be required by any persons requesting read/write access to the NSDB. Those persons requiring read/write access include PARM/LCMs, NAVSEA PEOs, ship builders and contractor support for those activities. Although this course is not required for persons requesting read only access, it is recommended so that they fully understand the working of the data base and can take full advantage of the data in the data base. This will be the first time this course has been offered and it is expected that additional course offerings will be made as the need arises.



invites you to attend the

75th Shock & Vibration Symposium

October 17-22, 2004

**Cavalier Hotel
Virginia Beach, VA**

featuring

Naval Surface Warfare Center Dahlgren Division

(poc Jamie Howell/Bob Keen)

Northrop Grumman Newport News

(poc Travis Kerr)

PCB Piezotronics, Inc.

(poc John Sullivan)

important dates

Abstracts Due: June 3, 2004

Notification of Acceptance: July 16, 2004

Papers Due: October 8, 2004

for more information visit our web site, www.saviac.org

