83rd Shock and Vibration Symposium

New Orleans | November 4-8, 2012

CONFERENCE PROGRAM

SAVE
SHOCK & VIBRATION
EXCHANGE

Huntington
Ingalls
Industries

HI-TEST
Laboratories, Inc.

Introduction

Welcome to New Orleans and the 83rd Shock and Vibration Symposium!

Since the first meeting in 1947, the Shock and Vibration Symposium has become the oldest continual forum dealing with the 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 now provides a valuable opportunity for the technical community in government, private industry, and academia to meet and discuss research, practices, developments, and other issues of mutual interest.

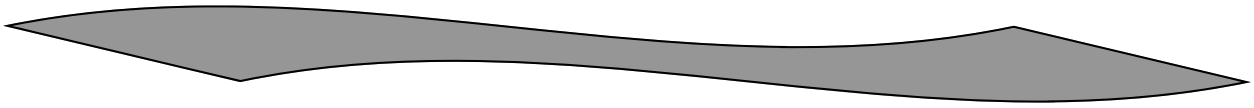
We are pleased to present **Huntington Ingalls Industries** as the featured organization for this year's symposium. The symposium is presented by HI-TEST Laboratories and The Shock and Vibration Exchange.

Huntington Ingalls Industries

Huntington Ingalls Industries (HII) designs, builds and maintains nuclear and non-nuclear ships for the U.S. Navy and Coast Guard and provides after-market services for military ships around the globe. For more than a century, HII has built more ships in more ship classes than any other U.S. naval shipbuilder. Employing nearly 38,000 in Virginia, Mississippi, Louisiana and California, its primary business divisions are Newport News Shipbuilding and Ingalls Shipbuilding.

***Ingalls Shipbuilding**, a division of Huntington Ingalls Industries, builds highly capable warships for the surface Navy fleet, U.S. Coast Guard, U.S. Marine Corps and foreign and commercial customers. For more than 70 years, the more than 18,000 employees of Ingalls Shipbuilding facilities have pioneered the development and production of technologically advanced, highly capable warships for the surface Navy fleet, U.S. Coast Guard, U.S. Marine Corps, and foreign and commercial customers. Ingalls Shipbuilding in Pascagoula, with 800 acres and 11,000 employees, is the largest manufacturing employer Mississippi and a major contributor to the economic growth of the state.*

***Newport News Shipbuilding,** a division of Huntington Ingalls Industries, is the nation's sole-industrial designer, builder and refueler of nuclear-powered aircraft carriers and one of the only two shipyards capable of designing and building nuclear-powered submarines. For 126 years, Newport News Shipbuilding has carried on the legacy of American shipbuilding, building some of the most famous ships in American naval history with a diverse workforce of craftsmen, engineers and scientists. With 21,000 employees, HII-NNS is the largest industrial employer in Virginia.*



83rd Shock and Vibration Symposium Committee

Mr. Ed Alexander (BAE Systems)
Mr. Austin Alvarez (General Dynamics Electric Boat)
Mr. James Breault (Lansmont Corp.)
Mr. Will Cobb (HI-TEST Labs)
Mr. Frederick Costanzo (NAVSEA Carderock)
Ms. Alicia D'Aurora (HII-NNS)
Mr. Tim Edwards (Sandia National Labs)
Mr. Pete Filkins (IDA)
Mr. Ami Frydman (ARL)
Mr. Bill Gregory (HI-TEST Labs)
Mr. Greg Harris (NAVSEA Indian Head)
Mr. Kurt Hartsough (NAVSEA Philadelphia)
Mr. Thomas Julian (OSD, DOT&E)
Dr. Sam Kiger (Univ. of Missouri)
Mr. Bob Krezel (HII-NNS)
Mr. Herb LeKuch (ShockTech/901D)
Mr. Bob Metz (PCB Piezotronics)
Mr. Jeffrey Milburn (NUWC Newport)
Dr. Tom Moyer (NAVSEA Carderock)
Mr. Sean Murphy (HII-Ingalls)
Mr. Drew Perkins (HI-TEST Labs)
Mr. Mike Poslusny (NTS)
Mr. John Przybysz (IDA)
Mr. Henry Pusey (HI-TEST Labs)
Mrs. Ashley Shumaker (HI-TEST Labs)
Mr. Ernie Staubs (AFRL.RWWL)
Mr. Neil Stout (HI-TEST Labs)
Ms. Margaret Tang (Weidlinger Assoc)
Mr. Roland Trailor (General Dynamics Electric Boat)
Mr. Bill Yancey (HI-TEST Labs)
Ms. Lauren Yancey (HI-TEST Labs)

PROGRAM OVERVIEW / DAILY OUTLINE / TOC

INTERNET CAFE	
Room: Poydras	
HOSTED BY: WEIDLINGER	
Sunday, Nov 4	12PM—8PM
Monday, Nov 5	7AM—8PM
Tuesday, Nov 6	7AM—8PM
Wednesday, Nov 7	7AM—7PM
Thursday, Nov 8	7AM—12PM

EXHIBIT HALL SCHEDULE **(Exhibitors Listed on Page 30-37)**		
Monday, Nov 5	*Setup*	*3:00PM—10:00PM*
Tuesday, Nov 6	Exhibit Hall Open	11:00AM—5:00PM
	Exhibitors' Luncheon	11:30AM—1:00PM
	Session Break—PM	3:00PM—3:40PM
Wednesday, Nov 7	Exhibit Hall Open	7:30AM—5:00PM
	Session Break—AM	9:40AM—10:00AM
	Session Break—PM	3:00PM—3:40PM
	Dismantle	*5:00PM—10:00PM*

REGISTRATION	
Sunday, Nov 4	9AM—6PM
Monday, Nov 5	7AM—6PM
Tuesday, Nov 6	7AM—6PM
Wednesday, Nov 7	7AM—6PM
Thursday, Nov 8	7AM—12PM

FOOD & BEVERAGE EVENTS

All Symposium Attendees Welcome at All Events / Symposium Guests Welcome at Wednesday Evening Social

Monday, November 5th

• Welcome Reception	7:30pm—9:30pm	Armstrong Ballroom

Tuesday, November 6th

• Continental Breakfast	7:00am—8:00am	Napoleon Ballroom Foyer
• Exhibitors' Luncheon	11:30am—1:00pm	Napoleon Ballroom / Exhibit Hall

Wednesday, November 7th

• Continental Breakfast	7:00am—8:00am	Napoleon Ballroom Foyer
• Symposium Luncheon	Noon—1:00pm	Napoleon Ballroom / Exhibit Hall
• Symposium Social Event	7:00pm—10:00pm	Offsite

Thursday, November 8th

• Continental Breakfast	7:00am—8:00am	Napoleon Ballroom Foyer
• S&V Committee Meeting (Invt. Only)	2:00pm—3:30pm	Oak Alley

Welcome Reception

Monday, Nov. 3 • 7:30pm—9:30pm • Armstrong Ballroom

Sponsored by: National Technical Systems & HI-TEST Laboratories

Exhibitors' Luncheon

Tuesday, Nov. 4 • 11:30am—1:00pm • Napoleon Ballroom (Exhibit Hall)

Sponsored by: 83rd Shock & Vibration Symposium Exhibitors

Symposium Luncheon

Wednesday, Nov. 5 • Noon—1:00pm • Napoleon Ballroom (Exhibit Hall)

Sponsored by: General Dynamics Electric Boat & HI-TEST Laboratories

Symposium Social on the *Creole Queen* Paddlewheeler

Wednesday, Nov. 5 • 7:00pm—10:00pm (Boarding from 7pm-7:45pm)

Sponsored by: National Technical Systems, PCB Piezotronics & HI-TEST Laboratories

SUNDAY (NOVEMBER 4)

Symposium Tutorials

(Additional Fees Apply to Attend Tutorials)

Tutorial Session 1

Time	*Tutorial & Presenter(s)*	*Meeting Room*
1:00 - 4:00	**MIL-S-901D Shock Qualification Testing** Mr. Kurt Hartsough & Mr. Domenic Urzillo	***Bayside A***
	Introduction to Hazard-Based Reliability Analysis Dr. George Lloyd	***Bayside B***
	Shock Response Spectra & Time History Synthesis Mr. Tom Irvine	***Bayside C***
	Airborne Stationary & Non-stationary Store Vibration Simulation Conditions Definition Mr. Zeev Sherf	***Gallier AB***

Tutorial Session 2

Time	*Tutorial & Presenter(s)*	*Meeting Room*
4:30 - 7:30	**MIL-S-901D Shock Qualification Testing Extensions** Mr. Kurt Hartsough & Mr. Domenic Urzillo	***Bayside A***
	Introduction to Vibration Testing Mr. Jon Wilson	***Bayside B***
	Introduction to Pyroshock Testing Dr. Vesta Bateman	***Bayside C***
	Introduction to the Principles of Fatigue & Fracture Mechanics Mr. Roger Bemont	***Gallier AB***
	Introduction to Dynamic Analysis & DDAM Mr. Barton McPheeters	***Southdown***

MONDAY (NOVEMBER 5)

Symposium Tutorials

(Additional Fees Apply to Attend Tutorials)

Tutorial Session 3

Time	*Tutorial & Presenter(s)*	*Meeting Room*
8:00 - 11:00	**Shock Test Failure Modes** Mr. Kurt Hartsough & Mr. Domenic Urzillo	*Bayside A*
	The Measurement & Utilization of Valid Shock & Vibration Data Dr. Patrick Walter	*Bayside B*
	Composite Laminate Engineering Mr. Barton McPheeters	*Bayside C*
	Spectral Theory of Random Vibration Dr. Tom Paez	*Gallier AB*
	Productive DDAM Analysis using FEA Dr. David Winkler & Mr. David Woyak	*Estherwood*
	Beyond the Shock Response Spectrum Mr. David Smallwood	*Southdown*

Tutorial Session 4

Time	*Tutorial & Presenter(s)*	*Meeting Room*
Noon - 3:00	**MIL-S-901D Engineering Topics** Mr. Domenic Urzillo	*Bayside A*
	Vibration & Shock Test Fixture Design Mr. Wayne Tustin	*Bayside B*
	Effective Solutions for Shock & Vibration Control Mr. Alan Klembczyk & Mr. Herb LeKuch	*Bayside C*
	Analyzing Noisy Data for Explicit Dynamics FEA Users Dr. Ted Diehl	*Gallier AB*

Tutorial Session 5

Time	*Tutorial & Presenter(s)*	*Meeting Room*
4:00 - 7:00	**MIL-S-901D Subsidiary Component Shock Testing & Alt. Test Vehicles** Mr. Kurt Hartsough & Mr. Domenic Urzillo	*Bayside A*
	Energy Methods for the Characterization & Simulation of Shock & Vibration Mr. Tim Edwards	*Bayside B*
	Implicit & Explicit Nonlinear Analysis Dr. Lee Taylor & Mr. Barton McPheeters	*Bayside C*
	Spectrogram Based Time/Frequency Analysis for Continuous & Discrete Spectra Dr. Ronald Merritt	*Gallier AB*
	Theory of Nonstationary Random Vibration & Generation of Realizations Dr. Tom Paez	*Estherwood*

MONDAY (NOVEMBER 5)

1:00-3:00	**IEST Committee Meeting DTE-022; MIMO Recommended Practice Committee** *Meeting Room: Southdown* Chairs: Mr. Tony Keller & Mr. Russ Ayres (Spectral Dynamics) Using more than one shaker to test large or unusually shaped objects is becoming an accepted part of the vibration testing industry. As interest in simultaneously testing articles in multiple axis increases, the need for guidelines to understand MIMO (multiple input multiple output) testing grows more important. Come get up to speed and contribute to our growing database on multi shaker concepts, fixturing, control, and reporting.

5:00-7:00	**LS-DYNA User Group Meeting** *Meeting Room: Southdown* Chair: Mr. Stefan Stojko (Rolls Royce Power Engineering) / Organizer: Dr. Len Schwer (Schwer Engineering) LS-DYNA and its predecessor, LLNL DYNA3D, were originally developed for military and defense applications, and are widely used in both the DoD and DoE. LS-DYNA has advanced features for defense applications, including simulating projectile penetration, blast response, explosives modeling, and underwater shock simulation. This meeting is an opportunity for engineers to meet with Livermore Software Technology Corporation (LSTC) personnel, learn about recent developments in LS-DYNA, LS-PrePost, LS-Opt, discuss application of LS-DYNA to their problems, share best practices, and make requests for new features. The meeting is hosted by Livermore Software and Technology Corporation (LSTC) and this year will be guest moderated by Mr. Stefan Stojko from Rolls Royce Power Engineering (UK) [Len Schwer has a schedule conflict this year.] You may contact Len (Len@Schwer.net) for more information, comments, or suggestions. The invited speaker this year is Mr. Todd Slavik, lead developer at LSTC for the LS-DYNA *LOAD_BLAST_ENHANCED capability. Increasing interest in LS-DYNA's capabilities for air blast loading on structures has motivated several new developments of this empirical air blast model. In addition to the traditional free air and surface burst capabilities, a moving air blast and height-of-burst capabilities have been added. Most recently, and significantly, the ability to couple *LOAD_BLAST_ENHANCED with the LS-DYNA Multi-Material Arbitrary Lagrange Eulerian (MM-ALE) capability provides a very effective, and CPU efficient, coupled technique for solving air blast problems, especially when modeling a fairly large standoff distance is required. An important feature of *LOAD_BLAST_ENHANCED for analysts is the graphical database that allows LS-PrePost users to carefully examine the blast loading evolution.

TUESDAY (NOVEMBER 6)

83RD SHOCK AND VIBRATION SYMPOSIUM
OPENING SESSION

8:30	Call to Order/Welcome	Mr. Drew Perkins, HI-TEST Laboratories
8:35	Featured Organization Overview	Mr. Rick Barlow, Director, Specialty Engineering & Integration - Ingalls Shipbuiling (HII)
8:55	Symposium & SAVE Highlights	Mr. Drew Perkins, HI-TEST Laboratories
9:10	S&V Committee Remarks	Mr. James Breault, Lansmont Corporation
9:25	Keynote Introduction	Mr. Ernie Staubs, Air Force Research Laboratory
9:30	Keynote Lecture	Dr. Mikel Miller, ST, Chief Scientist, Munitions Dir., Air Force Research Lab
10:15	Break	
10:35	Keynote Introduction	Mrs. Margaret Tang, Weidlinger Associates
10:40	Keynote Lecture	Mr. Andy Herrmann, President, ASCE & Principal, Hardesty & Hanover, LLP

TUESDAY PM (NOVEMBER 6)

	TRACK 1 UNDEX Numerical Methods & Applications I (1:00-3:00) Chair(s): Ms. Krista Harris (NAVSEA Carderock) Dr. Alan Brown (Virginia Tech)	TRACK 2 Structural Response to Blast Loading (1:00-2:40) Chair(s): Dr. Peter Vo (Raytheon) Prof. Andrew Whittaker (University of Buffalo)	TRACK 3 - LIM. DIST. C DS: Underwater Explosion Loading (1:00-2:40) Chair(s): Mr. Gregory Harris (NAVSEA Indian Head)
	All Presenters and Chairs (for Nov. 6th) are Required to Meet at 7:00AM in Maurepas for Presentation Loading		
	Meeting Room: Maurepas	***Meeting Room: Borgne***	***Meeting Room: Bayside A***
1:00	**Application of an RKDG-DGFM w/ALE Method to Model Underwater Explosions (1)** Dr. Alan Brown (Virginia Tech), LCDR Jinwon Park (ROKN)	**Modeling Concrete Erosion Strain for Blast-Resistant Design (3)** Prof. Andrew Whittaker, Prof. Amjad Aref, & Mr. Jinwon Shin (University of Buffalo)	**A Method for Fitting Water EOS Parameters for Underwater Explosion Simulations (5)** Dr. Thomas McGrath, Mr. Martin Marcus, & Mr. Alex Meissner, (NAVSEA Indian Head)
1:20	**A Direct Ghost Fluid Method (DGFM) for Modeling Explosive Gas & Water Flows (1)** Dr. Alan Brown (Virginia Tech), LCDR Jinwon Park (ROKN)	**Dynamic Analysis on Membrane Effect of One-Way Supported Structures to Resist Triangular Pressure Load (3)** Mr. Yonghui Wang (National University of Singapore)	**Determination of Sea Bottom Properties Using Underwater Explosion Pressure Data (5)** Mr. Martin Marcus & Mr. Gregory Harris (NAVSEA Indian Head)
1:40	**The Influence of Vapor Bubbles in the Mitigation of Underwater Explosion Structural Loading (1)** Mr. Jarema Didoszak & Dr. Young Kwon (Naval Postgraduate School), Lt. Steven Arbogast (US Navy)	**Limitations & Consequences of Fragment Protection for Near-Field Airblast Measurements (3)** Mr. Alexander Christiansen & Mr. David Bogosian (BakerRisk)	**DYSMAS Simulation of the Underwater Explosion Shock Wave Loading from a Large Charge on the Sea Bottom (5)** Mr. Martin Marcus & Mr. Gregory Harris (NAVSEA Indian Head)
2:00	**Dynamic Response of a Composite Propeller Blade Subjected to Shock & Bubble Pressure Loading (2)** Dr. Chai-Tsung Hsiao & Dr. Georges Chahine (Dynaflow)	**Innovative Blast-Resistant Design of Steel Stud Wall Systems Accounting for Composite Bending & Controlled Hinge Formation (4)** Mr. Casey O'Laughlin (Jacobs Technology), Ms. Ady Aviram, Mr. Ron Mayes, & Mr. Ron Hamburger (Simpson, Gumpertz & Heger)	**An Improved Pentolite JWL Equation of State for UNDEX Shock & Bubble Simulations (6)** Mr. Jeffrey St. Clair & Dr. Thomas McGrath (NAVSEA Indian Head)
2:20	**Study for the Close Proximity Underwater Explosion Problem Using Simplified Ship Model (2)** Dr. Jeong Il Kwon, Dr. Jung Hoon Chung, & Dr. Yun Ho Shin (Korea Institute of Machinery & Materials), Mr. Yeo Hoon Yun (Korea Simulation Technologies)	**Connection Design of Steel Members Subjected to Blast Loading (4)** Mr. David A. Holgado, Mr. Darrell Barker, Dr. Manuel Diaz, & Mr. William C. LeBoeuf (ABS Consulting)	**Validation Examples Using the Improved Pentolite EOS (6)** Dr. Bradley Klenow (NAVSEA Carderock)
2:40	**Shock Response Analysis & Evaluation for On-Board Equipment According to Approach Methodology Based on the Design Regulation (2)** Dr. Jeong Il Kwon, Dr. Jung Hoon Chung, & Dr. Yun Ho Shin (Korea Institute of Machinery & Materials), Dr. Tae Muk Choi (Createch Co.)		

SYMBOL KEY: (#) - Correlating Page Number in Abstract Book, ‡ - 10-Minute Presentation

TUESDAY PM (NOVEMBER 6)

	TRACK 4 - LIM. DIST. C Instrumentation Methods (1:00-1:50) Chair(s): Dr. Vesta Bateman (Mechanical Shock Conslt.) Mr. James Letternau (Meggitt)	TRACK 5 Multi-Axis Vibration (1:00-2:40) Chair(s): Mr. Tony Keller (Spectral Dynamics) Mr. Curt Nelson (Team Corporation)	OPEN DISCUSSION Open Discussion (1:00-2:20)
	Presenters and Chairs (for Nov. 6th) are Required to Meet at 7:00AM in Maurepas for Presentation Loading		
	Meeting Room: Bayside B/C	***Meeting Room: Waterbury***	***Meeting Room: Gallery***
1:00	**Characterization of Damped Accelerometers with Full Range Hopkinson Bar Shock (6)** Mr. James Letterneau (Meggitt, San Juan Capistrano) & Dr. Vesta Bateman (Mechanical Shock Consulting)	**On Controlling 6 DOF Electrodynamic Table (8)** Mr. Russ Ayres, Dr. Marcos Underwood, & Mr. Tony Keller (Spectral Dynamics, Inc.)	**Open Discussion:** **Overview of MIL-S-901D & Proposed Changes/Updates to the Spec** Mr. Kurt Hartsough (NAVSEA Philadelphia)
1:20	**Miniaturized High-g Shock Triaxial Accelerometers (6)** Mr. Randall Martin & Mr. James Letterneau (Meggitt, San Juan Capistrano)	**Multi Axis Excitation - More Realistic Vibration Testing (9)** Mr. Wayne Tustin (Equipment Reliability Institute)	
1:40	**‡ Laboratory Pre-Screening Method for Pre-Detonation Materials Against Plunger-Type Fuzed Mortars Using an Instrumented Inert Fuze (7)** Mr. Samuel Misko (Jacobs Technology), Lt. John Held (US Air Force)	**Contemporary Multi Axis Test Systems: Applications, Performance, & Limitations (9)** Mr. Curt Nelson (Team Corporation)	
2:00	TRACK 4 - LIM. DIST. C Airblast Data & Analysis (2:20-3:00) Chair(s): Dr. Vesta Bateman (Mechanical Shock Conslt.) Mr. James Letternau (Meggitt)	**Bringing True Broadband Field Vibration Environments into the Lab (9)** Mr. Curt Nelson (Team Corporation)	
2:20	**Guide to Nuclear Airblast Records: A Report Summary (7)** Mr. Jeffrey Thomsen (Applied Research Associates)	**Comparative Results of Single Axis versus Multi-Axis (10)** Ms. Chris Peterson (H&H Environmental Systems)	
2:40	**Salvaging Airblast Impulse Data from Shielded Gauges (8)** Mr. David Bogosian, Ms. Allison Yu, & Mr. Alex Christiansen (Baker Engineering & Risk Consultants)		

3:00 - 3:40	**BREAK IN EXHIBIT HALL**

TUESDAY PM (NOVEMBER 6)

	TRACK 1 Modeling & Simulation of Underwater Shock (3:40-5:00) Chair(s): Dr. Jeffrey Cipolla (Weidlinger Associates) Dr. Russ Miller (Alion Science & Technology)	TRACK 2 Blast Measurement & Analysis (3:40-5:20) Chair(s): Mr. James Breault (Lansmont Corporation)	TRACK 3 - LIM. DIST. C DS: Underwater Explosion Bubble Simulations (3:40-5:00) Chair(s): Dr. Georges Chahine (Dynaflow, Inc.) Dr. Thomas McGrath (NAVSEA Indian Head)
	All Presenters and Chairs (for Nov. 6th) are Required to Meet at 7:00AM in Maurepas for Presentation Loading		
	Meeting Room: Maurepas	***Meeting Room: Borgne***	***Meeting Room: Bayside A***
3:40	**Automated Ship Shock M&S Software Tool Integration / The New Common Structural Model (CSM) GUI: Rapid Early Stage Design Tool (10)** Dr. Russ Miller & Mr. Brian Rich (Alion Science & Technology), Mr. Paul Lara & Dr. Thomas Moyer (NAVSEA Carderock)	**Prediction of Landmine Blast Effects with CONWEP & SPH in LS-DYNA (12)** Dr. Xudong Xin, Dr. Abdullatif Zaouk, & Dr. Basant Parida (QinetiQ North America)	**Assessment of Multi-Cycle Underwater Explosion Bubble Simulation Capabilities in DYSMAS (14)** Mr. Gregory Harris & Mr. Ayodeji Ojofeitimi (NAVSEA Indian Head)
4:00	**Effect of a Bubbly Layer on an Incoming Pressure Wave (11)** Mr. Arvind Jayaprakasah, Mr. Sowmitra Singh, Dr. Chao-Tsung Hsiao, & Dr. Georges Chahine (Dynaflow Inc.)	**Modeling Detonations to Inform Blast-Resistant Design of Buildings (12)** Prof. Andrew Whittaker & Prof. Amjad Aref (University of Buffalo), Mr. Pushkaraj Sherker (Thornton-Tomasetti)	**Validation of DYSMAS for Close-In Shock & Bubble Jet Damage Test Against the ex-Turku Fast Attack Craft (14)** Mr. Kenneth Kiddy & Mr. Gregory Harris (NAVSEA Indian Head)
4:20	**Parameterization of the Pressure Wave Emitted by Hydrostatic Implosion of Submerged Cylinders (11)** Dr. Jeffrey Cipolla, Dr. Michael Shields, Dr. Pawel Woelke, & Dr. Najib Abboud (Weidlinger Associates)	**Implications of Explosively Accelerating Thin Flyer Plates in Transient Regimes of Explosive Systems (12)** Mr. Marcus Chavez (Sandia National Labs/NM Institute of Mining & Technology)	**DYSMAS Simulation of Underkeel Bubble Jet Attack (14)** Mr. Kenneth Kiddy & Mr. Gregory Harris (NAVSEA Indian Head)
4:40	**Use of a Neural Net for Response Surface Based Prediction of the Pressure Wave Emitted by Hydrostatic Implosion of Submerged Cylinders (11)** Dr. Michael Shields, Dr. Jeffrey Cipolla, Dr. Pawel Woelke, & Dr. Najib Abboud (Weidlinger Associates)	**Experimental Resistance Function Development Using Load-Tree Testing for Incorporation into Single-DOF Dynamic Blast Analysis (13)** Mr. Casey O'Laughlin & Mr. Charles Newberry (Jacobs Technology), Dr. Eric Williamson (Univ. of Texas at Austin)	**Accurate & Efficient Physics-Based Software to Model Air Guns (14)** Dr. Georges Chahine & Mr. Chao-Tsung Hsiao (Dynaflow, Inc.)
5:00		**Blast Over-Pressure Environments for Evaluating Soldier Protective Equipment (13)** Mr. Scott Walton, Mr. Brandon Hepner, & Mr. Michael Maffeo (US Army Aberdeen Test Center)	

5:00-7:00	**Pyroshock Working Group** Chair: Dr. Vesta Bateman (Mechanical Shock Consulting)	***Meeting Room: Nottoway***
	The changes to MIL-STD-810G, Change 1, for Method 516 for Shock (SME Mike Hale), Method 517 for Pyroshock (SME Vesta Bateman), and Method 522 (SME Scott Walton) will be presented and discussed including the new requirements for data acquisition and an Appendix about data analysis in Method 517. Anyone can join this group, so please come and provide your knowledge and expertise!	

TUESDAY PM (NOVEMBER 6)

	TRACK 4 - LIM. DIST. C Crew Injury Studies & Vehicle Protection (3:40-5:20) Chair(s): Mr. Ami Frydman (Army Research Laboratory) Ms. Krista Harris (NAVSEA Carderock)	TRACK 5 Isolation & Damping (3:40-5:00) Chair(s): Mr. Herb LeKuch (Engineering Consultant) Mr. Alan Klembczyk (Taylor Devices)	OPEN DISCUSSION Open Discussion (3:40-5:00)
	All Presenters and Chairs (for Nov. 6th) are Required to Meet at 7:00AM in Maurepas for Presentation Loading		
	Meeting Room: Bayside B/C	***Meeting Room: Waterbury***	***Meeting Room: Gallery***
3:40	**Overview of the UNDEX Induced Injury Test Series (16)** Ms. Krista Harris, Dr. Thomas Moyer, & Mr. Tom Brodrick (NAVSEA Carderock)	**Versatile Design of Internally Isolated Enclosures (17)** Ms. Caitlin O'Neill & Mr. Aldric Seguin (901D LLC)	**Open Discussion:** **History & Future of the Shock and Vibration Symposium** *Importance and Contributions of the Forum from 1947 to 2012* Mr. Henry Pusey (HI-TEST Laboratories)
4:00	**UNDEX Induced Injury Test Series: Evaluation of Anthropomorphic Test Device (16)** Dr. Timothy Walilko (Applied Research Associates) & Ms. Krista Harris (NAVSEA Carderock)	**Tuned Elastomer Vibration Isolator for the Reduction of Random Vibrations (18)** Mr. Kevork Kayayan (Shocktech), Mr. Herb LeKuch (Engineering Consultant)	
4:20	**An Algorithm for Predicting Crew Injuries/ Casualties Due to AIREX Loading (16)** Ms. Krista Harris, Dr. Thomas Moyer, & Mr. Tom Brodrick (NAVSEA Carderock)	**Simulation Algorithm for Orthogonally Coupled Behavior of Isolators (18)** Mr. Steven Drake (HII-NNS)	
4:40	**Overview of the Human Injury and Treatment (HIT) Program (-)** Ms. Lee Ann Young (Applied Research Associates)	**Describing the Shock Response Spectrum of an Isolated Enclosure & its Internal Components using Modal Analysis (18)** Mr. Herb LeKuch (Engineering Consultant), Mr. Neil Donavan (901D)	
5:00	**Out of Position Loading Response of the H-III & MIL-LX Lower Legs to Simulated Blast Effects (17)** Mr. Jeffrey Nesta & Mr. Ami Frydman (Army Research Laboratory)		

WEDNESDAY AM (NOVEMBER 7)

	TRACK 1 UNDEX Numerical Methods & Applications II (8:00-9:20) Chair(s): Mr. John Przybysz (Inst. for Defense Analyses)	TRACK 2 Ballistics (8:00-9:40) Chair(s): Dr. Shane Schumacher (Sandia National Labs)	TRACK 3 - LIM. DIST. C/D UNDEX Modeling & Testing (8:00-9:20) Chair(s): Mr. Chris Key (HI-TEST Laboratories)
	All Presenters and Chairs (for Nov. 7th) are Required to Meet at 7:00AM in Borgne for Presentation Loading		
	Meeting Room: Borgne	***Meeting Room: Gallier A/B***	***Meeting Room: Bayside A***
8:00	**On the Shock Environment Inside Ships Tanks (19)** Mr. Zbigniew Czaban (Royal Canadian Navy), Mr. Mervin Norwood (Martec Ltd.), Mr. Guy Lucien (NETE)	**Qualification Testing for Ballistic Shock Environments (20)** Mr. Christopher Monahan & Mr. Brandon Hepner (US Army Aberdeen Test Center), Mr. Joseph Marconi & Mr. Scott Walton (ATSS)	**Implosion At-Sea Experiments: Comparison of Pre-Test Predictions with Test Data (22)** Dr. Joseph Ambrico (NAVSEA Newport)
8:20	**Comparison of UNDEX Response Utilizing Different Methodologies (19)** Mr. Dustin Pearson, Dr. Rick Link, & Mr. John Crocker (Martec Ltd.)	**Simulation of Ballistic Impacts of Aluminum Plates with Ogive-Nose Steel Projectiles (21)** Dr. Vladimir Sokolinsky, Dr. Juan Hurtado, & Dr. Jonathan Arata (Dassault Systèmes SIMULIA Corp.)	**Mass Shock Qualification of Cable Hangers (23)** Mr. Jarrod Gilmore & Mr. Sean Murphy (Huntington Ingalls Industries– Ingalls Shipbuilding)
8:40	**New Numerical Transient & Spectral Methods to Model Naval Equipment Against UNDEX Loading (19)** Dr. Gerard Vanderborck (Thales Underwater Systems), Prof. Pascal Mosbah (ISEN)	**CTH Lagrangian Capabilities (Part 1) (21)** Dr. Shane Schumacher & Dr. Kevin Ruggirello, (Sandia National Laboratories), Dr. Bryan Kashiwa (Los Alamos National Laboratory)	**Cost Reduction Measures for Local Cable Hanger Installation (23)** Mr. Jarrod Gilmore (Huntington Ingalls Industries– Ingalls Shipbuilding)
9:00	**Shock Response Spectrum Computation for Nonlinear Structures using an Explicit Dynamics FEA Code (20)** Dr. Lee Taylor (Anatech Corp)	**CTH Lagrangian Capabilities (Part 2) (22)** Dr. Shane Schumacher & Dr. Kevin Ruggirello, (Sandia National Laboratories), Dr. Bryan Kashiwa (Los Alamos National Laboratory)	**Modification of Shock Isolation Mount Predictions & Loading Estimates (SIMPLE) Program for Multiple Interlinked Enclosure Analysis (-)** Mr. Edward Fleiss & Dr. Michael Talley (Huntington Ingalls Industries)
9:20		**Acceleration Profile of an Explosively Driven Flat Metallic Flyer During Projection (22)** Dr. Bin Lim (New Mexico Tech)	

8:00-9:40	**Electronically Programmable Shock Pulses vs. Mechanical Programming** Chair: Mr. Erik Timpson (Honeywell and University of Missouri - Columbia)	***Meeting Room: Napoleon A3***
	Helical Electromagnetic Launchers (HEML)s have been used to electronically program shock pulses. Meaning, we are no longer limited by mechanical programmers. Mechanical programmer limits include: time to characterize, life span, potential to damage the device under test, and length of duration. Please join us as we discuss what we want acceleration pulses to look like (now that mechanical programming limits have been removed). We will also discuss things we like about mechanical programmers that we do not want to lose. All are welcome.	

WEDNESDAY AM (NOVEMBER 7)

	TRACK 4	TRACK 5	TRAINING
	No Session Scheduled from 8:00-9:40 in Track 4.	DS: Understanding Security of Critical Infrastructure (8:00-9:40) Chair(s): Mrs. Margaret Tang (Weidlinger Associates) Dr. Mohammed Ettouney (Weidlinger Associates)	Training (8:00-9:00)
	All Presenters and Chairs (for Nov. 7th) are Required to Meet at 7:00AM in Borgne for Presentation Loading		
	Meeting Room: Bayside B/C	***Meeting Room: Waterbury***	***Meeting Room: Gallery***
8:00		**Understanding the Security of Critical Infrastructure (-)** Dr. Andy Herrmann (President, American Society of Civil Engineers)	**Training:** **Introduction to Smoothed Particle Hydrodynamics (SPH) in Abaqus** Dr. Victor Oancea (Dassault Systèmes SIMULIA Corp.)
8:20		**Importance of Infrastructure Security to Modern Society (25)** Dr. Mohammed Ettouney (Weidlinger Associates)	
8:40		**Aging Transportation Infrastructure & Its Impact on National Security (25)** Dr. Raimondo Betti (Columbia University)	
9:00		**The Evolution of Critical Infrastructure Security - Case Studies (25)** Dr. Najib Abboud (Weidlinger Associates)	
9:20		**Open Discussion on the Security of Critical Infrastructure / Q&A (-)** Dr. Mohammed Ettouney (Weidlinger Associates)	

9:40-10:00	**BREAK IN EXHIBIT HALL**

WEDNESDAY AM (NOVEMBER 7)

	TRACK 1 Shock & Vibration Testing Measurements & Qualification Testing (10:20-11:40) Chair(s): Dr. Patrick Walter (TCU / PCB Piezotronics) Ms. Alicia D'Aurora (Huntington Ingalls Indst.)	TRACK 2 Mechanical Shock Testing (10:00-11:40) Chair(s): Dr. Vesta Bateman (Mechanical Shock Consult.) Mr. Erik Timpson (Honeywell)	TRACK 3—LIM. DIST. C Numerical & Test Applications for Blast & Ballistics (10:00-Noon) Chair(s): Dr. Jennifer Cordes (US Army ARDEC)
	All Presenters and Chairs (for Nov. 7th) are Required to Meet at 7:00AM in Borgne for Presentation Loading		
	Meeting Room: Borgne	***Meeting Room: Gallier A/B***	***Meeting Room: Bayside A***
10:00		**Smart Hydraulic Landing Gear (27)** Dr. Ken-An Lou (ArmorWorks), Mr. Richard Zimmerman (Zerad), Mr. Phil Schaefer (Vortant Technologies), Mr. Bryan Pilati (US Army, Aviation Applied Technology Division)	**Numerical Simulation of ISO Containers Subjected to Internal Explosions (29)** Dr. Michael Oesterle & Mr. Robert Conway (Naval Facilities Engineering Service Center)
10:20	**Measuring Underwater Explosions: Transducers & Their Application (26)** Dr. Patrick Walter (Texas Christian University / PCB Piezotronics)	**Impact Reduction to 120mm Mortar TEST BASE IMPACT PIT @ Watervliet Federal Arsenal using KELLET MATERIAL (27)** Mr. Charles Kahane (KELLETT)	**Numerical Simulation of Explosives Buries in Soil (30)** Dr. Wije Wathugala & Dr. Wenshui Gan (ACTA)
10:40	**Shock Extension Methods Resources for Manufacturers (26)** Mr. Raymond Lamb (Huntington Ingalls Industries)	**Experimental Evaluation of Helical Electromagnetic Launchers for Electronically Programmable Shock Pulses (28)** Mr. Erik Timpson (Honeywell), Dr. Greg Engel (University of Missouri - Columbia)	**Novel Kinetic-Defeat Approaches for Overhead Protection Systems Employing Construction-Grade Materials (30)** Mr. Joe Magallanes, Mr. Jason Yang, & Mr. Mark Weaver (Karagozian & Case), Dr. Mike Oesterle (NAVFAC ESC)
11:00	**Shock & Vibration Qualification Databases (26)** Mr. Ted Bush & Mr. James Giles, Jr. (Huntington Ingalls Industries)	**Strain Gauges or Laser Vibrometer? Reference Standards for Calibration of Shock Accelerometers (28)** Dr. Martin Brucke & Mr. Michael Mende (SPEKTRA), Dr. Georg Siegmund (Polytec GmbH)	**Modeling of HE Fill Behavior During Impact Comparing Lagrangian, Eularian, & SPH Methodologies (30)** Mr. Lyonel Reinhardt, Mr. Pasquale Carlucci, & Mr. Steve Recchia (US Army ARDEC)
11:20	**Balancing a Figure 15 Fixture on the Medium Weight Shock Machine Without Ballast Weight with Supporting Analysis (27)** Mr. Nathan Poerschke & Mr. Patrick Minter (Huntington Ingalls Industries - Newport News Shipbuilding)	**Trundling Shocks - Development of Semi-Automatic Processes for Analysis & Test Specification (29)** Mr. Paul Lewis (Cranfield Aerospace Ltd.)	**Analysis & Testing of an Innovative Wall Design for Resistance to Blast Effects from a Confined Explosion (31)** Dr. Michael Oesterle (Naval Facilities Engineering Service Ctr.), Mr. Joe Magallanes, Mr. Mark Weaver, & Mr. Leo Torres (Karagozian & Case)
11:40			**Assigning Over-Pressure & Fragment Impact to an Interior Lagrangian Blast Simulation (31)** Mr. Stephen Recchia, Dr. Jennifer Cordes, Mr. Adam Enea, Mr. Gregory Stunzenas, & Mr. Vladimir Gold (US Army Armament Research Development & Engineering Center)

WEDNESDAY AM (NOVEMBER 7)

	TRACK 4—LIM. DIST. D+ DS: Hard Target Defeat (10:00-Noon) Chair(s): Mr. Ernie Staubs (Air Force Research Laboratory)	TRACK 5 DS: Trends in Critical Infrastructure (10:00-Noon) Chair(s): Mrs. Margaret Tang (Weidlinger Associates) Dr. Mohammed Ettouney (Weidlinger Associates)	TRAINING Training (10:00-Noon)
	All Presenters and Chairs (for Nov. 7th) are Required to Meet at 7:00AM in Borgne for Presentation Loading		
	Meeting Room: Bayside B/C	***Meeting Room: Waterbury***	***Meeting Room: Gallery***
10:00	**Overview of Hard Target Defeat Project Agreement, Phase 1 (24)** Mr. Ernie Staubs (Air Force Research Laboratory)	**Sustainability Architect's Overview (33)** Mr. Martin Denholm (SmithGroup)	**Training:** **An Introduction to Finite Element Analysis** Mr. Barton McPheeters (NEi Software)
10:20	**Overview of Hard Target Defeat Project Agreement, Phase 2 (24)** Mr. Ernie Staubs (Air Force Research Laboratory)	**Integration of Sustainability & Building Security (33)** Ms. Colleen Kirk, Ms. Margaret Tang, Dr. Raymond Daddazio, & Dr. Mohammed Ettouney (Weidlinger Associates)	
10:40	**Vulnerability of Computer Equipment & Networks to Blast Environments (31)** Mr. Ernie Staubs (Air Force Research Laboratory)	**Structural Health Monitoring for Bridge Applications (33)** Dr. Sreenivas Alampalli (NY State Department of Transportation)	
11:00	**Response of Desktop Computer Work Stations to Blast Pressure Loads Produced by Explosive Detonations (32)** Mr. David Watts (Air Force Research Laboratory)	**Structural Health Monitoring Systems for Rapid, Post-Disaster Assessment of Buildings (33)** Dr. Jerome Lynch (University of Michigan), Dr. Andrew Zimmerman (Civionics LLC)	**Training:** **Pseudo-Velocity Shock Spectrum, Part I** Dr. Howard Gaberson (Consultant)
11:20	**Iterative Model Development for Complex Blast Environments (32)** Ms. Sherri Hodgson (Applied Research Associates)	**Structures Management in Multihazard Environment (33)** Dr. Sreenivas Alampalli (NY State Department of Transportation)	
11:40	**Secondary Debris Loading on Bunker Walls from Internal Explosions (32)** Dr. Timothy Hasselman & Mr. Ryan Schnalzer (ACTA Inc.), Mr. Joseph Magallanes & Dr. Simon Fu (Karagozian & Case)	**WIM Data, Risk Management, & Bridge Security (34)** Ms. Margaret Tang, Mr. Ryan Anderson, & Dr. Mohammed Ettouney (Weidlinger Associates)	

WEDNESDAY PM (NOVEMBER 7)

	TRACK 1 DS: NSRP Modeling & Simulation Project / NSRP Foundation Modeling & Analysis I (1:00-3:00) Chair(s): Mr. Sean Murphy (HII-Ingalls Shipbuilding)	TRACK 2 Mechanical Shock Modeling & Analysis (1:00-2:30) Chair(s): Mr. Steven Drake (Huntington Ingalls Indst.) Mr. Brandon Hepner (US Army ATC)	TRACK 3 - LIM. DIST. C Shock & Vibration Testing (1:00-2:00) Chair(s): Ms. Krista Harris (NAVSEA Carderock)
	All Presenters and Chairs (for Nov. 7th) are Required to Meet at 7:00AM in Borgne for Presentation Loading		
	Meeting Room: Borgne	***Meeting Room: Gallier A/B***	***Meeting Room: Bayside A***
1:00	**National Shipbuilding Research Program (34)** Mr. Justin Montague (SCRA)	**Modeling of Ordnance-Induced Pyrotechnic Shock Testing (36)** Dr. Logan McLeod & Ms. Santina Tatum (National Technical Systems)	**An Example of Conservatism in MIL-STD-167 Testing (39)** Mr. Kenneth Lussky (BAE Systems)
1:20	**NSRP Modeling & Simulation Project (34)** Mr. Stewart Moore (General Dynamics Electric Boat)	**Time-Domain Analysis & Empirical Modeling of Shock Responses (37)** Mr. Robert Martinez (C.S. Draper Laboratory)	**ShieldTM Mount - Characterization & Performace (39)** Mr. Edward Fleiss (Huntington Ingalls Industries - NNS)
1:40	**Ship Structure Optimization Studies (34)** Mr. Nicholas Barner (General Dynamics Electric Boat)	**Modeling & Development of Low Frequency Mechanical Filter Accelerometer Mounting (37)** Mr. Brandon Hepner & Mr. Christopher Monahan (US Army Aberdeen Test Center), Mr. Joseph Marconi & Mr. Scott Walton (ATSS)	**Design, Analysis, & Testing of the M109A6 Paladin PIM Electric Servo Amplifier Isolation System (39)** Mr. Robert Sharp (Barry Controls), Mr. Bret Bartness, Mr. Ed Alexander, & Mr. Mike Levy (BAE Systems)
2:00	**Efficient Generation of Analysis Models for Ship Structures (35)** Mr. Len Covian, Mr. Daniel Pusey, & Mr. Dhiren Marjadi (Altair)	**Implementation of Equation of State for Dry Sand in Autodyn (37)** Dr. Leo Laine (LL Engineering), Mr. Ola Larsen (CAEwiz Consulting)	
2:20	**Automation of Modeling the 3-D welding Processes for Distortion & Residual Stresses (35)** Mr. Muralidharan Pandeheeradi (SIMULIA)	**‡ Development of Landscape Vehicular Anti-Ram Systems through Computational & Experimental Methods (38)** Ms. Lynsey Reese, Dr. Tong Qiu, & Dr. Daniel Linzell (Pennsylvania State University), Dr. Zoltan Rado (The Larson Transportation Inst.)	
2:40	**Streamlining the Simulation Process Flow using Collaborative Simulation Data Management (35)** Mr. Ira Goldstein & Mr. Dhiren Marjadi (Altair)		

1:30-3:00	**NEi Nastran Users Group Meeting** Chair: TBD	***Meeting Room: Waterbury***
	The NEi Nastran Users Group will be a meeting to describe new enhancements that have been incorporated into NEi Nastran V10.1, FEMAP V10.3, and NEi Explicit. As usual, we will discuss features users are interested in seeing implemented in the future and a discussion of capabilities that are under development for new products and upcoming product releases.	

WEDNESDAY PM (NOVEMBER 7)

	TRACK 4 - LIM. DIST. C	TRACK 5	TRAINING
	DS: System & Payload Response to Shock Environments I (1:00-2:40) Chair(s): Dr. Jason Foley (Air Force Research Laboratory) Dr. Janet Wolfson (Air Force Research Laboratory)	DS: Critical Infrastructure - Tools & Processes (1:00-3:00) Chair(s): Mrs. Margaret Tang (Weidlinger Associates) Dr. Mohammed Ettouney (Weidlinger Associates)	Training (1:00-2:00)
	All Presenters and Chairs (for Nov. 7th) are Required to Meet at 7:00AM in Borgne for Presentation Loading		
	Meeting Room: Bayside B/C	***Meeting Room: Oak Alley***	***Meeting Room: Gallery***
1:00	**A Linearized Representation of Penetrator Simulant Dynamics with a Correlated FE Model (40)** Dr. Janet Wolfson & Dr. Jason Foley (Air Force Research Laboratory), Mr. Gregory Falbo & Mr. Michael Pyrkosz (LMS Federal)	**Resiliency & Infrastructure Security (41)** Ms. Milagros Kennett (US Dept. of Homeland Security)	
1:20	**Embedded Instrumentation in Penetration Applications (40)** Dr. Jason Foley, Ms. Erin Silva, Mr. Stephen Szczepanski, Dr. Jacob Dodson, Mr. Michael Denigan, & Mr. George Jolly (AFRL), Mr. Jonathan Hong & Dr. Alain Beliveau (ARA), Dr. Derek Reding (Jacobs Eng.), Mr. Chris Mougeotte (US Army ARDEC)	**Performance-Based Design (PBD): Building Security (41)** Mr. Scott Campbell	**Training:** **Pseudo-Velocity Shock Spectrum, Part II** Dr. Howard Gaberson (Consultant)
1:40	***In Situ* Dynamics of Electronics Boards & Components Under Shock (40)** Mr. Chris Mougeotte (US Army ARDEC), Dr. Jason Foley & Dr. Ryan Lowe (Air Force Research Laboratory), Dr. Derek Reding (Qualis Engineering)	**The Building Security Rating System of AEI (42)** Dr. Amar Chaker (Engineering Mechanics Institute of ASCE)	
2:00	**Modeling & Simulation of Potted Electronics with Different Solder Materials (41)** Dr. J.A. Cordes, Dr. A.S. Haynes, Dr. L.E. Reinhardt (US Army Picatinny Arsenal)	**Integrated Rapid Visual Screening (IRVS) (42)** Mr. Roger Grant (National Institute of Building Sciences)	
2:20	**Energy Propagation Through Normal & Threaded Interfaces (41)** Dr. Jacob Dodson, Dr. Janet Wolfson, Mr. Neil Gilkin, Mr. Jordan Cocker, Dr. Jason Foley (Air Force Research Laboratory)	**Owners Performance Requirements (OPR) for Buildings (42)** Mr. Roger Grant (National Institute of Building Sciences)	
2:40		**Evaluating the Effects of Explosive Devices in Urban Streetscapes (42)** Dr. Robert Smilowitz & Mr. David Vaughan (Weidlinger Associates), Ms. Milagros Kennett (US Dept. of Homeland Security)	

3:00-3:40	**BREAK IN EXHIBIT HALL**

WEDNESDAY PM (NOVEMBER 7)

	TRACK 1 DS: NSRP Modeling & Simulation Project / NSRP Foundation Modeling & Analysis II (3:40-5:20) Chair(s): Mr. Sean Murphy (HII-Ingalls Shipbuilding)	TRACK 2 Vibration Testing (3:40-5:00) Chair(s): Dr. Ronald Merritt (Jacobs Engineering - NSG)	TRACK 3 - LIM. DIST. C UNDEX Analysis & Modeling (3:40-5:20) Chair(s): Dr. Joseph Ambrico (NAVSEA Newport) Mr. Rick Griffen (HII - Newport News Shpbld.)
	All Presenters and Chairs (for Nov. 7th) are Required to Meet at 7:00AM in Borgne for Presentation Loading		
	Meeting Room: Borgne	***Meeting Room: Gallier A/B***	***Meeting Room: Bayside A***
3:40	**Enhancing the Shock Analysis Process by Incorporating Automation, Optimization, & Sensitivity Studies (43)** Mr. Sean Murphy (Huntington Ingalls Industries—Ingalls Shipbuilding)	**Continuous/Discrete Spectra for Three Degree -of-Freedom Vibration Environments (46)** Dr. Ronald Merritt (Jacobs Engineering - NSG)	**Evaluation of Composite Material Damage Models in a Water-Backed UNDEX Environment (47)** Mr. Joshua Gorfain, Mr. Christopher Key, & Mr. William Gregory (HI-TEST Laboratories)
4:00	**Efficient Modeling of Foundations Part 1 (Automation of Geometry Idealization for Shock Modeling, DDAM Analysis) (43)** Mr. John Karagiannis (SIMULIA)	**Hull Vibration Reduction on a Fisheries Research Vessel using Active Control – Part 1: Problem Description and Solution Approach (46)** Mr. Thomas David & Mr. John Sailhammer (Barry Controls), Mr. Mathieu Noe (Paulstra-Vibrachoc)	**Investigation of the Fundamental Drivers in Implosion Dynamics (48)** Dr. Ryan Chamberlin & Dr. Emily Guzas (NAVSEA Newport)
4:20	**Efficient Modeling of Foundations Part 2 (Automation, Batch Processing, & Data Management of Shock Modeling, DDAM Analysis) (44)** Mr. Jared Graham (SIMULIA)	**Hull Vibration Reduction on a Fisheries Research Vessel using Active Control – Part 2: Operational Test Results (46)** Mr. Thomas David & Mr. John Sailhammer (Barry Controls), Mr. Mathieu Noe (Paulstra-Vibrachoc)	**An Improved Fluid-Structure Interaction Software Code for Simulating Implosion (48)** Dr. Joseph Ambrico & Dr. Emily Guzas (NAVSEA Newport)
4:40	**Semi-Automation of the Foundation Analysis Process (44)** Mr. Sean Murphy & Mr. Peter Samaj (Huntington Ingalls Industries—Ingalls Shipbuilding)	**Working Towards Optimum Life for Aircraft Defensive Aids (46)** Mr. Antony Bown (Cranfield Aerospace)	**Prediction of Dynamic Nonlinear Behavior of a Shock-Isolated Deck Module Composed of T-Stiffened Plate (48)** Mr. Matthew Tilley (Huntington Ingalls Industries - Newport News Shipbuilding)
5:00	**Optimization Driven Design Process for Foundations (45)** Mr. Andy Bartels, Mr. Daniel Pusey, & Mr. Dhiren Marjadi (Altair)		**Damage Prediction of a Weapons Elevator Door on the Floating Shock Platform Using Nonlinear Transient (48)** Mr. Rick Griffen & Mr. Matt Davis (Huntington Ingalls Industries - Newport News Shipbuilding)
5:20			

5:00-7:00	**Handbook of Dynamic Data Acquisition and Analysis Working Group (IEST-DTE-RD-012.2)** Chair: Dr. Vesta Bateman (Mechanical Shock Consulting)	***Meeting Room: Gallier A/B***
	Originated by Harry Himelblau and Allan Piersol for the Air Force, this Handbook was originally intended to be a Military Standard and may potentially become a Military Standard in the future. Numerous members of this working group have volunteered to review sections of the Handbook of Dynamic Data Acquisition and Analysis (IEST-RD-DTE012). Comments from these volunteers will be reviewed during the meeting. Additional members are needed to provide review and improvements to the Handbook of Dynamic Data Acquisition and Analysis (HDDAA). Anyone can join this group, so please come and provide your knowledge and expertise!	

WEDNESDAY PM (NOVEMBER 7)

	TRACK 4 - LIM. DIST. C	TRACK 5	TRAINING
	DS: System & Payload Response to Shock Environments II (3:40-5:40) Chair(s): Dr. Jason Foley (Air Force Research Laboratory) Dr. Janet Wolfson (Air Force Research Laboratory)	DS: Blast, Progressive Collapse, & Post-Disaster Performance of Infrastructure (3:40-5:40) Chair(s): Mrs. Margaret Tang (Weidlinger Associates) Dr. Mohammed Ettouney (Weidlinger Associates)	Training (3:40-5:40)
	All Presenters and Chairs (for Nov. 7th) are Required to Meet at 7:00AM in Borgne for Presentation Loading		
	Meeting Room: Bayside B/C	***Meeting Room: Oak Alley***	***Meeting Room: Gallery***
3:40	**High Frequency Structural Excitation: Implementing an Acoustic Source (49)** Dr. Janet Wolfson & Dr. Jason Foley (Air Force Research Laboratory), Mr. Gregory Falbo & Mr. Michael Pyrkosz (LMS Federal)	**State of Progressive Collapse Knowledge & Research (50)** Dr. Mohammed Ettouney (Weidlinger Associates)	**Training:** **Physiology and Measurement of Explosions in Air and Underwater** **Part 1: Introduction, Sensing Technology, Cabling, and Signal Conditioning** Dr. Pat Walter (Texas Christian University / PCB Piezotronics)
4:00	**High Fidelity Force Localization in Beam Structures (49)** Mr. Pooya Ghaderi & Dr. Andrew Dick (Rice University), Dr. Jason Foley (Air Force Research Laboratory), Mr. Greg Falbo (LMS Federal)	**New Findings on Progressive Collapse of Buildings & Global Structural Integrity of Damaged Structures (50)** Dr. Simos Gerasimidis & Dr. George Deodatis (Columbia University), Dr. Mohammed Ettouney (Weidlinger Associates)	
4:20	**Blast Simulator Testing for High-G Shock Environment Characterization (49)** Dr. Lauren Stewart, Mr. Brad Durant, & Dr. Gil Hegemier (Univ. of California San Diego), Dr. Janet Wolfson (Air Force Research Laboratory)	**Development of the Post Disaster Assessment Tool (PDAT) (51)** Mr. Adam Hapij, Mr. Adam Dick, Ms. Margaret Tang, & Dr. Mohammed Ettouney (Weidlinger Associates)	
4:40	**Practical DSP for Shock Environments (50)** Dr. Janet Wolfson, Dr. Jacob Dodson, Dr. Jason Foley, & Mr. George Jolly (Air Force Research Laboratory), Dr. Alain Beliveau (Applied Research Associates)	**Effects of Blast Load Local & Global responses on Highway Bridges (51)** Mr. Zhihua Yi & Dr. Anil Agrwal (City College of CUNY)	**Training:** **Physiology and Measurement of Explosions in Air and Underwater** **Part 2: Making the Measurement** Dr. Pat Walter (Texas Christian University / PCB Piezotronics)
5:00	**Calibrating & Evaluating Performance of COTS Piezoresistive Shock Accelerometers (50)** Dr. Alain Beliveau & Mr. Jonathan Hong (Applied Research Associates), Dr. Jason Foley, Mr. Neil Gilkin, & Mr. Jordan Coker (Air Force Research Laboratory)	**Nanomaterials for Infrastructure Protection & Security (52)** Dr. Alexander Cheng & Dr. Ahmed Al-Ostaz (University of Mississippi)	
5:20	**Characterization of a New Accelerated Drop Tower for Shock Testing (50)** Mr. Jonathan Hong & Dr. Alain Beliveau (Applied Research Associates), Mr. Stephen Szczepanski (Air Force Research Laboratory)	**Multi-Disciplinary Aspects of Tunnel Security (52)** Dr. Amar Chaker (Engineering Mechanics Institute of ASCE) & Dr. Mohammed Ettouney (Weidlinger Associates)	

5:20-7:00	**Abaqus in the Defense Industry** Chairs: Mr. Mike Sasdelli & Mr. Peter Nannucci (Dassault Systèmes SIMULIA Corp.)	***Meeting Room: Borgne***
	SIMULIA is the Dassault Systèmes brand that delivers a portfolio of Realistic Simulation solutions including the Abaqus product suite for Unified Finite Element Analysis, multiphysics solutions for insight into challenging engineering problems, and lifecycle management solutions for managing simulation data, processes, and intellectual property. An overview presentation, "SIMULIA for Defense Labs", covering some of the newer features in Abaqus and other SIMULIA products that are of interest to the SAVIAC community will be presented. Afterward, will be moderate an open discussion focused on the use of the Abaqus product suite in these key industries.	

THURSDAY AM (NOVEMBER 8)

	TRACK 1 Innovations in Sensor Technology & Data Management (8:00-10:00) Chair(s): Mr. Mike Poslusny (National Technical Systems)	TRACK 2 Vibration Modeling, Simulation, & Analysis (8:00-10:00) Chair(s): Mr. Kirk Doughty (NUWC Kepyort) Mr. Roland Trailor (G.D. Electric Boat)	TRACK 3 - LIM. DIST. C DS: UQ/V&V of Large Structures to Shock Loading (8:20-9:20) Chair(s): Dr. Michael Shields (Weidlinger Associates)
	All Presenters and Chairs (for Nov. 8th) are Required to Meet at 7:00AM in Napoleon D1/D2 for Presentation Loading		
	Meeting Room: Napoleon D1/D2	***Meeting Room: Napoleon D3***	***Meeting Room: Bayside A***
8:00	**Development of a Critically Damped 2000G MEMS Accelerometer (52)** Mr. Robert Sill (PCB Piezotronics)	**Several Aspects to be Considered in the Definition of a Laboratory Vibration Simulation Program for Airborne Stores in Captive Strain Flight (53)** Mr. Zeev Sherf, Mr. Arie Elka, & Mr. Philip Hopstone (RAFAEL)	
8:20	**Low Noise, High Range Strain Measurements at 2 MHz (52)** Mr. Tom Graver (Micron Optics, Inc.)	**Reconstitution of a Disrupted Missile Free-Flight Measured Vibration Time-History (54)** Mr. Zeev Sherf, Mr. Arie Elka, & Mr. Philip Hopstone (RAFAEL)	**A Combined Reduced Order & Substructuring Approach for Uncertainty Quantification of Heavy Equipment Response (65)** Dr. Kirubel Teferra, Dr. Michael Shields, Mr. Adam Hapij, & Dr. Raymond Daddazio (Weidlinger Associates)
8:40	**Performance Characterization of Precision Inertial Accelerometers (53)** Mr. Robert Martinez (C.S. Draper Laboratory)	**Criteria for the Evaluation of the Equivalence Between a Free-Flight Measured Vibration Time-History, & a Mathematically Reconstituted or Shaker Simulated Version (55)** Mr. Zeev Sherf, Mr. Arie Elka, & Mr. Philip Hopstone (RAFAEL)	**Bootstrap Monte Carlo using Adaptive Stratified Sampling for UQ/V&V of Large Structures Subjected to Shock Loading (66)** Dr. Michael Shields, Dr. Kirubel Teferra, Dr. Najib Abboud, Mr. Adam Hapij, & Dr. Raymond Daddazio (Weidlinger Associates)
9:00	**Amendment to ISO 16063-22:2005, "Methods for the Calibration of Vibration & Shock Transducers - Part 22: Shock Calibration by Comparison to a Reference Transducer (53)** Dr. Vesta Bateman (Mechanical Shock Consulting)	**Synthesis of a PSD Compatible Acceleration Time-History (55)** Mr. Ed Alexander (BAE Systems)	**Assessment of Validation Metrics for UNDEX Simulations (66)** Dr. David Manko (Sandia National Labs), Dr. Thomas Paez (Consultant)
9:20	**Rapid Design Cycles and Explosive Data Growth in Engineering Test (53)** Mr. Robert Eaton (EADS North America)	**Designing Structures to Withstand High Speed Fluid Impacts with Abaqus/Explicit—CEL (55)** Mr. Peter Nannucci (Dassault Systèmes SIMULIA Corp.)	
9:40	**Assessment of Fiber Optic Sensors Embedded in Composite Structures Subjected to Shock Loading (-)** Mr. Bill Gregory & Chris Key (HI-TEST Laboratories)	**Dissipated Energy Life Model of a Cantilevered Beam Subject to Random Vibration (56)** Mr. Kirk Doughty & Mr. Mark Paulus (NAVSEA Keyport)	

THURSDAY AM (NOVEMBER 8)

	TRACK 4 Material/Structural Response (8:00-10:00) Chair(s): Mr. Robert Sharp (Barry Controls)	TRAINING Training (8:00-10:00)
	All Presenters and Chairs (for Nov. 8th) are Required to Meet at 7:00AM in Napoleon D1/D2 for Presentation Loading	
	Meeting Room: Bayside B/C	***Meeting Room: Gallery***
8:00	**Validation Studies for the Release III K&C Concrete Model (57)** Mr. John Crawford, Mr. Joe Magallanes, Dr. Youcai Wu, & Dr. Shengrui Lan (Karagozian & Case)	**Training:** **An Introduction to MIL-S-901D Medium Weight & Lightweight Shock Testing** Mr. Braden O'Meara (HI-TEST Laboratories)
8:20	**The Transition from the Inverse to Classical Hall-Petch Phenomenon in Single Crystal Copper under Impact Loading (57)** Prof. Zhen Chen (University of Missouri)	
8:40	**New Insight into Granite Rock Target Damage from Macroscopic & Microscopic Study of Recent Earth Penetrator Events (58)** Mr. Robert Couch, Mr. Jeff Duray, & Mr. Robert Cilke (Applied Research Associates), Dr. Craig Schwandt (McCrone Associates)	
9:00	**Synthesis, Microstructures, & Explosive Properties of Spray-Deposited Silver Acetylide-Silver Nitrate Composite Light Initiated High Explosives (58)** Mr. Timothy Covert & Mr. Marcus Chavez (Sandia National Laboratories)	
9:20	**Evaluation of Residual Capacity of Composite Pressure Vessels After Impact Events (59)** Dr. Lee Taylor (Anatech), Mr. Alan Hsu (NEi Software)	
9:40	**An Investigation into Venting Solutions for the M548 Ammunition Container Due to its Contents Igniting (59)** Mr. Jonathan Jablonksi, Mr. Pasquale Carlucci, Mr. Travis Heitehoff, & Mr. Alexander Colletti (US Army ARDEC)	

THURSDAY AM (NOVEMBER 8)

	TRACK 1 Instrumentation & Measurement Techniques (10:00-11:40) Chair(s): Mr. Ed Alexander (BAE Systems) Mr. Joshua Gorfain (HI-TEST Laboratories)	TRACK 2 Blast Protection Technologies (10:00-Noon) Chair(s): Dr. Jason Florek (BakerRisk)	TRACK 3 *No Session Scheduled from 10:00-Noon in Track 3.*
	All Presenters and Chairs (for Nov. 8th) are Required to Meet at 7:00AM in Napoleon D1/D2 for Presentation Loading		
	Meeting Room: Napoleon D1/D2	***Meeting Room: Napoleon D3***	***Meeting Room: Bayside A***
10:00	**Testing Anti-Ram Barrier Protection Systems at the Larson Institute Crash Safety Research Facility (60)** Mr. Kurt Veggeberg (National Instruments)	**Analytical Validation & Design Guidelines of Innovative Blast-Resistant Steel Stud Wall System (63)** Dr. Ady Aviram, Dr. Ronald Mayes, & Mr. Ronald Hamburger (Simpson, Gumpertz, & Heger, Inc.)	
10:20	**Improved Data Acquisition Methods for Shaft Alignment (61)** Mr. Greg McLelland, Mr. Charles Cook, & Mr. David Palmer (Huntington Ingalls Industries)	**Experimental Testing of High-Strength Steel Stud Wall System for Enhanced Blast Protection (62)** Dr. Ady Aviram, Dr. Ronald Mayes, & Mr. Ronald Hamburger (Simpson, Gumpertz, & Heger, Inc.)	
10:40	**Using Digital Image Correlation for High Accuracy Measurements in Air Blast Test Environments (61)** Mr. Samuel Misko (Jacobs Technology), Mr. Ryan Alberson (Protection Engineering Consultants)	**Numerical Simulations & Testing Validation of Retrofitted Prefabricated Composite Steel Stud Blast Panels (63)** Dr. Jason Florek, Mr. Khaled El-Domiaty, & Mr. Thomas Mander (BakerRisk), Mr. Eric Wolff (Fyfe Company)	
11:00	**Deflection Measurement Solutions for Air Blast testing of Protective Window Systems (62)** Mr. Samuel Misko & Mr. Matthew Strickland (Jacobs Technology)	**Blast & Fragmentation Effects of Close-Range Detonations & related Mitigation Techniques (64)** Mr. Khaled El-Domiaty & Dr. Jason Florek (BakerRisk)	
11:20	**Free Pseudovelocity Shock Data Analysis Software Using GNU Octave (62)** Dr. Howard Gaberson (Consultant)	**Development of Shallow Foundation Streetscape Vehicular Anti-ram Systems through Modeling & Testing (64)** Mr. Edward O'Hare, Dr. Daniel Linzell, & Dr. Zoltan Rado (The Pennsylvania State University)	
11:40		**New Developments in a Blast Mitigating System Made of Laminated Polycarbonate for Exterior Building Protection (65)** Mr. James Lorenzo, Dr. Robert Pyles, & Mr. Karl Wiecking (Bayer MaterialScience LLC)	

THURSDAY AM (NOVEMBER 8)

	TRACK 4 - LIM. DIST. C Weapons Systems & Munitions Studies (10:00-11:40) Chair(s): Mr. Michael Magrini (Jacobs Technology) Dr. Jennifer Cordes (US Army ARDEC)	TRAINING Training (10:00-Noon)
	All Presenters and Chairs (for Nov. 8th) are Required to Meet at 7:00AM in Napoleon D1/D2 for Presentation Loading	
	Meeting Room: Bayside B/C	***Meeting Room: Gallery***
10:00	**Fragmentation Characterization of a Naturally Fragmenting Cased Munition with a Large Length to Diameter Ratio (67)** Mr. Michael Magrini (Jacobs Technology), Lt. John Held (US Air Force)	**Training:** **An Introduction to MIL-S-901D Heavyweight Shock Testing** Mr. Travis Kerr (HI-TEST Laboratories)
10:20	**A Novel Approach to a 100 Percent Fragment Capture Test of a Large Naturally Fragmenting Cased Munition (67)** Mr. Michael Magrini & Mr. Samuel Misko (Jacobs Technology)	
10:40	**Dynamics of the Safe & Arm Assembly in the M739A1 Fuze during Gun Launch & Projectile Flight (68)** Mr. Jonathan Jablonksi, Mr. Pavol Stofko, Mr. Robert Lee, & Mr. Dave Tabao (US Army-ARDEC)	
11:00	**Modeling & Simulation of the Zigzag Setback Pin for Fuzing Applications (68)** Ms. Melissa Rhode, Mr. Jonathan Jablonski, Mr. John Geaney (US Army ARDEC)	
11:20	**Comparing of Hydrocodes for Predicting an Explosive Sequence (69)** Dr. Jennifer Cordes, Mr. Steven Recchia, & Mr. Chuck Chin (US Army - Picatinny Arsenal), Dr. Robert Dorgan (Eglin Air Force Base)	

TUTORIAL DESCRIPTIONS

MIL-S-901D Shock Qualification Testing **November 4th / 1:00-4:00**
Mr. Kurt Hartsough & Mr. 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 Heavy-weight 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. 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 & maintenance of shock hardened Navy ships and shock qualification test facilities.

Introduction to Hazard-Based Reliability Analysis **November 4th / 1:00-4:00**
Dr. George Lloyd

It is increasingly important to quantify the expected reliability of long-lived complex systems which are subjected to very non-stationary environments, arising for example from system relocations to disparate environments and the consequent exposure to shock and vibration. Quantifying reliability and the uncertainty of its estimate under these scenarios is difficult using classical empirically-based approaches or strictly computational damage-based modeling schemes. In this tutorial we introduce attendees to the fundamentals of a hazard-based technique which provides a framework for advanced methodologies for accomplishing reliability estimates with quantified uncertainty. The ultimate goal of the method is to leverage existing empirical data to construct surrogate populations and hazard estimates along desired covariate trajectories for reliability analysis.

The scope of the tutorial will be confined to an overview of several topics which lie at the core of this ultimate strategy. The topics consist of the selection of reliability variables and a survey of empirical reliability estimators for censored reliability data, selection of covariates (factors which influence reliability) and quantification of continuous and intermittent covariates as stochastic processes, and descriptions of the empirical hazard associated with observed covariate histories in a parametric reliability framework suitable for more advanced work.

Shock Response Spectra and Time History Synthesis **November 4th / 1:00-4:00**
Mr. Tom Irvine

Students will receive basic instruction in calculating shock response spectra for time histories and for synthesizing time histories to meet shock response spectra specifications. Students will receive software programs in both C/C++ & Matlab for making these calculations, as well as accompany pdf files with formulas.

Students are encouraged to bring a notebook PC to the course in order to perform in-class exercises. Matlab is recommended, but not required. Furthermore, a PC is not required for this tutorial session. Students will receive software which they can take back to their workplaces regardless.

Airborne Stationary and Non-stationary Store Vibration Simulation Conditions Definition **November 4th / 1:00-4:00**
Mr. Zeev Sherf

Topics to be Covered in This Tutorial Include:

1) descriptive parameters of random time series in the time, frequency and amplitude domains
2) evaluation methods of the power spectral densities (PSD) under stationary flight conditions
3) elements required in the process of simulation conditions definitions
4) building the envelope psd –the functional testing conditions by a) using the PSDs of the different flight exercises and b) using the AR average vector
5) definition of the life span's simulation conditions,
6) handling non stationary flight vibration data (buffet, etc.) Simulation by Time Wave Replication

MIL-S-901D Shock Qualification Testing Extensions **November 4th / 4:30-7:30**
Mr. Kurt Hartsough & Mr. 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 Heavy-weight 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. 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 & maintenance of shock hardened Navy ships and shock qualification test facilities.

Introduction to Vibration Testing **November 4th / 4:30-7:30**
Mr. 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.

Introduction to Pyroshock Testing **November 4th / 4:30-7:30**
Dr. Vesta Bateman

This course discusses the concepts of Near-Field, Mid-Field Pyroshock and Far-Field Pyroshock and their criteria. Instrumentation used for measurement of pyroshock and structural response to pyroshock is described. The development of pyroshock specifications using primarily the Shock Response Spectra is discussed in detail, and various other analysis techniques are presented as well. Simulation techniques for near-field, mid-field and far-field pyroshock are presented and include both pyrotechnic simulations and mechanical simulations. Examples of actual test specifications and the resulting laboratory test configuration and measured results are discussed.

In addition, recent problems and issues in the pyroshock community are described and analyzed.

Introduction to the Principles of Fatigue and Fracture Mechanics **November 4th / 4:30-7:30**
Mr. Roger Bemont

This tutorial will provide a introduction to the principles of Fatigue and Fracture Mechanics from a practical Structural Engineering point of view. In this tutorial we will introduce the principles and then apply them to practical problems to illustrate the key concepts. You should bring a simple scientific calculator. The following topics will be included in this tutorial:

Strength of Materials Review; Scatter in Material Data; Typical vs Minimum Material Properties; Margin of Safety and Factor of Safety; “What is Fatigue?”; Stress Life Curves and Fatigue Data; Fatigue Stress Definitions; Low Cycle Fatigue and High Cycle Fatigue; Fatigue Strength Allowables; Factors Affecting Fatigue Strength; Constant Life Diagrams; Mean Stress Effects; Stress Concentration Effects; Variable Loading, Rainflow Cycle Counting, and Miner's Rule; “What is Fracture Mechanics?”; Cracked Members; Fracture Mechanics Definitions; Crack Loading Modes; Stress Intensity; Fracture Toughness; Crack Growth; and Damage Tolerance

TUTORIAL DESCRIPTIONS

Introduction to Dynamic Analysis and DDAM **November 4th / 4:30-7:30**
Mr. Barton McPheeters

Basic dynamic analysis is the foundation behind most analytical shock and vibration techniques. This tutorial will provide a brief introduction to the highlights of dynamic analysis with a slant towards shock and vibration.

We will cover basic modal analysis techniques and the interpretation of modal results. We will move on to the two major dynamic analysis types, forced vibration or frequency response and transient analysis or time dependent analysis. We will examine the direct and modal approaches to these analysis and the advantages of both. The tutorial will cover the various kinds of damping available to the analyst and the ramifications of using the different types. We will finish up with a short talk on Random analysis and a longer discussion of response spectrum analysis and DDAM.

Shock Test Failure Modes **November 5th / 8:00-11:00**
Mr. Kurt Hartsough & Mr. Domenic Urzillo

This tutorial will cover examples of shock test failures typically experienced by equipment exposed to MIL-S-901D shock levels. MIL-S-901D provides guidance for designers responsible for meeting the requirements of MIL-S-901D. This tutorial will show how and why equipment failures occur and show how minor design changes can prevent shock failures. Hands on demonstrations, real time high speed video and analysis will be used to demonstrate both failures and corrective actions.

The Measurement & Utilization of Valid Shock and Vibration Data **November 5th / 8:00-11:00**
Dr. Patrick Walter

Significant focus is often provided to applying sophisticated analysis techniques to the data resulting from shock and vibration tests. However, inadequate focus is often provided to assuring that valid 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, the physics of piezoelectric and silicon based accelerometers, and motion characterization.

For the experienced test technician or engineer it will provide additional insight into topics such as optimized measurement system design, accelerometer and measurement system calibration, accelerometer mounting effects, analog filtering, data validation, data utilization, and more. For the analyst or designer it will provide a series of simple observations and back of the envelope calculations that he/she can make on data to validate its credibility before using it in product de sign.

Composite Laminate Engineering **November 5th / 8:00-11:00**
Mr. Barton McPheeters

This tutorial is designed for engineers who are using composite materials, or are considering using them. The tutorial will cover theories used to predict the behavior of composite materials and its limitations. We will cover the current state of composite analysis technology and illustrate some successful implementations. the tutorial will then have a section devoted to the implementation of composite analysis in finite elements, its strengths and its limitations. Various modeling strategies will be considered to handle common issues in composites, such as sandwich materials, delamination and progressive and partial failure. Finally, we well close with a discussion of the limitations of current technology and a summary of best practices for considering the analysis of composite materials.

Spectral Theory of Random Vibration **November 5th / 8:00-11:00**
Dr. Tom Paez

The classical theory of random vibration relates stationary random excitations to the responses they excite in linear systems. The classical theory focuses on relations between moments of the excitation and the response, especially in the frequency domain. The so-called fundamental relation of random vibration expresses the spectral density of structural response as the spectral density of excitation times the modulus squared of a frequency response function. However, the relations of random vibration can also be written in an alternate form, the spectral form. This form expresses excitation and response random processes, themselves, as Fourier-type expansions with complex random amplitudes. The basic expression of the spectral form of a random process is the stochastic integral (suggested as long ago as the 1930 paper in which Wiener specified the definition of spectral density). The input/output relations of random vibration can be written in this spectral form. The resulting expressions are completely consistent with the classical expressions for random vibration, but they are more useful for direct representation of time-domain random vibration analysis and simulation. This tutorial develops, briefly, the necessary ideas of probability and stochastic processes, then proceeds to a spectral representation of random vibration. Along the way, the classical formula, the fundamental relation of random vibration, is written.

The theory is developed in a clear, understandable, step-by-step process with examples at practically every step. Many examples are presented, and MATLAB software to perform the operations developed in the class is available, free-of-charge, to all attendees who wish to have it. The course serves as an introduction to the follow-on "Theory of Nonstationary Random Vibration and Generation of Realizations," but it is useful by itself, and is not a necessary pre -requisite for the latter course.

Productive DDAM Analysis using FEA **November 5th / 8:00-11:00**
Dr. David Winkler & Mr. David Woyak

Most general purpose finite element programs provide basic tools for performing the Dynamic Design Analysis Method (DDAM) but fail to address common issues that users face during a typical analysis. As a result, productivity of the engineer and accuracy of results can suffer. Modern day FE models are large and have many vibrational modes. Selecting the right modes to assure accuracy and efficiency is no trivial task. To complicate matters, closely spaced -modes and lightweight components almost always add misery to the process. We use examples to clearly demonstrate significant risks that are hidden within the method. This tutorial will explain how and why numerical artifacts inherent to the DDAM can lead to results that sometimes under-predict the correct solution. We will also educate attendees on how these same shortcomings of the method can over-predict results, and without addressing both issues, the user has no way of knowing if a design is good. A free add-on module that is available for the Abaqus finite element program is used in the class and will be made available to attendees. This material is suitable for both managers and analysts.

Beyond the Shock Response Spectrum **November 5th / 8:00-11:00**
Mr. David Smallwood

In practice shocks are often quite complicated oscillatory time histories with a large random component. By far the most common method for the characterization of shocks is the shock response spectrum (SRS). The SRS was developed to reduce the complexity to a simple measure, that is, the peak response of a single-degree-of-freedom system to the shock. One of the serious limitations of the SRS is that all temporal information is lost. Several attempts have been make to reduce this limitation by specifying the duration of the shock. However the definition of the "duration" for a complicated shock has not been consistent. Temporal moments provide a consistent framework to define the duration and other moments. Fourier spectra can also be used to characterize shock, but again all temporal information is lost. The most general way to characterize a shock with a large random component is with a time varying spectral density. However, we frequently have insufficient information to estimate this spectrum. Bandlimited temporal moments can help bridge this gap.

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. Using the product model, a connection between the uncertainty parameter and the variance in the energy estimates will be established. 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. 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 SRS, or used to supplement the SRS of a shock.

It will be shown how the product model can be used to synthesize realizations of a shock, which match the temporal moments. Examples will be shown that suggest, that 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. Wavelet transforms can also be used to characterize shocks. These techniques will be introduced as a method to decompose a transient into component parts that are approximately bandlimited. The product of the bandwidth and duration is held approximately constant for each component. Thus higher frequencies are resolved with good time resolution giving up frequency resolution while the lower frequencies are resolved with good frequency resolution giving up time resolution. It is shown how the wavelet transform can correct some flawed shock data. The Harmonic Wavelet Transform is introduced as an excellent tool for visualizing shocks in a time-frequency framework. The Karhunen-Loeve Expansion is introduced as a way to characterize and simulate ensembles of shocks that can be modeled as nonstationary random events. A new method of characterizing shocks in an energy framework is introduced. The method has several advantages over the SRS. It is shown that there is a close relationship between the Energy Input, the Fourier Energy Spectrum, and the pseudo velocity SRS. The energy methods can handle nonlinear systems, and multiple degree of freedom systems in a rigorous mathematical framework.

MIL-S-901D Engineering Topics **November 5th / 12:00-3:00**
Mr. Domenic Urzillo

MIL-S-901D Math is a follow-on to the NAVSEAINST 9072.1A and MIL-S-901D training courses and is aimed at providing the NAVSEA acquisition and engineering communities a more in-depth review of engineering mathematics routinely used in equipment shock qualification. Topics covered includes shock spectrum as it relates to MIL-S-901D testing, digital data filtering, shock test fixture design fundamentals, FSP deck simulation fixtures and Multivariable Data Reduction (MDR).

Vibration and Shock Test Fixture Design **November 5th / 12:00-3:00**
Mr. 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.

TUTORIAL DESCRIPTIONS

Effective Solutions for Shock and Vibration Control **November 5th / 12:00-3:00**
Mr. Alan Klembczyk & Mr. Herb LeKuch

This presentation provides an outline of various applications and methods for implementing isolation control of dynamic loads and damping within a wide array of dynamic systems and structures. Photos, videos, and graphical results are presented of solutions that have been proven effective and reliable in the past. Design examples are given and typical applications are reviewed Additionally, key definitions and useful formulae are presented that will provide the analyst or systems engineer with the methods for solving isolation problems within the commercial, military, and aerospace sectors.

A wide range of isolation mounts and systems are covered including liquid dampers, elastomer and wire rope isolators, tuned mass dampers, and engineered enclosures. Engineering guidelines are presented for the selection and evaluation of isolation control products. Protection of COTS electronic equipment and probable damage levels are reviewed for the preparation of design and test specifications. Applications involve shipboard, off-road vehicles and airborne projects. Included also are industrial equipment and seismic control of structures and secondary equipment. Field and test data such as Mil-S-901D barge test measurements are presented. The use of Shock Response Spectra (SRS) for equipment assessment as well as isolator analysis is discussed. Details and examples of shock and vibration analyses are presented including case studies with step by step description of engineering calculations.

Analyzing Noisy Data for Explicit Dynamics FEA Users **November 5th / 12:00-3:00**
Dr. Ted Diehl

User's of Explicit Dynamics codes (LS-Dyna, Abaqus/Explicit, Radioss …) compute transient solutions that typically contain "solution noise" in addition to the expected "frequency-rich" content created by severe impacts, shocks, failure, etc. The overall characteristics of the frequency content vary within result quantities of acceleration, velocity, displacement, strain, stress, and reaction forces. Evaluating these simulation results with time-history plots and deformation and stress contour plots/videos can easily become highly inaccurate and misleading due to "noise" and distortions caused by aliasing. This course will explain why solution noise exists, how to request FEA results data correctly to avoid aliasing, and how to apply various filtering tools to remove noise - ultimately, uncovering significantly improved FEA results.

Significantly improved model robustness, accuracy and solution efficiency can be achieved by the proper understanding and use of DSP (Digital Signal Processing) technology. The 3-hour seminar covers highlights of DSP theory in the language of Mechanical Engineering pertinent to FEA users along with numerous practical applications presented. This seminar introduces key aspects of working with transient data in an FEA setting – specifically, clearly explaining time-domain and frequency domain analysis (DFS, FFT, PSD); data collection (sampling, up-sampling, decimation, and aliasing); filtering (lowpass, highpass, IIR, and FIR), and numerous unique aspects related to explicit dynamics FEA data (non-constant time increments, massively oversampled data, short transient signals with non-zero end conditions, …).

Several simplified interactive demonstrations are presented to solidify key DSP aspects, along with many relevant real-world examples - including a penetration analysis, severe impact/shock analysis of an electronic device, dynamic analysis of a snap-fit, and failure simulation of a metal component modeled with cohesive elements. Both FEA users and experimentalists will benefit from this training.

MIL-S-901D Subsidiary Component Shock Testing & Alt. Test Vehicles **November 5th / 4:00-7:00**
Mr. Kurt Hartsough & Mr. Domenic Urzillo

The MIL-S-901D Subsidiary Component Shock Testing and Alternate Test Vehicles course will cover the following areas; NAVSEA 05P3's current policy for testing subsidiary components, Description of test environment requirements, Examples of recent successful test programs, Alternate Test vehicle descriptions, Alternate Test Vehicle limitations, Discussions on Shock Spectra, Multi-Variable Data Reduction and Various Shock Isolation Systems. This course is intended to give the necessary information to equipment designers and program managers who intend to shock qualify COTS equipment that will require frequent upgrades due to obsolescence, equipment upgrades, change in mission, etc. Although not required, it is recommended that those attending this course also attend courses on Shock Policy, MIL-S-901D Testing and particularly MIL-S-901D Extensions offered by the same instructors (Domenic Urzillo and Kurt Hartsough).

Energy Methods for the Characterization & Simulation of Shock & Vibration **November 5th / 4:00-7:00**
Mr. Tim Edwards

The shock response spectrum (SRS) is the most frequently used method to characterize shock in spite of its limitations. New methods using work and energy are gaining popularity. Work and energy concepts are frequently used to reduce complex engineering problems to fundamental principles. In shock analysis, energy quantities can be derived that represent the energy delivered to a structure and the manner in which the structure dissipates the energy delivered to it. The input energy is relatively independent of the structure, which makes it ideal for characterizing the input. The response of the structure then depends on the input energy and the structural characteristics. This nicely decouples the problem.

We will derive the basic equations for the energy delivered to and absorbed by a single-degree-of-freedom (SDOF) system. It will be shown how the input energy can be used to characterize the shock. It will be shown how the method can be applied to SDOF systems with nonlinear damping and stiffness. A brief discussion of the application to stationary random vibration and sine will be given. We will then show how modal decoupling of multiple-degree-of-freedom (MDOF) systems will allow the same SDOF methods to be applied to MDOF systems. This will help explain why the first mode is usually the mode that absorbs the most energy and is frequently the response that causes damage.

Next we will discuss the relationship between the energy input, the Fourier energy spectrum, and the pseudo-velocity SRS. The calculation of the energy terms and the synthesis of time histories with a specified input energy will be discussed. Matlab functions for the calculations will be furnished upon request. Lastly we will discuss why the duration of the shock event should still be preserved. Temporal moments are suggested as an adequate method to preserve the essential characteristics.

Implicit and Explicit Nonlinear Analysis **November 5th / 4:00-7:00**
Dr. Lee Taylor & Mr. Barton McPheeters

This tutorial will provide an introduction to nonlinear analysis using both an implicit finite element code and an explicit code. We will cover the basics of nonlinear analysis as it relates to both implicit and explicit analysis codes. Implicit codes have many nonlinear capabilities that can be used to solve shock and vibration problems. This tutorial will discuss different types of nonlinear problems, exploring the theory and strategies for solution using an implicit FEA solution.

Concurrently, many computational simulations are not tractable in a standard implicit simulation because the models are too large, the contact conditions are too complicated, or the expected large displacements/rotations/deformations are simply too nonlinear for implicit solution. Often a combination of all three problems exists. An explicit dynamics solver is ideally suited for large, highly nonlinear, contact dominated models. Examples of problems that can benefit from an explicit solver include ballistic scenarios, crash simulations, jet engine bird strike, and metal forming processes.

There are situations where it is useful to combine the best of both types of analysis may be necessary to employ both an implicit and explicit finite element codes. There are several ways to accomplish this. The tutorial will discuss the important features necessary for initializing models within an implicit FEA code for static prestress and/or thermal analysis and subsequently continuing the analysis within an explicit code.

The instructors will employ NEi Nastran and NEi Explicit software for modeling examples of implicit and explicit analysis. The connectivity between the NEi implicit and explicit solvers allows for the streamlined problem solving of using a single solution to resolve a specific model where both implicit and explicit solution characteristics exist. The concepts, and theoretical background presented in this tutorial is applicable to any nonlinear analysis. Some of the techniques shown in the individual examples may also transferrable to other FEA software solutions.

Spectrogram Based Time/Frequency Analysis for Continuous and Discrete Spectra **November 5th / 4:00-7:00**
Dr. Ronald Merritt

Generally, qualification of fielded materiel for vibration consists of analyzing a sample of the field vibration environment prior to development of the laboratory vibration qualification test. Typical field measurements have significant time-varying components. For comprehensive laboratory qualification testing, it is essential that the time-varying nature of the environment be characterized and appropriate "time-varying" laboratory tests be implemented. For characterizing a vibration environment in time the spectrogram represents the time-varying counterpart of the single most important descriptor of vibration i.e., the autospectral density estimate or psd. The tutorial is designed to illustrate the usefulness of the spectrogram in quantifying measured time-varying vibration for laboratory test specification development. Emphasis is placed on environment estimates that contain tones that vary in time.

First, the tutorial reviews the basis for spectrogram processing i.e., ASD estimation for stationary and nonstationary (product model) processing. Second, the spectrogram is defined and illustrated in processing of triaxial accelerometer measurements. The usefulness of the spectrogram display for time/frequency assessment is discussed. Third, an extensive development is provided on estimation of significant discrete components within a time history based upon Fourier processing techniques. The development of a "discrete component map" is provided whereby tone amplitude and frequency are tracked in time and frequency domain moments are used to define laboratory test. In addition the removal of the discrete components is illustrated for convenience in estimation of the underlying continuous random spectrum. Fourth, estimation of the continuous/discrete spectra for both stationary and nonstationary (product model) is provided. And guidance is provided on laboratory test specification in terms of (1) sine-on-random/swept-sine-on-random for stationary environments or (2) Time Waveform Replication (TWR) for non-stationary (product model) environments.

Finally, the processing for continuous/discrete spectra is extended to cross-spectra considerations when multi-axis/multi-exciter laboratory testing is anticipated. All processing is discussed in detail and is transparent using readily available MATLAB code.

Theory of Nonstationary Random Vibration & Generation of Realizations **November 5th / 4:00-7:00**
Dr. Tom Paez

All real random vibrations are nonstationary, though many environments can be accurately represented as stationary. For greatest accuracy, many random excitation and response environments should be modeled as nonstationary. The spectral theory of stationary random process representation leads directly to a representation for nonstationary random processes. Priestley formalized such a representation in a sequence of papers written in the 1960s. The spectral theory of nonstationary random processes is well suited to interpretation and generation of nonstationary random process realizations, a particularly important feature in today's structural modeling environment that is closely tied to finite element modeling and simulation. A fundamental feature of the spectral representation of nonstationary random processes is the evolutionary spectral density. It is a direct generalization of the spectral density of a stationary random process.

Input/output relations for the random vibration of linear systems can be expressed, directly, using the spectral framework for nonstationary random processes, and those relations are developed in this tutorial. The tutorial starts with a brief review of the material presented in the "Spectral Theory of Random Vibration." It then proceeds to extend the ideas of the spectral representation to the nonstationary case. Finally, the course develops the nonstationary input/output relations for linear structures. It is shown that a special case of the nonstationary input/output relations is the fundamental relation of random vibration for stationary environments. The theory is developed in a clear, understandable, step-by-step process with examples at practically every step. Many examples are presented, and MATLAB software to perform the operations developed in the class is available, free-of-charge, to all attendees who wish to have it. The course serves as a follow-on to the "Spectral Theory of Random Vibration," but it is useful by itself.

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EXHIBITOR DESCRIPTIONS

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Heather Gryp
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Aberdeen Test Center is the DoDs premier test center providing a comprehensive test and training environment at world class facilities. Our Engineers, Scientists and Technicians offer expert knowledge and skills in data acquisition, instrumentation, fabrication and test methodologies which ensures our nation's Warfighters have the right capabilities for success.

Dorothena Bonham
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Advanced Antivibration Components (AAC) is the division of Designatronics devoted to marketing products exclusively related to elimination of vibration, energy absorption and protection of components and device from shock and possible destruction. Our product line is extensive with over 3000 products in our portfolio. Now, in addition to shock and vibration mounts, AAC offers Thermal Conductive Silicone Products to resolve heat problems associated with electronic equipment.

Dhiren Marjadi
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Altair's simulation-driven design process and technology help reduce the Total Ownership Cost, reduce Design Cycle Times, increase Energy Efficiency and improve Survivability of Navy ships by delivering mature designs early in the design cycle. Altair has a flexible engagement model with our customers to provide technology and expertise throughout the program. We are proud to serve the US Navy as an Engineering Prime Contractor to assist the Navy in your critical mission.

Kevin Rees
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ATK Aerospace is the world's top producer of solid rocket propulsion systems and a leading supplier of military and commercial aircraft structures. It also specializes in small and micro-satellites; satellite components and subsystems; lightweight space deployables and solar arrays; low-cost, quick-to-market launch solutions; flares and decoys; and energetic materials and related technologies. The group also has extensive experience supporting human and space payload missions.

Tom Diehl
Tom.Diehl@BodieTech.com

Bodie Technology - Specialists in properly handling noisy data via Digital Signal Processing (DSP). Our unique expertise benefits users of Transient Dynamics Simulations (Abaqus/Explicit, LS-Dyna, Virtual.Lab Motion …) and Engineers/Technicians working with Experimental Measurements. Those trying to correlate/interpret transient simulations and experiments find our Kornucopia® software, Customizable Training, and Consulting highly valuable.

EXHIBITOR DESCRIPTIONS (CONT.)

Steve Tanaka
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Boeing is the world's leading aerospace company and largest and most versatile manufacturer of commercial and military aircraft. Boeing designs, manufactures, and supports aircraft, unmanned vehicles, electronic and defense systems, missiles, satellites and advanced communication systems. Boeing also is a major service provider to NASA for the space shuttle and International Space Station.

Richard Mack
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Brüel & Kjær will be highlighting the latest PULSE hardware and software for data acquisition including PULSE Reflex Shock response spectrum (SRS) synthesis and control that provides a valuable tool to evaluate the shock-worthiness of equipment. In addition, we will also be showcasing VC-LAN which is the latest generation of vibration controllers, offering LAN-based connectivity alongside advanced testing capabilities such as kurtosis control and environmental chamber integration. Brüel & Kjær offers a full range of accelerometers, force transducers, impact hammers, impedance heads, non-contact transducers, conditioning amplifiers, cables and accessories.

Darren Fraser
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Crystal Instruments (CI) is a leading worldwide supplier of vibration controllers, portable dynamic signal analyzers, and dynamic measurement systems for product testing, machine monitoring, and vibration and acoustic analysis. CI's products are used across a wide range of industries, including aerospace, defense, and medical device manufacturing.

Russell Zuppo
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Established in 1984, **Data Physics** is a worldwide leader in high performance solutions for noise and vibration testing. Data Physics manufactures hardware and software with its full line of SignalCalc Dynamic Signal Analyzers, SignalStar Vibration Control Systems, SignalSound High Intensity and Underwater Acoustic Systems and SignalForce Electrodynamic Shakers.

Joe Deo
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Ask about our new 3 inch displacement UD T5500 shaker! **Dayton T. Brown, Inc.** is an A2LA / NVLAP accredited*, independent engineering and testing lab. Our facility stands apart from the rest by providing a full spectrum of engineering and testing services. For over 60 years, our goal has been to provide our customers with competitive pricing, low project cost and impeccable services. At DTB, we are committed to helping you successfully meet all of your goals. Our lab's low set-up costs and reduced time-to-test will satisfy your most demanding and complex test objectives. No other testing lab can offer the host of testing services that we can provide to you in one location with a 24/7 schedule.
*Please refer to our website for testing covered under Scopes of Accreditation.

Haley Norris
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Defense Threat Reduction Agency is the U.S. Department of Defense's official Combat Support Agency for countering weapons of mass destruction. Our people are Subject Matter Experts on WMD, and we address the entire spectrum of chemical, biological, radiological, nuclear and high yield explosive threats. DTRA's programs include basic science research and development, operational support to U.S. warfighters on the front line, and an in-house WMD think tank that aims to anticipate and mitigate future threats long before they have a chance to harm the United States and our allies. SCC-WMD, the U.S. Strategic Command Center for Combating Weapons of Mass Destruction, synchronizes Combating Weapons of Mass Destruction efforts across our military's geographic commands and leverages the people, programs and interagency relationships of DTRA at a strategic level. We work with the military services, other elements of the United States government, and countries across the planet on counterproliferation, nonproliferation and WMD reduction issues with one goal in mind: Making the World Safer.

Shelly Horvath
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Diversified Technical Systems is the world's leading manufacturer of data acquisition systems and sensors for the experienced test professional. For over 21 years, DTS systems have been at the forefront of collecting life-saving data on human injury and survivability. Unique features like ultra-small size, flexible configurations, IEPE sensor compatibility and 24/7/365 technical support have made DTS the #1 choice in crashworthy data acquisition systems worldwide.

EXHIBITOR DESCRIPTIONS (CONT.)

Laurie Marquart
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Dytran Instruments, Inc. is a leading designer and manufacturer of innovative piezoelectric and MEMS type sensors. Their expansive product line includes piezoelectric and MEMS type accelerometers, force sensors, pressure sensors, impulse hammers, cable assemblies and support electronics. Dytran sensors serve in shock, ballistic, modal analysis, structural dynamics, NVH, ESS and crash applications to name a few. Their sensors are getting "smarter" with the addition of TEDS (Transducer Electronic Data Sheet) and MEMS capabilities. Dytran is always looking forward to new challenges.

Connie Dague
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ETS Solutions, a leader in affordable, high-performance vibration test equipment, has developed simultaneous 3-axis vibration testing systems to meet MIL-STD-810G, Method 527. A more realistic approach that reduces test time by two thirds and identifies failure modes not found in single-axis tests.

Roger Rutz
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Experior Laboratories is a third party, independent test service provider and test laboratory. Specializing in environmental testing, Experior provides services to component manufacturers, military contractors, integrators and system providers within the space, aerospace, industrial, telecom, and defense markets. Experior Labs' extensive test facility has the capability to conduct a wide-range of services, from structural and subassembly assessment to material evaluation, utilizing environmental and mechanical tests such as vibration, shock, temperature/humidity, altitude, corrosion, and many more. Experior's provided testing services are in accordance with IEEE, MIL, SAE, AS, RTCA and other standard bodies.

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General Dynamics Electric Boat is the world's premier designer and manufacturer of nuclear submarines. For over 100 years, Electric Boat personnel have supported development, design, analysis, fabrication, installation and testing of high quality products for the U. S. Navy. Electric Boat has been a corporate supporter of SAVIAC for the past fourteen years and has participated in Shock & Vibration Symposia for over forty years. Electric Boat is a technology-oriented corporation that supports shock design, analysis and qualification of all major submarine systems with a variety of engineering, design and construction services. The exhibit will display a variety of recent engineering, design, testing, construction and/or technology development activities that Electric Boat has performed for the U. S. Navy.

Steven Holm
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Greene Rubber Company is a leading manufacturer of custom molded and fabricated rubber components including shock and vibration isolators as well as gaskets and seals. We have over forty years of experience in the engineering, design and manufacturing of shock and vibration products and have our own testing facility.

Tony Crook
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Hi-Techniques has been a leader in High Performance Data Acquisition Systems for nearly 30 years. Initially founded as a spin off of Norland Corporation, Hi-Techniques has specialized in transient recorders, data acquisition systems and high resolution Digital Oscilloscope products for a variety of applications and markets. Our latest product range, the Synergy, is Hi-Techniques' 7th Generation of Data Acquisition Products. Designed from the ground up, Synergy offers unparalleled performance and flexibility in data acquisition.

Lauren Yancey
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HI-TEST Laboratories, Inc. is a world-class provider of single-source test program solutions for industry and government, including research, design, testing and evaluation. The company's testing facility is based in Arvonia, VA and offers a full spectrum of testing including standard MIL-S-901D lightweight, medium weight, and heavyweight testing, MIL-STD-167 Types I and II vibration testing, MIL-STD-740 noise and MIL-1399 inclination testing. HI-TEST's Applied Technologies Division offers numerical and analytical testing expertise including response to underwater shock, survivability/vulnerability analysis, advanced composite materials design, progressive failure/survivability of composite structures, fracture mechanics and ballistic modeling and simulation. HI-TEST is a certified HUBZone Small Business (FAR 19.13).

EXHIBITOR DESCRIPTIONS (CONT.)

Greg Hoshal
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IST offers a full line of instruments from low cost shock detectors and shock & vibration loggers to full-featured shock & vibration waveform recorders and high speed/large memory units for demanding airborne measurements. We offer systems for applications ranging from low level seismic (milli-g range) to high g shock applications up to several thousand (2,000+ gs). We also offer specialized instruments for 6-axis measurement including roll, pitch and yaw as well as high speed atmospheric pressure recorders for specialized air drop & rate of descent testing. We even offer a miniaturized unit for in-situ helmet testing during sporting events or military or industrial training.

Max Barasso
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Isolation Dynamics Corp (IDC) is a leader in the design, engineering, and manufacture of Shock & Vibration Isolation systems for both military and commercial applications. Specializing in rugged, all-metallic, cable type isolators, IDC has amassed an impressive list of shock qualified systems for the US Navy and all branches of the military. IDC's unsurpassed experience and knowledge in the field of shock and vibration isolation, makes it possible for us to engineer a solution from early concept, to final product. All of IDC's products are proudly made in the USA using only the highest quality domestic materials.

Ronnie Viscusi
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ITT is a diversified leading manufacturer of highly engineered critical components and customized technology solutions for growing industrial end-markets in energy infrastructure, electronics, aerospace and transportation. Building on its heritage of innovation, ITT partners with its customers to deliver enduring solutions to the key industries that underpin our modern way of life. Founded in 1920, ITT is headquartered in White Plains, NY, with employees in more than 15 countries and sales in more than 125 countries.

Terry Mauldin
terry@kellettent.com

Kellett Enterprises, Inc - When vibration and sound reduction is essential to the success of your next project, do you have the reliability and experience of an organization providing solutions to these problems for over 50 years? By laminating composites utilizing mass damping and vibration reducing substrates, Kellett can manufacture products to your specifications. Our products are custom cut—never custom priced.

Rich Cadille
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Kistler Instrument Corporation will exhibit dynamic pressure and force sensors, along with accelerometers used in many shock and vibration applications. New this year is our 8315 single and 8395 triax K-Beam accelerometers that offer 0…1000 Hz response and 0…+/- 2 up to 0…+/-200 g of measuring range. Application engineering support available at our booth.

Jim Breault
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Lansmont Corporation provides specialized engineering and manufacturing services, delivering field instruments (portable data recorders) and dynamic test equipment (shock, vibration, drop, compression) used to improve quality, reduce costs and fulfill regulatory compliances associated with robust product and efficient transport packaging. Over the last 40 years Lansmont has developed distinct expertise in mechanical and electrical design, as well as software control and data analysis. Engineers around the world have relied on Lansmont equipment and our Field-to-Lab™ Methodology to discover the limits and eliminate the unknowns associated with robust design of their products.

Nils Heilemann
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LUDECA INC., your source for Preventive, Predictive and Corrective Maintenance Solutions including laser shaft alignment, pulley alignment, bore alignment, straightness and flatness measurement, monitoring of thermal growth, online condition monitoring, vibration analysis and balancing equipment as well as software, services and training. Stainless Steel Shims and Induction Heaters for proper monitoring of Bearings.

Jessica Koble
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Meggitt Sensing Systems is the Meggitt division specializing in sensing and monitoring systems. We measure physical parameters in the extreme environments of aircraft, space vehicles, power generators, nuclear, oil and gas installations and test laboratories. Meggitt Sensing Systems has operated through its antecedents since 1927 under the names of Ferroperm Piezoceramics, Lodge Ignition, Endevco, Sensorex, ECET, Vibro-Meter and Wilcoxon Research. Today, their capabilities and facilities have been integrated under one Meggitt division to provide complete systems from a single supply base.

EXHIBITOR DESCRIPTIONS (CONT.)

Greg Fountain
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Moog CSA Engineering is a recognized world leader in the field of vibration suppression, providing unparalleled experience in the analysis, design and production of a wide array of leading edge, high precision systems. Our major customers include AFRL, DARPA, Northrop Grumman, Lockheed Martin, Loral and leading research laboratories.

sales@mpina.com

Product designers and test engineers throughout the world trust **m+p international** for reliable noise and vibration analysis, structural dynamics, vibration and acoustic control. On display will be m+p's Smart Office Analyzer and Vibco with VibPilot 24, VXI, LXI and USB measurement hardware along with the new data acquisition and control system hardware, VibRunner. Additionally, m+p's Coda, Continous On-line, Data Acquisition system will be demonstrated.

Mike Poslusny
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National Technical Systems (NTS) offers a full range of engineering solutions; from product design, development and testing to systems integration, project management and managed services at laboratories located across the US. Our testing capabilities include MIL-S-901D, MIL-STD-167, MIL-STD-810, MIL-STD-461/461, RS 105, DO-160, MIL-STD 202, and MIL-STD 883.

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NEi Software is the developer of NEi Nastran, NEi Explicit, and global provider of Femap with a portfolio of FEA and CFD software that interfaces with codes like CATIA, AutoCAD, SolidWorks, and MAESTRO for ship modeling and analysis of structural dynamics, DDAM, shock and vibration, impacts, penetration, weapons effects, and virtual explosions.

info@pcb.com

PCB Piezotronics has over 40-years of history in the design and manufacture of piezoelectric, piezoresistive, strain gage, MEMS and capacitive sensors and instrumentation for aerospace applications. PCB specializes in high shock and MEMS accelerometers.

Doug Firth
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Precision Filters, Inc specializes in a broad range of high performance instrumentation for test measurements including signal conditioning for bridge, strain, dynamic strain, charge/IEPE w/ LD-TEDS, thermocouple, frequency and others. The all new PF-1U System provides 16 channels of fully programmable filter/amps in a compact 1U (1.75") package complete with Ethernet interface.

John Uzzolino
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For more than 10 years, **PVI** has served many companies that require deep, specialized technical knowledge and proven performance in failure analysis, reliability and predictive engineering, and instrumentation and testing. PVI Systems offers both custom engineering services and flexible measurement products so that customers can conduct faster research, build more reliable products, and reduce the cost of test using the latest off-the-shelf technologies and tools from National Instruments and other premium suppliers.

David Haberman
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SIMULIA is the Dassault Systèmes brand that makes realistic simulation an integral business practice improving product performance, reducing physical prototypes, and driving innovation. SIMULIA solutions include Abaqus Unified Finite Element Analysis solutions, multiphysics solutions for insight into challenging engineering problems, and SIMULIA SLM for managing simulation data, processes, and intellectual property.

EXHIBITOR DESCRIPTIONS (CONT.)

Joni Normandin
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Society for Experimental Mechanics (SEM) is composed of international members from academia, government and industry who are committed to interdisciplinary application, research and development, education and active promotion of experimental methods to: (a) increase the knowledge of physical phenomena; (b) further the understanding of the behavior of materials, structures and systems; and (c) provide the necessary physical basis and verification for analytical and computational approaches to the development of engineering solutions.

Gary Marracini
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Spectral Dynamics (SD) is a technically innovative company that has served the Shock and Vibration community continuously for 48 years. Whether it's Sine control of challenging tests, innovative MIMO control of multiple shakers, Shock data capture at 5 Msample/s/channel or accurate Phase-locked acquisition of hundreds of channels of data, Spectral Dynamics uses mathematics effectively to reduce the total costs of dynamic testing. Call Spectral Dynamics for a customized solution to your needs in Vibration, Shock or Acoustic Test Control; Multi-Channel Data Acquisition; Modal Analysis or PIND Testing.

Bruce Swanson
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SPEKTRA-Dresden was founded in 1994 and has since developed into one of the leading suppliers of calibration, measurement and test systems and services in the fields of vibration and acoustics. The five main pillars of our business activities are: measurement and test systems, calibration systems CS18, vibration control systems VCS, vibration and shock exciters, and calibration and environmental services, metrological testing.

Douglas Taylor
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The *Shock and Vibration Literature/Information Table* is sponsored by **Taylor Devices, Inc.**, designers and manufacturers of components and systems for the control of shock and vibration. Founded in 1955, Taylor Devices' products are used world-wide for energy absorption and control, damping, weapons effects, MIL-S901D, vibration control, and seismic protection.

Curt Nelson
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As the knowledged leader in multi-axis test system design, **Team Corporation** has developed a number of 6 DoF test systems used commercially and in support of DoD programs. The newest addition to Team's line up of high performance multi-axis systems is the TE6-9000, a 4,000 lbf 6 DoF system with unmatched frequency response and controllability. Please stop by Booth 32 to learn how hydrostatic bearings and electrodynamic shakers can be combined to allow reproduction of your toughest test parameters.

Steve Astulfi
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Tritek Inc. markets, sells, and supports the **TEAC** line of Instrumentation Data Recorders and Data Acquisition products to the Automotive, Aerospace, Defense, Medical, and Industrial sectors. The TEAC family of data recorders combines superb basic performance with a host of special features - ease of operation and data processing, etc. - that respond to user needs.

Karen Bresson
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The mission of the **Vibration Institute** is to disseminate practical information on the evaluation of machinery behavior and condition without commercial interest. The Institute offers programs that include education, training, certification, opportunities for exchanging technical knowledge, information, procedures, and data that are offered through meetings, publications, formal training and networking.

Jordan Van Baren
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Vibration Research Corporation will be exhibiting its 5th generation vibration control system hardware (VR9500 Revolution) with Version 10 software for electro-dynamic & servo-hydraulic shakers. Advanced hardware capabilities combined with powerful user friendly software make Vibration Research controllers the premier choice of testing labs around the globe.

Margaret Tang
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Weidlinger Associates has been one of the world's leading structural engineering and applied mechanics consultants since its founding in 1949. With a staff of more than 300, the firm has seven U.S. offices and an office in the United Kingdom. Weidlinger investigates, designs, rehabilitates, and protects buildings and infrastructure and performs advanced computational analyses for many complex and award-winning projects. The firm is committed to the principles of sustainable design and energy efficiency and is a member of the U.S. Green Building Council.

Leah Holber
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Xcitex is an innovator in the industries of motion analysis and video-based motion capture. ProAnalyst® is the world's leading software for extracting ("tracking"), analyzing, and presenting motion from pre-recorded video. MiDAS DA software combines and synchronizes data from a variety of sensors with your high-speed video.

EXHIBIT HALL

Not to Scale / Exhibit Hall Entrance at Bottom of Layout - Foyer