SAVIAC
Shock and Vibration Information Analysis Center
Current Awareness
September 2005

# The 76th Shock & Vibration Symposium Featured Organizations

## US Army Engineer Research and Development Center

A lot has changed in the 10 years since the U.S. Army Engineer Research and Development Center (ERDC) was last featured at the Shock & Vibration Symposium. When we featured them at the 66th Symposium in Biloxi, MS, they were called the Waterways Experiment Station. As part of the Army reorganization, the 4 labs in Vicksburg, MS (Coastal and Hydraulics (CHL), Geotechnical and Structures (GSL), Environmental (EL), and Information Technology (ITL)) were combined with the labs in Champaign, IL, (Construction Engineering Research (CERL)) Hanover, NH, (Cold Regions Research and Engineering (CRREL)) and Alexandria, VA, (Topographical Engineering Center (TEC)) to bring the technical expertise together to solve problems that stretch across multiple disciplines. I went to Vicksburg where I met with the Dr Bob Welch, SAVIAC Director and Chief if the Engineering and Informatics Systems Division, and Dr. Robert Hall, Chief of the Geotechnical and Structures Division, for a tour of the facilities.

The SAVIAC contract is handled out of the Information Technology Laboratory (ITL), so we started the tour with an overview briefing of ITL by Dr. Deborah Dent, the Deputy Laboratory Director. ITL is responsible for the development and application of advanced information technology to support military and civilian works mission areas. They operate three centers: High Performance Computing (HPC) Major Shared Resource Center (MSRC), the

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## Weidlinger Associates, Inc.

SAVIAC is proud to have Weidlinger Associates, Inc. as one of this year's Featured Companies. The firm is a leader in underwater shock analysis and blast-resistant design and has completed hundreds of protective design projects, including numerous U.S. embassies and courthouses. Founded in 1949 by Paul Weidlinger, the firm has grown to five divisions: Structures, Transportation, Infrastructure, Applied Science and Investigations. They have a full time staff of 300 people with revenues of $50 million in 2004. You can get more information at their web site, www.wai.com. You might also want to request their newsletter; it's well written and filled with details on some fascinating projects.

I visited Weidlinger while in Manhattan to attend the ASCE Structures Conference, a conference they are heavily involved in. The firm believes in presenting and publishing its work and in sending its young as well as experienced people to conferences to maintain and/or develop skills

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## MSC.Software

I was excited when Bart Mcpheeters of MSC.Software received permission from his management to be a Featured Company at the 76th Shock & Vibration Symposium. I had used MSC/NASTRAN in an earlier career and had invited Dr. Richard MacNeal, the "M" in MSC, to speak on the history of the finite element method at the 64th Shock & Vibration Symposium in San Diego, so I thought I was familiar with the company and their products. I was in for a surprise. MSC.Software was founded in 1963 by MacNeal and Mr. Robert Schwendler as the MacNeal Schwendler Corporation with an initial investment of $18,000. In 1965, they participated in a joint project with NASA and other major aerospace and defense companies to develop NASTRAN (NASA Structural Analysis Program). In 1971 they announced their proprietary version, MSC/NASTRAN. They went public in 1983 and in 1989 entered the highly nonlinear physics market with the acquisition of PISCES International B.V. of Gouda, The Netherlands. They introduced MSC.Dytran, a highly nonlinear dynamic response

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CADD/GIS Technology Center, and the Corps of Engineers Enterprise Infrastructure Services, and have two divisions, Dr. Welch's division cited earlier, and the Infostructure and Knowledge Management Division. You will read more about the MSRC in the next paragraph, for more information on the other parts of ITL, please visit the ERDC web site, www.erdc.usace.army.mil. The GSL and ITL both block fund SAVIAC.

John West, Director of the HPC, took me on a tour of the HPC, showing me the computer hardware that must be updated every 18 months in order to keep current, the storage carousel capable of holding huge amounts of data from the user's analyses, and the ability to connect with other HPC's around the country and with users around the world. The computer systems of the HPC generally stay within the top 15 most powerful I the world. The HPC support includes systems for other government computing needs as well as those for the Shock & Vibration world. In addition to the hardware infrastructure, they also have a cadre of world-class computer programmers. They are also a block funding organization for SAVIAC.

Next, I met with Dr. Robert Ebeling who works in Dr. Welch's Division and is leading a group working on developing methods to predict the properties of carbon nanotube based construction materials using molecular dynamics. Carbon nanotubes are tubular macro-molecular versions of the Buckminster Fullerene (also known as Bucky Balls). Carbon nanotube-based composite construction materials may hold the key for construction materials that are one- to two- orders of magnitude over current materials, and would allow engineers to design much stronger and lighter structures. This is an example of ERDC pulling together expertise from the different laboratories (participation is from ITL, CERL and EL) to work on a problem. .

Sonny Johnson and Dan Eng briefed me on their blast and structural response measurements work. They are determining safe standoff distances for people. Forty years ago, the interest was in the long duration pulse from a nuclear explosion. Today they are interested in short duration air blast effects, effects of multiple reflections from internal explosions, and determining if a short duration over-pressure can kill.

I met next with staff from the Mobility Systems Branch of GSL that does many ride and shock tests and has developed a database of vehicle parameters from the data. They use a single wheel tire tester that can characterize a tire to test new tread patterns. Cliff Grey, who is matrixed to Mobility from Dr. Welch's division, showed me a Bradley that has a rubber track, resulting in a quieter ride with less wear on the road. They are also working on autonomous vehicle proof-of-concepts.

Dr. Tom Slawson of GSL showed me the Blast Load Simulator, a shock tube enclosed by a circular tunnel or

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and network. This policy is one reason why they have survived and flourished while a lot of other firms have gone out of business.

My first conversation was with Dr. Ivan Sandler, recipient of the Mel Baron Award at the 74th S&V Symposium in San Diego. Incidentally, Mel Baron was a principal at Weidlinger's when he passed away and the award was conceived of as a way to remember him while recognizing the achievements of members of the community. The firm donated the money to purchase the medals that are presented to each recipient. Ivan's citation reads "For his pioneering work on uniqueness and stability of material models, which were critical to enhancing the shock and vibration community's understanding and appreciation for stable material laws, and in awakening the community to the importance of robust material laws in large scale computations."

Ivan has been working in this field for thirty six years; long enough to have observed changes in both the technical as well as non-technical areas of how business gets done. As we talked, the idea for an Elias Klein Lecture titled "History of Engineering Analysis: An Old Man's Lament", for next year took shape. Look for it in Seattle for the 77th S&V Symposium, it should be a good one. One of Ivan's observations is that competition has made it harder to assemble a research team; energy is being spent in competing, not cooperating.

Ivan works in the areas of ground and water shock. He has developed computational tools and sees a need for a full up coupling of fluid/structure interaction to understand a blast close to a structure. What is missing is a simplifying idea to couple the codes and how materials respond in those regimes.

My next interview was with Margaret Tang, an engineer with 28 months experience. Margaret has worked on submarine and FSP analyses; unconventional loading on conventional structures, blast on buildings and the World Trade Center investigation. Not bad for a junior engineer. The projects are so big that they are typically broken down into parts and she works with a senior person to get the benefit of their knowledge.

Margaret attends the Symposium to gain new knowledge. She's interested in learning the basis for so called "rules of thumb" that people use and would like to see "How to do it" sessions. The new Young Engineer's Forum that will debut at the Symposium developed as we talked about how SAVIAC could better serve the community. Margaret will chair it and has provided the suggestions for the content that has led to presentations on how a building and a submarine are constructed. The forum, when combined with the Training Track is turning the Symposium into a good educational experience for young engineers interested in Shock & Vibration.

Adam Hapij is an associate with 8 ½ years of experience. He has worked on vulnerability assessment of com-

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# PCB GROUP INC.

The **PCB "Measurement" Group** of companies offers a wide range of sensor technologies. With Depew, New York-based PCB Piezotronics as its flagship company, individual companies and core competencies include:

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# 75th Shock & Vibration Symposium Exhibitor Highlights

**Exhibits will open this year on Tuesday, October 19th at 11:30 am, immediately following the Opening Session, for the Exhibitor's Luncheon and will remain open until 5:00. The area will reopen on Wednesday morning at 7:30, closing at 5:00 pm to enable the hotel to set up for the evening networking event in the Exhibit Hall from 7:00 - 9:00 pm. All breaks will be held in the Exhibit Hall.**

**To date, the following companies and organizations will be exhibiting. All exhibitor information is provided by the exhibitors. SAVIAC has performed minor editing.**

**Abaqus, Inc.**
ABAQUS, Inc., is the world's leading provider of software, technology and services for advanced finite element analysis. The ABAQUS software suite has an unsurpassed reputation for technology, quality, and reliability. ABAQUS offers a powerful and complete solution for simple to complex linear and nonlinear engineering problems, using the finite element method.

**Aberdeen Test Center**
Aberdeen Test Center (ATC) conducts testing for government, academia, private industry, and foreign governments. Core competencies include automotive, firepower, survivability/lethality, and Warfighter training and support equipment testing. Among the many facilities at ATC that support shock and vibration are the Roadway Simulator, Underwater Explosions Test Facilities, and the Vibration Facility.

**Anteon**
Anteon is a leader in IT and systems engineering and integration. We design, integrate and maintain state-of-the-art systems for national defense, intelligence and other high priority government missions. Our products include: intelligence systems; missile defense; weapons systems; secure identification access; logistics systems; emergency response; training and simulation.

**Bruel & Kjaer, North American**
Bruel & Kjaer is a world leader in sound and vibration test equipment. Since 1942 Bruel & Kjaer has been helping engineers worldwide solve tough sound and vibration problems. From microphones to accelerometers, single channel handheld meters to 1000+ channel lab systems, Bruel & Kjaer is truly your complete supplier of sound and vibration gear.

**Century Dynamics, Inc.**
Century Dynamics designs, develops, globally markets and supports advanced engineering and scientific simulation software. We provide solutions for understanding how designs and processes behave in real world applications. We service a wide spectrum of industries including aerospace, automotive, defense, education, marine, offshore, petrochemical, power and security. For two decades, the world's most prestigious companies and institutions have relied on Century Dynamics' significant, unique and proven technologies coupled with our world-class technical expertise to give them insight to solutions for their most difficult engineering problems.

**Data Physics**
Data Physics will exhibit its SignalCalc Dynamic Signal Analyzers, SignalStar Vibration Control Systems and SignalForce Electrodynamic Shakers. Data Physics has been supplying high performance solutions in signal processing to the noise and vibration community for over 20 years. With the addition of a full line of electrodynamic shakers to complement its vibration controllers and dynamic signal analyzers, Data Physics is a total solution supplier for vibration applications. Additional information can be found at www.dataphysics.com.

**DTRA/TDT**
Defense Threat Reduction Agency (DTRA) has a well deserved professional reputation for its' understanding of conventional and nuclear weapons effects. DTRA experiments, analyzes, and proposes to our armed services new employment schemes validated during our testing programs that include dual and multiple weapons delivery, ship-bomb into tunnels, fuse optimization, bunker response, and limit of collateral effects when necessary.

**Endevco**
Founded in 1947 and headquartered in San Juan Capistrano, CA. Endevco is one of the world's leading designers and manufactures of dynamic instrumentation for vibration, shock and pressure measurement. The company's comprehensive line of piezoelectric, piezoresistive, and variable capacitance sensors are used to solve measurement problems in a wide variety of industries including aerospace, automotive, defense, medical, industrial and marine. Available products include accelerometers, pressure transducers, microphones, electronic instruments, and calibration systems. ENDEVCO has factory direct sale forces and applications support in the U.S., Europe and Asia.

**Enidine**
Enidine will be on display with the industry's broadest array of shock absorption and vibration isolation products for defense applications, including hydraulic, elastomeric, wire rope, and mechanical designs. Enidine can solve your shock and vibration isolation problems in the areas of shipboard shock, mobile electronics, engine isolation, noise attenuation, transportation/shipping and more. Let our world-class engineering and innovative designs "make your ride a little smoother". Visit Enidine at the SAVIAC exhibition area or at www.enidine.com.

**General Dynamics - Electric Boat**
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.

**Hi-Techniques**
Hi-Techniques introduces the new Synergy recorder which merges frequency-domain and time-domain data acquisition. Equipped with universal signal conditioning, selectable AA filters, and up to 64 1-MHz-bandwidth

**Exhibitors, continued on page 5**

channels, it combines transient capture, streaming data acquisition, and real-time frequency analysis. Synergy is our sixth generation of data acquisition systems to serve military, aerospace and automotive customers.

**Hi-Test Laboratories**

HI-TEST Laboratories, Inc. has been a leader in the shock and vibration community for over 30 years. HI-TEST is the nation's only facility that provides the full range of NAVSEA approved MIL-S-901D shock testing (lightweight, medium weight, heavyweight) as well as MIL-STD-167 vibration testing all at one location. Our focus on delivering high caliber customer service in the field of shock and vibration make us a leader in the industry.

**Instrumented Sensor Technology**

Offering self contained, battery powered data recorders for dynamic test and measurement; shock, vibration, seismic, angular roll, pitch, yaw, temperature, humidity, pressure. Low power, extended field time applications to several weeks. Environmentally rugged, flight certified, intrinsically safe. Offering units from one to nine channels, 12 bit digitization to 50 kHz, onboard memory to 108MB, completely user programmable for as wide range of triggering and recording modes. Crash test, drop test, flight test, ship test, we do it all.

**Kistler Instrument Corporation**

Kistler will exhibit recently released accelerometers designed for shock and vibration testing. Exclusive PiezoStar® crystal elements are being added to new accelerometers that provide increased sensitivity and higher working temperatures. Accelerometers with piezoelectric elements and variable capacitive elements are featured. Related products and accessories for defense research and testing are shown.

**Martec Limited**

Martec is a leading Canadian engineering firm specializing in advanced engineering simulation and analysis technology, particularly in the areas of explosions, combustion, shock waves and the resulting structural response. Martec's Chinook CFD software is a state- of-the-art blast analysis tool that provides physically accurate solutions to multi-diversional high-speed flow problems

**MFPT**

The Society for Machinery Failure Prevention Technology (MFPT) is a division of the Vibration Institute, a not-for-profit corporation. The Society and the Institute are dedicated to technical information exchange, education and training in multidisciplinary technologies. Activities include annual technical meetings and training courses. The 2006 meeting is scheduled for April 3-6, 2006. The exhibit will feature literature, publications and displays that illustrate the mission, goals, activities, services and membership benefits of the Society and the Institute.

**MSC Software**

MSC Software (OTC: MNSC.PK) is the leading global provider of virtual product development (VPD) solutions including simulation software and services that help companies save time and reduce costs associated with designing and testing manufactured products. MSC Software employs more than 1400 people in 23 countries. For additional information about MSC Software's products and services, please visit www.mscsoftware.com.

**NAVSEA**

The NAVSEA Warfare Centers is part of an elite team of the Naval Sea Systems Command (NAVSEA) activities that serve the Fleet. The Warfare Center's role is to provide the right technology, the right capabilities, and the specialized research and development facilities to support all aspects of surface and undersea warfare.

**Newport News Industrial Corporation**

Newport News Industrial manufactures the C-Worthy S&V Insulation Mounts, which allows the use of COTS electrical and electronic equipment on board Navy ships. C-Worthy Mounts provide superior characteristics to include a higher dampening factor and better balance between tensile and compressive deflection regimes. With the C-Worthy Mount we provide expert application engineering services as part of our business model to ensure that each mount isolation selection performs consistent with customer objectives.

**Noran Engineering**

Noran Engineering's NEiNastran provides a wide range of industry proven finite element solutions for marine applications that enable our customers to evaluate and optimize many performance and reliability aspects of their designs and manufacturing processes. We invite you to visit our booth and attend our presentations at the Tutorial Session. Visit www.NENastran.com or call 1-800-Nastran.

**NTS**

National Technical Systems is a full service Independent Testing Lab with locations throughout the US. Excellence in Dynamics is our specialty. We provide vibration, shock and acceleration testing to specifications such as MIL-S-901D, MIL-STD-167-1, MIL-STD-810, MIL-STD-202, GR-63, and IEEE-344.. In addition, NTS offers R&D and specialized testing such as true pyro-shock capabilities to 100,000 g's, dual shaker vibration, multi-axis vibration, ED shakers to 45,000 F-lbs, modal analysis, and consultation services.

**Pacific Instruments, Inc.**

Pacific Instruments designs and manufactures high-performance transducer signal conditioning, data acquisition and control systems, portable ruggedized data recorders and telemetry data acquisition systems. Products are supported with application software for Windows 2000 and XP.

**PCB Piezotronics, Inc.**

PCB Piezotronics designs and manufactures a complete range of accelerometers, microphones, pressure sensors, force sensors, load cells, and torque transducers utilizing ICP®, piezoelectric, capacitive, strain gage, and piezoresistive sensing technologies. PCB also offers TEDS sensors and accessories and precision condenser, prepolarized, array, and special purpose microphones for acoustic measurements.

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MSC, continued from page 1



system for the analysis of solids, structures, and fluids in 1991 and MSC.Nastran for Windows in 1994. In 1997 they introduced MSC.SuperModel for advanced airframe modeling and the following year announced MSC.Acumen, a combination of a customization toolkit with MSC's extended core technology and professional services, acquired Silverado Software & Consulting, Inc. (SSC), a provider of engineering services and custom software solutions and Knowledge Revolution, the leading developer and distributor of 2D and 3D motion simulation software for design engineers and analysts. In 1999 they acquired MARC Analysis Research and Universal Analytics, Inc. and changed their name to MSC.Software. In 2001 they acquired Advanced Enterprise Solutions, Inc. and in 2002 Mechanical Dynamics, Inc. As of 2003 they were a company of 1400 employees with approximately $253 Million in revenue, including 300 service professionals and global offices. With the development and acquisitions, MSC.Software has simulation tools covering nearly every aspect of mechanical simulation such as dynamic motion, controls, hydraulics, acoustics, manufacturing, composites, and durability. The product line includes more than 150 products that are accessible through a token-based licensing system called MSC.Masterkey. You can get more information at their web site, www.mscsoftware.com. This article is based on conversations and e-mails I had with Tim Webb, Director, Marketing & Customer Satisfaction, and Reza Sadeghi, Vice President of VPD Solver Development

MSC.Software's role in the SAVIAC community is to provide the tools to mathematically simulate how a design will respond to its environment before any material is purchased. Properly done, it has the potential for huge savings in money and time by identifying weak points in design early in the process. Their products are used in nonlinear stress, shock and vibration, underwater explosion, controls, motion dynamics, acoustics, thermal, and crash/crush. They are always working to introduce new products and capabilities are currently working on several projects involving Fluid Structure Interaction, including damage caused by underwater explosion, fluid slosh in tanks, aerodynamics effect on structures, and fatigue.

Their goal is to enable a customer to develop a product model that can be used to do different types of analyses. The ability to use the same model to do motion, shock & vibration, thermal analyses, in the linear and non-linear regime, coupling the fluid/structure interaction can save a lot of time. MSC.Software calls this the Virtual Product Development for use in new product development where the customer can improve the concept development, design, testing and production activities. They work with their customers to development new analytical capabilities for their analysis packages and also to provide the capability to pass information, be it the model or analysis results, from one package so it can be used by another. For example, with SimOffice, a designer could use MSC.EASY5 for prototyping, simulation and control; go to MSC.Marc for simple to complex, linear and nonlinear analyses of structural, fluid, thermal, and coupled systems, into MSC.Akusmod to assess the acoustic responses of different designs, and finally MSC.SuperForm for the simulation and optimization of component manufacturing processes. In addition to SimOffice, which is a stand-alone VPD environment, they offer SimDesigner, a CAD-embedded VPD Environment and MSC.SimManager, a web based environment for automating and managing collaborative VPD. Each package can be tailored to include the modules (of which there are 150 different ones) required for a particular customer's product development. The SimOffice modules specific to the SAVIAC community are MSC.Nastran, MSC.Patran MSC.Marc, MSC.Dytran and MSC.SimManager

The biggest change in the next 10 years will the integration of analyses and the ease of use for the engineer. MSC.Software's solver development teams, led by Reza Sadeghi and located in Ann Arbor, MI, Los Angeles, CA, Italy, and other global locations , are working hard to make the goals of integration and ease of user reality. They plan on having a product model ready in 2006. The technical issues to meet the goal are solvable. The harder part of the problem is cultural; how do you convince people who have relied on tests that simulation can give you the same level of comfort that the design will work as intended? Reza pointed out to me that a test only gives you one data point while you can simulate multiple tests and play "what if" games with a physically realistic mat model. The aerospace industry has been a major driver and adopter of simulation and automotive industries are moving quickly to adopt simulation to reduce costly physical tests. Still, it will take a lot of success stories to realize this vision. One important point going for it is that we can't afford to keep doing business the old way; its too costly and time consuming to build and test. Those companies that are willing to take a chance on simulation, and do it right, will be around for a long time.

MSC.Software is also working hard to make our Symposium a success. Reza Sadeghi will welcome you to the Symposium and Bart Mcpheeters, SAVIAC TAG member and Program Committee Co-Chair, will present the Henry Pusey Award and do a tutorial on DDAM using MSC.Software Tools. Reza is also looking into a session on simulation success stories. Bart has also been busy promoting the Symposium to the aerospace community. When all is said and done, MSC.Software can help this community by enabling companies to reduce physical destructive tests, save time and money, and create better product development processes.

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building that is buried in the ground. It will be used to simulate blast loads from a wide variety of explosives to study their effects on targets at different standoffs. The facility is nearing operational status.

Frank Dallriva, a branch chief in the GSL, heads the Structures Lab Model Development. They are working on models to predict structural response to blast effects. Having these models will enable designers to develop retrofits to strengthen current structures against airblast.

Dr. Bill Grogan, the Deputy Laboratory Director of GSL, briefed me on SACON, a shock absorbing concrete and JELCOR, a material made out of rubber chips and diapers that trap bullets so they do not ricochet. The Army is one of the biggest user's of disposable diapers in Vicksburg.

The Director of ERDC, Dr. James Houston, worked on explosion-generated waves as a GI in the 60's and worked on projects of the Defense Nuclear Agency, the predecessor to the other Featured Organization, the Defense Threat Reduction Agency, in the 70's. His challenge is to build programs based on customer needs, drawing expertise from the technical disciplines in the seven laboratories that comprise ERDC. We talked a bit about where the future talent will come from, since the US kids are not as interested in science careers and more foreign students are returning to their homes as opportunities open up there. Dr. Houston will be the Keynote Speaker for this year's Symposium.

Hank McDevitt of the Impact and Explosion Effects Branch is working on how to make predictive measurements for air blast and how to use explosions in the manufacturing process.

Don Cargile, a senior research civil engineer is one of the top people in the country in weapon penetration. He took me on a tour of their gas-driven guns that propel projectiles into concrete targets.

Ms. Wipawi Vanadit-Ellis, Assistant Director of the Centrifuge Facility, took me on a tour of the ERDC Centrifuge. This facility can recreate a wide range of field phenomena and environments under laboratory conditions including blast and earthquake. It is the largest geotechnical centrifuge in the world.

ERDC has been very active in the planning for this year's Symposium. In addition to Dr. Houston delivering the Keynote Address, we will have Dr. Welch as a Welcoming Speaker and Dr. Paul Mlakar presenting the Henry Pusey Award. Dr. Welch will also do a tutorial on "A Primer on Explosion Effects in the Air, Water, and Soil", on Monday. Dr. Will McMahon and Dr. Yazmin Seda-Sanabria are organizing a limited distribution session "Vulnerability of Civil Infrastructure to Terrorist Threats", and Ms. Vanadit-Ellis will provide a Training Paper on the Centrifuge.

Weidlinger, continued from page 2

mercial vessels, developing mass and stiffness matrices to characterize the ship and determining the ultimate and residual bending strength of a ship segment. His knowledge base is technical data, old models and people. He is working on creating a knowledge base to use in future work. Adam noted that in today's world it's harder to be a renaissance engineer, the analyses are so complex that specialization is required.

I met Dr. Jeremy Isenberg at the ASCE Conference I referred to earlier, where he spoke at the Plenary Session. Jerry is the President of Weidlinger's and during a long and illustrious career has made contributions in the areas of UNDEX and Blast. Computational models go hand in hand with experiments, ensuring that the simulations are rooted in the physical world. This down to earth, no nonsense approach carries over to his management style where he supports his management team's efforts to develop a highly trained staff.

My last interview was with Dr. Ray Daddazio, a principal and head of the Applied Science Division, SAVIAC TAG member and co-chair of the Program Committee for the 76th S&V Symposium. Ray leads a group of 45 people located in New York City, Los Altos, CA, Washington, DC and Albuquerque. Mel Baron started this division in the 50's and count the Navy and DTRA as long stand clients. Ray's involvement in the Symposium goes back to 1979 and he sees the Symposium as a great forum, a good influence on the younger engineers, value in the tutorials and the ability to meet people in the community.

SAVIAC is excited to have Weidlinger Associates, Inc. as one of the Featured Organizations this year. Ray Daddazio will be a Welcoming Speaker, Howard Levine will co-present the Henry Pusey Award. Ray will co-instruct with Fred Costanzo a tutorial on UNDEX. They are also developing a joint US/UK limited distribution session on Air Guns and Margaret Tang will chair the Young Engineer's Forum. The Air Gun Session is investigating the use of air guns as a surrogate for explosives in UNDEX testing. Come see why Structural Engineering magazine has voted Weidlinger's the best structural engineering firm to work for the last two years.

**Be sure to check http://www.saviac.org/preliminary_program.htm for up-to-date programming for the 76th Shock & Vibration Symposium.**

**Precision Filters**

Precision Filters specializes in a broad range of high performance instrumentation for test measurements including signal conditioning, switch matrix systems, VME/VXI conditioners and modules. The all new 28000 System sets the standard for bridge conditioners with up to 64 channels of 300 kHz bandwidth amplifiers in a ruggedized package complete with Etherenet interface.

**Spectral Dynamics**

Spectral Dynamics has pioneered many exciting innovations in both Analysis and Control system Engineering. Recent developments have included advanced multi-shaker, multi-axis (MIMO) control Systems, and very high speed sampling and storage systems for studying the effects of blasts on various articles. Both of these systems will be on display at the 76th Shock & Vibration Symposium. In addition, the latest software solutions in Modal Analysis and Real-Time Rotating Machinery Analysis will be on display.

**R.C. Electronics, Inc.**

R.C. Electronics is a world leader in the design and manufacture of high speed, high performance multi-channel data recorders and high performance signal conditioning amplifiers and systems. RC Electronics is also the North American Distributor for TEZC data recorder products, which allows R.C.E. to offer both laboratory based and portable data acquisition systems. R.C. Electronics will be exhibiting the Datamax Digital data recorder, the new DTX-5000 signal conditioning system, the TEAC GX-1 integrated recorder, the LX-series flash memory recorder and the new DS-series multi channel raid systems.

**Society for Experimental Mechanics**

The Society for Experimental Mechanics (SEM) was founded in 1943 and currently has membership of approximately 2,000. The Society for Experimental Mechanics 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."

**Taylor Devices**

Taylor Devices will again provide Symposium attendees the opportunity to obtain and display literature at the Shock and Vibration Literature/ Information Table. This display area is available at no charge, on a first come-first served basis to small business firms and service organizations that are attending, but not exhibiting at the Symposium. Taylor Devices' products are used world wide for energy absorption and control, damping and isolation of components, systems and structures.

**Team Corporation**

Team Corporation has been manufacturing custom vibration and shock test vehicles for over 50 years. Our latest offerings include a system to reproduce the shipboard shock environment within an isolated cabinet when subjected to MIL STD 901 criteria. A recently completed guided head expander system for satellite testing reduces cross-axis motion to less than 20% while maintaining about a one million in-lbs overturning moment. These new offerings complement our family of high frequency multi-axis test systems and hydrostatic bearing slip tables. To learn what's new at Team Corporation, please visit our booth.

**Weidlinger Associates, Inc.**

Weidlinger Associates, Inc. is a multi-disciplinary consulting engineering firm specializing in applied science, structural, civil, transportation, and forensic engineering. Advancing the technology for blast, shock, impact and vibration effects since 1949, our computational tools are continually validated with physical testing. Our analyses support sea trials for most classes of naval vessels, helps suppress noise in submarines and helps protect surface ships from underwater explosions. We adapted these cold war technologies to antiterrorist design and our services include the definition of explosive environments, prevention of progressive collapse, and blast resistant facade systems. This expertise is applied to courthouses, airports, embassies, and commercial buildings.

# HI-TEST Laboratories & PCB Piezotronics

**cordially invite you to**

## Welcoming Reception
## Sunday Night - 7:00 - 9:00 Location TBA

## Hospitality Suite
## Tuesday Night - 7:00 - 9:00 Location TBA

**Check at the Registration Desk and look for posted notices for room location**

SAVIAC
Shock and Vibration Information Analysis Center

# would like to say thank you to the following contributors who have helped to make great things happen in the community during 2005:

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### February S&V Seminar Instructors
Dr. Charles Robert Welch
Dr. Paul Mlakar
Dr. David K. Vaughan
Patrick Lindsey
Dr. Eric Rinehart
Mr. Bart McPheeters
Mr. Allen Parkes
Mr. Tim Edwards
Ms Susan Blaeser
Mr. Greg Harris
Mr. Bob Krezel

### June S&V Seminar Instructors
Dr. Charles Robert Welch
Dr. Paul Mlakar
Ms Margaret Tang
Tim Edwards
Prof Sam Kiger
Mr. Bart McPheeters
Mr. Jeff Morris
Dr. Ray Daddazio
Dr. Rudy Scavuzzo

Mr. Bence I. Gerber

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Mr. Richard Peppin
Dr. Vesta Bateman
Mr. Tim Edwards
Mr. Don Dusenberry
Mr. Andy Anderson
Mr. Ahid Nashif
Mr. Pete Loeffler

### New Engineers Forum Speakers
Prof. Ted Krauthammer
Mr. Robert Krezel
Mr. Austin Alvarez

### 76th S&V Symposium Training Instructors
Mr. Richard Peppin
Dr. Howard Gaberson
Mr. Scott Walton
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Defense Threat Reduction Agency - FC
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# Registration Form

## 76th Shock and Vibration Symposium
## October 30 – November 4, 2005
## Destin, FL

*return to:*
*SAVIAC/ HI-TEST Labs*
*5136 Celestial Way*
*Columbia, MD 21044*
*(301) 596-0100*
*fax: (301) 596 -6400*

Name: _____

Organization: _____

Address: _____

_____

Phone: _____ Fax: _____ Email: _____

**REGISTRATION FEE: $845 (Discounted price of $745 granted to registrations, INCLUDING PAYMENT INFORMATION, if received by SAVIAC by October 9, 2005)**

**I WILL BE ATTENDING (Check all that apply, send appropriate clearance form to US Army ERDC)**
❑ Unclassified ❑ Classified

**TUTORIALS: $250 each/$350 if not attending Symposium (See the policy on Symposium attendance prior to registering)** **Sunday, Oct 30**

| | | |
|---|---|---|
| ❑ | Theoretical background and best practice using DDAM – Tony Abbey | 8-11 AM |
| ❑ | Beyond the Shock Spectrum - Temporal & Frequency Moments, the Product Model, & Uncertainty – Dave Smallwood | 8-11 AM |
| ❑ | UNDEX Analysis – Fred Costanzo & Ray Daddazio | 8-11 AM |
| ❑ | Dynamic Pressure Measurements for Munitions, Ordnance, and Other Testing: Part Science and Part Art – Pat Walter | 8-11 AM |
| ❑ | DDAM Using MSC.Software Tools – Bart Mcpheeters | 12-3 PM |
| ❑ | Shock Response Spectrum – Uses & Abuses – Tim Edwards | 12-3 PM |
| ❑ | Calibration, Maintenance and Operation of the LWSM & MWSM – Chris Grunau & Jeff Morris | 12-3 PM |
| ❑ | Data Validation and Editing – Allan Piersol | 12-3 PM |
| ❑ | Productive DDAM Analysis Using ABAQUS – David Winkler | 4-7 PM |
| ❑ | Basis of Elementary Shock Isolation System Design – D. Christopher Merrill | 4-7 PM |
| ❑ | ESS, HALT & Hass – Wayne Tustin | 4-7 PM |
| ❑ | Introduction to Vibration Testing – Jon Wilson | 4-7 PM |

**Monday, Oct 31**

| | | |
|---|---|---|
| ❑ | An Introduction to ABAQUS – Karl D'Souza | 8-11 AM |
| ❑ | Review of Structural Dynamics – Josh Gordis | 8-11 AM |
| ❑ | Naval Shock Analysis & Design – Rudy Scavuzzo | 8-11 AM |
| ❑ | Blast Resistant Structural Connections and Detailing – Ted Krauthammer | 8-11 AM |
| ❑ | The Measurement and Utilization of Valid Shock and Vibration Data – Patrick Walter | 8-11 AM |
| ❑ | Non-Linear FE Analysis for Shock and Vibration – Tony Abbey | 12-3 PM |
| ❑ | Shock and Vibration Analysis Using MATLAB – Kjell Ahlin | 12-3 PM |
| ❑ | Overview of Underwater Shock and DDAM – Young Shin | 12-3 PM |
| ❑ | A Primer On Explosion Effects In the Air, Water, and Soil – Bob Welch | 12-3 PM |
| ❑ | UNDEX and Acoustic Analysis with ABAQUS – Jeff Cipolla | 4-7 PM |
| ❑ | Damping Analysis and Technology – Jack Henderson, Peter Torvik & Ahid Nashif | 4-7 PM |
| ❑ | Application of the USA Code to Underwater Shock Problems - John DeRuntz | 4-7 PM |
| ❑ | Blast Effects and Blast Resistant Design – Ted Krauthammer | 4-7 PM |

**SOCIAL EVENT**: Wednesday evening, Registered attendee: no charge/Guest charge: $10
❑ yes, I will attend ❑ yes, I will attend with 1 guest ❑ no, I will not attend

**GUESTS' PROGRAM:**

| | | |
|---|---|---|
| Tues | Seaside | ❑ guest attending Tues (11/1): $10 |
| Wed | Silver Sands Outlets | ❑ guest attending Wed (11/2): $0 |
| Thur | Serenity by the Sea Spa | ❑ guest attending Thur (11/3): $60 |

**TOUR**: Friday 11/4 TBD ❑ yes (indicate # of persons) ___ Names: _____

**By registering for the Symposium you are agreeing to abide by the rules and regulations of Symposium conduct set by SAVIAC. These rules are available for viewing at www.saviac.org**

**PAYMENT INFORMATION: Please provide complete payment information.** Checks should be made payable to SAVIAC/HI-TEST. Payment may also be made by AMEX, Visa, or Master Card. Purchase orders are not accepted. Bank transfer fees are the responsibility of the attendee. **A $50 administrative fee will be charged to ALL cancellations received after October 9, 2005. Substitutions are accepted.**

❑ Check ❑ AMEX ❑ Visa ❑ Master Card Card # _ _ _ _ - _ _ _ _ - _ _ _ _ - _ _ _ _

Exp. Date _____ Cardholder Name (print): _____

AMOUNT PAID _____ Cardholder Signature: _____

**PLEASE FAX FORM & CREDIT CARD INFO TO (301) 596-6400 BY OCTOBER 9, 2005 TO RECEIVE DISCOUNT**

**YOU MAY ALSO REGISTER ON THE WEB AT www.saviac.org/76_symposium.htm**

# CLEARANCE FORM FOR CLASSIFIED SESSIONS

## 76th Shock & Vibration Symposium

## Destin, FL

| | | |
|---|---|---|
| ***FAX Copy To:*** | | ERDC Security<br>ATTN: Linda McGowan<br>(601)-634-3897 or 2995 (FAX)<br>(601)-634-4218, 3527, or 2776 (Verification) |

**Put my name on distribution for the (check appropriate box(es))**

‡ **Limited Proceedings** ‡ **Critical Technologies Journal**

**PART I: PERSONAL DATA** (To Be Completed By Attendee)

**Name:** _____ **Social Security No** _____
(Last) (First) (Initial)

**Place of Birth:** _____ **Citizenship:** _____ **Date of Birth:** _____

**Employer (Company/Gov't Agency/Military):** _____

**Employer's Address:** _____

**Classified Mailing Address:** _____

**Email:** _____ **Phone No:** ( ) - _____ **Fax No:** ( ) - _____

**Signature of Attendee:** _____

**PART II: SECURITY CLEARANCE INFORMATION** (To Be Completed By The Attendee's Security Officer)
**By signing below, I certify the attendee meets the requirements for access to classified material in accordance with Executive Order 12958, DoDR 5200.1-R, and DoDM 5220.22M (as applicable).**

**Clearance Level:** _____ **Investigation Type:** _____

**Date Clearance Granted:** _____ **Date of Investigation:** _____

**Granted By:** _____ **Authorized NATO Access:** _____
(Yes / No)

**Security Officer** _____
Name (Print): (Last) (First) (Initial)

**Title:** _____ **Organization:** _____

**Phone No:** ( ) - _____ **Fax No:** ( ) - _____

_____
**Signature of Security Officer** **Date**

**PART III: NEED-TO-KNOW (Contractors Only)** (To Be Completed By The Government Contracting Activity Officer)
**By signing below, I certify the attendee has the NEED-TO-KNOW to attend the classified portions of this symposium in accordance with Executive Order 12958, DoDR 5200.1-R, and DoDM 5220.22M (as applicable).**

**Name (Print):** _____
(Last) (First) (Initial)

**Title:** _____ **Organization:** _____

**Phone No:** ( ) - _____ **Fax No:** ( ) - _____

_____
**Signature of Contracting Activity Officer** **Date**

**PRIVACY ACT STATEMENT**

***AUTHORITY**: DoD 5200.1-R, para 6-202*
***PRINCIPAL PURPOSE**: To identify persons seeking approval to attend classified meetings during the symposium lsited above.*
***ROUTINE USES**: Information contained hereon is used for reviewing the request to attend the classified briefings during the symposium. Also used to certify the individual attendee's security clearance and access authorization.*
***DISCLOSURE IS VOLUNTARY**: Failure to provide the information will result in disapproval of the request to attend classified briefings.*

SAVIAC / HI-TEST Laboratories Inc.
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# *In the September 2005 Current Awareness Newsletter*

***Symposium Features US Army Research & Development Center, Weidlinger Associates, Inc. and MSC.Software***
***Exhibitor Highlights***
***Symposium Registration Form***
***Symposium Visit Request Form***

The Current Awareness newsletter is published by the Shock and Vibration Information Analysis Center, which is operated by HI-TEST Laboratories, Inc., under contract to the U.S. Army Engineer Research and Development Center.

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