SAVIAC
Shock and Vibration Information Analysis Center
Current Awareness
July 2004

Introduction to Air Blast Measurements

Part III: Guaranteeing that Validated Pressure Measurements are Acquired

Editor's Note: This is the third in a series of articles high-lighting one of this year's featured commercial agencies, PCB Piezotronics.

Parts I and II of this series provided a brief background on blast pressure phenomenology and its measurement. They also described how coupling the pressure transducer to the blast environment could influence the response of the measurement system. The current part introduces the concept of data validation.

In addition to pressure, which is the desired environment to be measured, there are competing undesired environments that occur concurrent with the pressure environment. These include, as a minimum: transient temperature, light, acceleration, strain, ionization products of the detonation, and others. When considering the potential effects of these undesired environments, it can be seen that strain, acceleration and temperature can all interact with the piezoelectric crystal within the transducer to result in an erroneous pressure indication. In addition, thermoelectric, photoelectric, electromagnetic, triboelectric, and other energy induced effects can result in additive electrical signals that create errors in the transducer output. All of these extraneous signals can be viewed as noise, which contaminates the desired pressure measurement. To validate that the transducer output signal is not contaminated (i.e., it is solely attributable to pressure), a combination of placebo3 and "check"4 channels must be used.

If one looks at the piezoelectric d-coefficients of quartz, they appear as: *(See Equation 1)*. These equations show that there is one crystal axis of quartz (z-axis, 3rd equation) that produces no piezoelectric output when stress is applied. Figure 10 contains a boule of quartz with this axis (z) identified. It is possible to manufacture a placebo blast transducer, i.e., one that produces no piezoelectric output, using z-cut quartz.

$$
\begin{aligned}
P_{xx} &= d_{11}\,\sigma_{xx} - d_{11}\,\sigma_{yy} + 0\,\sigma_{zz} + d14\,\tau_{yz} + 0\,\tau_{zx} + 0\,\tau_{xy} \\
P_{yy} &= 0\,\sigma_{xx} + 0\,\sigma_{yy} + 0\,\sigma_{zz} + 0\,\tau_{yz} - d14\,\tau_{zx} - 2d11\,\tau_{xy} \qquad (3) \\
P_{zz} &= 0\,\sigma_{xx} + 0\,\sigma_{yy} + 0\,\sigma_{zz} + 0\,\tau_{yz} + 0\,\tau_{zx} + 0\,\tau_{xy}
\end{aligned}
$$

Equation 1

The placebo transducer can be applied in the test in the same manner as any of the operational transducers, but it will not respond to mechanical inputs (pressure acceleration, strain). Any electrical output from it identifies signal contamination due to thermoelectric, photoelectric, electromagnetic, and / or triboelectric effects. In reality, a signal from the placebo transducer is typically caused by electrical or magnetic noise induced effects, and indicates that the operational transducers are probably also similarly contaminated. Triboelectric (i.e., frictionally generated) charge effects in cables can be ruled out as a noise source if integral electronics (ICP) are included within or at the transducer. This is because ICP converts the transducer to an equivalent low-impedance voltage source. Just as an electrical signal from a placebo transducer indicates signal contamination, no electrical signal from it indicates the effects responsible for the contamination to be absent.

Light intensity should also have no influence on the transducers discussed to date. Thermal effects will subsequently be discussed as a separate topic.

It remains yet to determine whether strain and / or acceleration result in additional contamination of the signal from the pressure transducer. Strain and acceleration have a cause / effect relationship. For example, under pressure induced acceleration loading, flexural modes of vibration might be excited in a plate in which a blast pressure transducer is mounted. The plate's motion elicits an acceleration response from the transducer by inducing stress in the piezoelectric element of the transducer, as does the resultant strain.

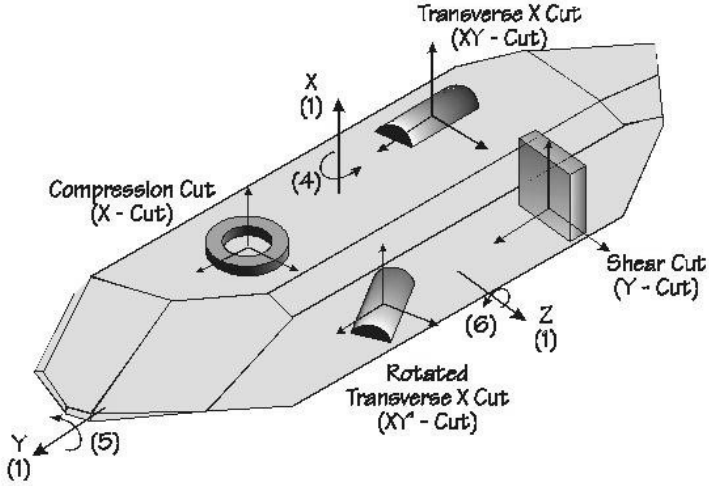

Fig. 10: Quartz Boule With Linear and Rotational Axes' Directions Identified

Intro Air Blast, con't on Page 2

Intro Air Blast, con't from Page 1

To identify the combined effect of acceleration and strain on the piezoelectric element, we take an operational transducer and isolate it from the desired pressure environment. It becomes a "check" channel. The right-hand portion of Figure 11 shows the field application of a "check" transducer. An operational transducer is mounted per the manufacturer's specifications in a hole dimensioned deep enough to prevent the transducer from making contact. If necessary, a small weep-hole can be drilled into the hole from the back surface of the plate to assure that no pressure build-up occurs due to flexing under pressure loads of the material in front of the transducer diaphragm. Any signal output from the check channel in excess of that produced by the placebo transducer is noise induced by strain and / or acceleration.

Under no circumstances can the undesired response from either the placebo transducer or "check" channel be "subtracted" from the signal of the pressure measuring transducer(s) as a data correction scheme. This is because the undesired environments contained in the pressure transducer(s) signals are spatially distributed across the test item. Thus, phasing errors would occur. The next several paragraphs, up to and including Figure 11, outline the process(es) and analysis that must be undertaken in order to replicate the effect of the "subtraction" if it could legitimately occur.

The combination of the placebo transducer and the "check" transducer allows us to document almost all of the aforementioned undesired responses with the noted exception of thermal effects due to transient temperature. The Model 134 Blast Probe is principally used to define the fast-rise-time shock front. Due to the acoustic waveguide principle on which the probe operates, a thin layer of black tape on its front face is required to mitigate thermal inputs to its very thin tourmaline crystal. This transducer is not intended to record the entire pressure-time history of the blast pulse. Adding additional tape at the probe's front boundary will provide greater thermal delay, but will also result in increased mechanical impedance, which degrades performance. Thus, its application is limited to short record times. Longer record times, such as those required for the total pressure impulse, necessitate a transducer with a mechanical configuration like that shown in Figure 5 (in an earlier article). Fortunately a transducer made like that in Figure 5 produces a very recognizable signature when a transient thermal input creates a problem. A thermal transient initially couples into and causes lateral expansion of the interior quartz crystals followed by expansion of the preload sleeve containing the quartz crystal assembly. The byproduct of this later expansion shows up as a positive (i.e., nonreturn to zero) signal residing after the blast event is clearly over.

Every manufacturer's transducers will respond to these undesired environments. However, some respond much less than others. The question is: "How do you manage or mitigate these responses?" Limited examples follow.

Thermal transient responses must be mitigated by application of ceramic or RTV coatings on the face of the transducer diaphragm. These provide a thermal delay, hopefully until the blast event is over. The reference provided as footnote 5 provides one such quantitative study of time delays that are achievable.

Figure 11 (left side) shows how a strain-induced signal can be eliminated as a noise source through mechanical isolation, in this case, via a concentric groove machined around the transducer to interrupt the strain transmission path. Low-density foam can be used to fill this groove if it presents a discontinuity to the flow of the blast products.

Previously, Figure 4 showed how essentially building an accelerometer within the pressure transducer, if its output is added in opposition to the acceleration response of the pressure-sensing element, could minimize acceleration effects. If the acceleration-compensation mass is further adjusted, the sensor's frequency response is also enhanced. This is called "frequency tailoring."

Elimination of those noise-induced signals uniquely identified by the placebo transducer would likely occur through attention to proper grounding and shielding. It should be noted that electrostatic shielding materials (e.g., copper, aluminum) are very poor electromagnetic shielding materials.

As can be seen, once documented, the various undesired responses require individual noise-reduction solutions. After additional tests in which both the placebo and "check" transducers produce no output, the pressure signals on the other data channels can be considered validated. That is, all the recorded data can now be considered to be the appropriate response of the pressure transducer(s) to the pressure environment alone.

Fig. 11: Strain Isolated Pressure Transducer Left - Isolated "Check" Transducer Right

3. Shock and Vibration Transducer Selection, Institute of Environmental Sciences and Technology, IEST RP-DTE011.1, Sec. 7.9, Oct. 2002.

4. Stein, P. K., The Unified Approach to the Engineering of Measurement Systems, Stein Engineering Services, Phoenix, AZ, April 1992.

5. Hilten, John, Vezzetti, Carol, Mayo-Wells, J. Franklin, Lederer, Paul, Experimental Investigation of Means for Reducing the Response of Pressure Transducers to Thermal Transients, NBS Tech Note 961, January 1978

Explosion Effects and Structural Design for Blast

A 2-day Training Course
At the Embassy Suites Hotel at
Baltimore/Washington International Airport
August 13 - 14, 2004

Instructors: Dr. Sam A. Kiger, PE and Dr. Stan Woodson, PE

Engineers have an opportunity to improve their skills in understanding explosion effects and designing facilities that are safer to occupants by understanding and minimizing the effects of explosive detonations on structures. Architects and builders will also benefit by appreciating the impact of explosive design decisions early in the process. All new government buildings now require some level of blast resistant design and this training will specifically address those requirements.

Course Description:

This course will focus on the fundamentals of explosion effects, determining blast loads on structures, computing structural response to blast loads, and the design and retrofit of structures to resist blast effects. The emphasis will be on terrorist threats from vehicle bombs, but the fundamental concepts can be applied to other explosive scenarios. Currently available software and publications for blast effects and design guidance will be discussed and demonstrated. Much of the design guidance and software is restricted distribution to government agencies and their contractors, however specific information on how to use and obtain the software will be covered in the course. The participant will gain an understanding of how to compute blast loads on a structure, how to compute structural response to blast loading, and practical methods for designing and retrofitting structures to resist blast effects. Participants will be provided with a complete set of class notes. A general background in structural analysis and structural design will be assumed.

Primary Topics Include:

Explosion Effects, Loads on Structures, Behavior of Structural Elements, Structural Dynamics, Response Calculations (approximate methods and computer codes), and Retrofit Techniques.

Course Location:

The course will be held at the Embassy Suites at Baltimore/Washington International Airport. A block of rooms are being held until July 12 at the reduced rate of $109 per night. For reservations, call 1-800-EMBASSY and request the special room rate for “Explosion Effects Design Class”.

Course Registration:

Registration Fee is $895.00. Your payment, in full, must accompany your registration form.

Course Refund Policy:

Refund of registration fee, less $50 to cover processing costs, are available upon cancellation notice by the registrant. Notification will be by fax, dated and signed by the person registered, to Dr. Sam Kiger at 573-882-4784. The refund will be by check mailed, within 30 days, to the registrant at the address requested on the fax. No refund will be allowed after five working days before the day the course begins. In the event the course is canceled a full refund will be paid to the individual at the address given at the time of registration. Questions may be directed to Dr. Sam Kiger at kigers@missouri.edu or by calling 573-882-3285.

More information about the instructors, the course, and accommodations can be found at http://blastdesigntraining.com. Professional engineers will get continuing education credit of 15 PDH's for the course. On-line registration is available and will ensure your seat is reserved. Questions regarding content and appropriateness can be obtained by contacting Dr. Sam Kiger at 573-882-3285, KigerS@missouri.edu or Stan Woodson at 601-636-4429, WoodsonEng@direcway.com.

Registration Form

75th Shock and Vibration Symposium
October 17-22, 2004
Virginia Beach, VA

return to:
SAVIAC/ HI-TEST Labs
PO Box 87
Arvonia, VA 23004
(434) 581-3204
fax: (509) 351-9733

Name: _____

Organization: _____

Address: _____

_____

Phone: _____ Fax: _____ Email: _____

REGISTRATION FEE: $795 (Discounted price of $695 granted to registrations, INCLUDING PAYMENT INFORMATION, if received by SAVIAC by September 26, 2004.)

I WILL BE ATTENDING (Check all that apply, send appropriate clearance form to NSWC/DD/Dam Neck)
❑ Unclassified ❑ Classified

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

		Sunday, Oct 17
❑	Elementary Shock Isolation System Design – D. Christopher Merrill	8-11 AM
❑	Introduction to DDAM Analysis Using NE/Nastran – Tony Abbey	8-11 AM
❑	Substructure Coupling and Structural Modification for Shock & Vibration - Joshua Gordis	8-11 AM
❑	The Navy Shock Qualification Process - Kurt Hartsough	9-12 AM
❑	Performing DDAM Analysis Using MSC.Software products - Bart McPheeters	12-3 PM
❑	Beyond the Shock Spectrum - Temporal & Frequency Moments, the Product Model, & Uncertainty - Dave Smallwood	12-3 PM
❑	An Introduction to ABAQUS - Jeff Cipolla	12-3 PM
❑	MIL-S-901D Shock Qualification Testing - Kurt Hartsough & Domenic Urzillo	1-5 PM
❑	Navy Weapons Systems Safety Program – Jamie Howell	4-7 PM
❑	Wavelets – Tim Edwards	4-7 PM
❑	Productive DDAM Analysis Using ABAQUS – David Winkler & David Woyak	4-7 PM
❑	Structural Detailing for Blast Resistance - Ted Krauthammer	4-7 PM

		Monday, Oct 18
❑	Basic Concepts of Digital Data Acquisition for Shock and Vibration Testing - Strether Smith	8-11 AM
❑	Calibration, Maintenance and Operation of the LWSM & MWSM – Chris Grunau & Jeff Morris	8-12 PM
❑	UNDEX and Acoustic Analysis Using ABAQUS - Jeff Cipolla	8-11 AM
❑	Naval Shock Analysis & Design - Rudy Scavuzzo	8-11 AM
❑	Damping – Jack Henderson, Peter Torvik & Ahid Nashif	8-11 AM
❑	Validation and Editing of Shock & Vibration Data - Allan Piersol	12-3 PM
❑	Introduction to Non-Linear Methods in Shock and Vibration using NE/Nastran – Tony Abbey	12-3 PM
❑	Overview of Underwater Shock and DDAM - Young Shin	12-3 PM
❑	MIL-S-901D Shock Qualification Extensions - Kurt Hartsough & Domenic Urzillo	12-3 PM
❑	The Measurement and Utilization of Valid Shock and Vibration Data - Patrick Walter	4-8 PM
❑	Shock Response Spectrum - Wayne Tustin	4-7 PM
❑	Application of the USA Code to Underwater Shock Problems - John DeRuntz	4-7 PM
❑	Navy Shock Database User Certification - Paul Medeiros & Kurt Hartsough	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 WILLIAMSBURG, VA ❑ guest attending Tues (10/19): $50
Wed HISTORIC NORFOLK ❑ guest attending Wed (10/20): $30
Thur GOURMET COOKING ❑ guest attending Thur (10/21): $10

TOUR: Friday 10/22 NSWCDD/Dam Neck ❑ yes (indicate # of persons) ___ Names: _____

TOUR RESTRICTED TO US CITIZENS AND SYMPOSIUM ATTENDEES

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. **A $50 administrative fee will be charged to ALL cancellations received after September 26, 2004. 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 (509) 351-9733 BY SEPTEMBER 26, 2004 TO RECEIVE DISCOUNT

YOU MAY ALSO REGISTER ON THE WEB AT www.saviac.org/75_symposium.htm

Multiple Attendance Registration Form

75th Shock and Vibration Symposium
October 17-22, 2004
Virginia Beach, VA

return to:
SAVIAC/ HI-TEST Labs
2421 26th Road South
Arlington VA 22206
703.892.0060
efax: 509.351.9733

SAVIAC is offering discounts for multiple registrations from the same company. To take advantage of this offer, choose the option below and **fill out a regular registration form for each attendee**. Send the entire package together with payment to SAVIAC. You may also register at our web site.

❑ ***BRONZE*** – 2 Registrations and up to 6 tutorials per registrant, SAVIAC Supporter Recognition, Bronze Level ($3,000) ***(Savings of $1390 over the individual price of $4390)***

Company: _____

Attendee: _____ Attendee: _____

❑ ***SILVER*** – One 8' x 8' Tabletop Exhibit Booth, 3 Registrations, up to 6 tutorials per registrant, One Copy Single Use License of the SAVIAC Compendium, SAVIAC Supporter Recognition, Silver Level ($5,000) ***(Savings of $3580 over the individual price of $8580)***

Company: _____ Attendee: _____

Attendee: _____ Attendee: _____

Exhibit Space : 1st Choice _____ 2nd Choice _____ 3rd Choice _____

❑ ***GOLD*** – One 8' x 10' Exhibit Booth, 5 Registrations, up to 6 tutorials per registrant, One Copy Single Use License of the SAVIAC Compendium, One 2005 Calendar Ad, SAVIAC Supporter Recognition, Gold Level ($10,000) ***(Savings of $3,525 over the individual price of $13,525)***

Company: _____ Attendee: _____

Attendee: _____ Attendee: _____

Attendee: _____ Attendee: _____

Exhibit Space : 1st Choice _____ 2nd Choice _____ 3rd Choice _____

Calendar Month Preference 1st Choice _____ 2nd Choice _____

❑ ***PLATINUM*** – Two 8' x 10' Exhibit Booths, 7 Registrations, up to 6 tutorials per registrant, One Copy Five-User License SAVIAC Compendium, One 2005 Calendar Ad, SAVIAC Supporter Recognition, Platinum Level ($15,000) ***(Savings of $4,425 over the individual price of $19,425)***

Company: _____ Attendee: _____

Attendee: _____ Attendee: _____

Attendee: _____ Attendee: _____

Attendee: _____ Attendee: _____

Exhibit Space : 1st Choice _____ 2nd Choice _____ 3rd Choice _____

Calendar Month Preference 1st Choice _____ 2nd Choice _____

By registering for the symposium you are agreeing to abide by the rules and regulation of symposium conduct set for the by SAVIAC. These rules are available for viewing by visiting www.saviac.org.

PAYMENT INFORMATION: Please provide complete payment information. Check should be made payable to SAVIAC/HI-TEST. Payment may also be made by AMEX, Visa, or Master Card. **Government credit cards will be processed during the Symposium**. Purchase orders are not accepted. **A $50 administrative fee will be charged to ALL cancellations received after October 1, 2003. Substitutions are accepted.**

❑ Check ❑ AMEX ❑ Visa ❑ Master Card Card # _ _ _ _ - _ _ _ _ - _ _ _ _ - _ _ _ _ Exp. Date _____

Cardholder Name (print) _____ AMOUNT PAID _____ Cardholder Signature _____

CLEARANCE FORM FOR CLASSIFIED SESSIONS
75th Shock & Vibration Symposium
Virginia Beach, VA

FAX Copy To:		ERDC Security ATTN: Linda McGowan (601)-634-3897 or 2995 (FAX) (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.*

75th S&V Symposium Clearance Form Instructions

IMPORTANT INSTRUCTIONS

1. This Security Certification must be faxed to:

Address: **US Army Engineer Research and Development Center**
ATTN: Linda McGowan

Fax: **(601)-634-3897 or 2995**
Verification Number: **(601)-634-4218, 3527, or 2776**

2. TELEPHONE REQUESTS WILL NOT BE ACCEPTED.

3. GOVERNMENT ATTENDEES: Send clearances directly to ERDC.
CONTRACTORS: Send clearances through your user agency for need-to-know verifica tion and forward to ERDC.

4. Clearance certifications must be received no later than October 1, 2004.

5. If you wish to receive the CLASSIFIED Proceedings and/or the Critical Technologies Journal, you must check the appropriate box(es) at the top of the form

Conference and Short Course Announcements

Be sure to check www.saviac.org for more information on upcoming events.

Process For Designing and Assessing Shock Mounted Systems using the 6 DOF Shock Isolation Mount Prediction and Loading Estimate (SIMPLE) Software
September 10, 2004, 9:00am to 4:00pm
Norfolk, VA

This course will provide a process for designing and assessing shock mounted systems with special emphasis on applications related to the design of ship structures and equipment for shock loads produced by underwater explosions utilizing the analytical software tool "Shock Isolation Mount Prediction And Loading Estimate" (SIMPLE). Copies of the SIMPLE software are available free to anyone and may be downloaded at http://users.erols.com/michael-talley/. The course will be presented by Dr. Michael A. Talley of Shock Analysis & Testing, Michael-Talley@erols.com, and Bob Krezel of ROG Consulting, Bob_Krezel@hotmail.com

The registration fee is $500, which includes the cost of all sessions, related course information, continental breakfast, coffee breaks, and lunch. A CD with the SIMPLE software will be provided. Early registration is suggested because enrollment is limited. Please send email or phone call requesting a registration form from Bob Krezel, (757) 484 8387, (bob_krezel@hotmail.com). Registration should be completed by 27 August 2004. Each participant should bring a laptop computer having Windows 95 or higher and a CD or Zip drive.

Fundamentals of Vibration and Shock Testing Training; A Short Course on Practical Vibration and Shock Training
Equipment Reliability Institute
October 5-7, 2004
Hotel Zugertor, Baarerstrasse 97 · CH-6300 Zug, Switzerland

This course is needed by engineers and technicians who conduct developmental and production vibration and shock tests, by designers of products that must survive tests AND rigorous service conditions, by metrologists who measure vibration and shock on automobiles, aircraft, etc., and by sales/applications engineers involved in the sales of equipment used in test (shakers, shock test machines, etc.) and measurement (transducers, data acquisition etc.). The course will be taught by Markus B. Dumelin, current ERI's consultant and recently retired from managing Ruag Munition, one of the largest laboratories in Switzerland.

Course details can be found at http://www.equipment-reliability.com/switzerl.htm. To register, visit http://www.equipment-reliability.com/regist_form.htm. Instructor Dumelin welcomes questions about the course.

SAVIAC / HI-TEST Laboratories Inc.
5136 Celestial Way
Columbia, MD 21044
DO NOT FORWARD. ADDRESS CORRECTION
REQUESTED. RETURN POSTAGE GUARANTEED.

In the July 2004 Current Awareness Newsletter

Intro to Air Blast Measurement Part III: Guaranteeing that Validated Pressure Measurements are Acquired
Exhibit at the 75th Symposium
Explosion Effects and Structural Design for Blast
75th S&V Symposium Registration Forms
Visit Request Form
Conference & Short Course Announcements

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.

Program Manager
Joel Leifer
(301) 596-0100
joel.leifer@saviac.org

Marketing & Event Planning
Lauren Yancey
(703) 892-0060
lauren.yancey@saviac.org

Manager of Technical Services
Henry Pusey
(540) 678-8678
henry.pusey@saviac.org

SAVIAC/HI-TEST Laboratories Inc.
5136 Celestial Way
Columbia, MD 21044
(301) 596-6400 (fax)

SAVIAC Director
Dr. Charles Robert Welch
US Army Engineer Research and Development Center
Vicksburg, MS 39180
saviac@wes.army.mil