

H · V · I · S

HYPERVELOCITY IMPACT SOCIETY

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NEWSLETTER

1994 HVIS

In the last Newsletter, we reported that approximately 350 people attended the 1994 HVIS in Santa Fe (actually, there were 339 participants and 48 companions). The symposium was truly international; here are the numbers of attendees by country: Canada (1), France (15), Germany (14), Israel (2), Japan (4), The Netherlands (5), Peoples Republic of China (4), former Soviet Union states (11), South Korea (2), Sweden (6), United Kingdom (8), United States (267). There were 102 technical presentations: 43 oral presentations (including Dr. Gene Shoemaker's keynote talk on *The Crash of Periodic Comet Shoemaker-Levy 9 on Jupiter*) and 59 poster presentations (this includes the 19 Comet Day posters). As reported last time, the 1994 HVIS has the distinction of being the first post-crash meeting concerning the impact of Shoemaker-Levy (*Nature*, Vol. 372, Dec. 1, 1994).

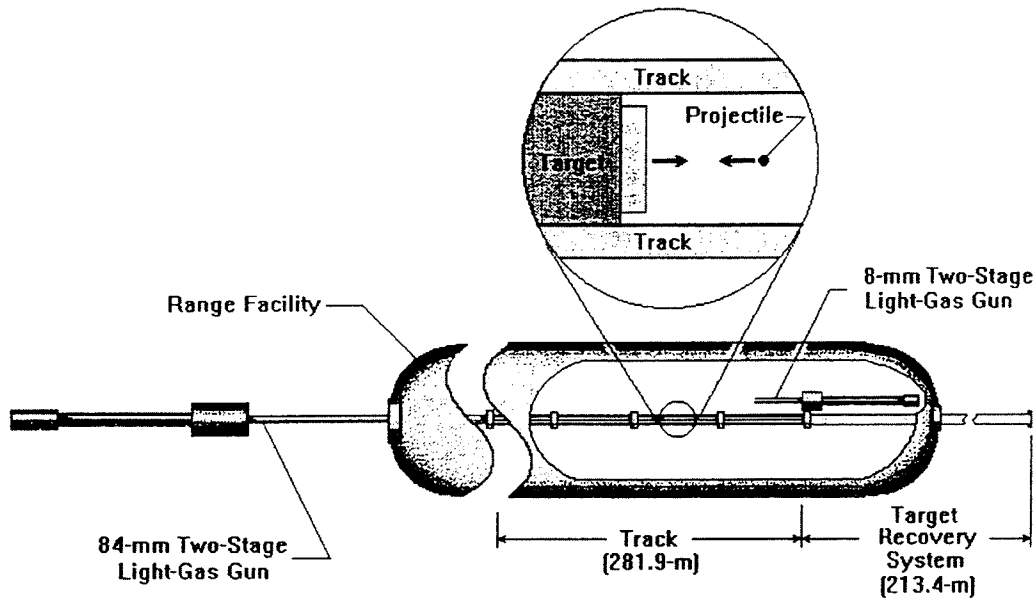
Lalit Chhabildas has provided an estimate of the number of presentations by topical area: debris shields (16), materials phenomenology (10), planetary impact (5), launchers and diagnostics (12), penetration mechanics (14), fracture and fragmentation (7), analytical modeling (5), numerical analysis (10), special sessions, i.e., keynote and plenary sessions (4), and Comet Day (19). There were also 13 presentations at the Classified Session. The proceedings, being published as Volume 17 of the *International Journal of Impact Engineering*, contains almost all the presentations. The exceptions are Gene Shoemaker's keynote lecture, Jim Asay's Distinguished Scientist keynote presentation, John Hunter's plenary talk on SHARP, and the 19 Comet Day poster presentations. More information on the proceedings is given later in the Newsletter.

FEATURE FACILITY OVERVIEW: AEDC Counter-Fire Demonstration

Editor's Note: In last month's Newsletter, Dennis Orphal briefly recounted the successful counter-fire experiment at the Arnold Engineering Development Center (AEDC). The following is a condensed version of a write-up provided by Ray Young at AEDC.

AEDC has completed the demonstration of a unique "counter-fire" test technique. Counter-fire produces impacts at extremely high velocities by two projectiles which are launched from opposing two-stage light-gas guns. The velocity of each projectile can be in excess of 7 km/s; therefore, impact velocities provided by the counter-fire technique can exceed 14 km/s. Such high impact velocities are needed for evaluation of light-weight shielding and validation of impact codes.

The primary launcher is an 84-mm, two-stage, powder-hydrogen gun which is capable of launching the "target" model at velocities ranging from approximately 2 to 7 km/s. A track assembly, comprised of a four-rail system for model guidance, is attached to the launcher muzzle and extends the full length of the 282-m-long tank. The track system provides restricted flight of the model. At the downrange end of the facility, the model is guided into the recovery system where, via aerodynamic deceleration, it is recovered intact. In the counter-fire technique, the target model is launched from the primary launcher and travels along the facility track system to the impact location, where it is intercepted by a projectile traveling at up to 8.5 km/s launched from an opposing 8-mm two-stage light-gas gun. In-flight instrumentation, such as X-ray and laser photographic systems, are used to monitor the



Counter-Fire Technique

impact event. The target then enters the facility recovery system for retrieval and post-test analysis.

The intercept of a projectile launched from a two-stage light-gas gun and having a total flight time of only 43 ms is no simple matter. Variations in gun cycle time (time from the fire pulse to projectile exit of the muzzle), launch velocity, and projectile dispersion are all major considerations for a successful intercept. Several techniques were developed to accomplish the intercept capability. Variations in gun cycle time and launch velocity of the 84-mm launcher were isolated by the development of the AEDC Velocity Independent Event Synchronizer (VIES). The VIES system detects the target, measures the time of flight between two location, accounts for the inherent delay of the controlled system (gun cycle time of the 8-mm launcher), and provides the control signal (fire pulse to the 8-mm launcher). The trajectory of the target is controlled by the facility track system; the gun cycle time and projectile dispersion of the 8-mm launcher were statistically established.

The targets can be semi-infinite or multiple configurations. Potential target configurations

are limited in diameter by the 84-mm launcher and must be able to withstand the launch conditions. The impactor may consist of a variety of shapes and materials, although the size is limited by the current 8-mm launcher.

To date, five counter-fire demonstration tests have been attempted, resulting in four intercepts with a rendezvous velocity of approximately 12.5 km/s. Two models have been successfully recovered intact after hypervelocity impact.

For additional information, call Ray Young at (615) 454-5075, or Rick Rushing at (615) 454-5801.

SOCIETY NEWS

1996 Hypervelocity Impact Symposium

The next *HVIS* is scheduled for October 7-10, 1996, in Freiburg, Germany. Hosts and coordinators for the Symposium will be the Ernst-Mach-Institut (EMI) and Institute de St. Louis (ISL). The Symposium Chairmen and Technical Chairmen are listed near the end of the Newsletter. Stay tuned for additional details as they become available.

Student Grants

A limited number of Student Grants are available for the *1996 Hypervelocity Impact Symposium*. These grants are being made available by the Hypervelocity Impact Society to encourage student interest and participation in this technology.

The Student Grants cover transportation and lodging for the symposium, up to a limit of \$1000. Free registration and a copy of the proceedings are also provided. In addition, the students will have a short introductory meeting with HVIS Board and committee members.

Student Grants are available to students interested in hypervelocity impact. It is intended that these grants will be primarily for graduate students, although undergraduate students may apply. The application will consist of a letter of recommendation from the Student's Advisor. This letter should be limited to a maximum of three pages, and should include the following:

- Names, address, and telephone numbers of both the Student and the Advisor;
- A brief overview of the student's academic background and record;
- A description of future academic work to be pursued by the student;
- A discussion of why the symposium would be helpful for the student.

The selections will be made by the HVIS Educational Outreach Committee. The applications must be received by 1 June 1996. Selection and notification will be made by 1 August 1996. The application should be sent to:

Dr. Gordon R. Johnson
Alliant Techsystems, Inc.
Mail Station MN11-1614
600 Second Street NE
Hopkins, MN 55343
USA

Constitution and Bylaws

If you wish a copy of the *Constitution and Bylaws of the Hypervelocity Impact Society*, please request a copy from Charlie Anderson (phone: 210-522-2313; fax: 210-522-3042; e-mail: canderson@swri.edu). E-mail or fax is

preferred; please include your address, and if you are connected to the Internet, your e-mail address.

Distinguished Scientist Award Lecture

Alex Charters was awarded the Society's Distinguished Scientist Award in 1989. We have extra copies of Alex Charters' *The Early Years*, and if you wish a copy, please send your request to Charlie Anderson. As above, e-mail or fax is preferred since Charlie will then have a "hard" copy of the request. Alex's talk is also being published in the *1994 HVIS* proceedings.

1994 HVIS Proceedings

We have been told by Pergamon/Elsevier Science that the proceedings should be shipped near the end of October or early November. The approximately 975-page volume contains 83 technical articles, an author index, a subject index, and a list of attendees. The volume includes the Distinguished Scientist Keynote presentations from the *1989* and *1992 HVIS* symposia (Alex Charters, and Alois Stilp and Volker Hohler, respectively) along with the introductory tributes by Dennis Orphal (for Alex) and Gustov Schröder (for Alois and Volker).

Extra Copies of the 1994 HVIS Proceedings

Extra copies of the *1994 HVIS* proceedings, Volume 17 of the *International Journal of Impact Engineering*, can be obtained at \$100.00 per copy. If you wish one or more additional copies, please send a check to:

Dr. Lalit Chhabildas
Sandia National Laboratories
P.O. Box 5800 MS 0821
Albuquerque, NM 87185-5800

Checks should be made out to the Hypervelocity Impact Society, and must be prepaid. Please include your name and address with submittal of the check. Phone (505-844-4147) or fax (505-844-0918) orders will be accepted provided the check follows promptly.

Standing Committees

Near the end of the Newsletter, there is a list of the standing committees. The committee memberships for the next term are now being formed. If you know of someone who you think should be active in the Society or be on a particular committee, please notify Dennis Orphal (phone: 510-460-0474; fax: 510-460-0449; e-mail: denny@calres.com). Self-nominations are also appropriate. As with all positions within the Society, committee membership is voluntary; there are no funds available to cover time or expenses.

Ronald S. Dingus:

September 16, 1938 - January 7, 1995

We lost an active and enthusiastic member of our community with the death of Ron Dingus this past January. He had been skiing at Los Alamos, and at lunch time, at the ski lodge, he suffered a massive heart attack.

After schooling in physics at the University of Missouri and at Iowa State University, Ron was a Fulbright Post-Doctoral Fellow at the University of Aarhus in Denmark, and conducted post-doctoral research at the University of Colorado. He joined Los Alamos Lab in 1968, and over the succeeding 26 years studied nuclear weapon effects, worked on many underground tests, and made numerous original contributions in the area of laser-material interactions. In 1992 and 1993, he served on a change-of-station assignment in the Ballistic Missile Defense Organization at the Pentagon. During that time, he initiated a number of programs with various institutes in the former Soviet Union to investigate hypervelocity impact and material response phenomena. Since returning to Los Alamos, he had been using his broad experience in laser interactions and effects to investigate new laser applications in medical science and biomedical engineering in conjunction with both industry and academia.

During his years in Los Alamos, Ron was an active member of the ski patrol, and participated in many search and rescue activities in the surrounding areas. Ron is survived by his wife, two grown children, and three grandchildren. On hearing of his death, one of his acquaintances from his work with the Russians wrote, "...he will always be alive: wanting a new era between

our countries, loving life and people, enjoying every minute of his life, always working." Ron will be missed, but certainly not forgotten.

Jeff Lawrence
Sandia

NOTES FROM THE EDITOR

Reminder: Abstracts Due

1996 HVIS: Abstracts for the 1996 HVIS are due by January 5, 1996. Abstracts should be limited to 1000 words plus figures and references. The abstracts must include authors names, affiliations and addresses. The abstracts should be submitted to:

Mrs. Susanne Deschoux
1996 HVIS
ERNST-MACH-INSTITUT
-Fraunhofer-Institute fuer Kurzzzeitdynamik-
Eckerstr. 4
D - 79104 FREIBURG I. BR
GERMANY

Ballistics Symposium: Abstracts for the 16th International Symposium on Ballistics, to be held in San Francisco (September 24-27, 1996) are due by January 12, 1996. These 300-500 word abstracts should be submitted to:

ADPA
BALLISTICS '96
Suite 400
2101 Wilson Boulevard
Arlington, VA 22201-3061

Journal Subscriptions

As a service to our membership, we have negotiated a special subscription price for the *International Journal of Impact Engineering*. The Journal is now being published six times a year. The subscription cost for HVIS members is \$85.00 for 1995 (Volume 16); this is approximately one-third the regular subscription costs. If you are not already signed up for the journal and wish to receive the subscription, please remit a check for \$85.00, payable to the Hypervelocity Impact Society, and send the check with the mailing address for where you want to receive the Journal, to:

Dr. Charles E. Anderson, Jr.
Southwest Research Institute
P. O. Drawer 28510
San Antonio, TX 78228-0510.

You will receive all issues for the current year with your subscription.

Note: the Proceedings of the 1994 Symposium (Vol. 17) are not included in this special subscription price. However, if you would like to purchase a softbound copy of the proceedings, which is being published in two volumes, the cost is \$95.00. Provide the appropriate information and send your check to the above address. (See information presented earlier in the newsletter to purchase a single-volume hardbound edition.)

1996 Subscriptions

The Journal will go to eight issues a year in 1996. If you are interested in receiving the eight issues

for the 1996 volume (Volume 18), please let Charlie know. The cost is \$95.00. A check, made out to the Hypervelocity Impact Society, should be sent to Charlie's attention at the above address. Your name will be added to the 1996 subscription list.

Note to Authors—Color Figures

It is often desirable, particularly with computational results, to use color to enhance and clarify technical information. Color figures are possible for the *International Journal of Impact Engineering*. However, there is an additional cost requirement that must be met by the author or his/her institution. The cost per color page (there can be more than one color figure per page, but each page must be processed separately), is \$576.00 (US), payable to the publisher at the time the paper is accepted for publication. (Prices are set by the publisher and may change.)

HVIS STANDING COMMITTEES

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Educational Outreach Committee
Membership Committee
Nominations Committee
Publications Committee

Chairs

James Wilbeck (Kaman Sciences)
Gordon Johnson (Alliant Techsystems)
Hal Swift (UDRI)
Don Shockey (SRI)
Charles Anderson (SwRI)

1996 Hypervelocity Impact Symposium

Symposium Chairmen

A. J. Stilp (EMI), G.-A. Schröder (EMI), and
H. Schulte (ISL)

Technical Chairmen

V. Hohler (EMI) and E. Schneider (EMI)

CALENDER OF RELATED CONFERENCES AND SYMPOSIA

Meeting	Location	Dates
1995 ASME Winter Annual Meeting	San Francisco, CA	November 12-17, 1995
3rd Ballistics Symposium on Classified and Controlled Topics	Laurel, MD	November 14-15, 1995
International Conference on Tungsten and Refractory Metals	McLean, VA	November 15-16, 1995
JANNAF Propulsion and Subcommittee Joint Meetings	Tampa, FL	December 4-8, 1995
First Australian Congress on Applied Mechanics	Melbourne, Australia	February 19-21, 1996
6th International Conference on Numerical Combustion	New Orleans, LA	March 4-6, 1996
Materials Research at High Pressures, APS Meeting	St. Louis, MO	March 1996
Insensitive Munitions Technology Symposium	San Diego, CA	March 19-21, 1996
7th TARDEC Ground Vehicle Survivability Symposium	Monterey, CA	March 26-28, 1996
8th EML Symposium	Baltimore, MD	April 21-24, 1996
Bombs & Warhead Technical Symposium	Monterey, CA	May 13-15, 1996
Space '96: The 5th Int. Conf. & Exposition on Engineering, Construction, and Operations in Space	Albuquerque, NM	June 1-6, 1996
5th Gordon Research Conference on Energetic Materials	New Hampton, NH	June 16-21, 1996
Gordon Conference on Research at High Pressure	Meriden, NH	June 23-28, 1996
IUTAM Symposium	Dublin, Ireland	June 30 - July 5, 1996
SUSI '96: 4th Int. Conf. Structures Under Shock and Impact	Udine, Italy	July 3-5, 1996
Structures Under Extreme Loading Conditions: ASME PVP Conference	Montreal, Canada	July 21-26, 1996
3rd International Conference on Composites Engineering	New Orleans, LA	July 21-27, 1996
FRAGBLAST' 5: 5th Int. Symp. on Rock Fragmentation by Blasting	Montreal, Canada	August 25-29, 1996
16th International Symposium on Ballistics	San Francisco, CA	September 23-25, 1996
1996 Hypervelocity Impact Symposium	Freiburg, Germany	October 7-10, 1996
47th Aeroballistic Range Association Meeting	ISL, St. Louis, France	October 14-17, 1996
XVI AIRAPT Conference	Kobe, Japan	1997
1997 APS Topical Conference on Shock Waves in Condensed Matter	Amherst, MA	July 27-August 1, 1997