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COVER STORY

Jet Propulsion Laboratory - CalTech

Robotics

EVENT SPOTLIGHT

Univ. of Michigan-Dearborn

Technology Day

CONFERENCE SPOTLIGHT

LSTC

9th International

LS-DYNA Users Conference

June 4-6, 2006 Dearborn, MI

FEA Information Worldwide Participants

Contents

Editor: **Trent Eggleston** **Managing Editor:** **Marsha Victory** **Technical Editor:** **Art Shapiro** **Graphic Designer:** **Wayne L. Mindle**	**Technical Writers:** **Dr. David Benson** **Uli Franz** **Dr. Ala Tabiei** **Suri Bala** **Technical Consultants:** **Steve Pilz** **Reza Sadeghi**

FEA Information Announcements

Special Interest Announcement:

LS-DYNA now being supported on Mac OS X

MPP Interconnect and MPI			
Vendor	**O/S**	**HPC Interconnect**	**MPI Software**
Apple	Mac OSX 10.4		LAM/MPICH

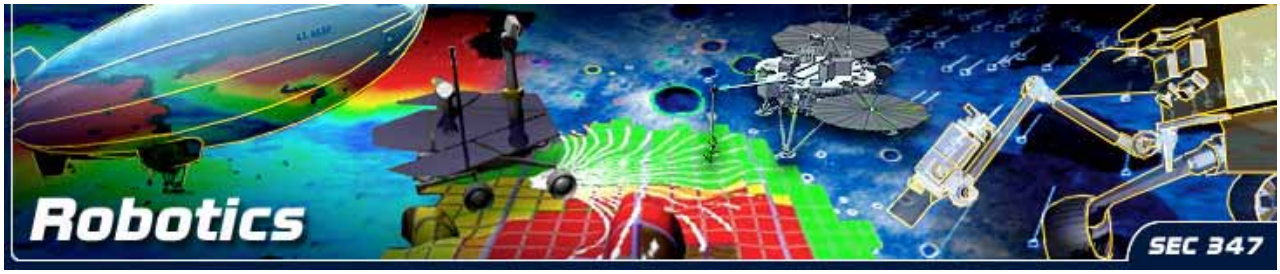
LS-DYNA International Users Conference -June 04-06, 2006

Our Participant's to visit:

Booth Number	Alpha Order
106	ANSYS
400	AMD
208	ARUP
305	ESI
200	ETA
303	FUJITSU
101	HP
405	IBM
201	INTEL
103	JRI
301	MICROSOFT
308	MSC.SOFTWARE
207	NEC
102	QLogic
100	SGI

Sincerely, ***Trent Eggleston & Marsha Victory***

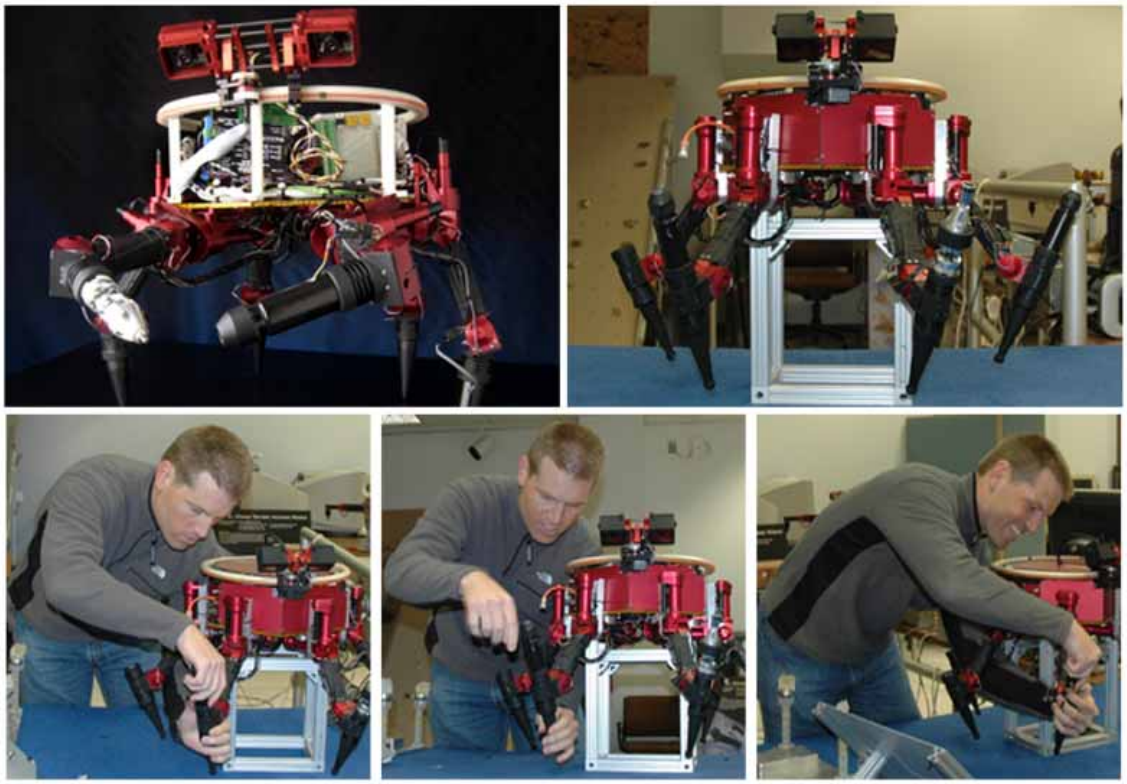
Jet Propulsion Laboratory – California Inst. of Technology



http://www.jpl.nasa.gov/news/features.cfm?feature=1101

Limber Robot Might Hitchhike to Space
May 11, 2006

Lemurs, those wide-eyed, active, monkey-like animals running around the island in the movie "Madagascar," are known for their ability to leap. A robotic lemur being tested at NASA's Jet Propulsion Laboratory moves more slowly, but might someday take its own giant leap - by going into space with astronauts.



The crawling robot, Lemur, was built to help astronauts complete small jobs in space. "Lemur could be an astronauts pet monkey," says JPL engineer Brett Kennedy who designed the 6-limbed robot. Lemur performs a variety of functions with attachable tools.

"Lemur," short for the Limbed Excursion Mechanical Utility Robot, was originally conceived to help maintain future spacecraft and space stations. It weighs in at just 26 pounds (12 kilograms) and is small enough to hitch a ride on the space shuttle or NASA's planned crew exploration vehicle.

"Lemur could be an astronaut's pet monkey," says JPL engineer Brett Kennedy, principal investigator for the robotic project. "It can perform tasks that are too small for astronauts to do easily. It's built to get into the nooks and crannies of a structure."

To make Lemur flexible and versatile, Kennedy and his team combined the body styles and abilities of an octopus, a crab and a primate into a six-limbed robot with Swiss army knife tendencies. Attachable tools fit onto each limb and perform a variety of functions. Lemur can support itself evenly on three legs while two other limbs are freed up to work. And the sixth limb? "It's a bonus, and besides, five limbs would look funny," Kennedy says.

Since there's no gravity in space, Lemur could work upside down, as long as one limb is anchored. Astronauts could instruct Lemur to perform simple fixes inside or outside a spacecraft, eliminating the need for a human spacewalk.

Lemur's circular body enables it to move in any direction. Its "eyes," two stereo cameras on a circular track mounted on top, can swivel freely, which means the base of the robot doesn't have to rotate. "It saves time, because we can turn the cameras in the direction we want to move and then go," explains Kennedy. Lemur also has a palm-sized camera that doubles as a microscope.

In JPL test labs, Lemur has already learned some impressive tricks. For example, one limb has fastened a screw into a structure, with another limb shining a flashlight on the operation. In one experiment, engineers attached an ink pen to one of Lemur's limbs and developed a set of computer programs to teach the robot how to write its name.

With all its gadgetry and talents, Lemur might have a bright future not only as an assistant astronaut, but also as a Martian rock climber. Lemur could scamper up much steeper hills and cliffs than the Spirit and Opportunity rovers that are currently wheeling around on Mars. "We built Lemur with limbs so it can use both arms and legs just as a biological primate would," Kennedy said.

Kennedy and his colleagues hope Lemur and its sibling, Lemur IIb, will be ready to make the leap to space travel within the next decade. At that point, back on Earth, Kennedy and his colleagues will also be leaping – for joy.

Yahoo Group Yammerings

Jim Kennedy
KBS2 Inc.
jmk@kbs2.com

Len Schwer
Schwer Engineering & Consulting Services
Len@Schwer.net

Jim Kennedy & Len Schwer plan to attend the LS-DYNA User's Conference in Dearborn on 4-6 June. If you see them, please introduce yourself as a Yahoo Group participant, or Yammerings fan.

It's always nice to associate a face with email colleagues.

This installment of "Yahoo Yammerings" features four questions, with responses, from the past month of postings to the LS-DYNA Yahoo Group:

1. *Information in LS-DYNA d3hsp & messag files*
2. *RCFORC File Contents?*
3. *Mat 5 (*Mat_Soil_and_Foam)?*
4. *UMAT with Erosion?*

Question: Information in LS-DYNA d3hsp & messag files?

When I run LS-DYNA, I always get this information:

The LS-DYNA time step size should not exceed 0.262E-04

I wonder what is meaning of the first value and how to determine it?
Also,

global x velocity..... 0.00000E+00
global y velocity..... 0.00000E+00
global z velocity..... -1.31460E+01

Can someone tell me how to calculate the global velocity, it is very different from the initial velocity?

Response by Conrad Izatt

The first value that you have quoted is I assume the time step calculated for the contact surfaces. The segments in the contact surfaces each have a stiffness and mass associated with them.

Therefore, just like ordinary elements, each contact segment has a time step required for numerical stability. The time step quoted is the smallest value calculated by LS-DYNA for all of the master/slave sides of the contact surfaces. So, to be sure that the contact surfaces remain stable, the time step should not exceed this value.

In practice, I have found that it is often possible to use larger time steps than

this without the contact surfaces becoming unstable, but you should be aware that there might be a problem.

The global XYZ velocities are the average velocity for the whole model, i.e. this is the velocity of the center-of-gravity of the entire model. So this will not be the same as your initial velocity if some parts of the model are not moving or have a different initial velocity.

Response by Jim Kennedy

This time step value is only a warning to advise you to check this if you have contact instability problems.

I suggest that you look at Chapters 23.3 Penalty Method and 23.7 Sliding With Closure and Separation of the LS-DYNA Theory Manual for some discussions of time step size scaling for contact. You also might look at Suri Bala's notes for information, in particular, see Chapters 4.0, 4.1 and 4.2 Contact Stiffness Calculations and Chapter 7.3 Standard Penalty-Based or Soft Constraint Stiffness Method:

Bala, Suri, "Contact Modeling in LS-DYNA - Parts 1, 2, 3, and 4", Livermore Software Technology Corporation, 2001.
(can be found under author list here)
http://www.feainformation.com/fea_news_author.shtml

You also might the following useful information:
ftp://ftp.lstc.com/outgoing/faq/contact.soft1
ftp://ftp.lstc.com/outgoing/faq/contact.soft2

As for the global velocity, this value is made from the momentum equation (nodal values) of all parts having a mass, no matter whether they have a velocity or not:
global velocity = (sum of mass x velocity)/(sum of mass)

Question: RCFORC File Contents?

In the RCFORC file, I have 3 slaves and 3 masters, also there are Time, X,Y,Z and Mass information. Can anyone explain what these item represent?

Response by Jim Kennedy

The RCFORC file provides the resultant interface forces for the various *CONTACT_(options) from your input data file. In most contact definitions, there are two surfaces involved, one is designated a master side and the other is the slave side. The contact surfaces are usually defined by plane segments of shell or solid elements.

The X, Y, Z are the global components of the resultant interface force. The mass values are the sum of the master and slave segment values, respectively, given in the contact definition.

Question: Mat 5 (*Mat_Soil_and_Foam)?

I am trying to use Mat_5 to model a soil. To do this I want to define the soil behavior under a compressive load. The LS-DYNA manual states that pressure in compression must be entered as positive and that the natural log of relative volume in compression is negative.

That's OK, but in the same manual, there is an example curve in which the log of relative volume is positive!! So, I

am wondering which should be the correct sign to be used in the
curve for Mat_5, positive or negative?

Response by Len Schwer

The text instructions are correct. The example curve is the typical way such results are displayed in civil engineering applications.

The conflict you note is the difference between continuum mechanics sign convention, used by LS-DYNA, and the standard civil engineering sign convention of compression positive for geomaterials.

Also, I *think* LS-DYNA checks the input and automatically reverses the sign of the volume strain if it is entered as positive.

Response by Jim Kennedy

Please look at the following example taken from the LS-DYNA Examples Manual:

http://www.dynaexamples.com/Examplesmanual/Material/index.php?example=Foam

Question: UMAT with Erosion?

I have a UMAT with a damage model and I'm trying to implement erosion with solid elements. I know we need to vectorize the subroutine, but it is not working, even with a very simple elastic material model. There is no support from LS-DYNA for UMAT problems, so if anyone is also working with UMAT, any help is appreciated!

Response by Jim Kennedy

Fabio Mantovani and Mahmoud Amini discussed this subject back in April of 2005. Please see Messages # 5798, 5799, 5805, 5807, 5808, 5809, and 5810. Perhaps these messages may be of some help.

There is a subroutine example provided in Appendix A of the LS-DYNA Version 970 User's Manual.

Go the following site:
ftp://ftp.lstc.com/outgoing/faq/user_defined_materials

Many of your questions can be answered there on how to create a custom executable, where to obtain user-defined routines, example input decks, a user-defined material class (always a good idea), how to get class notes, FAQ answers, etc.

Leon Shawn and Florian Biehl also provided a discussion concerning user defined MAT_024 back on March 8 and 9, 2005. Please see Messages # 5433, 5458, 5459, 5470, and 5476. Perhaps these messages may be of help or they can provide you some help for the latest subroutines.

LS-DYNA Yahoo Groups

There are over 1790 subscribers from all over the world, and this list seems to grow by a hundred new subscribers ever few months; no small testament to the rapidly growing popularity of LS-DYNA. The group currently averages about 250 message per month, i.e. about 10 message per day. You can subscribe to the group by sending an email request to LS-DYNA-subscribe@yahoogroups.com or by vis-

iting the Yahoo Groups web site http://groups.yahoo.com

Generally, the quickest/best responses are to those questions posed with the most specifics. General questions such as “How do I use XXX feature?” either go unanswered, or are answered by Jim Kennedy with links to appropriate references in the growing LS-DYNA related literature, e.g. see the archive of LS-DYNA Conference proceedings at www.dynalook.com .

On Monday June 5th at the LS-DYNA Conference

Len Schwer will present his paper:

Perforation of Metal Plates: Laboratory Experiments and Numerical Simulation

LS-DYNA® THEORY Manual Now Available

ISBN 0-9788540-0-0 2006 Edition: Theory Manual

Pricing and your shipping address will be confirmed by e-mail prior to Credit Card Charge. Shipping within 24 hours of confirmation.

Pricing Includes Shipping – Visa, MC, AMEX accepted
For any questions contact Marsha vic@lstc.com

US, Canada, Mexico	$100 USD
Europe	$150 USD
Asia Pacific	$175 USD

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E-mail for Confirmation_____

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Technology Day 2006 - June 7, 2006

UNIVERSITY OF MICHIGAN-DEARBORN

http://www.engin.umd.umich.edu/ceep.

The Center for Engineering Education and Practice (CEEP) supports relevant collaborative projects of faculty and industrial partners. Technology Day is an annual event sponsored by CEEP to provide an update of the University's collaborations with industry.

The Purpose of Technology Day

- Showcase faculty research
- Encourage dialog between faculty and industry guests
- Exhibit student senior design and student competition projects
- Feature prominent external speakers on topics relevant to education & industry
- Exhibit industry advanced technology design concepts and products
- Look for collaborative applied research opportunities for faculty with industry

For Information Visit http://www.engin.umd.umich.edu/ceep.

Or contact:

Donna Goddard, Administrative Assistant
Center for Engineering Education and Practice
E-Mail: dgoddard@engin.umd.umich.edu
Telephone: (313) 593-3403

Seminars from the 9th Int'l LS-DYNA Users Conference will be held at the University of Michigan-Dearborn June 7-8.

LSTC Training Classes – 2006

Jane Hallquist
Training Coordinator
LSTC California & Michigan
Email: ***jane@lstc.com***
Tel: ***925-449-2500***

California Location

LSTC California
7374 Las Positas Road
Livermore, CA 94551

Michigan Location

LSTC Michigan
1740 W. Big Beaver Rd
Suite 100
Troy , MI 48084

LSTC Training Classes – 2006 - continued

Training Class	US $	Livermore, CA	Detroit, MI
Advanced LS-DYNA for Impact Analysis	$950	June 27-30 Sept 5-6	
Advanced Options in LS-DYNA	$750	August 15-16	
ALE/Eulerian & Fluid/Structure Interaction in LS-DYNA	$750	July 12-14	
Concrete and Geomaterial Model-ing with LS-DYNA	$750	Oct 24-25	

Contact in LS-DYNA	$750	Sept. 12-13	Aug 15-16
Introduction to LS-DYNA	$750	May 02-05 Aug. 01-04 Nov. 14-17	April 25-28 July 25-28 Oct 16-19 Dec. 11-14
Introduction to LS-OPT	$750	May 16-19 Nov. 07-10	
LS-DYNA Composite Materials	$750	Sept. 14-15	
LS-DYNA Implicit	$750	June 15-16	Sept. 07-08
LS-DYNA for Heat Transfer & Thermal-Stress Problems	$500		
Material Modeling Using LS-DYNA User Defined Options	$750	June 13-14	
MESH Free Methods in LS-DYNA (SPH and EFG)	$750		

Participant Distribution & Consulting Channels

Sales – Support –Training – Benchmark – Consulting.

Australia 	**Leading Engineering Analysis Providers** (LEAP) info@leapaust.com.au
Germany 	**CAD-FEM GmbH** lsdyna@cadfem.de
Japan 	**CRC Solutions Corp.** ls-dyna@crc.co.jp
Korea 	**Korean Simulation Technologies** young@kostech.co.kr
Canada 	**Metal Forming Analysis Corp.** galb@mfac.com
USA 	**Dynamax** sales@dynamax-inc.com
UK 	**Oasys, Ltd.** dyna.sales@arup.com

EVENTS – 2006

If you want your event listed please send the information to:
mv@feainformation.com

2006	
June 04-06	**9th International LS-DYNA Users Conference** Dearborn, MI - US -Registration and Hotel available on line
June 07	**Technology Day -** University of Michigan, Deaborn
July 02-06	**ICSV13 Vienna** Vienna, Austria
July 5-7	**HEAT TRANSFER 2006** Ninth International Conference on Advanced Computational Methods and Experimental Measurements in Heat and Mass Transfer - The New Forest, UK
August	**Altair Engineering's: South Asia CAE Users' Conference 2006**
Sept 19-20	**JAPAN LS-DYNA Users Conference 2006** Tokyo, Japan Hosted by JRI
Sept 25	11th Korea LS-DYNA Users Conference 2006, Seoul, Korea Hosted by Theme Engineering Inc.
Oct 12-13	**LS-DYNA Users Meeting in Ulm.** Hosted by DYNAmore
Oct 25-27	**2006 CADFEM Users Meeting** International Congress on FEM Technology Stuttgart area - Germany
Nov 14- 16	**Aerospace Design Expo 06** Anaheim, CA - US

LS-DYNA Resource Page

Interface - Hardware - OS And General Information

Participant Hardware / OS that run LS-DYNA (alphabetical order).

LS-DYNA has been fully QA'd by Livermore Software Technology Corporation for All Hardware and OS listed below.

TABLE 1: SMP - Fully QA'd by LSTC	
AMD Opteron	Linux
FUJITSU Prime Power	SUN OS 5.8
FUJITSU VPP	Unix_System_V
HP PA-8x00	HP-UX 11.11 and above
HP IA-64	HP-UX 11.22 and above
HP Opteron	Linux CP4000/XC
HP Alpha	True 64
IBM Power 4/5	AIX 5.1, 5.2, 5.3
IBM Power 5	SUSE 9.0
INTEL IA32	Linux, Windows
INTEL IA64	Linux
INTEL Xeon EMT64	Linux
NEC SX6	Super-UX
SGI Mips	IRIX 6.5 X
SGI IA64	SUSE 9 with ProPack 4 Red Hat 3 with ProPack 3

LS-DYNA Resource Page

MPP Interconnect and MPI

FEA Information Inc. Participant's (alphabetical order)

Fully QA'd by Livermore Software Technology Corporation

TABLE 1: SMP - Fully QA'd by LSTC	
AMD Opteron	Linux
FUJITSU Prime Power	SUN OS 5.8
FUJITSU VPP	Unix_System_V
HP PA-8x00	HP-UX 11.11 and above
HP IA-64	HP-UX 11.22 and above
HP Opteron	Linux CP4000/XC
HP Alpha	True 64
IBM Power 4/5	AIX 5.1, 5.2, 5.3
IBM Power 5	SUSE 9.0
INTEL IA32	Linux, Windows
INTEL IA64	Linux
INTEL Xeon EMT64	Linux
NEC SX6	Super-UX
SGI Mips	IRIX 6.5 X
SGI IA64	SUSE 9 with ProPack 4 Red Hat 3 with ProPack 3

TABLE 2: MPP Interconnect and MPI			
Vendor	**O/S**	**HPC Intereconnect**	**MPI Software**
AMD Opteron	Linux	InfiniBand (SilverStorm), MyriCom, Pathscale InfiniPath	LAM/MPI, MPICH, HP MPI, SCALI
FUJITSU Prime Power	SUN OS 5.8		
FUJITSU VPP	Unix_System_V		
HP PA8000	HPUX		
HPIA64	HPUX		
HP Alpha	True 64		
IBM Power 4/5	AIX 5.1, 5.2, 5.3		
IBM Power 5	SUSE 9.0		LAM/MPI
INTEL IA32	Linux, Windows	InfiniBand (Voltaire), MyriCom	LAM/MPI, MPICH, HP MPI, SCALI
INTEL IA64	Linux		LAM/MPI, MPICH, HP MPI
INTEL Xeon EMT64	Linux	InfiniBand (Topspin, Voltaire), MyriCom, Pathscale InfiniPath	LAM/MPI, MPICH, HP MPI, INTEL MPI, SCALI
NEC SX6	Super-UX		
SGI Mips	IRIX 6.5	NUMAlink	MPT
SGI IA64	SUSE 9 w/ProPack 4 RedHat 3 w/ProPack 3	NUMAlink, InfiniBand, (Voltaire)	MPT, Intel MPI, MPICH

LS-DYNA Resource Page

Participant Software Interfacing or Embedding LS-DYNA

Each software program can interface to all, or a very specific and limited segment of the other software program. The following list are software programs interfacing to or having the LS-DYNA solver embedded within their product. For complete information on the software products visit the corporate website.

ANSYS - ANSYS/LS-DYNA
www.ansys.com/products/environment.asp

ANSYS/LS-DYNA - Built upon the successful ANSYS interface, ANSYS/LS-DYNA is an integrated pre and postprocessor for the worlds most respected explicit dynamics solver, LS-DYNA. The combination makes it possible to solve combined explicit/implicit simulations in a very efficient manner, as well as perform extensive coupled simulations in Robust Design by using mature structural, thermal, electromagnetic and CFD technologies.

AI*Environment: A high end pre and post processor for LS-DYNA, AI*Environment is a powerful tool for advanced modeling of complex structures found in automotive, aerospace, electronic and medical fields. Solid, Shell, Beam, Fluid and Electromagnetic meshing and mesh editing tools are included under a single interface, making AI*Environement highly capable, yet easy to use for advanced modeling needs.

ETA – DYNAFORM
www.eta.com

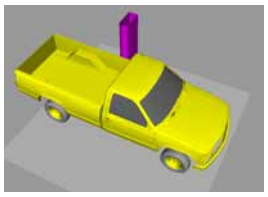
Includes a complete CAD interface capable of importing, modeling and analyzing, any die design. Available for PC, LINUX and UNIX, DYNAFORM couples affordable software with today's high-end, low-cost hardware for a complete and affordable metal forming solution.

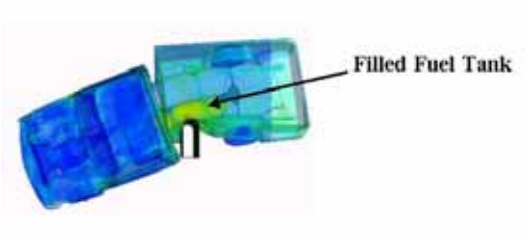
ETA – VPG
www.eta.com

Streamlined CAE software package provides an event-based simulation solution of nonlinear, dynamic problems. eta/VPG's single software package overcomes the limitations of existing CAE analysis methods. It is designed to analyze the behavior of mechanical and structural systems as simple as linkages, and as complex as full vehicles

MSC.Software "MSC.Dytran LS-DYNA"
www.msc.software.com

Tightly-integrated solution that combines MSC.Dytran's advanced fluid-structure interaction capabilities with LS-DYNA's high-performance structural DMP within a common simulation environment. Innovative explicit nonlinear technology enables extreme, short-duration dynamic events to be simulated for a variety of industrial and commercial applications on UNIX, Linux, and Windows platforms. Joint solution can also be used in conjunction with a full suite of Virtual Product Development tools via a flexible, cost-effective MSC.MasterKey License System.





Side Impact With Fuel Oil Inside

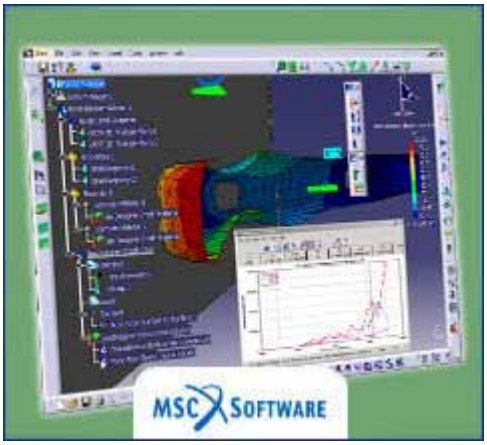
MSC.Software - MSC.Nastran/SOL 700

The MSC.Nastran™ Explicit Nonlinear product module (SOL 700) provides MSC.Nastran users the ability access the explicit nonlinear structural simulation capabilities of the MSC.Dytran LS-DYNA solver using the MSC.Nastran Bulk Data input format. This product module offers unprecedented capabilities to analyze a variety of problems involving short duration, highly dynamic events with severe geometric and material nonlinearities.

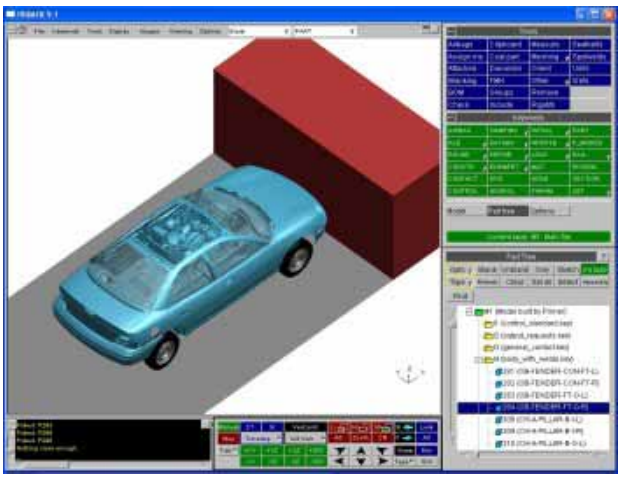
MSC.Nastran Explicit Nonlinear will allow users to work within one common modeling environment using the same Bulk Data interface. NVH, linear, and nonlinear models can be used for explicit applications such as crash, crush, and drop test simulations. This reduces the time required to build additional models for another analysis programs, lowers risk due to information transfer or translation issues, and eliminates the need for additional software training.

MSC.Software – Gateway for LS-DYNA

Gateway for LS-DYNA provides you with the ability to access basic LS-DYNA simulation capabilities in a fully integrated and generative way. Accessed via a specific Crash workbench on the GPS workspace, the application enhances CATIA V5 to allow finite element analysis models to be output to LS-DYNA and then results to be displayed back in CATIA. Gateway for LS-DYNA supports explicit nonlinear analysis such as crash, drop test, and rigid wall analysis.



Gateway products provide CATIA V5 users with the ability to directly interface with their existing corporate simulation resources, and exchange and archive associated simulation data.



Oasys software for LS-DYNA
www.arup.com/dyna

Oasys software is custom-written for 100% compatibility with LS-DYNA. Oasys PRIMER offers model creation, editing and error removal, together with many specialist functions for rapid generation of error-free models. Oasys also offer post-processing software for in-depth analysis of results and automatic report generation.

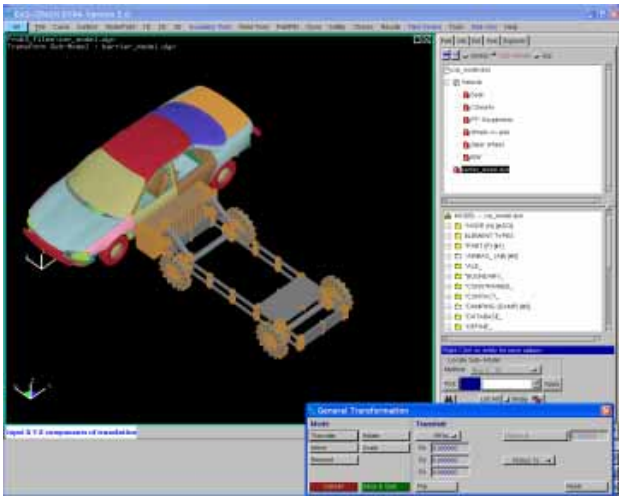
EASi-CRASH DYNA
http://www.esi-group.com/SimulationSoftware/EASi_CRASH-DYNA/

EASi-CRASH DYNA is the first fully integrated environment for crashworthiness and occupant safety simulations with LS-DYNA, and covers the complete CAE-process from model building and dataset preparation to result evaluation and design comparisons.

EASi-CRASH DYNA can be used for concept crash, FE crash and coupled rigid body/FE crash simulations in conjunction with MADYMO.

EASi-CRASH DYNA's main features include:

- Support of all keywords of LS-DYNA 970/971
- Powerful mesh editing features, such as automesh and remesh
- LS-DYNA/MADYMO coupling capabilities for pre- and post processing (support of MADYMO format till version 6.2.2)
- Model Assembler for organizing the model through sub assembly/sub models and included files
- Enhanced Weld tools for manipulation of connections and Weld comparison
- Simple dummy positing and seat belt routing
- Pre and Post processing in same environment
- Superpose and merge multiple models
- Animation and plotting
- Process compatible
- Full capability to handle IGES, CATIA V4, CATIA V5, UG and NASTRAN files



Hardware & Computing and Communication Products

www.amd.com

www.fujitsu.com

www.hp.com

www-1.ibm.com/servers/deepcomputing

www.intel.com

www.nec.com

www.sgi.com

www.pathscale.com

www.microsoft.com

Software Distributors

Alphabetical order by Country

Australia	**Leading Engineering Analysis Providers** www.leapaust.com.au
Canada	**Metal Forming Analysis Corporation** www.mfac.com
China	**ANSYS China** www.ansys.cn
China	**MSC. Software – China** www.mscsoftware.com.cn
Germany	**CAD-FEM** www.cadfem.de
Germany	**Dyna*More*** www.dynamore.de
India	**GissETA** www.gisseta.com
India	**Altair Engineering India** www.altair-india.com
Italy	**Altair Engineering Italy** www.altairtorino.it
Italy	**Numerica SRL** www.numerica-srl.it
Japan	**Fujitsu Limited** www.fujitsu.com
Japan	**The Japan Research Institute** www.jri.co.jp
Japan	**CRC Solutions Corp.** www.engineering-eye.com
Korea	**Korean Simulation Technologies** www.kostech.co.kr
Korea	**Theme Engineering** www.lsdyna.co.kr

Software Distributors (cont.)

Alphabetical order by Country

Netherlands	**Infinite Simulation Systems B.V** www.infinite.nl
Russia	**Strela, LLC** www.ls-dynarussia.com
Sweden	**Engineering Research AB** www.erab.se
Taiwan	**Flotrend** www.flotrend.com.tw
USA	**Engineering Technology Associates** www.eta.com
USA	**Dynamax** www.dynamax-inc.com
USA	**Livermore Software Technology Corp.** www.lstc.com
USA	**ANSYS Inc.** www.ansys.com
UK	**Oasys, LTD** www.arup.com/dyna/

Consulting and Engineering Services
Alphabetical Order By Country

Australia Manly, NSW www.leapaust.com.au	**Leading Engineering Analysis Providers** Greg Horner info@leapaust.com.au 02 8966 7888
Canada Kingston, Ontario www.mfac.com	**Metal Forming Analysis Corporation** Chris Galbraith galb@mfac.com (613) 547-5395
India Bangalore www.altair-india.com	**Altair Engineering India** Nelson Dias info-in@altair.com 91 (0)80 2658-8540
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UK Solihull, West Midlands www.arup.com	**ARUP** Brian Walker brian.walker@arup.com 44 (0) 121 213 3317
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USA Windsor, CA www.schwer.net/SECS	**SE&CS** Len Schwer len@schwer.net (707) 837-0559
USA Corvallis, OR www.predictiveengineering.com	**Predictive Engineering** George Laird (1-800) 345-4671 george.laird@predictiveengineering.com
USA Neenah, WI www.structuretechnology.com	**Structure Incorporated** Todd L. Peters (920) 722 7060 info@structuretechnology.com

Educational & Contributing Participants

Alphabetical Order By Country

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Italy	Professor Gennaro Monacelli	Prode – Elasis & Univ. of Napoli, Frederico II
Russia	Dr. Alexey I. Borovkov	St. Petersburg State Tech. University
USA	Dr. Ted Belytschko	Northwestern University
USA	Dr. David Benson	University of California – San Diego
USA	Dr. Bhavin V. Mehta	Ohio University
USA	Dr. Taylan Altan	The Ohio State U – ERC/NSM
USA	Dr. Ala Tabiei	University of Cincinnati
USA	Tony Taylor	Irvin Aerospace Inc.

FEA Information China Participants

Software, Hardware, Training, Consulting, Services

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Informational Websites

The LSTC LS-DYNA Support site: www.dynasupport.com

LSTC LS-DYNA Support Site	**www.dynasupport.com**
FEA Informationwebsites	**www.feainformation.com**
TopCrunch – Benchmarks	**www.topcrunch.org**
LS-DYNA Examples (more than 100 Examples)	**www.dynaexamples.com**
LS-DYNA Conference Site	**www.ls-dynaconferences.com**
LS-DYNA Publications to Download On Line	**www.dynalook.com**
LS-DYNA Publications	**www.feapublications.com**
LS-DYNA CADFEM Portal	**www.lsdyna-portal.com.**

FEA Information Participants that are Sponsors of The 2006 LS-DYNA International Users Conference

We are moving rapidly toward June 4th and our opening day of the conference. The last minute preparations are being put in place and we look forward to meeting you at the conference.

Conference Proceedings is being printed and once again includes a wide range of applications. A CDROM of the proceedings will also be available so don't forget to sign up for the free conference proceeding CD that includes free shipping.

LS-DYNA Conference Sponsors

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Tuesday Breakfast	AMD
Monday/Tuesday Breaks	QLOGIC
Registration/Courtesy Booth	FUJITSU
Monday Lunch	hp invent

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(Full listing is on the exhibitor floor map in this issue)

Booth Number	Alpha Order
106	ANSYS
400	AMD
208	ARUP
305	ESI
200	ETA
303	FUJITSU
101	HP
405	IBM
201	INTEL
103	JRI
301	MICROSOFT
308	MSC SOFTWARE
207	NEC
102	QLogic
100	SGI

Presentations by FEA Information Participants

(all presentations are listed in the agenda in this issue)

Monday June 5th

ARUP

A New Generation of Crash Barrier Models for LS-DYNA

Schwer Engineering & Consulting Services

Perforation of Metal Plates: Laboratory Experiments and Numerical Simulation

Hewlett-Packard Company

The Advantages of HP-MPI for MPP LS-DYNA

DYNA*more* Gmb*H*

BioRID II Dummy Model Development – Influence of Parameters In Validation and Consumer Tests

LSTC

New Features in LS-OPT® Version 3

Arup

An assessment of the Robustness of the European Pedestrian Leg Impact Test Using LS-OPT® and LS-DYNA®

DYNA*more* Gmb*H*

Optimization of and Adaptive Restraint System Using LS-OPT® and Visual Exploration of the Design Space Using D-SPEX

INTEL

LS-DYNA® Peformance on 64-Bit Intel® Xeon® Processor-Based Clusters

SGI

Considerations for LS-DYNA Workflow Efficiencies in an HPC Linux Environment

TUESDAY – June 6th

ESI Group

Productive Environment for Quick CAE Modeling and Simulation – Visual Environment

Engineering Technology Associates, Inc.

The Evolution of Sheet Metal Forming Simulations In Stamping Industry

LSTC

LS-DYNA Features for Hot Stamping

Flotrend

Process Automation for LS-DYNA Based Shock and Impact Studies (Drop Testing) in eta/VPG Environment

MSC.Software Corporation

Flexible Body Suspension Modeling and Simulation Using MD/NASTRAN SOL 700 in VPG Environment

LSTC

Introduction of an Electromagnetism Module in LS-DYNA for Couples Mechanical-Thermal-Electromagnetic Simulations

LSTC

A Grid-Based Adaptive Scheme for the Three-Dimensional Forging and Extrusion Problems with EFG Method

Engineering Research Nordic AB

A User-Defined Element Interface in LS-DYNA V. 971

LSTC

The New CE/SE Fluid Solver and Fluid/Structures Coupling

LSTC

Fluid Structure Interaction in LS-DYNA Using Lagrangian Interfaces, Automatic Re-meshing and Adaptivity

LSTC

Porous Euler-Lagrange Couling: Application to Parachute Dynamics

Computing Infrastructure

QLogic Corporation (formerly PathScale)

Fuijtsu

Advanced Micro Devices Inc.

Hewlett-Packard Company

Microsoft Corporation

Engineering Technology Associates

Silicon Graphics, Inc.

Intel Corporation

Keynote Presentation

LSTC – LS-DYNA Development

9th International LS-DYNA® Users Conference 2006

June 4- 6, 2006
Hyatt Regency Dearborn
Dearborn, Michigan USA

Sunday June 4th

12:30 p.m. - 4:00 p.m.	**Rouge Factory Tour**	
5:00 p.m. - 8:00 p.m.	**Registration** ***Sponsored by Fujitsu***	**Great Lakes Center**
6:00 p.m. - 8:00 p.m.	**Welcome Reception** ***Sponsored by Microsoft***	**Great Lakes Center**
5:00 p.m. - 8:00 p.m.	**Exhibition**	**Great Lakes Center**

Monday June 5th

7:30 a.m. – 4:00 p.m.	Registration ***Sponsored by Fujitsu***	**Great Lakes Center**
7:30 a.m. – 8:20 p.m.	Continental Breakfast ***Sponsored by Sun Microsystems***	**Great Lakes Center**
8:00 a.m. – 6:00 p.m.	Exhibition	**Great Lakes Center**
8:20 a.m.	Welcome and Opening Remarks – Wayne L. Mindle (LSTC)	**Great Lakes Center**

8:35 a.m. Keynote Presentations **Great Lakes Center**

Session Chair: John O. Hallquist (LSTC)

8:35 **Dr. Ted Belytschko** *"Trends in Nonlinear Simulation"*
Walter P. Murphy Professor
Northwestern University

9:15 **Mr. James W. Welton** *"LS-DYNA at GM – Current & Future"*
Director
Global CAE Development and Integration
General Motors Corporation

9:55 a.m. ***Coffee Break – Sponsored by QLogic*** **Great Lakes Center**

10:05 **Mr. Kwan-Hum Park** *"Virtual Vehicle Development in HMC"*
Director
Hyundai Motor Company

10:45 **Mr. Paul Du Bois** *"A Constitutive Formulation for Polymers Subjected to High Strain Rates"*
Consulting Engineer

12:00 p.m. **Lunch –** ***Sponsored by HP*** **Great Lakes Center**

1:00 p.m. Session 1 -- Crash / Safety (1) Marquis Ballroom

Session Chair: TBA

1:00 *Abu-Odeh, A., Texas Transportation Institute, The Texas A&M University System*
Application of New Concrete Model to Roadside Safety Barriers

1:25 *Tryland, T., Hydro Automotive Structures*
Alternative Models of the Offset and Side Impact Deformable Barriers

1:50 *Walker, B., Arup*
A New Generation of Crash Barrier Models for LS-DYNA

2:15 *Gupta, R., North Carolina A & T State University*
Nonlinear Crash Dynamics Simulation of Novel Airbag Based Next Generation Energy Absorbing Barrier

2:40 *Sheikh, N.M., Texas Transportation Institute, Texas A&M University System*
Development of an Energy Absorbing End Terminal for Open Box Beam Guardrail

1:00 p.m. Session 2 -- Penetration / Explosive Modeling Stanley Steamer Suite

Session Chair: TBA

1:00 *Schwer, L.E., Schwer Engineering & Consulting Services*
Perforation of Metal Plates: Laboratory Experiments and Numerical Simulations

1:25 *Chen, M.M., U.S. Army Research Laboratory*
Structural Design and Analysis of Hit-To-Kill Projectile

1:50 *Hinrichsen, R.L., Rhamm Technologies, LLC*
High Velocity Impacts of Man Portable Air Defense Systems (MANPADS) on Selected Targets

2:15 *Fox, D.M., US Army Tank Automotive Research*
Development, Optimization and Design for Robustness of a Novel FMVSS 201U Energy Absorber

2:40 *Raguraman, M., Indian Institute of Science*
Accurate Prediction of Projectile Residual Velocity for Impact on Single and Multi-Layered Steel and Aluminum Plates

1:00 p.m. Session 3 -- Simulation Technology (1) Desoto Ballroom

Session Chair:

1:00 *Wu, J.*
Advanced Modeling and Drop Simulation With New Features of LS-DYNA

1:25 *Shkolnikov, M.B.*
Thin-Walled Beams Research and Development

1:50 *Bhargava, A., The George Washington University*
Analysis of Extended End-Plate Connections Under Cyclic Loading Using the LS-DYNA Implicit Solver

2:15 *Han, H., Dalhousie University*
Comparison of LS-DYNA and NISA in Solving Dynamic Pulse Buckling Problems in Laminated Composite Beams

2:40 *Song, G.G., DaimlerChrysler Corporation*
CAE Correlation with Test for Door Slam in Nonlinear Dynamic Stress and Fatigue Life Analysis

1:00 p.m. Session 4 -- Impact Analysis (1) Pierce Arrow Suite

Session Chair: TBA

1:00 *Shahkarami, A., The University of British Columbia*
An Efficient Shell Element Based Approach to Modeling the Impact Response of Fabrics

1:25 *Cheng, J., The University of Akron*
A Numerical Model for Tri-Axially Braided Composites Under High Velocity Soft Projectile Impact

1:50 *Zheng, D., The University of Akron*
Numerical Modeling of Friction Effects on the Ballistic Impact Response of Single-Ply Tri-Axial Braided Fabric

2:15 *Xin, X, Karagozian & Case*
A New Way for Multi-piece and Multi-hit Fragment Impact Simulation Using LS-DYNA

2:40 *Deka, L.J., University of Alabama at Birmingham*
Damage Evaluation and Energy Absorption of FRP Plates Subjected to Ballistic Impact Using a Numerical Model

1:00 p.m.Session 5 -- Computing / Code Technology (1) Stearns Knight Suite

Session Chair: TBA

1:00 *Makino, M., Fujitsu Limited*
The Performance of Large Car Model by MPP Version of LS-DYNA on Fujitsu PrimePower

1:25 *Dunlap, D., Platform Computing*
Using Platform LSF to Harness Non-Dedicated Computational Resources for LS-DYNA Crash Simulations at DaimlerChrysler

1:50 *Burke, M., Sun Microsystems, Inc.*
LS-DYNA® Performance and Scalability on Sun(TM) x64 Systems

2:15 *Lin, Y.Y., Hewlett-Packard Company*
The Advantages of HP-MPI for MPP LS-DYNA

3:05 p.m. Coffee Break – *Sponsored by QLogic* Great Lakes Center

3:20 p.m. Session 6 -- Crash / Safety (2) Marquis Ballroom

Session Chair: TBA

3:20 *Untariou, C., Center for Applied Biomechanics, University of Virginia*
Development and Validation of a Headform Impactor Finite Element Model with Application to Vehicle Hood Design for Pedestrian Protection

3:45 *Hamid, M.S., Delphi Corporation*
Systems Engineering Approach in Development of Delphi Driver Protection Module (DDPM) by Virtual Engineering

4:10 *Wang, Q., University of Windsor*
A Numerical Investigation into the Injury Potential of Three-year-old Children Seated in Forward Facing Child Safety Seats During Side Impact Crashes in Far Side Configurations

4:35 *Stahlschmidt, S., DYNAmore GmbH*
BioRID II Dummy Model Development - Influence of Parameters in Validation and Consumer Tests

3:20 p.m. Session 7 -- Optimization **Stanley Steamer Suite**

Session Chair: TBA

3:20 *McLundie, B., Jaguar and Land Rover*
Pedestrian Hood Generation & Optimization Using Knowledge-Based Engineering

3:45 *Stander, N., Livermore Software Technology Corporation*
New Features in LS-OPT® Version 3

4:10 *Magistrali, S., Omega Srl, Research and Innovation Centre*
Calibration and Experimental Validation of LS-DYNA Composite Material Models by Multi Objective Optimization Techniques

4:35 *Keer, T., Arup*
An Assessment of the Robustness of the European Pedestrian Leg Impact Test Using LS-OPT and LS-DYNA

5:00 *Seo, S.Y., Samsung Electronics Co. Ltd.*
A Study on a Multi-Disciplinary Optimization Method for the PMP

5:25 *Thiele. M., DYNAmore GmbH*
Optimization of and Adaptive Restraint System Using LS-OPT and Visual Exploration of the Design Space Using D-SPEX

3:20 p.m. Session 8 -- Simulation Technology (2) **Desoto Ballroom**

Session Chair: TBA

3:20 *Siebert, A., University Karlsruhe*
Investigating the Vibration Behavior and Sound of Church Bells Considering Ornaments and Reliefs Using LS-DYNA

3:45 *Grytten, F., Norwegian University of Science and Technology*
On the Qausi-Static Perforation Resistance of Circular AA5083-H116 Aluminium Plates

4:10 *Hua, J., The Ohio State University*
Process Modeling of Piercing Micro-hole with High Pressure Water Beam

4:35 *Sinha, K., DaimlerChrysler Research and Technology*
A Simulation-Driven System Design Methodology with Manufacturing Constraints

5:00 *Rentschler, M., University of Nebraska*
LS-DYNA Simulation of *in vivo* Surgical Robot Mobility

5:25 *Shoukry, S.N., West Virginia University*
Application of Dynamic Relaxation in Thermo-Elastic Structural Analysis of Highway Pavement Structures

3:20 p.m.Session 9 -- Impact Analysis (2) Pierce Arrow Suite

Session Chair: TBA

3:20 *Jackson, K.E., US Army Research Laboratory, VTD*
A Mesh Refinement Study on the Impact Response of a Shuttle Leading-Edge Panel Finite Element Simulation

3:45 *Raftenberg, M.N., U.S. Army Research Laboratory*
A Brittle Damage Model: Implementation into LS-DYNA and Application to Normal Plate-on-Plate Impact

4:10 *Yashin, A., Sarov Laboratories North America*
Design and Finite Element Analysis of Type C Shipping Cask for International Licensing

4:35 *Kirkpatrick, S.W., Applied Research Associates, Inc.*
Modeling Methodologies for Assessment of Aircraft Impact Damage to the World Trade Center Towers

3:20 p.m.Session 10 -- Code / Technology (2) Stearns Knight Suite

Session Chair: TBA

3:20 *Prince, T., Intel® Software and Solutions Group*
LS-DYNA® Performance on 64-Bit Intel® Xeon® Processor-Based Clusters

3:45 *Rustagi, P., Sun Microsystems, Inc.*
Projecting Performance of LS-DYNA Implicit for Large Multiprocessor Systems

4:10 *Posey, S., SGI*
Considerations for LS-DYNA Workflow Efficiencies in an HPC Linux Environment

7:00 p.m. – 9:00 p.m. Conference Banquet – *Sponsored by Intel and SGI* Great Lakes Center
Entertainment – *Sponsored by LSTC*

7:30 a.m. – 8:20 a.m.	Continental Breakfast ***Sponsored by AMD***	Great Lakes Center
7:30 a.m.	Registration ***Sponsored by Fujitsu***	Great Lakes Center
8:00 a.m. – 4:00 p.m.	Exhibition	Great Lakes Center

8:25 a.m. Session 11 -- Crash / Safety (3) Marquis Ballroom

Session Chair: TBA

8:25 *Nutwell, E., Honda R&D Americas*
Material Model Development for Impact Strength Validation of a Composite Truck Bed Design

8:50 *Thole, C.A., Fraunhofer Institute for Algorithms and Scientific Computing*
Scatter Analysis of Crash Simulation Results Enabled by Data Compression

9:15 *Elitok ,K., TEMSA A.S.*
An Investigation on the Roll-Over Crashworthiness of an Intercity Coach, Influence of Seat Structure and Passenger Weight

9:40 *Shetty, S.H., ESI Group*
Productive Environment for Quick CAE Modeling and Simulation – Visual Environment

8:25 a.m. Session 12 -- Metal Forming (1) Stanley Steamer Suite

Session Chair: TBA

8:25 *Li, K., Daimler Chrysler*
MPP in Stamping Simulations with LS-DYNA

8:50 *Tang, A., Engineering Technology Associates, Inc.*
The Evolution of Sheet Metal Forming Simulation in Stamping Industry

9:15 *Ren, F., Ford Motor Company*
Prediction of Impact Marks for a Stamped Panel with LS-DYNA

9:40 *Shapiro, A.B., Livermore Software Technology Corporation*
LS-DYNA Features for Hot Stamping

8:25 a.m. Session 13 -- Simulation Technology (3) Desoto Ballroom

Session Chair: TBA

8:25 *Fyllingen, Ø., Norwegian University of Science and Technology*
Simulations of Axially Loaded Straight Aluminium Profiles with Random Geometric Imperfections

8:50 *Xue, L., Massachusetts Institute of Technology*
Verification of a New Fracture Criterion Using LS-DYNA

9:15 *Petrushina, M., UIIP NAS of Belarus*
Thermomechanical Analysis of the Turbo-Compressor Sliding Bearing Mount Units

8:25 a.m. Session 14 -- Impact Analysis (3) Pierce Arrow Suite

Session Chair: TBA

8:25 *Yang, H.M., Flotrend Corporation*
Process Automation for LS-DYNA Based Shock and Impact Studies (Drop Testing) in eta/VPG Environment

8:50 *Yaksh, M., NAC International Inc.*
Evaluation of the Impact Condition for a High Capacity Spent Nuclear Fuel System

9:15 *Fasanella, E.L., NASA Langley Research Center*
Test and Analysis Correlation of High Speed Impacts of Ice Cylinders

9:40 *Borovkov, A., St.Petersburg State Polytechnical University*
Finite Element Modeling and Analysis of Crash Safe Composite Lighting Columns, Contact-Impact Problem

8:25 a.m. Session 15 -- Material Modeling (1) Stearns Knight Suite

Session Chair: TBA

8:25 *Carney, K.S., NASA Glenn Research Center*
A High Strain Rate Model with Failure for Ice in LS-DYNA

8:50 *Bergström, J.S., Exponent, Inc.*
Development and Implementation of an Advanced User Material Model for UHMWPE

9:15 *Benson, D.J., University of California San Diego*
A Simplified Approach for Strain-Rate Dependent Hyperelastic Materials with Damage

9:40 *Donadon, M.V., Imperial College London*
A Constitutive Formulation for Polymers Subjected to High Strain Rates

10:05 a.m. Coffee Break – *Sponsored by QLogic* Great Lakes Center

10:25 a.m. Session 16 -- Crash / Safety (4) Marquis Ballroom

Session Chair: TBA

10:25 *Wang, H.P., General Motors Corporation*
Crashworthiness Simulation Using Coupled Meshfree/Finite Element Formulations in LS-DYNA

10:50 *Heydari, C., MSC.Software Corporation*
Flexible Body Suspension System Modeling and Simulation Using MD/NASTRAN SOL700 in VPG Environment

11:15 *Wood, P.K.C., University of Warwick*
Validating Performance of Automotive Materials at High Strain Rate for Improved Crash Design

11:40 *McGregor, C., The University of British Columbia*
Simulation of Progressive Damage Development in Braided Composite Tubes Undergoing Axial Crushing

10:25 a.m. Session 17 -- Metal Forming (2) Stanley Steamer Suite

Session Chair: TBA

10:25 *L'Eplattenier, P., Livermore Software Technology Corporation*
Introduction of an Electromagnetism Module in LS-DYNA for Coupled Mechanical-Thermal-Electromagnetic Simulations

10:50 *Lim, T., Dofasco Inc*
Springback Predictions of the Numisheet 2005 Benchmark II Using DP600: The Effect of Using 21 Through Thickness Integration Points and Using a Static Implicit Finish to the Forming Simulation

11:15 *Kuldiwar, A.A.*
Finite Element Modeling of Strip Curvature During Hot Rolling

11:40 *Lu, H.S., Livermore Software Technology Corporation*
A Grid-based Adaptive Scheme for the Three-Dimensional Forging and Extrusion Problems with the EFG Method

10:25 a.m. Session 18 -- Simulation Technology (4) Desoto Ballroom

Session Chair: TBA

10:25 *Kojima, S., Toyota Technical Development Corporation*
Development of Aluminum Honeycomb Model Using Shell Elements

10:50 *Borrvall, T., Engineering Research Nordic AB*
A User-Defined Element Interface in LS-DYNA v971

11:15 *Tho, C.H., Bell Helicopter Textron Inc.*
Bird Strike Simulation for BA609 Spinner and Rotor Controls

11:40 *Akarca, S.S., University of Windsor*
A Coupled Thermal and Mechanical Model of Sliding Wear

12:05 *Neumayer, D., Bosch-Siemens-Hausgeräte*
Drop Test Simulation of a Cooker Including Foam Packaging and Pre-stressed Plastic Foil Wrapping

10:25 a.m. Session 19 -- Fluid / Structure **Pierce Arrow Suite**

Session Chair: TBA

10:25 *Tutt, B., Irvin Aerospace Inc*
The Application of a New Material Porosity Algorithm for Parachute Analysis

10:50 *Zhang, N., Toyoda Gosei North America*
Issues on Gas-Fabric Interaction in Airbag Simulation Using LS-DYNA ALE

11:15 *Zhang, Z.C., Livermore Software Technology Corporation*
The New CE/SE Fluid Solver and Fluid/Structure Coupling

11:40 *Del Pin, F., Livermore Software Technology Corporation*
Fluid Structure Interaction in LS-DYNA Using Lagrangian Interfaces, Automatic Re-meshing and Adaptivity

12:05 *Wang, J., Livermore Software Technology Corporation*
Porous Euler-Lagrange Coupling: Application to Parachute Dynamics

10:25 a.m. Session 20 -- Material Modeling (2) **Stearns Knight Suite**

Session Chair: TBA

10:25 *Heimbs, S., EADS, Corporate Research Center*
Honeycomb Sandwich Material Modeling for Dynamic Simulations of Aircraft Interior Components

10:50 *Berstad, T., SINTEF Materials and Chemistry*
Implementation of Constitutive Model for Thermoplastics with Some Preliminary Results

11:15 *Murray, Y.D., Aptek, Inc.*
Mixed Mode Constitutive Driver

11:40 *Yoon, J.W., Alcoa Technical Center*
Implementations of User Defined Shell Elements and Material Models to LS-DYNA and Their Application

12:05 *Lobo, H., DatapointsLabs*
Advances in the Measurement and Modeling of Plastics for Impact Simulations

12:30 p.m. **Lunch – *Sponsored by Penguin Computing*** **Great Lakes Center**

1:30 p.m. Common Session -- Computing Infrastructure Great Lakes Center

Session Chair: TBA

Sun Microsystems, Inc.
Penguin Computing
QLogic Corporation (Formerly PathScale)
Fujitsu
Advanced Micro Devices, Inc.
Hewlett-Packard Company
Microsoft Corporation
Engineering Technology Associates, Inc.
Silicon Graphics, Inc.
Intel Corporation

3:45 p.m. ***Coffee Break – Sponsored by QLogic*** **Great Lakes Center**

4:00 p.m. Keynote Presentation Great Lakes Center

Session Chair: TBA

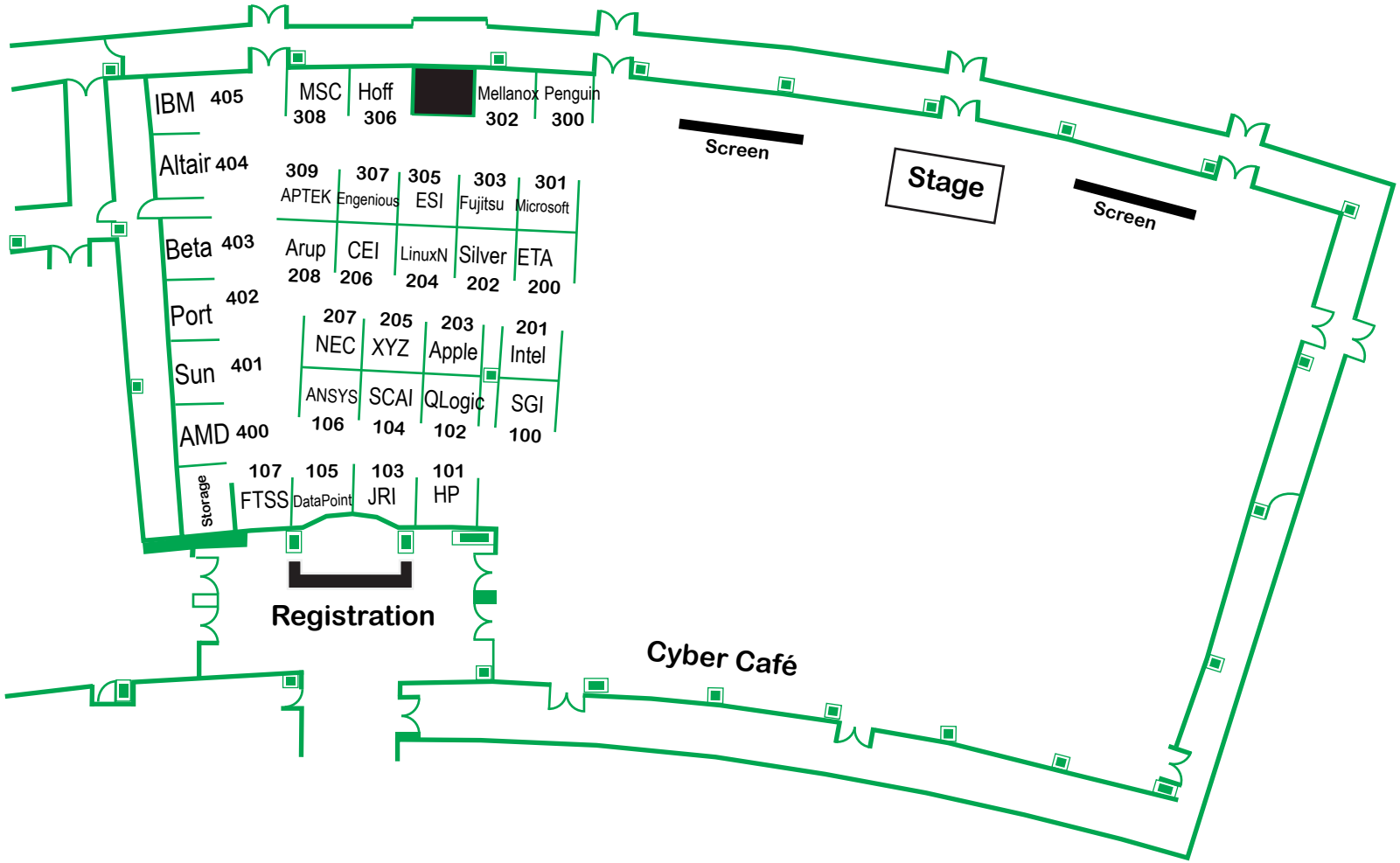
John O. Hallquist, President, LSTC ***"LS-DYNA Development"***

Closing Remarks: Wayne L. Mindle, LSTC

Thank you for your participation in the 9th International LS-DYNA® Users Conference!

Post-Conference Training Seminars
June 7th & 8th
(Seminars are conducted at the University of Michigan-Dearborn)
9:00 a.m. – 5:00 p.m.
(Lunch is provided)

Advanced Crashworthiness	*Paul A. Du Bois*
ALE/Eulerian Fluid/Structure Interaction	*M'hamed Souli, Ph.D.*
Heat Transfer Analysis	*Arthur Shapiro, Ph.D.*
Implicit Analysis	*Ala Tabiei, Ph.D.*
LS-OPT®	*Nielen Stander, Ph.D.*
LS-PrePost®	*Philip Ho*
Metal Forming	*Xinhai Zhu, Ph.D.*



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