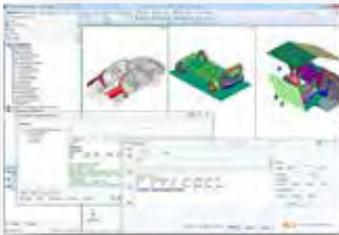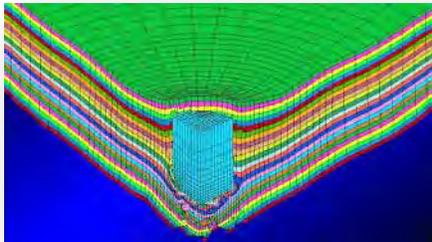**Webinar - Visual-Crash DYNA, an integrated module dedicated to LS-DYNA**

BETA CAE Systems - v17.0.4

MAT161/162 Dynamic Composite Simulator module of LS-DYNA

LS-DYNA Smooth Particle Galerkin (SPG) Method
        C.T. Wu,
        Y. Guo,
        W. Hu

Material Model

*MAT_1966

*MAT_JERGEUS

Computer History Museum

FEA Information Inc.

A publishing company founded April 2000 – published monthly since October 2000.

The publication's focus is engineering technical solutions/information.

FEA Information Inc. publishes:

FEA Information Engineering Solutions

FEA Information Engineering Journal

FEA Information China Engineering Solutions

Livermore Software Technology, Corp. (LSTC) Developer of LS-DYNA One Code Methodology.

LS-DYNA provides fully integrated, strongly coupled, solvers for extensive multiphysics capabilities. Integrated, at no additional cost. Optimized for shared and distributed memory for Unix, Linux, & Windows Based platforms.

DYNAmore GmbH – LSTC's Master Distributor in the EU

DYNAmore is dedicated to sales, support, training engineers with LS-DYNA to solve non-linear mechanical problems numerically. Employs 85 engineers in Europe. Co-develops the LSTC software and provide engineering services.

LSTC
Livermore Software
Technology Corp.

DatapointLabs

DELL

LANCEMORE

TERRABYTE Co.,Ltd.
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& Computer Simulation

KAIZENAT
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LS-DYNA Smooth Particle Galerkin (SPG) Method
    C.T. Wu, -   Y. Guo, -   W. Hu

Announcements

*Webinar - Visual-Crash DYNA, an integrated module dedicated to LS-DYNA*

LS-DYNA - R9.1.0 executable for SMP and MPP and notes are available - Contact your local distributor for information.

New section: -　　　Apps and Software specific to LS-DYNA

Sincerely,
Marsha Victory　Trent Eggleston
Marnie Azadian　Suri Bala　Dilip Bhalsod　Yanhua Zhao　Aleta Hays

www.materials-sciences.com
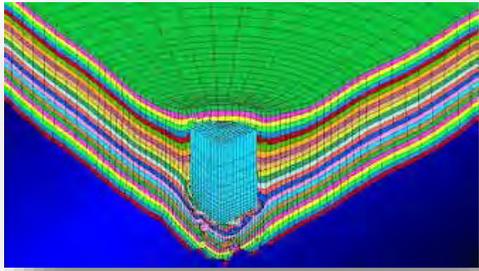
High Velocity Impact of a square plate

The official Youtube channel for Materials Sciences Corporation.

www.youtube.com/user/materialssciences

Materials Sciences Corporation (MSC) and Livermore Software Technology Corporation (LSTC) announce enhanced features have been added to the Dynamic Composite Simulator module of LS-DYNA.

This enhancement to LS-DYNA, known as MAT161/162, enables the most effective and accurate dynamic progressive failure modeling of composite structures to enable the most effective and accurate dynamic progressive failure modeling of composite structures currently available.

MSC/LS-DYNA Composite Software and Database -

 Fact Sheet: http://www.materials-sciences.com/dyna-factsheet.pdf

· MSC and LSTC have joined forces in developing this powerful composite dynamic analysis code.

· For the first time, users will have the enhanced ability to simulate explicit dynamic engineering problems for composite structures.

· The integration of this module, known as 'MAT 161', into LS-DYNA allows users to account for progressive damage of various fiber, matrix and interply delamination failure modes.

· Implementing this code will result in the ability to optimize the design of composite structures, with significantly improved survivability under various blast and ballistic threats.

· MSC's LS-DYNA module can be used to characterize a variety of composite structures in numerous applications— such as this composite hull under blast

Capabilities

· • Database of elastic/strength properties provides quick material selection of a wide spectrum of composite materials including Glass, Kevlar, and Carbon fiber reinforced composite plastic materials • Composite progressive failure models integrated into LS-DYNA allow quickly performing difficult dynamic impact problems such as ballistic/blast impact, crash and drop weight

· Composite micromechanical models can be readily used to estimate elastic and strength properties for selected composite systems • Applicable to shell and 3D elements • Upgraded output capability for damage zones display • Provides functionality of specifying initial damage parameters for residual strength evaluation

Applications

This integrated software/database package can be used effectively to design various composite applications including:

· •Protection systems such as composite armors of various levels of ballistic/blast protection, helmets for aviation and sports, blast barriers for buildings, blast resistant containers, etc.

· Automobile parts for crashworthiness capability such as car body, bumpers, girders, steering wheel and steering

Materials Sciences Corporation
135 Rock Rd.
Horsham, PA 19044
Phone: 215-542-8400
Fax: 215-542-8401
Email: info@materials-sciences.com

www.beta-cae.com/ansa.htm

BETA CAE Systems announces the release of the v17.0.4 of its software suite

Below is an excerpt – full information is found at the website:
http://www.beta-cae.com/news/20170209_announcement_suite_v17.0.4.htm

About this release
BETA CAE Systems announces the release of the new BETA suite v17.0.4.
This maintenance release focuses on resolving identified issues with v17.0x.

The most important fixes implemented are listed below.

Known issues resolved in ANSA
CAD Import: ANSA translation libraries would not handle curves away from periodic surfaces.
Compare – Report: In certain cases, erroneous number of SETs would appear in Compare Report.
Data Management: When changing the representation of a part, internal connections might be erased.
Connections – Connections Manager: When realizing self-connected connections, both the GS of the NASTRAN CWELD and the SHIDA would be erroneously attached to the same element.
Shell Mesh: The Reconstruct function could erroneously split the edges of frozen shells.
Decks: Renumber: When reading ELEMENT numbering rules from older ANSA versions, Rules for RBE2s might not be correctly applied.
Save as v16:   When saving the Database with option "Save as v16", RIGID BODY entities' Ids would be renumbered.
CFD Decks: Upon input of SC/TETRA files, BC (boundary condition) regions could not be read when their name contained a space character.
NASTRAN: Checks>CWELDs: Elements could be identified as problematic.
LS-DYNA: Thick Shell Orientation, Cohesive Solid Orientation Checks might not identify existing problems.

PERMAS: MPC RIGID entities might not be written correctly upon output.
RADIOSS: Unsupported Engine Keywords might be omitted when opening an ANSA database created from a RADIOSS file.
Scripting: The base.CollectEntities() function would fail to gather the ABAQUS SPRING and PERMAS XSTIFF elements from CELAS2 NASTRAN elements.

For more details about the new software features, enhancements and corrections please, refer to the Release Notes document.

Known issues resolved in META

Supported Interfaces: Not all states would be recognized and loaded for certain EnSight transient analysis files.
- The MS-Windows version of META would terminate when reading larger than 2GB IM files.
- No Strain Energy results would be recognized and loaded for the last cycle of NASTRAN SOL200 .op2 files.
- Loading META projects of Pam-Crash frequency response results would cause erroneous termination.

2D Plots
- Curves from LS-DYNA elout files could not be plotted using META commands.
- Several curve functions, including crash criteria and filters, would not take into account the curves' unit system.
- Editing the Axis Options of polar plots would cause termination.
- Saving curves in NASTRAN TABLED format could cause termination.

NVH
- In the Modal Response tool when declaring a subload, other than the first one, as enforced excitation, the results might be incorrect.
- The META commands to create a new MAC plot from the AutoMAC tool were not working.

Section Forces
- Section Forces calculated from FEMZIP-compressed files would be incorrect.

Toolbars
- The OIC toolbar would not work for WS-50 dummies if a user-defined IR-TRACC length was used.
- The TPA from Forces and FRFs toolbar would not input correctly FRFs in .unv format.
- The SOL200 Plot toolbar would not read Design Response values from .f06 files at certain cases.

Save
- The File Manager for exporting files could not access USB devices.
- Saving models in Abaqus format, connections would not be saved correctly in the .metadb if it was saved with the <16.0.0 option.

Webinar - Visual-Crash DYNA, an integrated module dedicated to LS-DYNA

www.esi-group.com/company/events/2017/cae-preprocessing-chain-complete-model-build

Visual Environment is a software platform offering clients intuitive multi-model/ multi-window/multi-application usage. Complete workflow execution from meshing to preprocessing to post-processing can be achieved in one single and customizable simulation environment. Data models can be smoothly transitioned between the integrated modules for meshing/ pre- and post-processing and process automation without losing any data/information or relaunching the application.

Explore more and join a webinar on the 14th or 15th March, 2017

Topic: CAE Pre-processing Chain for Complete Model Build-Up
This webinar features Visual-Crash DYNA, an integrated module
dedicated to LS-DYNA® preprocessing and shows how to use it.

Agenda:

·   Introduction to Visual-Environment
·   Visual-Crash DYNA - Graphical User Interface
·   Explorer – Model Window
·   LS-DYNA® - Card Image > LS-DYNA® solver card
·   How to create/edit a LS-DYNA® data model (entities, contacts, materials)
·   How to use LS-DYNA® data checks
·   Live-Demonstration
·   Q&A

www.computerhistory.org/

The world's leading institution exploring the history of computing and its ongoing impact on society.
- **Dedicated to the preservation and celebration of computer history**
- **Home to the largest international collection of computing artifacts in the world, encompassing computer hardware, software, documentation, ephemera, photographs, oral histories, and moving**

www.computerhistory.org/makesoftware/exhibit/

Mission: To preserve and present for posterity the artifacts and stories of the Information Age.

Computer history comes to life through:
- large-scale exhibits,
- an acclaimed speaker series,
- a dynamic website,
- docent-led tours
- award-winning education program.

> **Fly through World of Warcraft's fantastic world of Azeroth, learn Photoshop from the pros, try your hand at coding, and speed-text your way to victory in Make Software: Change the World!**

CAR CRASH SIMULATION
SIMULATING SAFETY
Would you volunteer to drive into a brick wall? Probably not. Which is why computer simulations are crucial to auto safety.

Software lets engineers run crash tests inside computers rather than on roads. It also allows them to compare the performance of different designs early in the process while cars are still on the drawing board, saving money and injuries.

Car model by George Washington University, 2012. Image courtesy of Livermore Software Technology Corporation

Dag Spicer - Senior Curator

Dag Spicer is CHM's "Chief Content Officer", and is responsible for creating the intellectual frameworks and interpretive schema of the Museum's various programs and exhibitions

Author: Aleta Hays   aleta@lstc.com

Upcoming ICFD class to be held in Troy, MI,

April 20-21, 2017 – contact Aleta@lstc.com

The following information was made available by nasa.gov.

On February 20, 1962, Astronaut John H. Glenn, Jr. became the first American to orbit the Earth when NASA launched the Mercury "Friendship 7" spacecraft from Kennedy Space Center, Florida. The mission, orbit the Earth, observe his reactions and return him home safely. Glenn completed a successful three-orbit mission in just under five hours, reaching an altitude of approximately 162 miles and an orbital velocity of approximately 17,500 miles per hour.

February 20, 2017, marked the 55th anniversary of this historic mission. Since then NASA has made tremendous advancements in space travel to include safely landing a man on the moon and planning a Journey to Mars.

BeenuZz published on March 21, 2016 Space Shuttle using LS-DYNA DEM
(Discrete Element Method) https://www.youtube.com/watch?v=Wr5B01NmgfU

**Fact of Interest - For Young Upcoming Engineering Scientists –
When Your Dad wants you to be a doctor.**

Vincenzo, in his time, was a well-known musician who then decided his son should be a doctor. His son did study medicine and studied mathematics. Rather than be a doctor he did get permission, from his father, to change his profession and became a Professor of mathematics. In 1609 from an invention of the spyglass he used his mathematical skills to improve it, and invent the telescope. The son of Vincenzo, was Galileo Galilei, Italian physicist and astronomer.

Above information for the young can be found at:
Starchild

February Showcase:
- · YouTube video posted by BeenuZz
- · YouTube video posted by LS-DYNA Multiphysics
- · Papers from the 10th International LS-DYNA User's Conference 2008
- · Paper from the 12th International LS-DYNA User's Conference 2012
- · Journey to Mars powered by nasa.gov

1. **YouTube video** by BeenuZz published on March 21, 2016 Space Shuttle using LS-DYNA DEM
    (Discrete Element Method) https://www.youtube.com/watch?v=Wr5B01NmgfU

2. **YouTube video** posted by LS-DYNA Multiphysics published on June 12, 2012 Simulation of the Orion space capsule impacting water in icfd/LS-DYNA Description: The following example shows a fully coupled Fluid Structure Interaction problem with a free-falling space capsule impacting the water. The fluid is modeled as a free surface flow.
https://www.youtube.com/watch?v=yvj27f0LaAc

3. **Paper**s from the 10th International LS-DYNA User;s Conference 2008
    Development of an Airbag Landing System for the Orion Crew Module
        Benjamin Tutt - Airborne Systems
        Keith Johnson, Karen Lyle - NASA Langley Research Ctr

    Validation of Finite Element Crash Test Dummy Models for the Prediction of Orion Crew Member Injuries during a Simulated Vehicle Landing
        Ala (Al) Tabiei - Mason, OH
        Charles Lawrence - NASA Glenn Research Ctr, Cleveland, OH
        Edwin L. Fasanella - NASA Langley Research Center, Hampton, VA

4. **Paper** from the 12th International LS-DYNA User's Conference 2012
        Recent Developments and Roadmap Part 3: Incompressible CFD
            Dr. Facundo Del Pin (LSTC)
        Recent Developments: Incompressible CFD

5.   **For more information** on the Journey to Mars and the role the Orion capsule is expected to play
        please visit https://www.nasa.gov/topics/journeytomars/index.html
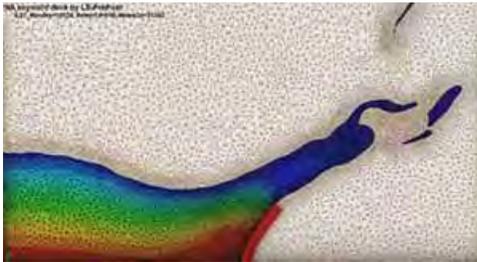
Author: Nils Karajan nik@dynamore.de

Webinar series on the Incompressible Fluid Solver (ICFD)
Marcus Timgren (DYNAmore Nordic)

Watch past episodes on YouTube:
- · ICFD how to set up a 2D FSI case: https://youtu.be/jB36LWzJW7I
- · ICFD how to set up a 3D CFD case: https://youtu.be/egJ2dsekUHQ

Introduction – Recently, the input decks that can be downloaded from www.dynaexamples.com/icfd have been updated by 42 new application cases. To give the users even more help in getting started with the ICFD solver, Marcus Timgren from DYAmore Nordic has started a webinar series to provide the users with background information on the examples.

The incompressible fluid solver ICFD is one of the most rapidly progressing solvers in LS-DYNA. For more and more LS-DYNA users, the ICFD solver is the method of choice when it comes to solving standard problems in computational fluid dynamics (CFD) as well as more sophisticated problems such as fluid-structure interaction (FSI) and conjugate heat transfer. Moreover, the ICFD solver exhibits also a good parallel scalability which leads to short turnaround times for the user.

·

Webinar topics, dates and registration
- · How to set-up a 3D FSI case in LS-DYNA
   28 February, 10-11 AM CET
     Registration
- · Difference between weak and strong coupling in FSI simulations in LS-DYNA
   7 March, 10-11 AM CET
     Registration
- · CFD mesh controls in LS-DYNA
   21 March, 10-11 AM CET
     Registration
- · How to model conjugate heat transfer in LS-DYNA
   4 April, 10-11 AM CET
     Registration
- · How to model flow through porous media in LS-DYNA
   25 April, 10-11 AM CET
     Registration
- · Coupling between DEM particles and ICFD solver in LS-DYNA
   15 May, 10-11 AM CET
     Registration
- · How to model sloshing using the ICFD solver in LS-DYNA
   23 May, 10-11 AM CET
     Registration

A FIRST COURSE IN THE FINITE ELEMENT METHOD

The book is written primarily as a basic learning tool for the undergraduate students in civil and mechanical engineering who are primarily interested in stress analysis and heat transfer. The text offers ideal preparation for students who want to apply the finite element method as a tool to solve practical physical problems.

Provide a simple, direct approach that highlights the basics with A FIRST COURSE IN THE FINITE ELEMENT METHOD, 6E. This unique book is written so both undergraduate and graduate students can easily comprehend the content without the usual prerequisites, such as structural analysis.
Editorial Reviews

Review

"It is extremely well presented for an introductory text…The author does an excellent job of getting to the underlying issues without confusing the reader with overwrought detail…The examples were very interesting and actually included advanced topics that many students would not be able to address based upon the presentation in other texts...Interesting examples that are simply explained that present complex topics."

"The presentation with regard to the example problems is the best I have seen in any textbook during 40+ years I have been teaching the finite element method…The textbook must be readable and at the appropriate level of sophistication for the students who will be using it. I find that this text does an excellent job of meeting both of these criteria."

About the Author

Daryl L. Logan is Professor of Mechanical Engineering at the University of Wisconsin-Platteville. He received his Ph.D. in 1972 from the University of Illinois -- Chicago. He has been a member of the American Society of Mechanical Engineers (ASME), Tau Beta Pi - National Honor Society, and the American Society for Engineering Education (ASEE). He holds a Professional Engineer's License in the state of Indiana.

European Conference - NVH Class

Aleta Hays   aleta@lstc.com

Yun Huang

Yun is a developer at LSTC and instructs classes in NVH

Sign up now for Yun's class at the 11th European LS-DYNA Conference, May 9-11, 2017 in Salzburg Austria. Contents will be taken from his 2 day class

The class he instructs at LSTC is a 2 day course.
Description: This two day class will provide introduction to the frequency domain vibration, fatigue and acoustic features of LS-DYNA to users, and give a detailed look at the application of these features in vehicle NVH simulation.

2 day Course contents

- **Introduction**: NVH theory and lab testing technology; overview of LS-DYNA frequency domain features and applications; Frequency domain vs. time domain; Fourier transforms;
- **FRF**: Modal superposition method; Damping; Nodal force / Resultant force FRF
- **SSD with harmonic loading:** Large mass method for enforced motion; ERP (Equivalent Radiated Power); Mode expansion with LS-PrePost
- **Random vibration with PSD loading: Correlated and uncorrelated multiple PSD excitations;** Shaker table testing; Acoustic waves; Pre-stress condition

- **Acoustics:** BEM, FEM; Vibro-acoustic problems; Acoustic panel contribution analysis; Muffler transmission loss analysis; ATV and MATV; Acoustic eigenvalue analysis; Incident waves
- **Response spectrum analysis:** Input earthquake spectrum; Modal combination methods (SRSS, CQC, etc.); Multi input spectra
- **Fatigue:** Fatigue analysis in harmonic / random vibration environment; Miner's rule; S-N curves; Dirlik method
- **Advanced topics**: SEA (Statistical Energy Analysis); Brake Squeal Analysis; NVH based on IGA
- **Workshop:** Hands-on exercise, post-processing of results

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Editor: Marsha J. Victory livermorehorses@aol.com

DYNAmore Nordic AB

Here you can find a Master's thesis in composites called "Modelling and simulation of composites crash tests for validation of material models using LS-DYNA". It's written by Fredrik Karlsson and Wictor Gradin who studied Applied Mechanics at Chalmers University of Technology. Read the paper in PDF here: https://lnkd.in/gZaMnZz

DYNAmore Nordic AB

The 11th European LS-DYNA Conference will be held 9 - 11 May 2017 in Salzburg, Austria. The official deadline for submitting your abstract has already passed, but papers will still be accepted in the very near future; so it is not too late to submit you abstract. Read more about the conference, and how to register here: https://lnkd.in/gUHtHZN

ALTAIR

We are mourning the unexpected loss of Dr. Harold Thomas, a true technology leader, friend, colleague, and inspiration to our global family. He will be greatly missed by all who had the privilege of working with him. Our deepest sympathies go out to his family during this difficult time.

**With grateful thanks for the support of LSTC and
our customers.**

Your Kaizenat Team

We are pleased to announce our fifth year anniversary of Kaizenat, bringing LS-DYNA sales, support and training to local engineers, companies, students, teachers and educational institutions.
Yes! We are excited for this challenging and cheerful journey to get close to 100 customers of LS-DYNA. We are honored to support their 2,000 core licenses of LS-DYNA.

We would like to send a special thank you to all our customers for their trust and support extended to us.   We look forward to helping the CAE Industry with better and more win-win-win situations.

As a customer focused organization, we have grown and continue our journey:
- ·   We have started offices in Bangalore, Chennai & Pune and planned to start in Delhi shortly.
- ·   Apart from offices, we have local representation in Hydrabad & UAE
- ·   Expanding our technical and sales team to cover the customer all over the regions.
- ·   Have launched Kaizen-DYNA mobile & web app to support our customer on the go.
- ·   Focus on explaining value add tools like LS-OPT, LS-PREPOST & LS-TaSC
- ·   Offer benefits of LS-DYNA to prospects to taste without any expense

'Kaizenat-DYNA" is a mobile & web application which is built to help LS-DYNA Users to get instant answers for technical query from global experts.   ramesh@kaizenat.com

Book Review – How to Build a Car:

Reviewed by: *Arthur B. Shapiro*   **Recommended by** *Rheannon Shapiro*, age 5

From Amazon web site —

How to Build a Car: A high-speed adventure of mechanics, teamwork, and friendship

by Martin Sodomka (Author), Saskia Lacey (Author)

(Technical Tales) Hardcover – September 14, 2015

4.7 out of 5 stars   13 customer reviews

Learn about car mechanics and teamwork as three unlikely friends work to build a miniature racer.

In How to Build a Car, three unlikely friends-- Eli, a mouse; Phoebe, a sparrow; and Hank, a frog--decide to build a small motorcar together. The story follows the friendly trio as they learn all about how a car works and how it is constructed. Detailed illustrations show the inner workings of the car, teaching children the basics of how each part works together to get the car moving. Through hard work and perseverance, Eli, Phoebe, and Hank learn about both car mechanics and teamwork as they build a miniature racer. With the help of this sweet story, children will learn the different parts and functions of a car.

Archived Books

Reviewed by: Arthur B. Shapiro   Recommended by Rheannon Shapiro, age 5

	The Most Magnificent Thing! By: Ashley Spires **"...the sometimes-frustrating process of translating ideas to reality and shows how a new perspective can help problem solve and rekindle enthusiasm and joy. Grades K-2."**

*MAT_JERGEUS_{OPTION}

This is Material Type 1966. This is a spacetime-dependent randomly anisotropic quantum perturbed quasi-elastoplastic material which will replace all previous and future material models. It is usually available for all elements in LS-DYNA except for beam, shell, and solid elements. A specialization of this material allows the modeling of certain fluids and their interaction with the human balance organs.

Files containing MAT_JERGEUS models should have generic names and be stored in a folder together with 120 other files with very similar names.

Available options include:

> **<BLANK>**
>
> **FLUID_BEER**
>
> **ADDBALL**
>
> **POKEMON**
>
> **GRILL**

For safety reasons, never attempt to use MAT_JERGEUS on Saturdays or Sundays.

Card 1	1	2	3	4	5	6	7	8
Variable	MID	RO	E	NPOC	BT	9:30_AM	2:30_PM	FISH
Type	A8	F	F	F	F	F	F	F

Define the following extra card for FLUID_BEER option:

Card 2	1	2	3	4	5	6	7	8
Variable	AWLOC	WDAY	PASSOUT	DSTOP	ISTUPID			
Type	F	F	F	F	F			

Define the following extra card for ADDBALL option:

Card 3	1	2	3	4	5	6	7	8
Variable	BTYPE	NLEVEL	1ST_TIME	GLASSLOC				
Type	F	F	F	F				

Define the following extra card for POKEMON option:

Card 4	1	2	3	4	5	6	7
Variable	LDELTA	PCATCH					
Type	F	F					

Define the following extra card for GRILL option:

Card 5	1	2	3	4	5	6	7	8
Variable	WDAY2	OBSCLVL						
Type	F	F						

VARIABLE	DESCRIPTION
MID	Material identification. A unique number or label not exceeding 8 characters must be specified.
RO	Mass density. Always kept secret, but sometimes decreasing.
E	Stillquite-Young's modulus. See Remarks section.
NPOC	Number of trouser leg pockets.
BT	Birth time. 1966 only option.
09:30_AM	Pre-lunch setting for known availability.
02:30_PM	Post-lunch setting including Metro knowledge.
FISH	When activated, the FISH flag will immediately terminate the simulation.

AWLOC   After Work location.

        EQ.1: Ölrepubliken,

        EQ.2: Rover,

        EQ.3: Tre Små Rum,

        EQ.4: all of the above plus a few more (default). Material failure is automatically activated for this option during initialization. **Note**: severe stability issues have been reported with this flag active.

WDAY   Day of week. Affects termination time.

PASSOUT   Alcohol level threshold for complete erosion of MAT_JERGEUS.
                        Default is 0.2 %.

DSTOP   Controlled termination of drinking. Governed by Gun. Overrides any
                        other termination setting.

ISTUPID   Self explanatory.

BTYPE   Type of ball.

                                EQ.1: 3-level Addictaball (default)

                                EQ.2: other

NLEVEL   Number of current Addictaball level.

1ST_TIME   Time for Addictaball 1st level completion.

                                EQ.1: < 30 seconds

                                EQ.2: > 30 seconds

GLASSLOC   Location of eyeglasses during Addictaball solving.

                                EQ.1: On table

                                EQ.2: On forehead

LDELTA   Difference in Pokemon Go level between MAT_JERGEUS and its auto-generated subroutine (MAT_JERGEUS_ERIK). Must always be a positive number.

PCATCH   Estimated number of Pokemons caught per simulation hour.

WDAY2   Day of week for grill lunch. Friday only option.

OBSCLVL   Obscurity level of grill restaurant.

                                      EQ.1: Decent

                                      EQ.2: Shady location but OK reputation

                                      EQ.3: "What the hell is this!" (default)

Remarks:

The stiffness model of *MAT_JERGEUS is based on Stillquite-Young's modulus which is heavily localized and dependent on time of day. For early morning simulations, the more cost effective MAT_RIGID gives similar results. Afternoon simulations can use the complex parameters to their full extent. There are anonymous user reports of localized stiffnesses during late night simulations.

The 09:30_AM flag is useful for applications requiring high reliability. In this setting, the location of the material model is always known (Safety Centre coffee room) except that parameter inputs automatically searched for by MAT_JERGEUS in the Metro daily newspaper cannot be guaranteed. Users are referred to the 02:30_PM flag to ensure all parameters are captured.

Considerable stability gains can be made when using the ADDICTABALL option in combination with correct settings. The prospect of a chocolate prize for completed levels will usually help MAT_JERGEUS smoothen out any irregularities and anomalies in the model.

The FLUID_BEER option takes several factors into account. The damage model is primarily governed by AWLOC which defines the number of pubs for beer consumption. In the default setting of AWLOC EQ.4, all parts using MAT_JERGEUS will eventually appear severely underintegrated towards the end of the simulation. Termination will usually occur automatically, rendering the material model completely useless for the next 24 hours. See graph below.

More Y

Some curves

More X
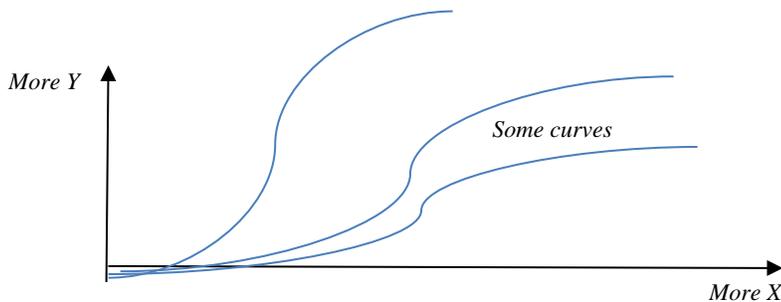
When using the POKEMON option it is important to always keep experience points and levels higher than those of the MAT_JERGEUS_ERIK subroutine. Failure to do so usually results in a model working slowly and reluctantly, taking several attempts to initialize.

The GRILL option should be used with care as the default setting of OBSCLVL (EQ.3) may neutralize the user for several days.

AUTOMOTIVE NEWS & EVENTS

Editor: Dilip Bhalsod

The purpose of this section is to provide a place, for our automotive readers, to share news and events relative to their company and/or products.

The criteria for submitting information is as follows:

- · It has to be public information
- · Published on the Internet
- · Be automotive informational, or human interest.
- · We do not accept financial quarterly information

We would welcome the opportunity to share information about your company with our readership.

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Excerpt from article

The all-new Expedition is part of Ford's plan to grow its SUV leadership with five new vehicles for North America in the next four years.

The all-new Expedition arrives this fall. It is built at Kentucky Truck Plant in Louisville, Kentucky.

Feb 7, 2017 | DALLAS - All-New Ford Expedition Redefines Full-Size SUVs with Adaptable Interior, Smart Technology for Every Occupant

· •All-new Ford Expedition – the smartest, most capable and most adaptable Expedition ever – provides families generous space, connectivity and smart new technology for their next adventures

· •Flexible seating and storage solutions include second-row tip-and-slide seating that provides easy access to the third row even when child seats are installed; new, more powerful 3.5-liter EcoBoost® engine and class-exclusive 10-speed automatic transmission are expected to deliver the best towing capability of any full-size SUV

· •Ford introduces the all-new Expedition today with an assist from the Dallas Cowboys in Texas – America's best-selling full-size SUV market; Dallas firefighters join Ford to surprise a local first responder with an all-new Expedition

ALL-NEW FORD EXPEDITION COLLECTION

DALLAS, Feb. 7, 2017 – For today's active families, Ford introduces the all-new Expedition – the smartest, most capable and most adaptable Expedition ever – with technology to keep every passenger connected, more power for drivers, and more expected towing capability than any other full-size SUV.

The all-new Expedition makes its debut today with an assist from the Dallas Cowboys in Texas – America's best-selling full-size SUV market.

"When Expedition was introduced 20 years ago, it set the standard for active families who simply needed a big and strong SUV to take them places," said Joe Hinrichs, Ford president of The Americas. "Today's families want even more smart technology to help them cover more ground safely, more efficiently and more comfortably – all while staying connected to friends and family."

The all-new Expedition offers more driver-assist technology than any other full-size SUV.

In addition, an all-new high-strength, aluminum-alloy body and redesigned high-strength steel frame form the foundation for Expedition's rugged off-road and strong towing capabilities. Thanks to the use of advanced materials, the all-new Expedition saves up to 300 pounds, and the team reinvested that weight savings everywhere it counts to give customers more technology and convenience features than ever before.

More than 40 features and driver-assist technologies new to Expedition help make the journey as enjoyable as the destination.

These include class-exclusive enhanced active park assist to easily pull in and out of parking spots, as well as available 360-degree camera technology to help customers see more around their Expedition for easier parking.

On the road, Expedition's lane-keeping aid is designed to reduce unintentional drifting of the vehicle outside its intended lane, while adaptive cruise control with stop-and-go allows drivers to set a cruising speed, using radar and camera technology to monitor traffic to maintain a set distance between vehicles.

Its collision avoidance detection system helps drivers avoid other vehicles or pedestrians, while available Blind Spot Information System helps monitor blind spots outside the driver's immediate view.

In addition, Expedition offers available new connectivity technologies and convenience features, including:

- •Wireless charging; Expedition is Ford's first vehicle to feature this system, which allows customers to place compatible mobile devices on an integrated charging pad conveniently located in the front center console
- •Wi-Fi hotspot supports as many as 10 devices at once, up to 50 feet away from the vehicle
- •Dual-headrest rear seat entertainment system provides a next-generation video experience that allows passengers to view their home cable programming on either of two video screens or hand-held devices.......

AEROSPACE NEWS & EVENTS

Editor: Marnie Azadian

The purpose of this section is to provide a place, for our aerospace readers, to share news and events relative to their company and/or products.

The criteria for submitting information is as follows:

- · It has to be public information
- · An internet URL
- · Be technical, informational, or human interest.
- · We do not accept financial quarterly information

We would welcome the opportunity to share information about your company with our readership.

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Submissions should be received by the 15th of each month, of the month you want your article placed. For example: We would need the title of the news or event by December 15th, 2015 to be featured in the December 2015 FEA newsletter.

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NASA Opens Media Accreditation for Next Orbital ATK Cargo Resupply Mission

A United Launch Alliance Atlas V rocket lifts off from Space Launch Complex 41 at Cape Canaveral Air Force Station in Florida on March 22, 2016, carrying an Orbital ATK Cygnus resupply spacecraft to the International Space Station. Orbital ATK's seventh contracted commercial resupply mission to the station is targeted to launch on an Atlas V rocket no earlier than March 19, bringing research, supplies and vehicle hardware to the crew members.

Orbital ATK Commercial Resupply launch in March 2016

NASA has opened media accreditation for the next Orbital ATK launch of a commercial resupply mission to the International Space Station. The Cygnus spacecraft is targeted to launch March 19, during a 30-minute window that opens at approximately 10:56 p.m. EDT.

Cygnus will launch on a United Launch Alliance Atlas V rocket from Space Launch Complex 41 at Cape Canaveral Air Force Station (CCAFS) in Florida. The spacecraft will carry crew supplies and vehicle hardware to the orbital laboratory to support the Expedition 50 and 51 crews.

Investigations scheduled on this launch include an Advanced Plant Habitat, which will integrate new technology to increase overall efficiency, reliability, and robustness of plants grown on station. This experiment will build on the success of NASA's Veggie, the first fresh food growth system on station, and will provide ongoing research for the development of food production systems for long-duration exploration missions.

Manipulating cell cultures in space is challenging as the cells can spontaneously grow in 3-D. Another new investigation bound for the U.S. National Laboratory will look at using magnetized cells and tools to make it easier to handle cells and cultures, and improve the reproducibility of experiments.

The Slosh Coating experiment will investigate a special type of coating that can repel liquids when applied to container walls. If effective, the liquid repellent could be used to design more efficient storage tanks for propellant and other fluids used in space exploration.

There also will be a number of CubeSats onboard Cygnus that will be deployed from the NanoRacks CubeSat Deployment on the space station, including a NASA science payload known as IceCube, which will provide data to scientists' understanding of ice clouds and their role in climate change.

The International Space Station is a convergence of science, technology and human innovation that demonstrates new technologies and makes research breakthroughs not possible on Earth. The space station has been occupied continuously since November 2000. In that time, more than 200 people and a variety of international and commercial spacecraft have visited the orbiting laboratory. The space station remains the springboard to NASA's next great leap in exploration, including future missions to an asteroid and Mars.

The NASA TV schedule and video streaming information is available online. Visit the agency's website for more information about the mission including launch countdown coverage and NASA's launch blog.

-end-

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An advanced multidisciplinary CAE pre-processing tool that provides all the necessary functionality for full-model build up, from CAD data to ready-to-run solver input file, in a single integrated environment. ANSA is a full product modeler for LS-DYNA, with integrated Data Management and Process Automation. ANSA can also be directly coupled with LS-OPT of LSTC to provide an integrated solution in the field of optimization.

Is a multi-purpose post-processor meeting diverging needs from various CAE disciplines. It owes its success to its impressive performance, innovative features and capabilities of interaction between animations, plots, videos, reports and other objects. It offers extensive support and handling of LS-DYNA 2D and 3D results, including those compressed with SCAI's FEMZIP software

Solutions for:

Process Automation - Data Management – Meshing – Durability - Crash & Safety NVH   - CFD - Thermal analysis - Optimization - Powertrain

 Products made of composite materials   -   Analysis Tools   -

Maritime and Offshore Design   -   Aerospace engineering   -   Biomechanics

DatapointLabs **www.datapointlabs.com**

Testing over 1000 materials per year for a wide range of physical properties, DatapointLabs is a center of excellence providing global support to industries engaged in new product development and R&D.

The compary meets the material property needs of CAE/FEA analysts, with a specialized product line, TestPaks®, which allow CAE analysts to easily order material testing for the calibration of over 100 different material models.

DatapointLabs maintains a world-class testing facility with expertise in physical properties of plastics, rubber, food, ceramics, and metals.

Core competencies include mechanical, thermal and flow properties of materials with a focus on precision properties for use in product development and R&D.

Engineering Design Data including material model calibrations for CAE Research Support Services, your personal expert testing laboratory Lab Facilities gives you a glimpse of our extensive test facilities Test Catalog gets you instant quotes for over 200 physical properties.

ETA – Engineering Technology Associates   **www.eta.com**

etainfo@eta.com

Inventium Suite™

Inventium Suite™ is an enterprise-level CAE software solution, enabling concept to product. Inventium's first set of tools will be released soon, in the form of an advanced Pre & Post processor, called PreSys.

Inventium's unified and streamlined product architecture will provide users access to all of the suite's software tools. By design, its products will offer a high performance modeling and post-processing system, while providing a robust path for the integration of new tools and third party applications.

PreSys

Inventium's core FE modeling toolset. It is the successor to ETA's VPG/PrePost and FEMB products. PreSys offers an easy to use interface, with drop-down menus and toolbars, increased graphics speed and detailed graphics capabilities. These types of capabilities are combined with powerful, robust and accurate modeling functions.

VPG

Advanced systems analysis package. VPG delivers a unique set of tools which allow engineers to create and visualize, through its modules--structure, safety, drop test, and blast analyses.

DYNAFORM

Complete Die System Simulation Solution. The most accurate die analysis solution available today. Its formability simulation creates a "virtual tryout", predicting forming problems such as cracking, wrinkling, thinning and spring-back before any physical tooling is produced

Latest Release is ESI Visual-Environment 12.0

ESI Group   www.esi-group.com

Visual-Environment is an integrative simulation platform for simulation tools operating either concurrently or standalone for various solver. Comprehensive and integrated solutions for meshing, pre/post processing, process automation and simulation data management are available within same environment enabling seamless execution and automation of tedious workflows. This very open and versatile environment simplifies the work of CAE engineers across the enterprise by facilitating collaboration and data sharing leading to increase of productivity.

Visual-Crash DYNA provides advanced preprocessing functionality for LS-DYNA users, e.g. fast iteration and rapid model revision processes, from data input to visualization for crashworthiness simulation and design. It ensures quick model browsing, advanced mesh editing capabilities and rapid graphical assembly of system models. Visual-Crash DYNA allows graphical creation, modification and deletion of LS-DYNA entities. It comprises tools for checking model quality and simulation parameters prior to launching calculations with the solver. These

tools help in correcting errors and fine-tuning the model and simulation before submitting it to the solver, thus saving time and resources. Several high productivity tools such as advanced dummy positioning, seat morphing, belt fitting and airbag folder are provided in **Visual-Safe,** a dedicated application to safety utilities.

Visual-Mesh is a complete meshing tool supporting CAD import, 1D/2D/3D meshing and editing for linear and quadratic meshes. It supports all meshing capabilities, like shell and solid automesh, batch meshing, topo mesh, layer mesh, etc. A convenient Meshing Process guides you to mesh the given CAD component or full vehicle automatically.

Visual-Viewer built on a multi-page/multi-plot environment, enables data grouping into pages and plots. The application allows creation of any number of pages with up to 16 windows on a single page. These windows can be plot, animation, video, model or drawing block windows. Visual-Viewer performs automated tasks and generates customized reports and thereby increasing engineers' productivity.

Latest Release is ESI Visual-Environment 12.0

ESI Group   **www.esi-group.com**

Visual-Process provides a whole suite of generic templates based on LS-DYNA solver (et altera). It enables seamless and interactive process automation through customizable LS-DYNA based templates for automated CAE workflows.

All generic process templates are easily accessible within the unique framework of Visual-Environment and can be customized upon request and based on customer's needs.

Visual*DSS* is a framework for Simulation Data and Process Management which connects with Visual-Environment and supports product engineering teams, irrespective of their geographic location, to make correct and realistic decisions throughout the virtual prototyping phase. Visual*DSS* supports seamless connection with various CAD/PLM systems to extract the data required for building virtual tests as well as building and chaining several virtual tests upstream and downstream to achieve an integrated process. It enables the capture, storage and reuse of enterprise knowledge and best practices, as well as the automation of repetitive and cumbersome tasks in a virtual prototyping process, the propagation of engineering changes or design changes from one domain to another.

JSOL

JSOL Corporation   **www.jsol.co.jp/english/cae/**

HYCRASH

Easy-to-use one step solver, for Stamping-Crash Coupled Analysis. HYCRASH only requires the panels' geometry to calculate manufacturing process effect, geometry of die are not necessary. Additionally, as this is target to usage of crash/strength analysis, even forming analysis data is not needed. If only crash/strength analysis data exists and panel ids is defined. HYCRASH extract panels to calculate it's strain, thickness, and map them to the original data.

JSTAMP/NV

As an integrated press forming simulation system for virtual tool shop

the JSTAMP/NV meets the various industrial needs from the areas of automobile, electronics, iron and steel, etc. The JSTAMP/NV gives satisfaction to engineers, reliability to products, and robustness to tool shop via the advanced technology of the JSOL Corporation.

JMAG

JMAG uses the latest techniques to accurately model complex geometries, material properties, and thermal and structural phenomena associated with electromagnetic fields. With its excellent analysis capabilities, JMAG assists your manufacturing process

Livermore Software Technology Corp.

LS-DYNA

A general-purpose finite element program capable of simulating complex real world problems. It is used by the automobile, aerospace, construction, military, manufacturing, and bioengineering industries. LS-DYNA is optimized for shared and distributed memory Unix, Linux, and Windows based, platforms, and it is fully QA'd by LSTC. The code's origins lie in highly nonlinear, transient dynamic finite element analysis using explicit time integration.

LS-PrePost: An advanced pre and post-processor that is delivered free with LS-DYNA. The user interface is designed to be both efficient and intuitive. LS-PrePost runs on Windows, Linux, and Macs utilizing OpenGL graphics to achieve fast rendering and XY plotting.

LS-OPT: LS-OPT is a standalone Design Optimization and Probabilistic Analysis package with an interface to LS-DYNA. The graphical preprocessor LS-OPTui facilitates definition of the design input and the creation of a command file while the postprocessor provides output such as approximation accuracy, optimization convergence, tradeoff curves, anthill plots and the relative importance of design variables.

LS-TaSC: A Topology and Shape Computation tool. Developed for engineering analysts who need to optimize structures, LS-TaSC works with both the implicit and explicit solvers of LS-DYNA. LS-TaSC handles topology optimization of large non-linear problems, involving dynamic loads and contact conditions.

LSTC Dummy Models:

Anthropomorphic Test Devices (ATDs), as known as "crash test dummies", are life-size mannequins equipped with sensors that measure forces, moments, displacements, and accelerations.

LSTC Barrier Models: LSTC offers several Offset Deformable Barrier (ODB) and Movable Deformable Barrier (MDB) model.

Oasys Ltd. LS-DYNA Environment

The Oasys Suite of software is exclusively written for LS-DYNA® and is used worldwide by many of the largest LS-DYNA® customers. The suite comprises of:

Oasys PRIMER

Key benefits:

- Pre-Processor created specifically for LS-DYNA®
- Compatible with the latest version of LS-DYNA®
- Maintains the integrity of data
- Over 6000 checks and warnings – many auto-fixable
- Specialist tools for occupant positioning, seatbelt fitting and seat squashing (including setting up pre-simulations)
- Many features for model modification, such as part replace
- Ability to position and depenetrate impactors at multiple locations and produce many input decks

automatically (e.g. pedestrian impact, interior head impact)

- Contact penetration checking and fixing
- Connection feature for creation and management of connection entities.
- Support for Volume III keywords and large format/long labels
- Powerful scripting capabilities allowing the user to create custom features and processes

Oasys D3PLOT

Key benefits:

- Powerful 3D visualization post-processor created specifically for LS-DYNA®
- Fast, high quality graphics
- Easy, in-depth access to LS-DYNA® results
- Scripting capabilities allowing the user to speed up post-processing, as well as creating user defined data components

Oasys T/HIS

Key benefits:

- Graphical post-processor created specifically for LS-DYNA®
- Automatically reads all LS-DYNA® results
- Wide range of functions and injury criteria
- Easy handling of data from multiple models
- Scripting capabilities for fast post-processing

Oasys REPORTER

Key benefits:

- Automatic report generation tool created specifically for LS-DYNA®
- Automatically post-process and summarize multiple analyses
- Built-in report templates for easy automatic post-processing of many standard impact tests

Shanghai Hengstar

Center of Excellence: Hengstar Technology is the first LS-DYNA training center of excellence in China. As part of its expanding commitment to helping CAE engineers in China, Hengstar Technology will continue to organize high level training courses, seminars, workshops, forums etc., and will also continue to support CAE events such as: China CAE Annual Conference; China Conference of Automotive Safety Technology; International Forum of Automotive Traffic Safety in China; LS-DYNA China users conference etc.

On Site Training: Hengstar Technology also provides customer customized training programs on-site at the company facility. Training is tailored for customer needs using LS-DYNA such as material test and input keyword preparing; CAE process automation with customized script program; Simulation result correlation with the test result; Special topics with new LS-DYNA features etc..

www.hengstar.com

Distribution & Support: Hengstar distributes and supports LS-DYNA, LS-OPT, LS-Prepost, LS-TaSC, LSTC FEA Models; Hongsheng Lu, previously was directly employed by LSTC before opening his distributorship in China for LSTC software. Hongsheng visits LSTC often to keep update on the latest software features.

Hengstar also distributes and supports d3View; Genesis, Visual DOC, ELSDYNA; Visual-Crash Dyna, Visual-Process, Visual-Environment; EnkiBonnet; and DynaX & MadyX etc.

Consulting

As a consulting company, Hengstar focuses on LS-DYNA applications such as crash and safety, durability, bird strike, stamping, forging, concrete structures, drop analysis, blast response, penetration etc with using LS-DYNA's advanced methods: FEA, ALE, SPH, EFG, DEM, ICFD, EM, CSEC..

Lenovo

Lenovo is a USD39 billion personal and enterprise technology company, serving customers in more than 160 countries.

Dedicated to building exceptionally engineered PCs, mobile Internet devices and servers spanning entry through supercomputers, Lenovo has built its business on product innovation, a highly efficient global supply chain and strong strategic execution. The company develops, manufactures and markets reliable, high-quality, secure and easy-to-use technology products and services.

Lenovo acquired IBM's x86 server business in 2014. With this acquisition, Lenovo added award-winning System x enterprise server portfolio along with HPC and CAE expertise.

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Taiwan **AgileSim Technology Corp.**

www.agilesim.com.tw

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Cloud computing services
for
JSOL Corporation LS-DYNA users in Japan

JSOL Corporation is cooperating with chosen
cloud computing services

JSOL Corporation, a Japanese LS-DYNA distributor for Japanese LS-DYNA customers.

LS-DYNA customers in industries / academia / consultancies are facing increased needs for additional LS-DYNA cores

In calculations of optimization, robustness, statistical analysis, we find that an increase in cores of LS-DYNA are needed, for short term extra projects or cores.

JSOL Corporation is cooperating with some cloud computing services for JSOL's LS-DYNA users and willing to provide short term license.

This service is offered to customers using Cloud License fee schedule, the additional fee is less epensive than purchasing yearly license.

The following services are available
(only in Japanese). HPC OnLine:

NEC Solution Innovators, Ltd.
http://jpn.nec.com/manufacture/machinery/hpc_online/

Focus
Foundation for Computational Science
http://www.j-focus.or.jp

Platform Computation Cloud
CreDist.Inc.

PLEXUS CAE
Information Services International-Dentsu, Ltd. (ISID) https://portal.plexusplm.com/plexus-cae/

SCSK Corporation
http://www.scsk.jp/product/keyword/keyword07.html

www.rescale.com

Rescale: Cloud Simulation Platform

The Power of Simulation Innovation
We believe in the power of innovation. Engineering and science designs and ideas are limitless. So why should your hardware and software be limited? You shouldn't have to choose between expanding your simulations or saving time and budget.

Using the power of cloud technology combined with LS-DYNA allows you to:
· Accelerate complex simulations and fully explore the design space
· Optimize the analysis process with hourly software and hardware resources
· Leverage agile IT resources to provide flexibility and scalability

True On-Demand, Global Infrastructure
Teams are no longer in one location, country, or even continent. However, company data centers are often in one place, and everyone must connect in, regardless of office. For engineers across different regions, this can cause connection issues, wasted time, and product delays.

Rescale has strategic/technology partnerships with infrastructure and software providers to offer the following:
· Largest global hardware footprint – GPUs, Xeon Phi, InfiniBand
· Customizable configurations to meet every simulation demand
· Worldwide resource access provides industry-leading tools to every team
· Pay-per-use business model means you only pay for the resources you use
· True on-demand resources – no more queues

ScaleX Enterprise: Transform IT, Empower Engineers, Unleash Innovation
The ScaleX Enterprise simulation platform provides scalability and flexibility to companies while offering enterprise IT and management teams the opportunity to expand and empower their organizations.

ScaleX Enterprise allows enterprise companies to stay at the leading edge of computing technology while maximizing product design and accelerating the time to market by providing:
· Collaboration tools
· Administrative control
· API/Scheduler integration
· On-premise HPC integration

Industry-Leading Security
Rescale has built proprietary, industry-leading security solutions into the platform, meeting the

needs of customers in the most demanding and competitive industries and markets.
· Manage engineering teams with user authentication and administrative controls
· Data is secure every step of the way with end-to-end data encryption
· Jobs run on isolated, kernel-encrypted, private clusters
· Data centers include biometric entry authentication
· Platforms routinely submit to independent external security audits

Rescale maintains key relationships to provide LS-DYNA on demand on a global scale. If you have a need to accelerate the simulation process and be an innovative leader, contact Rescale or the following partners to begin running LS-DYNA on Rescale's industry-leading cloud simulation platform.

LSTC   - DYNAmore GmbH   JSOL Corporation

Rescale, Inc. - 1-855-737-2253 (1-855-RESCALE) - info@rescale.com

 944 Market St. #300, San Francisco, CA 94102 USA

ESI Cloud Based Virtual Engineering Solutions

ESI Cloud offers designers and engineers cloud-based computer aided engineering (CAE) solutions across physics and engineering disciplines.

ESI Cloud combines ESI's industry tested virtual engineering solutions integrated onto ESI's Cloud Platform with browser based modeling,

With ESI Cloud users can choose from two basic usage models:

· An end-to-end SaaS model: Where modeling, multi-physics solving, results visualization and collaboration are conducted in the cloud through a web browser.

· A Hybrid model: Where modeling is done on desktop with solve, visualization and collaboration done in the cloud through a web browser.

Virtual Performance Solution:

ESI Cloud offers ESI's flagship Virtual Performance Solution (VPS) for multi-domain performance simulation as a hybrid offering on its cloud platform. With this offering, users can harness the power of Virtual Performance Solution, leading multi-domain CAE solution for virtual engineering of crash, safety, comfort, NVH (noise, vibration and harshness), acoustics, stiffness and durability.

In this hybrid model, users utilize VPS on their desktop for modeling including geometry, meshing and simulation set up. ESI Cloud is then used for high performance computing with an integrated visualization and real time collaboration offering through a web browser.

The benefits of VPS hybrid on ESI Cloud include:

· Running large concurrent simulations on demand

· On demand access to scalable and secured cloud HPC resources

· Three tiered security strategy for your data

· Visualization of large simulation data sets

· Real-time browser based visualization and collaboration

· Time and cost reduction for data transfer between cloud and desktop environments

· Support, consulting and training services with ESI's engineering teams

ESI Cloud Based Virtual Engineering Solutions

www.esi-group.com/software-solutions/cloud-solutions/esi-cloud

VPS On Demand

ESI Cloud features the Virtual Performance Solution (VPS) enabling engineers to analyze and test products, components, parts or material used in different engineering domains including crash and high velocity impact, occupant safety, NVH and interior acoustics, static and dynamic load cases. The solution enables VPS users to overcome hardware limitations and to drastically reduce their simulation time by running on demand very large concurrent simulations that take advantage of the flexible nature of cloud computing.

Key solution capabilities:

- Access to various physics for multi-domain optimization
- Flexible hybrid model from desktop to cloud computing
- On demand provisioning of hardware resources
- Distributed parallel processing using MPI (Message Passing Interface) protocol
- Distributed parallel computing with 10 Gb/s high speed interconnects

Result visualization

ESI Cloud deploys both client-side and server-side rendering technologies. This enables the full interactivity needed during the simulation workflow along with the ability to handle large data generated for 3D result visualization in the browser, removing the need for time consuming data transfers. Additionally ESI Cloud visualization engine enables the comparisons of different results through a multiple window user interface design.

Key result visualization capabilities:

- CPU or GPU based client and server side rendering
- Mobility with desktop like performance through the browser
- 2D/3D VPS contour plots and animations
- Custom multi-window system for 2D plots and 3D contours
- Zooming, panning, rotating, and sectioning of multiple windows

Collaboration

To enable real time multi-user and multi company collaboration, ESI Cloud offers extensive synchronous and asynchronous collaboration capabilities. Several users can view the same project, interact with the same model results, pass control from one to another. Any markups, discussions or annotations can be archived for future reference or be assigned as tasks to other members of the team.

Key collaboration capabilities:

- Data, workflow or project asynchronous collaboration
- Multi-user, browser based collaboration for CAD, geometry, mesh and results models
- Real-time design review with notes, annotations and images archiving and retrieval
- Email invite to non ESI Cloud users for real time collaboration

TOYOTA - Total Human Model for Safety – THUMS
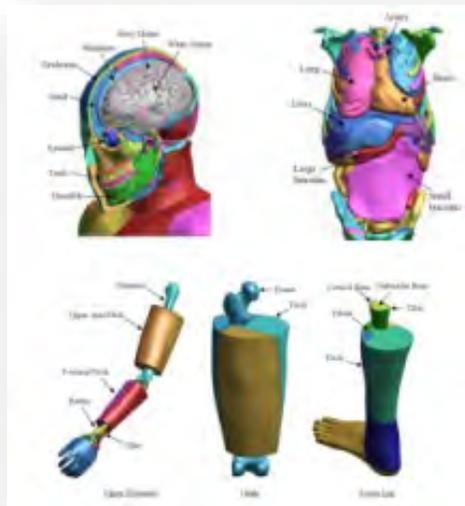
The Total Human Model for Safety, or THUMS®, is a joint development of Toyota Motor Corporation and Toyota Central R&D Labs. Unlike dummy models, which are simplified representation of humans, THUMS represents actual humans in detail, including the outer shape, but also bones, muscles, ligaments, tendons, and internal organs. Therefore, THUMS can be used in automotive crash simulations to identify safety problems and find their solutions.

Each of the different sized models is available as sitting model to represent vehicle occupants
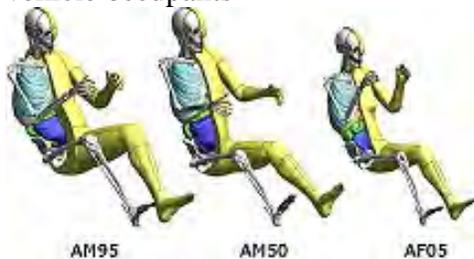
and as standing model to represent pedestrians.

The internal organs were modeled based on high resolution CT-scans.

THUMS is limited to civilian use and may under no circumstances be used in military applications.

LSTC is the US distributor for THUMS. Commercial and academic licenses are available.

For information please contact: THUMS@lstc.com

THUMS®, is a registered trademark of Toyota Central R&D Labs.

LSTC – Dummy Models

LSTC Crash Test Dummies (ATD)

Meeting the need of their LS-DYNA users for an affordable crash test dummy (ATD), LSTC offers the LSTC developed dummies at no cost to LS-DYNA users.

LSTC continues development on the LSTC Dummy models with the help and support of their customers. Some of the models are joint developments with their partners.

 e-mail to: atds@lstc.com

Models completed and available (in at least an alpha version)
- Hybrid III Rigid-FE Adults
- Hybrid III 50th percentile FAST
- Hybrid III 5th percentile detailed
- Hybrid III 50th percentile detailed
- Hybrid III 50th percentile standing
- EuroSID 2
- EuroSID 2re
- SID-IIs Revision D
- USSID
- Free Motion Headform
- Pedestrian Legform Impactors

Models In Development
- Hybrid III 95th percentile detailed
- Hybrid III 3-year-old
- Hybrid II
- WorldSID 50th percentile
- THOR NT FAST
- Ejection Mitigation Headform

Planned Models
- FAA Hybrid III
- FAST version of THOR NT
- FAST version of EuroSID 2
- FAST version of EuroSID 2re
- Pedestrian Headforms
- Q-Series Child Dummies
- FLEX-PLI

LSTC – Barrier Models

Meeting the need of their LS-DYNA users for affordable barrier models, LSTC offers the LSTC developed barrier models at no cost to LS-DYNA users.

LSTC offers several Offset Deformable Barrier (ODB) and Movable Deformable Barrier (MDB) models:

•ODB modeled with shell elements
•ODB modeled with solid elements
•ODB modeled with a combination of shell and solid elements

•MDB according to FMVSS 214 modeled with shell elements
•MDB according to FMVSS 214 modeled with solid elements

•MDB according to ECE R-95 modeled with shell elements
•AE-MDB modeled with shell elements

•IIHS MDB modeled with shell elements
•IIHS MDB modeled with solid elements
•RCAR bumper barrier

•RMDB modeled with shell and solid elements

e-mail to: atds@lstc.com.

Conference – Events – Users Meetings

Keep up to date on upcoming

Conferences

Meetings

Events

We will be adding to this section monthly – if you have a new event to be listed please send to agiac99@aol.com

7th BETA CAE   International Conference

30 May - 1 June, 2017

Thessaloniki, Greece

SPONSORED EVENTS: BETA CAE Systems participation

The Conference

We kindly invite all users of LS-DYNA, LS-OPT, and LS-TaSC to the 11th European LS-DYNA Conference in Salzburg. Also, we would like to thank all presenters for the numerous abstract submissions, which contribute greatly to the success of the event. The conference is your chance to talk with industry experts, catch up with colleagues and enjoy time exploring new ideas. Attendees can meet with exhibitors to learn about the latest hardware and software trends as well as additional services relating to the finite element solver LS-DYNA.

Moreover, accompanying seminars will take place in Salzburg before and after the conference.

Monday, 8 May:
  - Introduction to Nonlinear Implicit Analyses
  - Parameter Identification with LS-OPT
  - Meshfree EFG, SPG and Advanced FE Methods

Friday, 12 May:
  - NVH, Frequency Domain Analysis and Fatigue
  - Smoothed Particle Hydrodynamics (SPH)
  - Electromagnetism in LS-DYNA

Venue

Salzburg Congress is located in the center of Salzburg. Salzburg can be reached easily via freeway, the high speed train ICE, and the international airports of Salzburg or Munich. www.salzburgcongress.at

Participant fees

Industry: 590 Euro [1] / 640 Euro
Academic: 440 Euro [1] / 490 Euro
[1] Registration before 1 April 2017. All plus VAT.

Exhibiting and sponsoring

Please find further information online:
www.dynamore.de/conf2017-exh

Review of the 2015 Conference

Get an impression of the 10th European LS-DYNA Conference 2015 in our review on YouTube:
https://youtu.be/Mw5Dm-SXcWo

Contact

DYNAmore GmbH
Industriestr. 2, D-70565 Stuttgart, Germany
Tel. +49 (0) 7 11 - 45 96 00 - 0
E-Mail: conference@dynamore.de
www.dynamore.de/conf2017

Yanhua Zhao & China Conference Team - chinaconf@lstc.com

The 3rd China LS-DYNA conference will echo the success of the well-participated 1st and 2nd China User's Conference, in 2013 and 2015.

Accompanied by the rapid growth of CAE applications in China, LS-DYNA is highly recognized as one of the most widely used finite element analysis software by Chinese users.

China is gaining momentum and recognition in Finite Element Analysis. In the past years, the continuing expansion of application areas has been gaining more users in automotive, die and mold, aerospace and aeronautics industries in China.

In China LS-DYNA is fast becoming the software of choice, by all engineers, students, professors and consulting companies.   It is recognized that LS-DYNA, LS-PrePost, LS-

OPT and the LSTC ATD and Barrier Models, developed by LSTC, are setting standards for the finite element simulation industry. At the conference LSTC software new features will be introduced and helpful techniques will be shared.

The conference will be attended by experienced users from different industries, LSTC technical support engineers and software developers. Additionally, it will be attended by academic researchers, hardware vendors and software vendors.

With the popularity and attendance of the 1st and 2nd conference and demand from users it has been decided that the conference will be held regularly. One of the goals is to serve as a convenient platform for people in this field to exchange their ideas, share their findings and explore new software functions.

Hosts: Livermore Software Technology Corp. & Dalian Fukun Technology Development Corp.
Date: Oct. 23rd -25th, 2017
Location: InterContinental Shanghai Pudong, Shanghai, China
Website: http://www.lsdyna.cn
Contact: chinaconf@lstc.com

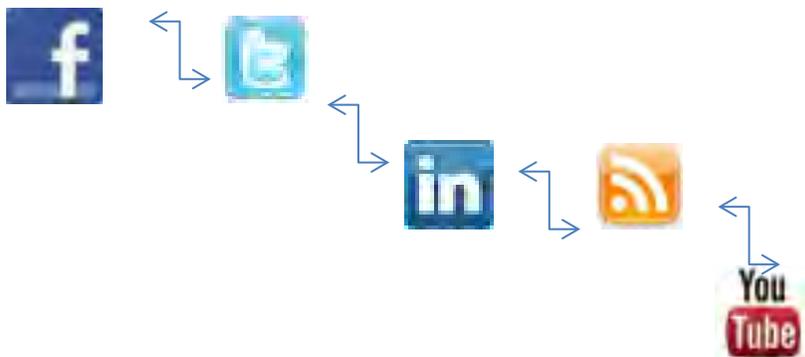## Training and Social Media Section

Aleta Hays

Training

Classes

Webinars

On Site – On Line

We will be adding to this section monthly – if you have a new event to be listed please send to Aleta ayh225@aol.com and cc Anthony agiac99@aol.com

Participant's Training Classes

Webinars

Info Days

Class Directory

Participant Class Directory

Arup (corporate)	www.oasys-software.com/dyna/en/training
BETA CAE Systems (corporate)	www.beta-cae.com/training.htm
DYNAmore (corporate)	www.dynamore.de/en/training/seminars
ESI-Group (corporate)	https://myesi.esi-group.com/trainings/schedules
ETA (corporate)	www.eta.com/support2/training-calendar
LSTC (corporate)	www.lstc.com/training
LS-DYNA OnLine (Al Tabiei)	www.LSDYNA-ONLINE.COM

ARUP   Visit the website for complete listings/changes/locations

www.oasys-software.com/dyna/en/training

Arup offers a wide range of training for new and existing users of the Oasys LS-DYNA Environment software who are seeking to improve their understanding and application of these powerful analysis tools. New users will benefit from our introductory courses and can quickly become effective in other areas of application through the range of courses on offer. The courses will also provide existing users with knowledge of how to use the latest features in Oasys and LS-DYNA.

26-27 January 2016

Paul Du Bois Courses

Polymeric Material Modelling in LS-DYNA

2 days   Cost: £1,000

BETA CAE   Visit the website for complete listings/changes/locations
SYSTEMS
                                     www.beta-cae.com/training.htm

Basic and advanced training courses can be scheduled upon request. A variety of standard or tailored training schedules, per product or per discipline, are being offered to meet customers needs.

A number of recommended training courses offered are described below. The list is not exhaustive and more courses can be designed according to your needs.
Please, contact ansa@beta-cae.com   for further details.

Recommended Training Courses (Complete information on website)

- SPDRM
- ANSA / μETA Basics
- ANSA / μETA for CFD
- ANSA / μETA for Crash & Safety simulation
- ANSA / μETA for Durability simulation

- ANSA / μETA for NVH analyses
- Multi-Body Dynamics
- Laminated Composites
- Morphing and Optimization
- Automation
- Additional special sessions

Author: Nils Karajan nik@dynamore.de

DYNAmore   Visit the website for complete overview and registration
www.dynamore.de/seminars

New seminar brochure for 2017 published by DYNAmore
Download full seminar brochure (pdf):   www.dynamore.de/seminars2017

Selection of trainings from January to March

Joining Techniques for Crash Analysis (G)	6-7 March, 4-5 April
Introduction to Passive Safety Simulation	9-10 March
CPM for Airbag Modeling	17 March
Contact definitions in LS-DYNA	20 March (L)
ALE and Fluid-Structure Interaction	21-22 March (V)
LS-OPT – Optimization and Robustness	22-24 March, 4-6 April (L)
Damagae and Failure Modeling of Metallic Materials	23-24 March (T)
Modeling Polymers & Elastomers in LS-DYNA	27-28 March
Simulation of Short Fiber Reinforced Polymers	29 March
Simulation of Continuous Fiber Reinforced Polymers	30-31 March
Implicit Analysis using LS-DYNA	4-5 April
Introduction to PRIMER for LS-DYNA	6 April
Contact Definitions for Crash Analysis	7 April
Modeling Metallic Materials in LS-DYNA	26-27 April (T)
User Materials in LS-DYNA	28 April

Information days or Webinars (free of charge)

Integrated Optimization with ANSA & LS-OPT	20 Feb. (webinar)
Composites Analysis with LS-DYNA	13 March
Mapping tool ENVYO	13 March
Cloud Solutions for LS-DYNA	27 March
Optimization/DOE/Robustness with LS-OPT	30 March (V)

Support days (free of charge)

LS-DYNA	17 Feb. / 21 April
Occupant Safety	17 March

If not otherwise stated, the event location is Stuttgart, Germany. Other event locations are:
G = Göteborg, Sweden; L = Linköping, Sweden V = Versailles, France; T = Turin, Italy,

If the offered seminars do not fully suit your needs, we are pleased to meet your individual requirements by arranging tailored on-site training courses on your company premises.

We hope that our offer will meet your needs and are looking forward to welcoming you at one of the events.
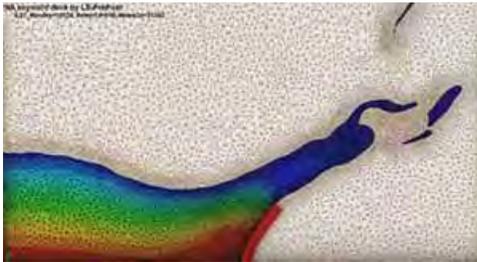
Author: Nils Karajan nik@dynamore.de

Webinar series on the Incompressible Fluid Solver (ICFD)
Marcus Timgren (DYNAmore Nordic)

Watch past episodes on YouTube:
  · ICFD how to set up a 2D FSI case:　https://youtu.be/jB36LWzJW7I
  · ICFD how to set up a 3D CFD case:　https://youtu.be/egJ2dsekUHQ

Introduction – Recently, the input decks that can be downloaded from www.dynaexamples.com/icfd have been updated by 42 new application cases. To give the users even more help in getting started with the ICFD solver, Marcus Timgren from DYAmore Nordic has started a webinar series to provide the users with background information on the examples.

The incompressible fluid solver ICFD is one of the most rapidly progressing solvers in LS-DYNA. For more and more LS-DYNA users, the ICFD solver is the method of choice when it comes to solving standard problems in computational fluid dynamics (CFD) as well as more sophisticated problems such as fluid-structure interaction (FSI) and conjugate heat transfer. Moreover, the ICFD solver exhibits

also a good parallel scalability which leads to short turnaround times for the user.

·
Webinar topics, dates and registration
  · How to set-up a 3D FSI case in LS-DYNA
      28 February, 10-11 AM CET
         Registration
  · Difference between weak and strong coupling in FSI simulations in LS-DYNA
      7 March, 10-11 AM CET
         Registration
  · CFD mesh controls in LS-DYNA
      21 March, 10-11 AM CET
         Registration
  · How to model conjugate heat transfer in LS-DYNA
      4 April, 10-11 AM CET
         Registration
  · How to model flow through porous media in LS-DYNA
      25 April, 10-11 AM CET
         Registration
  · Coupling between DEM particles and ICFD solver in LS-DYNA
      15 May, 10-11 AM CET
         Registration
  · How to model sloshing using the ICFD solver in LS-DYNA
      23 May, 10-11 AM CET
         Registration

https://myesi.esi-group.com/trainings/schedules

Please visit the website for complete information on all the classes and locations

https://myesi.esi-group.com/trainings/schedules

Introduction to ProCAST
7 Mar 2017 to 9 Mar 2017
Casting

VA One: FE/BEM Training
14 Mar 2017 to 15 Mar 2017
Vibro-Acoustics

VA One: Coupled FEA/SEA Training
16 Mar 2017 to 17 Mar 2017
Vibro-Acoustics

Basic PAM-STAMP
22 Mar 2017 to 23 Mar 2017
Sheet Metal Forming

Basic PAM-STAMP
26 Apr 2017 to 27 Apr 2017
Sheet Metal Forming

Basic PAM-STAMP
17 May 2017 to 18 May 2017
21 Jun 2017 to 22 Jun 2017
Sheet Metal Forming

LSTC 2017 Training

Date	Location	Class	Instructor(s)	Price
March				
13	CA	Intro to LS-PrePost	P. Ho / Q. Yan	$100
14-17	CA	Intro to LS-DYNA	J. Reid	$750
20	MI	Intro to LS-PrePost	P. Ho / Q. Yan	$100
21-24	MI	Intro to LS-DYNA	A. Nair	$750
April				
6-7	MI	Intro to LS-OPT	I. Gandikota	$750
10-11	MI	Airbag Folding	R. Chivukula	$750
11-13	CA	Advanced ALE Applications	I. Do / H.Chen	$600
12-13	MI	NVH and Frequency Domain Analysis	Y. Huang	$400
17-18	MI	LS-DYNA Advanced Class	S. Bala	$750
19	MI	Electromagnetics	I. Caldichoury	$100
20-21	MI	ICFD	I. Caldichoury	$200
May				
2-3	MI	Composite LS-DYNA	A. Tabiei	$1,250
4-5	MI	Rubber, Foam, & Viscoelastic Materials	A. Tabiei	$1,250
8-9	MI	Fracture, Failure & Damage	A. Tabiei	$1,250
10-11	MI	Plasticity, Plastics, Visco-plastic Materials	A. Tabiei	$1,250
15	CA	Intro to LS-PrePost	P. Ho / Q. Yan	$100
16-19	CA	Intro to LS-DYNA	A. Nair	$750
16-18	MI	Advanced ALE Applications	I. Do / H. Chen	$600
22-23	CA	Blast in LS-DYNA	A. Tabiei	$1,000
24-25	CA	Penetration Using LS-DYNA	A. Tabiei	$1,000

LSTC 2017 Training

June					
1-2	CA		User Materials in LS-DYNA (UMAT)	A. Tabiei	$1,250
1-2	MI		Contact	S. Bala	$200
9	MI		Material Characteristics for Metals Plastics and Polymers - Test Data to Material Model	S. Bala	$200
15-16	MI		Introduction to Metal Forming	L. Zhang / Q Yan	$400
19	MI		Intro to LS-PrePost	P. Ho / Q. Yan	$100
20-23	MI		Intro to LS-DYNA	J. Reid	$750
July					
10-11	MI		Occupant Simulation	S. Guha	$400
24	MI		Intro to LS-PrePost	P. Ho / Q. Yan	$100
25-29	MI		Intro to LS-DYNA	A. Tabiei	$750
August					
1-2	CA		Rubber, Foam & Viscoelastic Materials	A. Tabiei	$1,250
3-4	CA		Plasticity, Plastics, Visco-plastic Materials	A. Tabiei	$1,250
8-9	CA		Fracture, Failure, Damage	A. Tabiei	$1,250
10-11	CA		Composite LS-DYNA	A. Tabiei	$1,250
14-15	CA		Implicit LS-DYNA	A. Tabiei	$750
21-23	CA		ALE/Eulerian & FSI Interaction in LS-DYNA	M. Souli	$750
24-25	CA		Smoothed Particle Hydrodynamics (SPH)	M. Souli	$400
28	CA		Intro to LS-PrePost	P. Ho / Q. Yan	$100
Aug29-Sep1	CA		Intro to LS-DYNA	A. Nair	$750
September					
12-13	MI		Airbag Modeling	A. Nair	$400
13	CA		Material Characteristics for Metals, Plastics, and Polymers - Test Data to Material Model	S. Bala	$200
14-15	CA		Contact	S. Bala	$200

October				
11-13	MI	Optimization and Probalistic Analysis using LS-OPT	A. Basudhar	$750
16	MI	Intro to LS-PrePost	P. Ho / Q. Yan	$100
17-20	MI	Intro to LS-DYNA	A. Nair	$750
17-18	CA	NVH and Frequency Domain Analysis	Y. Huang	$400
November				
6	CA	Intro to LS-PrePost	P. Ho / Q. Yan	$100
7-10	CA	Intro to LS-DYNA	A. Nair	$750
13-14	CA	LS-DYNA Advanced	S. Bala	$400
Nov 30-Dec 1	CA	Advanced Metal Forming	L. Zhang / X.Zhu	$400
December				
11	MI	Intro to LS-PrePost	P. Ho / Q. Yan	$100
12-15	MI	Intro to LS-DYNA	A. Nair	$750

LS-DYNA   Visit the website for complete listings/changes/locations

On Line   www.LSDYNA-ONLINE.COM

For Information contact: courses@lsdyna-online.com or 513-3319139

Composite Materials In LS-DYNA

This course will allow first time LS-DYNA users to use composite materials. The most important elements to start using all the composite material models in LS-DYNA will be presented in the 8 hours.

Foam & Viscoelastic Materials in LS-DYNA

Objective of the course: Learn about several foam material models in LS-DYNA to solve engineering problems. Detailed descriptions are given of the data required to use such material in analysis. Examples are used to illustrate the points made in the lectures

Plasticity, Plastics, and Viscoplastics Materials in LS-DYNA

Objective of the course: Learn about several plasticity based material models in LS-DYNA to solve engineering problems. Detailed descriptions are given of the data required to use such material in analysis. Examples are used to illustrate the points made in the lectures.

Rubber Materials in LS-DYNA

Objective of the course: Learn about several rubber material models in LS-DYNA to solve engineering problems. Detailed descriptions are given of the data required to use such material in analysis. Examples are used to illustrate the points made in the lectures.

FACEBOOK

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ESI Group   Lenovo

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BETA CAE Systems   ESI Group

ETA   CADFEM   Lenovo

LINKEDIN

BETA CAE Systems   CADFEM

DYNAmore Nordic   ETA   Oasys

ESI Group

NEWS FEEDS   ETA:

YOUTUBE

YOUTUBE Channel	WebSite URL
BETA CAE Systems	www.beta-cae.com
CADFEM	www.cadfem.de
ESI Group	www.esi-group.com
ETA	www.eta.com
Lancemore	www.lancemore.jp/index_en.html
Lenovo	

GOOGLE+

BETA CAE Systems	

LS-DYNA Resource Links

LS-DYNA	Multiphysics	YouTube	Facundo Del Pin

https://www.youtube.com/user/980LsDyna

FAQ	LSTC	Jim Day

ftp.lstc.com/outgoing/support/FAQ

LS-DYNA Support Site

www.dynasupport.com

LS-OPT & LS-TaSC

www.lsoptsupport.com

LS-DYNA EXAMPLES

www.dynaexamples.com

LS-DYNA CONFERENCE PUBLICATIONS

www.dynalook.com

ATD –DUMMY MODELS

www.dummymodels.com

LSTC ATD MODELS

www.lstc.com/models   **www.lstc.com/products/models/mailinglist**

AEROSPACE WORKING GROUP

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LS-DYNA Smooth Particle Galerkin (SPG) Method
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LS-DYNA Smooth Particle Galerkin (SPG) Method

C.T. Wu, Y. Guo, W. Hu
LSTC

Element-free Galerkin (EFG) meshless method was introduced into LS-DYNA more than 10 years ago, and has been widely used in the solid and structure analyses. Compared to the conventional FEM, EFG is a better alternative in terms of numerical accuracy and capability for handling large material deformation. However, because of the constraint in using background mesh for numerical integration, EFG faces the similar difficulty as FEM in the application involving extreme large deformation and material failure. On the other hand, meshless method using nodal integration has been a highly active research area in the past decade. In recent years, we have been developing a new meshless method, called Smooth Particle Galerkin (SPG) [1,2,3], and improving its capability for industrial applications. SPG is a true meshless method using nodal integration under Galerkin framework, where a special smoothing scheme in displacement field is introduced to stabilize the numerical solution. Meanwhile, for large material deformation in explicit analysis, we are able to maintain the time step size by combining this smoothing scheme with kernel update, which helps to improve the overall computational performance. In this paper, we are going to briefly introduce the latest development of SPG and its keywords. Some numerical examples are presented to demonstrate its capability in manufacturing analysis involving large deformation and material failure.

SPG is currently implemented in LS-DYNA for solid analysis with element formation ELFORM=47 in the keyword *SECTION_SOLID_SPG. The FEM mesh (4/6/8-noded solid element) is automatically converted to SPG particles in LS-DYNA. The following is a snapshot of SPG keyword cards

Card 2	DX	DY	DZ	ISPLINE	KERNEL	LSCALE	SMSTE	SUKTIME
Default	1.5	1.5	1.5	0	0		15	
Card 3	IDAM	SF						
Default	0							

(1) Nodal support size   DX, DY, DZ

Like many other meshless method, the approximation function in SPG is constructed based on discrete nodes, which, by default, are from FEM model. The support size of a given node is determined by the size of surrounding element edges with the scaling parameters DX, DY and DZ. For non-uniform mesh, the absolute nodal support sizes vary across the computational domain due to the variation of element size. The recommended range of scaling parameters in SPG is 1.4~1.8, and the default value, 1.5, is good for most of applications.

(2) Kernel types   KERNEL

SPG currently has two different kernels: updated Lagrangian kernel and Eulerian kernel with KERNEL=0 and 1, respectively. L-kernel is suitable for large deformation analysis without material failure, for example, rubber-like and foam materials, while E-kernel can be widely used in the application involving extreme large deformation and failure of ductile, EOS and solid fluid materials. Standard Eulerian kernel has tensile instability issue, which leads to numerical failure (different from the true physics-based material failure). The E-kernel in SPG is constantly updated according to the material deformation in order to avoid the tensile instability issue.

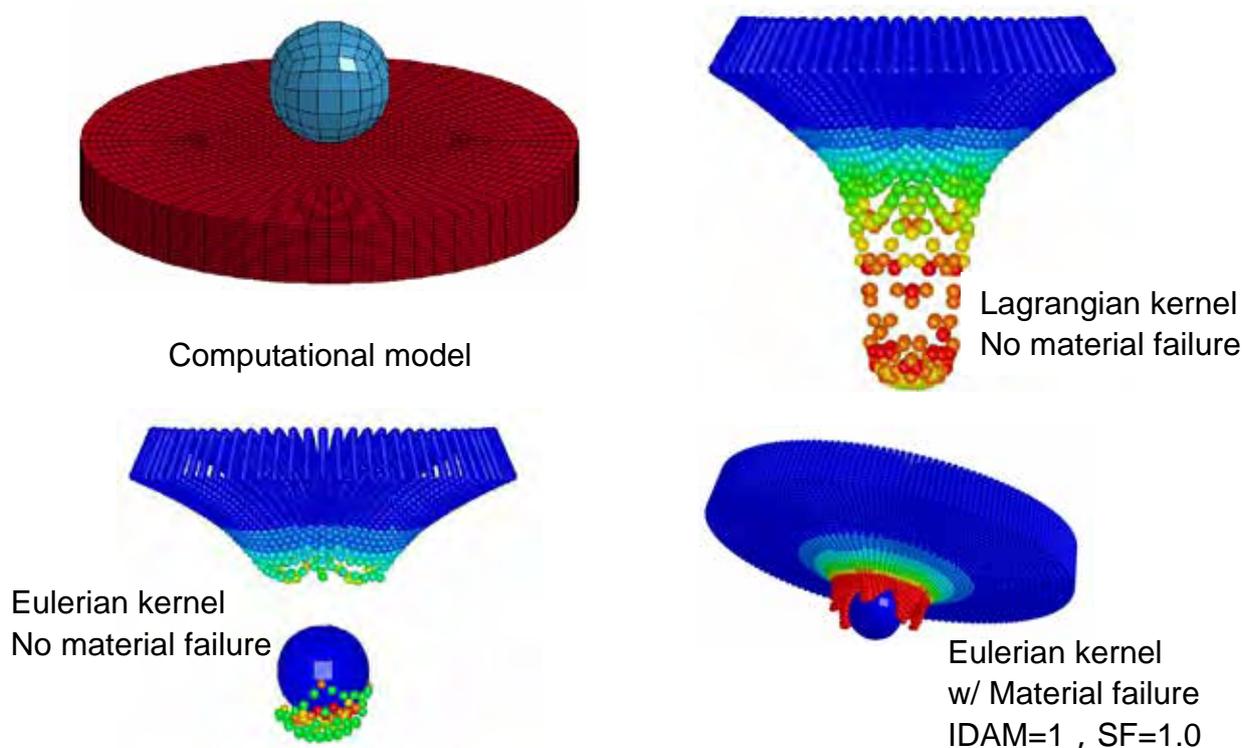(3) The frequency of numerical smoothing in the displacement field   SMSTE

The smoothing scheme is introduced to stabilize the numerical solution. SMSTE defines the frequency of smoothing by the number of time steps. Note that over smoothing will significantly increase CPU time and lower the solution accuracy, while insufficient smoothing often results in numerical oscillation and instability. The default value applies to most of solid and structure analyses. In practice, SMSTE is related to the scaling parameter TSSFAC (*CONTROL_TIMESTEP). The recommended range of TSSFAC for SPG is 0.1~0.3. The larger TSSFAC is set, the smaller SMSTE is needed, or vice versa.

(4) Failure criteria   IDAM & SF

Material failure is a very complicated process in physics. LS-DYNA has a large material library where most of failure models are mainly empirical based on parameters calibrated by experiments. By setting IDAM=0, SPG supports these material models. According to the type of application and users' preference, the failed nodes can be either eroded (*MAT_ADD_EROSION) or treated as discrete ones interacting through contact. It is known

that material failure is, by nature, a multiscale problem. The development of material failure model and corresponding numerical tools requires a lot of fundamental studies, which has been one of very important R&D directions in LSTC. We are looking forward to the support from both academia and industry. In SPG, we developed a bond-based failure criteria (IDAM=1), where the average effective plastic strain (EPS) of paired nodes in support zone is examined and compared to the user input value SF. On top of that, we considered the bond stretching as well. In the following numerical examples, we demonstrate that SPG (IDAM=1) works pretty well in various applications.

The first example is an impact analysis with rigid ball and metal plate. We tested the updated Lagrangian kernel (L), Eulerian kernel (E) and failure criteria IDAM=1. Note that the time step size keeps the same level through the analyses in all three cases. SPG (L) is able to deal with extreme large material deformation (no material failure). The numerical failure in case 2 using standard E-kernel can be corrected by SPG(E) with failure criteria IDAM=1 in case 3, where SPG well predicts the cracking behavior of metal plate under impact.

Computational model

Lagrangian kernel
No material failure

Eulerian kernel
No material failure

Eulerian kernel
w/ Material failure
IDAM=1   SF=1.0

The following shows analysis results of metal cutting and shearing problems using SPG.

The next plot shows the riveting analysis using SPG, where both plates are modeled by SPG particles.

Friction Stir Drilling (FDS) is a very challenging problem for numerical simulation. The conventional methods such as element erosion have difficulty to capture the drilling threads, while adaptive re-meshing is very expensive especially when material failure is taken into account. The above figure shows that, by using SPG (IDAM=1), we can not only well capture the formation of the drilling threads but also successfully simulate the pull-out process.

In general, SPG costs 2~3 times more CPU time compared to FEM. In practice, it is recommended to apply SPG only in the area with large deformation and material failure. In the following example, SPG particles are used in the surrounding area of a FDS joint, where the interaction to the rest of the model is through sharing nodes with FEM along the interface.
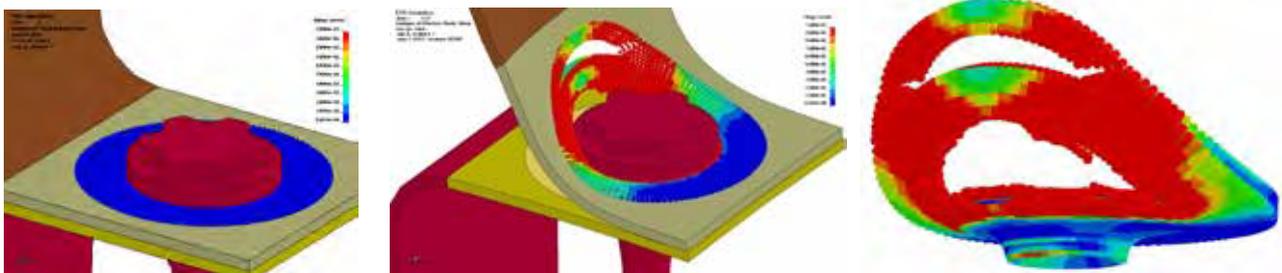
As a new element formulation in LS-DYNA, SPG has been continuously improved and becoming more and more mature over the past few years. The SPG thermal-mechanical coupling solver and particle-to-particle contact will soon be released in LS-DYNA. For industrial applications, composite material, mesoscale modeling and high-velocity impact analysis will be potentially the new area for us to explore with SPG technology.

[1] Wu C.T., Hu W. and Koishi M., *International Journal of Computational Methods*, 2015

[2] Wu C.T., Koishi M. and Hu W., *Computational Mechanics*, 2015

[3] Wu C.T., Chi S.W., Koishi M. and Wu Y., *International Journal for Numerical Methods in Engineering*, 2016

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