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LSTC Recent Developments In LS-DYNA (Editor: Yanhua Zhao)

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W. Hu

New Feature: Defining Hardening Curve
X. Zhu, L. Zhang, Y. Xiao

T. Yasuki - Received The Arnold W. Siegel International Transportation Safety Award

ESI releases IC.IDO 11

Terrabyte CAE Solutions

Rescale - How Cloud HPC is Changing the CAE Project Timeline

Predictive Engineering

LSTC Livermore Software Technology Corp. DYNAMORE

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BETA SIMULATION SOLUTIONS

MSC Materials Sciences Corporation ISO 9001:2008 CERTIFIED

eta

esi

JSOL

恒士达科技 Hengstar Tech.

Oasys The Software House of Arup

rescale

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Aerospace News **Editor - Marnie Azadian**
China FEA News –Events – Participants **Editor – Yahua Zhao**

Solutions

Participants	Distribution & Consulting	Cloud/On Demand/Subscription
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Announcements

Tsuyoshi Yasuki, Project general manager, Advance CAE Div. at Toyota Motor Corporation

Tsuyoshi Yasuki received 2017 ARNOLD W. SIEGEL INTERNATIONAL TRANSPORTATION SAFETY AWARD on 4th April 2017.

ANNOUNCEMENT – Rescale by Cameron Fillmore - cameron@rescale.com

Rescale recently released ScaleX Partner beta to serve our most trusted software partners. Rescale can now provide software vendors with a detailed understanding of how their customers use their software and consume on-demand licenses.

LS-DYNA®, LS-OPT®, LS-PrePost, LS-TASC®,
LSTC ATD and Barrier Models

- 12 – 6 - 3 months/1 or 2 core license available
- Students, Engineers.
- NON-COMMERICAL USE

For Information contact: sales@lstc.com

I was riding my pony, Sir Cody, in the arena and kept feeling as if someone was watching us. I finally looked up! I guess we have a ranch owl that also shares the riding arena. Mom Owl was in the nest – Dad is apparently keeping watch.

Marsha Victory

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

OASYS SHELL

www.oasys-software.com/dyna/en

UK and US office located in San Francisco

Oasys SHELL

The Oasys SHELL provides the user with an easy method of accessing the individual stages of the LS-DYNA analysis. Oasys PRIMER, T/HIS, D3PLOT, and REPORTER software can all be started from the Oasys SHELL. Most importantly, there is an advanced LS-DYNA submission shell for submitting analyses which allow the user easy access to the all the various options available when submitting an LS-DYNA run. It also provides easy access to the Oasys and LS-DYNA manuals.]

Main features:

- Online, background, batch and queue (NQS/LSF/ CODINE) submission
- Full control over queue and job CPU and memory limits
- Selection of all LS-DYNA input and output files
- Switch from the LSTC to the Arup naming convention (d3plot vs jobname.ptf)•Simplified restart procedure
- Access to manuals (both HTML and pdf available)

LS-DYNA Submission Window

The LS-DYNA submission window within the Oasys SHELL gives you full access to the various options available when submitting an LS-DYNA job and will work with most major queuing systems.

It also allows users to easily chose the required dump file when performing an LS-DYNA restart.

ESI releases IC.IDO 11, Placing Virtual Reality at the Core of Industrial Engineering

www.esi-group.com/company/press/news-releases/esi-releases-icido-11-placing-virtual-reality-core-industrial-engineering

ESI IC.IDO runs on HTC Vive Business Editions

ESI and Technology Partner HTC Vive Introduce Head Mounted Displays for Industrial Applications

ESI IC.IDO version 11 focuses on supporting the design and validation of efficient manufacturing and assembly processes, for all industries.

Paris, France – January 23, 2016 – ESI Group, leading innovator in Virtual Prototyping software and services for manufacturing industries, announces the latest release of IC.IDO, its Virtual Reality (VR) solution designed for industrial use. ESI IC.IDO 11 brings solid performance improvements along with new functionalities for efficient in-process engineering reviews, assembly tooling validation, and early accessibility and serviceability assessment. Fully compatible with Head Mounted Displays (HMD), IC.IDO 11 also enables manufacturing companies to benefit from the integration of VR at every step of the engineering process. Users can interact naturally with their designs, using realistic hand and arm motion, while applying engineering changes to their existing VR scenes.

ESI IC.IDO version 11 focuses on supporting the design and validation of efficient manufacturing and assembly processes, for all industries. Process release engineers, manufacturing process engineers, assembly tooling program managers and ergonomic engineers will benefit from IC.IDO's latest developments for speeding up process and assembly design, avoiding bottlenecks and optimizing productivity. Enabling collaborative process design reviews with colleagues either on-site or remote, IC.IDO is a great tool to foster interactive process reviews and to eliminate design and ergonomic errors early in the process, before any physical prototype is built.

According to Philippe JAMES, VP Continuous Improvement and Risks at Safran Nacelles, *"IC.IDO is profoundly changing the way Safran Nacelles engineers work: Virtual Reality reduces the need for physical prototypes and costly retooling, while promoting live team discussion to deploy optimum designs much faster than when working in silos."*

ESI releases IC.IDO 11, Placing Virtual Reality at the Core of Industrial Engineering

IC.IDO 11 is also the first version of the software built to run on Head-Mounted Displays (HMD), in addition to VR CAVEs, powerwalls and desktop systems. The ability to use HMDs, such as the well-known HTC Vive Business Edition, empowers engineers to delve deeper into design exploration through immersive VR. They can enjoy a more natural experience, with realistic hand and arm motion, and continue to benefit from real-time and real-scale product interactions. Furthermore, they can use VR earlier in the development process as they are no longer constrained by the availability of centralized resources (VR CAVE or VR experts). Their HMD now provides direct access to a user-friendly desktop VR system at any time.

With IC.IDO 11, engineers can perform virtual reviews of product/process integration naturally in Virtual Reality, validate accessibility without requiring users to wear dedicated body tracking suits/sleeves, and verify that a product design will be serviceable in the field. Within the VR environment in IC.IDO, they can interact with simulated objects just as assembly and service technicians would, once production begins. The beauty of this technology is that HMD also promotes a collaborative experience: IC.IDO 11 enables users throughout the world to connect to the same session using the same data on the same network, so colleagues can collaborate with each other within the same Virtual Reality, regardless of where they are.

"ESI's adoption of Vive Business Edition, with their industry leading IC.IDO, is testimony to how quickly virtual reality immersive display technology is being adopted by leading engineering and manufacturing companies," says Herve Fontaine, VP Virtual Reality Enterprise and Business Development at HTC Vive.

They [ESI] have been pioneering precision engineering simulation technology for decades; accelerating time to market, product quality, and cost efficiency across large segments of the manufacturing industry. We are proud to be the virtual reality solution of choice for their new product offering. IC.IDO 11 with Vive Business Edition allows engineers to simulate their designs in room-scale VR months before the first parts are available. Leveraging Vive Business Edition's high quality display, precise tracking and interactive controllers, every engineer can now perform quick prototyping and immersive "in-process" validation without requiring a CAVE.

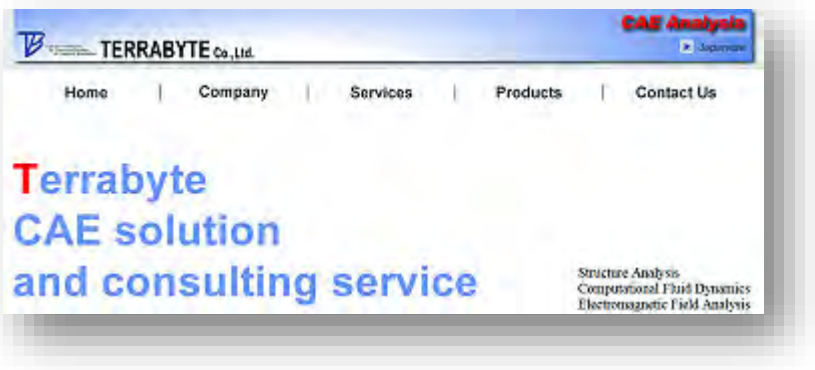
For more information about ESI IC.IDO, please visit www.esi-group.com/icido

Join ESI's customer portal myESI to get continuously updated product information, tips & tricks, view the online training schedule and access selected software downloads: https://myesi.esi-group.com.

For more ESI news, visit: www.esi-group.com/press. ESI Group – Media Relations - Céline Gallerne - +33 1 41 73 58 46

Terrabyte CAE Solution and Consulting Services

www.terrabyte.co.jp/english/services/services.htm



CAE consulting Software selection, CAE software sale & customer support initial launch-up support, periodic on-site support

Engineering Services - Timely solutions, rapid problem set up, expert analysis - all with our Engineering Services. Terrabyte can provide you with a complete solution to your problem; can provide you all the tools for you to obtain the solution, or offer any intermediate level of support and software.

Material property test - Tension test, compression test, high-speed tension test and viscoelasticitiy test for plastic, rubber or foam materials.We verify the material property by LS-DYNA calculations before delivery.

Drop test - Fragility test - measurement of acceleration and strain for smartphones, tablet computers and other mobile products and parts. We develop CAE solvers, database systems and GUI systems.

R&D - We develop CAE solvers, database systems and GUI systems.

CAE temporary personnel service - We send superior CAE engineers from Terra Service - our group company for temporary personnel business

Predictive Engineering – LS-DYNA Training Class Offered in May

LS-DYNA training class that is focused on the mechanical analysis of highly nonlinear systems (e.g., impact analysis, burst containment, drop test, bird-strike, progressive failure of composites, high-deformation analysis of polymers and foams or fluid-structure interaction using DEM / SPH / CFD).

LS-DYNA Analysis for Structural Mechanics

Explicit, Nonlinear, Large Deformation Analysis for Structural Mechanics

- **Duration**: 5 days
- **When**: May 15 - 19, 2017
- **Where**: Portland, Oregon, USA
- **Venue**: The Hotel Rose - Training and lodging
- **Cost**: $2850
- **Registere** for a training course, please email Training@PredictiveEngineering.com,

  ATTN: George Laird, PhD, PE
  call 503-962-0287

This week-long course is directed toward the engineering professional simulating highly nonlinear, transient dynamic problems involving large deformations and contact between multiple bodies. Our goal is to provide a realistic foundation toward the practical usage of LS-DYNA as we have used it on hundreds of simulation projects.

Visit www.predictiveengineering.com to download PDF course description

The course is fast paced and follows the scientifically proven method that flows from theory to usage to workshops. All workshops are provided in video format for later review by the students. Extensive LS-DYNA reference materials will also be provided for independent learning.

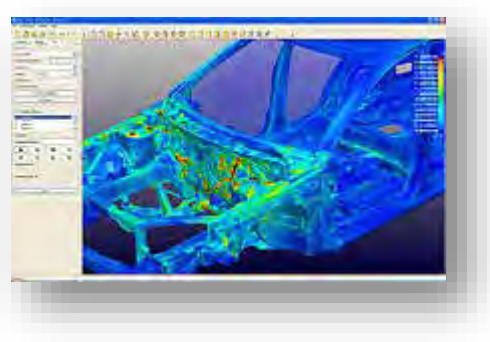
What's Included: Course training manual, notes and workshop video files will be provided on a flash drive for post-class refresher training. At least one lunch and one social event are provided to encourage class interaction with fellow users. Course provides certification of 40 hours of professional continuing education credits.

Day 1 - Theoretical Foundation
Day 2 - LSPP & Material Modeling
Day 3 - Contact & Load Initialization
Day 4 - Drop Test, Damping & Bird Strike (SPH)
Day 5 - Implicit Analysis: Linear to Nonlinear to Vibration

Like to see an example of our training materials? Please view our introductory video, "LS-DYNA Analysis for Structural Mechanics: Workshop I Getting Started"

Engineering Technology Associates – ETA - PreSys

www.eta.com



ETA - PreSys

An engineering simulation solution for the development of finite element analysis models.

PreSys is an engineering simulation solution for the development of finite element analysis models. It offers an intuitive user interface with many streamlined functions, allowing fewer operation steps with a minimum amount of data entry along the way. Using PreSys, the user can analyze product designs, view simulation results and analyze/predict how the product will perform in a given circumstance.

PreSys works the way you do. - The PreSys interface is fully customizable to suit user-specific needs. Also, a model explorer feature provides streamlined data navigation.

Menus, toolbars & many other user interface features can be customized by the user to streamline the guided user interface.

Developed by the leader in the creation & implementation of new CAE tools & methodology, PreSys is ETA's 4th generation Pre/Post Processor. It delivers the capability to handle finite element modeling with ease.

Complete finite element modeling toolset

- Task manager guides the user through operations
- Surface automeshing
- Boundary condition definition
- Automated solid meshing
- Material library
- Unlimited model size
- Direct interface with LS-DYNA, NEi Nastran, MSC NASTRAN, NISA
- Interactive mesh editing
- Model check and repair tools
- Continuous data error checking

Fully configurable user interface

- Native Windows XP/Vista/7 & 64-bit OS support
- High performance, openGL-based graphics
- Ability to open & control multiple models simultaneously
- Shortcut keys definable by user

Complete results visualization

- Stress/strain contour plotting
- Animation of deformations & stress/strain data
- Graphing tools for complete data analysis
- 3D view application for stand-alone viewing of models & results

Iterfaces with CAD software via standard formats

- IGES, STEP, SAT, CATIA, DXF, UG NX, ProE,Solidworks & Parasolid
- Import/export capability

Model data displayed in a tree-structure

- Quickly & efficiently access all model entities

•Card image view to create/edit non-graphical data

•Scripting interface for all commands

•Macro capability write/edit/replay

•Language localization

Rescale - How Cloud HPC is Changing the CAE Project Timeline

Adam Green - March 27, 2017

Automated workflows enable optimization, with systems searching through a complex design workspace often running hundreds of simulation models in the process.

The growth of CAE tools has followed the industry through a familiar progression of technologies, starting out on mainframes in the 1980's. Then pre- and post-processing migrated to the desktop in the 90's, while solving continued on HPC systems, especially for compute-intensive analysis. The 2000's have seen a continuous shift to more solving on the desktop with bigger, faster, parallel systems being used for the biggest problems.

CAE tools are now being used by mainstream engineers rather than CAE specialists, so more engineers are now able to run larger and more complex models. Smaller models may still be run on the desktop, but HPC systems are still required for larger, more-accurate models.

Another driver for increased compute power is automated workflows. Parameter sweeps for geometric changes or boundary conditions can mean that 10 or 20+ models may need to be computed. With a matrix of parameters, run counts can get even higher.

Automated workflows enable optimization, with systems searching through a complex design workspace often running hundreds of simulation models in the process. Multi Disciplinary Optimization (MDO) pushes the envelope on this technology, linking multiple analysis tools. HEEDs, ModeFrontier and ANSYS DesignXplorer are examples of tools in which runtimes can be drastically reduced by deploying HPC via the Rescale platform.

Water Pump Efficiency Optimization Process

A CAD tool can control many geometric parameters to automatically create new solid models for CFD analysis. With a lot of variables, design spaces can become huge, where even the best MDX search engines still needing to run perhaps 100 different CFD models to find a better design. If each water pump model is 10 million cells, it may converge in 24 hours on a 64 core on-premise HPC system. That's still 100 days! (Too much for a real world engineering problem.)

There are two ways to accelerate this with the Rescale ScaleX platform:

1. Increase the core count per job (Running each on 256 cores may reduce runtime per point to 6 hours), or

2. Run multiple jobs concurrently. Technically you could run all 100 points at once on the Rescale ScaleX platform, but most optimization search engines use the results from previous runs to guide the direction of new runs. Typically only 10 (or less) of the 100 points can be run concurrently. At 40 runs per day, the Rescale platform could still condense the timeline from 100 days to 2.5 days!

Bicycle Aerodynamics Analysis

Many bicycle magazines from the last two years contain reviews of a series of bicycle brands being compared in a wind tunnel. Companies will also try to emulate the process with CFD.

The manual workflow for this process:

- Build base CAD model
- Identify key geometric parameters
- Apply parametric variables to CAD model
- Export CAD model
- Create CFD mesh
- Solve for aerodynamics
- Post-process for drag

Then repeat 20 times for different yaw angles. Repetitive and exhausting.

Rescale - How Cloud HPC is Changing the CAE Project Timeline

Imagine an automated process where parametric CAD geometry is used to create new geometries followed by CFD to evaluate aerodynamic performance of the frame. The numerical computation becomes substantial, and even though the actual man-hours is reduced the elapsed time is still a problem.

Using the DOE functionality within the Rescale platform, all 20 models above could be run concurrently. It is a simple way for any company, including SMBs, to get instant scalability and power. Instead of a bicycle aero CFD model taking 24 hours on 16 desktop cores, you can use 196 fast cores on the Rescale platform to turn it around in 2 hours. In addition, you can run 20 models at once. The GANTT chart looks very different when the whole virtual wind tunnel CFD test can be completed in 24 hours instead of 20 days!

The need for faster, easily-accessible compute power is now greater than ever. How can companies really get the best from CAE tools when they are continuously stymied by limited resources? Project timelines planned using a GANTT chart can often show CFD project runtimes in days or weeks, a dominant part of the full project timeline.

This has been the accepted norm for many years. But now we can show you how the Rescale cloud platform can remove those roadblocks and condense project timelines!

Level the Playing Field!

Many engineering companies or consultants are cautious to accept work where a large investment in computer hardware is required. Now, with Rescale's ScaleX cloud HPC platform, any company can deploy adequate resources for the most complex CAE calculations. This is a market-changing dynamic. In the past, the most successful engineering companies would deploy large on-premise HPC systems. Much of their value to their clients was the availability of those systems. Now any group can deploy large HPC resources on-demand using the Rescale platform!

J Cameron Fillmore -
cameron@rescale.com

Rescale recently released ScaleX Partner beta to serve our most trusted software partners.

BOOKS – Engineering for the current and young

	**Finite Element Method: Applications in Solids, Structures, and Heat Transfer** (Mechanical Engineering) 1st Edition, Kindle Edition The finite element method (FEM) is the dominant tool for numerical analysis in engineering, yet many engineers apply it without fully understanding all the principles. Learning the method can be challenging, but Mike Gosz has condensed the basic mathematics, concepts, and applications into a simple and easy-to-understand reference.
	**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.

	**How to Build a Car: A high-speed adventure of mechanics, teamwork, and friendship** by Martin Sodomka (Author), Saskia Lacey (Author)
	**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."**

Editor: Marsha J. Victory livermorehorses@aol.com

TSUYOSHI YASUKI - Project general manager, Advance CAE Div. at Toyota Motor Corporation

Tsuyoshi Yasuki received 2017 ARNOLD W. SIEGEL INTERNATIONAL TRANSPORTATION SAFETY AWARD on 4th April 2017.

DYNAmore Nordic AB

Download the agenda for the 11th European LS-DYNA, which will be held 9 - 11 May, in Salzburg, Austria. You'll find it here: https://lnkd.in/gPuk3bD

RESCALE

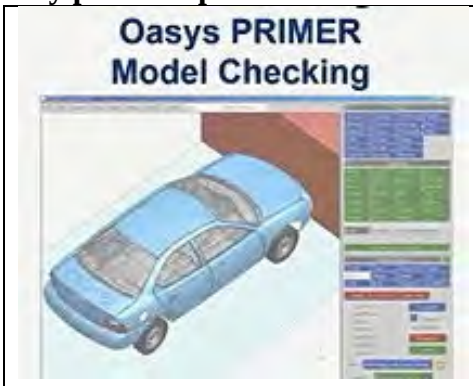
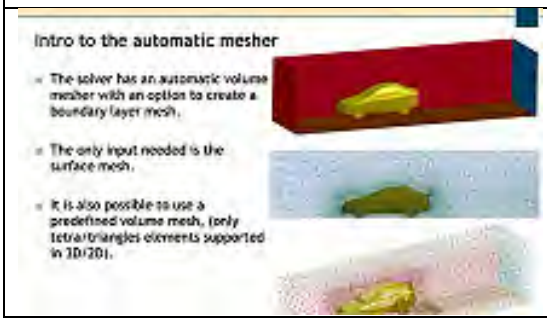
Joris Poort - CEO at Rescale

Rescale™ Announces ScaleX™ Labs with Intel® Xeon Phi™ Processors and Intel® Omni-Path Architecture

YouTube Choices for the Month

Author: Marsha Victory mv@feainformation.com

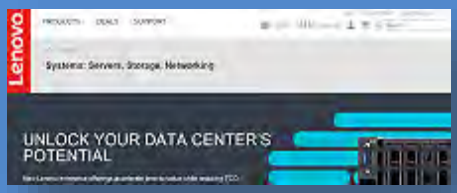
My personal pics for this month

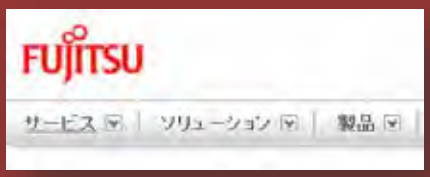
	This webinar describes and demonstrates model checking and model quality tools in Oasys PRIMER.
	Six cars crash with LS-DYNA Each car is moving at 35 mph. The input decks are coming from NCAC website. http://www.ncac.gwu.edu/vml/models.html
	Bird strike on turbojet This is a well known classics of SPH simulation - done with LS-DYNA The birds are modelled with water formulation (MAT_NULL and EOS_GRUNEISEN) and impact the blades at 80m/s. Model contains about 200 k SPH elements, simulated over 65 ms.
	Video – Tutorial In this video you will learn how to control the fluid volume mesh. You will also learn how to create a user defined mesh.

http://www.jsol.co.jp/english/cae/

May 12th	**The 2017 THUMS European Users' Meeting** - Salzburg, Austria **Participation**: THUMS users. Customers who are interested in THUMS. **Registration Fee:** Free	http://ls-dyna.jsol.co.jp/en/thums/thums_um2017.html JSOL is delighted to announce The 2017 THUMS European Users' Meeting. THUMS, the Total Human Model for Safety for use with LS-DYNA® is being rapidly adopted by users worldwide. We invite you to join us and share in THUMS technical information.
Oct 31st – Nov 1st	**LS-DYNA & JSTAMP Forum 2017** Tokyo, Japan	http://ls-dyna.jsol.co.jp/en/event/uf/

Website Month Showcase – Sites to Visit for Information





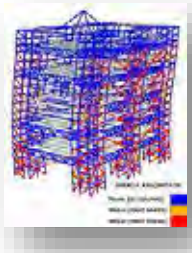
Earthquakes - Tsunamis & LS-DYNA

Aleta – aleta@lstc.com

LS-DYNA is used for modeling both earthquake and tsunami events

Earthquake

An earthquake is the shaking of the surface of the Earth, resulting from the sudden release of energy in the Earth's lithosphere creates seismic waves.



LS-DYNA was used for the pushover analysis and a non-linear time history analyses on the simplified models. However, in addition it was feasible to perform full 3-D non-linear seismic response analysis on a detailed model of the building as a whole in which every beam, column, brace and floor panel was modelled explicitly. This technique facilitated a more precise checking of the seismic response of the structure. The Figure shows the 3D structural analysis model, in which every beam, column and brace had the ability to yield when the combination of bending moment and axial force reached the appropriate "yield surface" for the element. **ARUP**

Creation of the Tsuanmi Warning System: 1964 Good Friday Earthquake

March 27, 1964 at 5:36 p.m. the largest recorded earthquake in North American history occurred in the Prince William Sound area of Alaska. The 9.2 megathrust earthquake lasted 4 minutes and 38 seconds, leaving behind an estimated $311 million dollars in property damage and causing two types of tsunamis. There was a tectonic tsunami produced in addition to about 20 smaller and local tsunamis. The smaller tsunamis were produced by submarine and subaerial landslides and were responsible for the majority of the tsunami damage. The West Coast and Alaska Tsunami Warning Center was formed as a direct response to this disaster.

Tsunami:

A tsunami or tidal wave, also known as a seismic sea wave, is a series of waves in a water body caused by the displacement of a large volume of water, generally in an ocean or a large lake.

YouTube SPH tsunami with LS-DYNA

Earthquakes - Tsunamis & LS-DYNA

LS-DYNA is used for modeling both earthquake and tsunami events

Earthquakes hand in hand with Tsunamis - 1906 San Francisco

Earthquake: On April 18, 1906 at 5:12 a.m. a major earthquake, considered to be one of the worst natural disasters to hit the U.S. occurred along the coast of Northern California.. April 18, 2017, marked the 111th Anniversary of the San Francisco Earthquake.

Tsunami: A sea level disturbance, known as a Tsunami, was recorded at the Presidio tide gauge station in San Francisco.

(Earthquake/Tsunami Information powered by the U.S. Geological Survey www.usgs.gov & Wikipedia www.wikipedia.org)

Soil-Structure Interaction – LS-DYNA

Large civil structures such as concrete dams, nuclear power plants, high-rise buildings and bridges are massive enough that their vibration due to earthquake excitation affects the motion of the soil or rock supporting them, which in turn further affects the motion of the structure itself. This interaction between the structure and the soil needs to be modelled accurately in order to design earthquake resistant structures and to correctly evaluate the earthquake safety of existing structures.

LSTC Classes – register now – for questions contact Aleta – aleta@lstc.com

August 14-15, 2017 - The Implicit class will be held in Livermore, CA,

August 21-25, 2017 - The ALE and SPH classes will be held in Livermore, CA,

Web URL's - LSTC Website

Soil-structure interaction www.lstc.com/applications/soil_structure

Effective Seismic Input www.lstc.com/applications/soil_structure/esi

Examples of Seismic Input www.lstc.com/applications/soil_structure/esi/examples

YouTube Video by BeenuZz published October 24, 2016

SPH Tsunami with LS-DYNA www.youtube.com/watch?v=yO-Y-Vc9Bas

Per BeenuZz - This simulation is done using LS-DYNA explicit solver, with SPH elements. The model contains 80k elements, and takes about 30h to compute over 9 seconds. (12 Xeon CPUs at 3.3Ghz)

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.

You may send Title to your information and the accompanying URL to agiac99@aol.com - Subject Line please use " Automotive News"

Submissions should be received by the 15th of each month, of the month you want your article placed

Submission publications is at the sole discretion of FEA Information Inc.

The Mercedes-Benz Museum

Collections Room "Gallery of Names" at the Mercedes-Benz Museum: Five new vehicles demonstrate personality

The Mercedes-Benz Museum is now setting a new tone with the Collection 4 Room "Gallery of Names": since 11 April 2017, the new room has enriched the permanent exhibition with the SLK 55 AMG of Lukas Podolski, the CLA SteetStyle designed by Cro the 190 E 2.3 of Nicolas Cage, the 190 SL of astronaut David Randolph Scott and the 300 GD of globetrotter Günther Holtorf.

Stuttgart. The "Gallery of Names" presents vehicles of famous individuals, such as Pope John Paul II., Lady Diana, Emperor Wilhelm II and Konrad Adenauer. The largest exhibit is the O 302 team bus of the German national football team from 1974, while the smallest object is the Daimler motorised road car of the Sultan of Morocco from 1892.

The Museum is now setting a new tone with the Collection 4 Room "Gallery of Names" and is exchanging vehicles. Space for the new additions will be made by four vehicles that will then be available for other purposes in the Mercedes-Benz Classic collection: the Mercedes-Benz 24/100/140 PS Roadster (1926) of Oscar Henschel, a Mercedes-Benz 190 SL (1958), the Mercedes-Benz 190 E 2.3 AMG (1984) of Ringo Starr and the Mercedes-Benz ML 320 by the movie "Jurassic Park" (1997).

The new vehicles: Mercedes-Benz CLA StreetStyle designed by Cro

In 2015, the musician Cro, famous as a rapper with the panda mask, transformed a Mercedes-Benz CLA into a work of art. By the free-hand use of spray cans, touch-up pencils and paint, he created a unique design in Street Art style, which is now on show at the Mercedes-Benz Museum.

The Mercedes-Benz Museum

Mercedes-Benz SLK 55 AMG of Lukas Podolski - German national footballer Lukas Podolski bought a Mercedes-Benz SLK 55 AMG in September 2006 – just after the football World Cup in Germany, in which the host country finished third. In terms of optional extras, the footballer opted for such features as the AMG Performance package.

Mercedes-Benz 190 E 2.3 of Nicolas Cage - An expressive Mercedes-Benz 190 E 2.3 was purchased by the actor, film producer and Oscar winner Nicolas Cage in February 1993: The black vehicle with AMG Drivers Package also boasts dark-tinted windows at the sides and rear. The original Mercedes-Benz cassette radio is still part of the extensive equipment specification.

Mercedes-Benz 190 SL of David Randolph Scott - The Mercedes-Benz 190 SL of NASA astronaut David Randolph Scott, who in 1971 became the seventh human being to set foot on the moon, is in its unrestored original condition. He bought the elegant roadster on 2 March 1959 from new and owned it until August 2004. The 190 SL was unveiled in 1954 along with the 300 SL "Gullwing". The two cars established the tradition of "SL standard production sports cars".

Mercedes-Benz 300 GD of Gunther Holtorf - A total of 897,000 kilometres in 215 countries: that is the impressive record set by the Mercedes-Benz 300 GD of globetrotter Gunther Holtorf, who used "Otto", the affectionate nickname given to the off-roader, for 26 years as an expedition vehicle. In doing so, he realised one of the brand's advertising promises: "Where there's a G, there's a way."

The Mercedes-Benz Museum is open Tuesday to Sunday from 9 am to 6 pm. The ticket counter always closes at 5 pm. Registration, reservations and latest information: Monday to Sunday from 9 a.m. to 6 p.m. by phone on +49 (0)711 173 0000, by email to classic@daimler.com or online at:
www.mercedes-benz.com/museum

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.

You may send Title to your information and the accompanying URL to agiac99@aol.com - Subject Line please use "Aerospace News"

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.

Submission publications is at the sole discretion of FEA Information Inc.

NOAA's GOES-S Satellite in Thermal Vacuum Testing

In March, NOAA's Geostationary Operational Environmental Satellite-S (GOES-S) satellite was lifted into a thermal vacuum chamber to test its ability to function in the cold void of space in its orbit 22,300 miles above the Earth.

The most complicated and challenging test is thermal vacuum where a satellite experiences four cycles of extreme cold to extreme heat in a giant vacuum chamber. To simulate the environment of space, the chamber is cooled to below minus 100 degrees Celsius or minus 148 degrees Fahrenheit and air is pumped out.

The test simulates the temperature changes GOES-S will encounter in space, as well as worst case scenarios of whether the instruments can come back to life in case of a shut down that exposes them to even colder temperatures. In this photo from March 8, the GOES-S satellite was lowered into the giant vacuum chamber at Lockheed Martin Space Systems, Denver, Colorado. GOES-S will be in the thermal vacuum chamber for 45 days. As of March 30, two of four thermal cycles were complete.

GOES-S is the second in the GOES-R series. The GOES-R program is a collaborative development and acquisition effort between the National Oceanic and Atmospheric Administration and NASA.

The GOES-R series of satellites will help meteorologists observe and predict local weather events, including thunderstorms, tornadoes, fog, flash floods, and other severe weather. In addition, GOES-R will monitor hazards such as aerosols, dust storms, volcanic eruptions, and forest fires and will also be used for space weather, oceanography, climate monitoring, in-situ data collection, and for search and rescue.

For more information about GOES-S, visit: www.goes-r.gov or www.nasa.gov/goes

Credit: Lockheed Martin
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Editor: Karl Hille

Editor: Yanhua Zhao – China FEA Information Engineering Solutions

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BETA CAE Systems. www.beta-cae.com

BETA CAE Systems - ANSA

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.

BETA CAE Systems μETA

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 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. **www.lstc.com**

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.

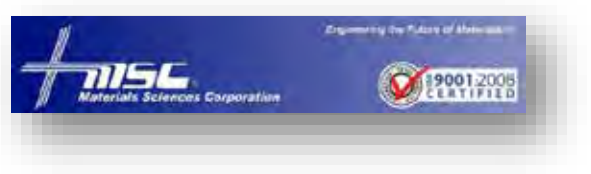
LS-OPT: LS-OPT is a standalone Design Optimization and Probabilistic Analysis package with an interface to LS-DYNA. The graphical preprocessor LS-OPTui facilitates definition of the design input and the creation of a command file while the postprocessor provides output such as approximation accuracy,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



Material Sciences Corporation **info@materials-sciences.com**

Materials Sciences Corporation has provided engineering services to the composites industry since 1970. During this time, we have participated in numerous programs that demonstrate our ability to: perform advanced composite design, analysis and testing; provide overall program management; work in a team environment; and transition new product development to the military and commercial sectors. MSC's corporate mission has expanded beyond basic research and development now to include transitioning its proprietary technologies from the research lab into innovative new products. This commitment is demonstrated through increased staffing and a more than 3-fold expansion of facilities to allow in-house manufacturing and testing of advanced composite materials and structures

Materials Sciences Corporation (MSC) MAT161/162 - 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

Oasys Ltd. LS-DYNA Environment **www.oasys-software.com/dyna**

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

www.oasys-software.com/dyna

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

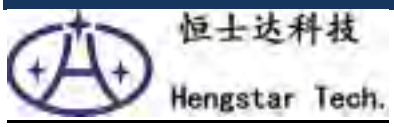
Key benefits:

- 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

www.hengstar.com

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..

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 www.lenovo.com

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.

Canada	**Metal Forming Analysis Corp MFAC** galb@mfac.com www.mfac.com			
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	eta/DYNAFORM	INVENTIUM/PreSys		
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	VA One	CFD-ACE+	ProCAST	
		Weld Planner	Visual-Environment	IC.IDO
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	LS-OPT	DYNAform		
United States	**Livermore Software Technology Corp** sales@lstc.com **LSTC** www.lstc.com			
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	LSTC Dummy Models	LSTC Barrier Models	TOYOTA THUMS	
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	LS-PrePost	LS-TaSC	LSTC Dummy Models	
			LSTC Barrier Models	

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	LSTC Barrier Models		DIGIMAT	

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	ESAComp	AnyBody		
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	TOYOTA THUMS		LSTC Dummy & Barrier Models	

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			LSTC Barrier Models		
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	LS-TaSC		PRIMER	D3PLOT	T/HIS
	REPORTER	SHELL	FEMZIP	HYCRASH	
	DIGIMAT	Simpleware	LSTC Dummy Models		
			LSTC Barrier Models		

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			LSTC Barrier Models	LS-TaSC
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	JSTAMP	HYCRASH	JMAG	
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	TOYOTA THUMS	
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	http://www.fujitsu.com/jp/solutions/business-technology/tc/sol/			
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	Consulting			
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	LSTC Dummy Models	LSTC Barrier Models		
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	Consulting			
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	LSTC Dummy Models	LSTC Barrier Models	AnyBody	

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	eta/DYNAFORM	FormingSuite	Simblow	TrueGRID
	JSTAMP/NV	Scan IP	Scan FE	Scan CAD
	FEMZIP			

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	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM
	eta/DYNAFORM	DIGIMAT	Simuform	Simpack
	AxStream	TrueGrid	FEMZIP	

Taiwan **AgileSim Technology Corp.**

www.agilesim.com.tw

LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM

Taiwan **Flotrend**

www.flotrend.com.tw

LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM

Taiwan **SiMWARE Inc..**

www.simware.com.tw

LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM

Contact: JSOL Corporation Engineering Technology Division cae-info@sci.jsol.co.jp

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

Rescale Cloud Simulation Platform

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

www.esi-group.com

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

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

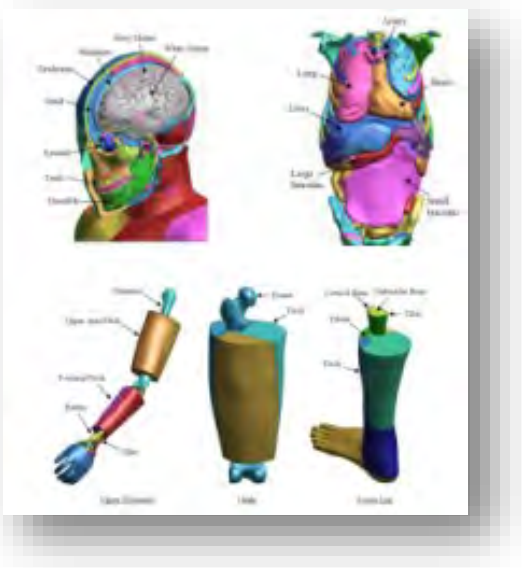
Collaboration

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:

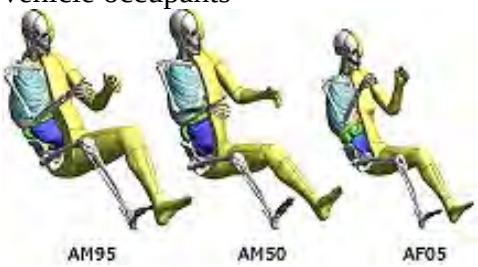
- Data, workflow or project asynchronous collaboration
- Multi-user, browser based collaboration for CAD, geometry, mesh and results models
- Real-time design review with notes, annotations and images archiving and retrieval
- Email invite to non ESI Cloud users for real time collaboration

TOYOTA - Total Human Model for Safety – THUMS

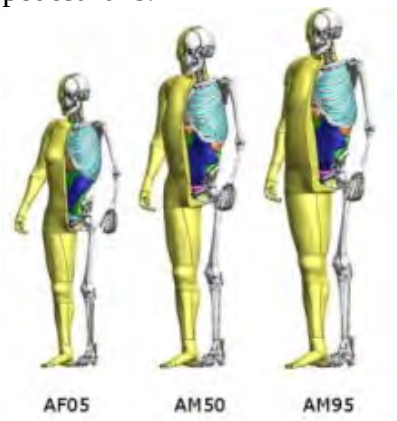


The Total Human Model for Safety, or THUMS®, is a joint development of Toyota Motor Corporation and Toyota Central R&D Labs. Unlike dummy models, which are simplified representation of humans, THUMS represents actual humans in detail, including the outer shape, but also bones, muscles, ligaments, tendons, 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

if you have a new event to be listed please send to agiac99@aol.com

Conference/Events

May 9th – 11th	**11th European LS-DYNA Conf.** Salzburg, Austria	https://lnkd.in/gUHtHZN
May 12th	**The 2017 THUMS European Users' Meeting** - Salzburg, Austria	http://ls-dyna.jsol.co.jp/en/thums/thums_um2017.html
May 30th - June 1st	**7th BETA CAE International Conf.** Thessaloniki, Greece	www.beta-cae.com/
June 11th – 14th	**NAFEMS World Congress & Int. SPDM Conf.** Stockholm, Sweden	www.nafems.org/congress
Oct. 23rd-25th	**3rd China LS-DYNA User's conference** Shanghai, China	http://www.lsdyna.cn
Oct 31st – Nov 1st	**LS-DYNA&JSTAMP Forum 2017** Tokyo, Japan	http://ls-dyna.jsol.co.jp/en/event/uf/

European Conference - NVH Class

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

Author: Nils Karajan nik@dynamore.de Conference Contact: conference@dynamore.de

REGISTAR NOW!

Final conference agenda released

11th European LS-DYNA® Conference May 9 - 11 2017, Salzburg, Austria

Conference Website:
www.dynamore.de/conf2017

Final conference agenda
In less than a month, the 11th European LS-DYNA Conference will take place in Salzburg. From 9th - 11th May you can expect more than 190 high quality technical presentations as well as 9 workshops and over 30 hardware and software exhibitors!
www.dynamore.de/conf2017-agenda

Register now!
Sign up today as conference participant.
www.dynamore.de/conf2017-reg

Participant fees

Industry speaker:	400 Euro
Academic speaker:	340 Euro
Industry:	640 Euro
Academic:	490 Euro

All plus VAT.

General Conference Information

Still looking for a place to stay? Please find hotel advice and general information about the 11th European LS-DYNA Conference at:

http://www.dynamore.de/conf17

Accompanying Seminars
Receive qualified training at the accompanying seminars. The seminars need to be booked separately and conference participants receive a 10% discount on the seminar fees. Find more information at:

www.dynamore.de/conf17-sem

Exhibiting and sponsoring
Please request further information.

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

2017 3rd China LS-DYNA User's conference Oct. 23rd-25th, Shanghai, China

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

NAFEMS World Congress & Int. SPDM Conference, 11 – 14 June 2017,

Stockholm, Sweden, www.nafems.org/congress

The 2017 NAFEMS World Congress will take place from the 11th to 14th of June in Stockholm, Sweden, and will focus entirely on engineering analysis, modelling and simulation and its impact on industry and beyond.

NAFEMS is the only independent voice of the CAE community, representing over 1300 member organisations worldwide from OEM's to suppliers, leading academic institutions, international research and development bodies, and prominent software vendors.

Engineering analysis, modelling, simulation, and systems engineering are becoming ever more embedded in the product development process across all industries in every part of the world. The technology is no longer seen as niche – we are moving into the mainstream at a rapid pace.

As manufacturing techniques and product lifecycle management processes develop and grow, the use of Finite Element Analysis (FEA),Computational Fluid Dynamics (CFD), Multibody Simulation (MBS) and all of the associated technologies is increasing exponentially. As a result, your community is expanding and evolving with the technology into a truly cross-industry, multi-skilled, global society, with its own unique perspectives, problems, and solutions.

We stand at a crossroad. In order for the technology to progress further and for us, the users, to keep pace with this development, collaboration and sharing of experience and knowledge is vital.

Among the exhibitors our participants

- Beta CAE Systems
- DYNAmore Nordic
- ESI Group
- Courtesy listing: Desktop Engineering

Not to miss dates:

- PowerPoint submission deadline: May 22nd 2017
- Conference dates: June 11th - 14th 2017

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
KOSTECH	www.kostech.co.kr/
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.

BETA CAE SYSTEMS Visit the website for complete listings/changes/locations

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.

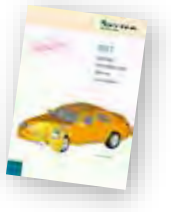
A number of recommended training courses offered are described below. The list is not exhaustive and more courses can be designed according to your needs.
Please, contact ansa@beta-cae.com for further details.

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

DYNAmore — New: Training Dates 2017

Author: Nils Karajan nik@dynamore.de



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

Seminar dates offered by DYNAmore – May/June 2017

Download full seminar brochure (pdf): www.dynamore.de/seminars2017

Selection of trainings from March to May

Crash and passive safety:	
Joining Techniques for Crash Analysis with LS-DYNA	4-5 April (G)
Crash Analysis with LS-DYNA	2-5 May (G)
Optimization:	
LS-OPT – Optimization and Robustness	4-6 April (L)
Parameter Identification with LS-OPT	8 May (Sb – Europ. LS-DYNA Conf.)
Material modelling:	
Damage and Failure Modeling of Metals	4-5 May
Material Modeling for Metals	2-3 May
Implicit classes:	
Implicit Analysis using LS-DYNA	4-5 April
Introduction to Nonlinear Implicit Analyses	8 May (Sb – Europ. LS-DYNA Conf.)
NVH, Frequency Domain Analysis and Fatigue	12 May (Sb – Europ. LS-DYNA Conf.)
Multiphysics:	
ALE and Fluid-Structure Interaction in LS-DYNA	15-16 May
Electromagnetism in LS-DYNA	12 May (Sb – Europ. LS-DYNA Conf.)
ICFD – Incompressible Fluid Solver in LS-DYNA	17-18 May
Particle methods:	
Meshfree EFG, SPG and advanced FE Methods	8 May (Sb – Europ. LS-DYNA Conf.)
Smoothed Particle Hydrodynamics (SPH) in LS-DYNA	12 May (Sb – Europ. LS-DYNA Conf.)
Process simulation:	
Metal Forming with LS-DYNA	29-31 May

Information days (free of charge)

New Features in LS-DYNA and LS-OPT	23 May (T)

ICFD Webinar series (free of charge) – Registration via www.dynamore.se

How to model conjugate heat transfer in LS-DYNA	4 April
How to model flow through porous media in LS-DYNA	25 April
Coupling between DEM particles and ICFD solver	15 May
How to model sloshing using the ICFD solver	23 May

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, Sb = Salzburg, Austria

We hope that our offer will meet your needs and are looking forward to welcoming you at one of the events.

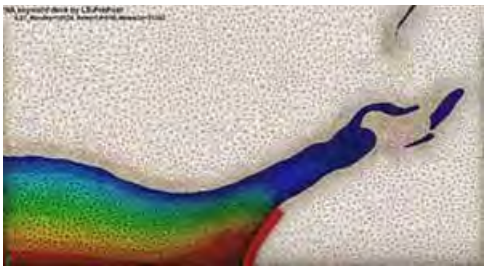
Author: Nils Karajan nik@dynamore.de

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 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

Among the many classes held during the year are the following:

May
15-16 LS-DYNA Intro to GeoMaterial
15 – 18 LS-DYNA Crash & Impact
29-31 Intro to both Explicit and Implicit

June
Intro to both Explicit and Implicit
15-16 LS-DYNA Modeling and Validation

September
11-12 LS-DYNA ALE/Euler
18-19 Intro LS-OPT – Funcunality & Standard
20 LS-DYNA Discrete Element Method
25-17Intro to LS-DYNA Explicit

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

KOrea Simulation TECHnology Co., Ltd. Training

www.kostech.co.kr/

Anna Choi, Assistant Manager - choian@kostech.co.kr
KOrea Simulation TECHnology Co.,Ltd [Kostech]
Rm. 804 Nam-Jung City Plaza 1th, 760 Janghang-dong
Ilsandong-gu, Goyang-si, Gyeonggi-do, 410-380, Korea

May

***Composite Seminar**

Date: At the end of May (to be announced)

Lecturer: Prof. Kim Chang-Wan (Konkuk University)

August

***Concrete and Geomaterial Modelling in LS-DYNA**

Date: August 17~18

Lecturer: Dr. Len Schwer(We invited him as a guest speaker)

LSTC 2017 Training

For Pricing Please visit www.lstc.com

Date	Location	Class	Instructor(s)
June			
1-2	CA	User Materials in LS-DYNA (UMAT)	A. Tabiei
1-2	MI	Contact	S. Bala
9	MI	Material Characteristics for Metals Plastics and Polymers - Test Data to Material Model	S. Bala
15-16	MI	Introduction to Metal Forming	L. Zhang / Q Yan
19	MI	Intro to LS-PrePost	P. Ho / Q. Yan
20-23	MI	Intro to LS-DYNA	J. Reid
July			
10-11	MI	Occupant Simulation	S. Guha
24	MI	Intro to LS-PrePost	P. Ho / Q. Yan
25-29	MI	Intro to LS-DYNA	A. Tabiei

LSTC 2017 Training

For Pricing Please visit www.lstc.com

August				
1-2	CA	Rubber, Foam & Viscoelastic Materials	A. Tabiei	
3-4	CA	Plasticity, Plastics, Visco-plastic Materials	A. Tabiei	
8-9	CA	Fracture, Failure, Damage	A. Tabiei	
10-11	CA	Composite LS-DYNA	A. Tabiei	
14-15	CA	Implicit LS-DYNA	A. Tabiei	
21-23	CA	ALE/Eulerian & FSI Interaction in LS-DYNA	M. Souli	
24-25	CA	Smoothed Particle Hydrodynamics (SPH)	M. Souli	
28	CA	Intro to LS-PrePost	P. Ho / Q. Yan	
Aug29-Sep1	CA	Intro to LS-DYNA	A. Nair	
September				
12-13	MI	Airbag Modeling	A. Nair	
13	CA	Material Characteristics for Metals, Plastics, and Polymers - Test Data to Material Model	S. Bala	
14-15	CA	Contact	S. Bala	
October				
10-13	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 On Line Visit the website for complete listings/changes/locations

www.LSDYNA-ONLINE.COM

For Information contact: courses@lsdyna-online.com or 513-331-9139

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.

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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

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

AEROSPACE WORKING GROUP

http://awg.lstc.com/tiki/tiki-index.php

	**LS-DYNA®, LS-OPT®, LS-PrePost, LS-TASC®,** **LSTC ATD and Barrier Models** · 12 – 6 - 3 months/1 or 2 core license available · Students, Engineers. · NON-COMMERICAL USE For Information contact: sales@lstc.com
	**LS-Run – A standalone application** - a new graphical control center to start LS-DYNA simulations with either SMP or MPP - LS-Run has a parametric LS-DYNA command line builder making it easy to create the command and change the most common arguments such as ”memory”, ”ncpu” and the solver executable. For information contact: nik@dynamore.de
	A mobile & web application which is built to help LS-DYNA Users to get instant answers for technical query from global experts. For information contact: ramesh@kaizenat.com

LS-DYNA at the Computer History Museum

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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

LSTC Recent Developments, Features, Updates, News, Presentations

Editor: Yanhua Zhao

New features of 3D adaptivity in LS-DYNA - W. Hu LSTC

New Feature: Defining Hardening Curve in LS-DYNA® - Xinhai Zhu, Li Zhang, Yuzhong Xiao LSTC

Previously Presented: For a copy write to yanhua@feainformation.com

March

Improvements toOne-Step Simulation in LS-DYNA
Xinhai Zhu, Houfu Fan, Li Zhang,

February

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

January

Lancing features in LS-DYNA
Quanqing Yan, Li Zhang, Yuzhong Xiao, Xinhai Zhu, Philip Ho - LSTC

December

Thermal Coupling Method Between SPH Particles and Solid Elements in LS-DYNA
Jingxiao Xu, Jason Wang, LSTC

November

Introduction to second order Lagrangian elements in LS-DYNA
Hailong Teng - Livermore Software Technology Corp.

October

An Introduction to *CONSTRAINED_BEAM_IN_SOLID
Hao Chen - Livermore Software Technology Corp

September:

Introduction to the new framework for User Subroutine Development of LS-DYNA
Zhidong Han and Brian Wainscott

*New Features in *ELEMENT_LANCING*
Xinhai Zhu, Li Zhang, Yuzhong Xiao

August :

Equivalent Radiated Power calculation with LS-DYNA
Yun Huang, Zhe Cui - Livermore Software Technology Corporation

July:

Recent Developments for Laminates and TSHELL Forming
Xinhai Zhu, Li Zhang, Yuzhong Xiao - LSTC

New features of 3D adaptivity in LS-DYNA

W. Hu LSTC

The 3D remeshing in adaptivity is defined by the keyword *CONTROL_REMESHING, where the two important parameters, RMIN and RMAX, are the minimum and maximum mesh size in the re-meshing. The internal remesher of LS-DYNA uses these two values globally for all adaptive parts. In many applications, users may need more flexibility on defining the mesh size for different parts of the model. This short paper presents two new features: run-time control and *DEFINE_ADAPTIVE_BOX in 3D adaptivity.

By setting IADPFCTRL=1 (*CONTROL_ADAPTIVE, Card4, the 7th flag), users are able to perform run-time control on 3D adaptivity through control files in the following manners:

(1) Trigger additional adaptive step in run time

(2) Setup a special adaptive step with the option of manual remeshing by users

(3) For multiple adaptive parts, define remeshing parameters individually

In the current implementation, there are two control files: adapt.fc1 and adapt.fc2. They can be automatically generated by LS-DYNA if they are not pre-defined.

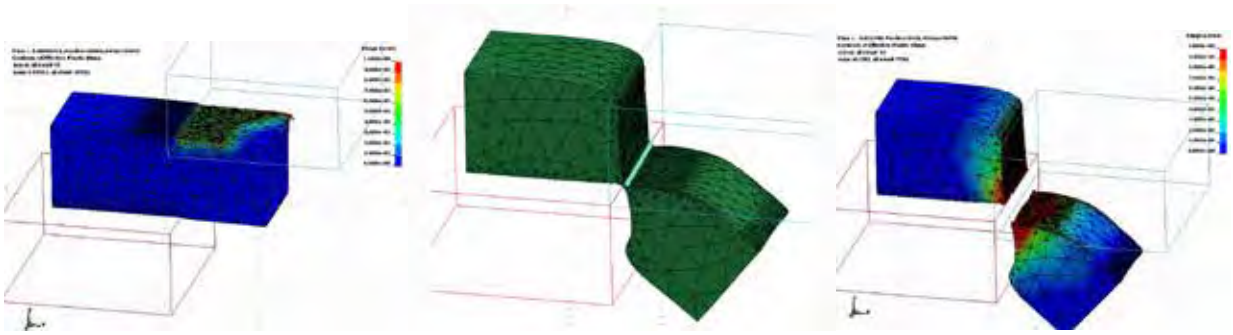
The file adapt.fc1 has three control parameters: C1 is the overall switch for this module; C2 defines the time for the next additional adaptive step; C3 is the switch for manual remeshing. The detail can be found in the following three examples:

(1) 1, 0.0, 0: C1=1 to turn on run-time control; C2=0.0 to start additional adaptivity immediately; C3=0 to turn off manual remeshing

(2) 1, 0.01, 0: C2=0.01 to start additional adaptivity at the time 0.01

(3) 1, 0.01, 3: C3=3 to turn on manual remeshing of the adaptive part 3 in the additional adaptive step at time 0.01

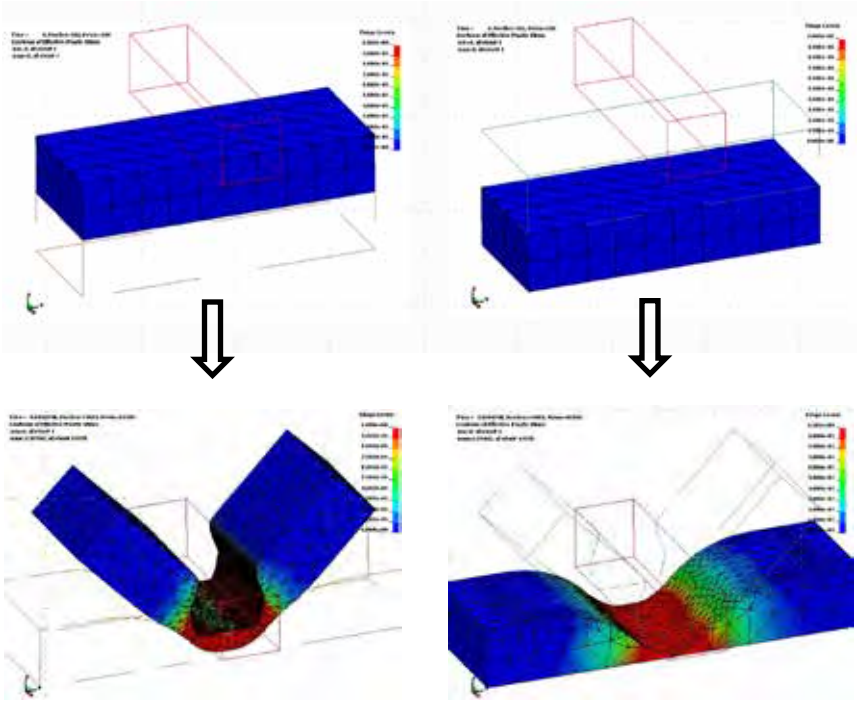
In this case, LS-DYNA is paused and the mesh information of part 3 is output into a keyword file, named user.mesh. Users can either manually change the mesh or use CAD software to generate a new mesh and then save into the same file. LS-DYNA continues the analysis by users setting C1=-1 in adapt.fc1.



In the metal cutting simulation shown above, it can be estimated when the tool front meets the bottom die so that the additional adaptive step can be triggered for users to trim the mesh using CAD software and then continue the analysis in LS-DYNA.

In the control file adapt.fc2, users are able to define the birth and death time of adaptivity (same as TBIRTH and TDEATH in *CONTROL_ADAPTIVE) as well as the mesh size (same as RMIN and RMAX in *CONTROL_REMESHING) for each adaptive part. Here is an example:

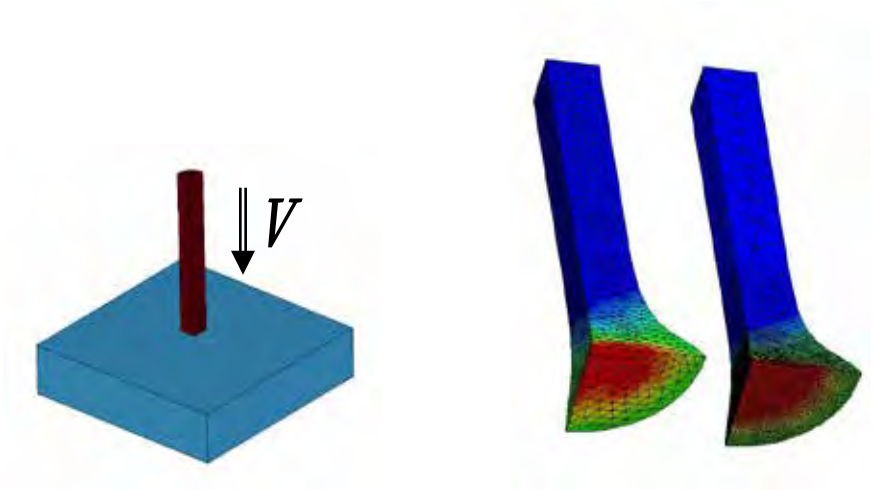
2	Set the parameters for two adaptive parts
2, 0.0, 0.1, 1.0, 4.0	Part 2: TBIRTH=0.0, TDEATH=0.1, RMIN=1.0, RMAX=4.0
3, 0.01, 0.2, 2.0, 4.0	Part 3: TBIRTH=0.01, TDEATH=0.2, RMIN=2.0, RMAX=4.0



In the example shown above, there are adaptive parts: the top one contacts with a very sharp tool so that a smaller mesh size is needed to well represent the contact surface and better simulate the local large deformation; the bottom part has much smoother profile of material deformation so that the less frequent adaptivity and larger mesh size are used to

reduce the overall computational cost. All of these differences in defining adaptivity for different parts can be made in adapt.fc2.

The 3D adaptivity in LS-DYNA has the capability to automatically perform dynamic mesh refinement based on the curvature of contact surfaces. In addition to that, *DEFINE_ADAPTIVE_BOX is now supported for users to define multiple boxes in space with different definitions of remeshing mesh size. In the card 2 of this keyword, users can specify the adaptive part ID (PID), the minimum mesh size (BRMIN) and the maximum mesh size (BRMAX) so that, within the box defined in the card 1, all the mesh from this part is remeshed using BRMIN/BRMAX instead of the global RMIN/RMAX. The following shows a Taylor bar impact simulation using 3D adaptivity (a quarter model), where the standard remeshing is compared to the one with three remeshing boxes defined by *DEFINE_ADAPTIVE_BOX. The results show that the second one is able to capture the high-gradient field with much finer mesh and at the same time achieve the optimal performance with better distribution of mesh size.



* Dr. W. Hu graduated from the department of civil engineering in UCLA in 2007, and joined LSTC in 2009. He has been working on the research and development of adaptivity and meshless methods.

New Feature: Defining Hardening Curve in LS-DYNA®

Xinhai Zhu, Li Zhang, Yuzhong Xiao
LSTC

INTRODUCTION

This keyword defines material hardening curve based on a few commonly used material hardening laws. Weighted combinations of the hardening laws are also made possible. The load curve ID, which represents stress-strain curve defined here, can be referenced in the load curve ID used by a specific material model. This feature is applicable to all material models with a hardening curve defined by a load curve using *DEFINE_CURVE.

MAIN FEATURES

With this keyword, a user can define five different types of hardening laws (ITYPE 1 through ITYPE 5), and to combine one of the laws (ITYPE 1) with other laws (ITYPE 2 through ITYPE 5) with weighting factors. There are currently five types of hardening laws implemented as follows,

ITYPE=1: Swift power law in the form of:

$\sigma = K(e_0 + \epsilon_p)^n$,

where σ is true effective stress, e_0 is the elastic strain at the initial yield point, K is a strength coefficient, ϵ_p is true effective plastic strain, n is the work hardening coefficient. Input variables defined as follows:

$P1 = K, \quad P2 = e_0, P3 = n.$

ITYPE=2: Voce law in the form of:

$\sigma = \sigma_0 + R_{sat}(1.0 - e^{-zeta*\epsilon_p})$,

where σ_0 is the initial yield stress, R_{sat} is the stress differential between σ_0 and the saturated stress, *zeta* is a strain coefficient. Input variables defined as follows:

$P1 = \sigma_0, P2 = R_{sat}, P3 = zeta,$ $P4$: hardening curve contributing weighting factor.

ITYPE=3: Voce law in the form of:

$\sigma = A - Be^{-C*\epsilon_p}$,

where A, B, C are material constants. Input variables defined as follows:

$P1 = A, P2 = B, P3 = C,$ $P4$: hardening curve contributing weighting factor.

ITYPE=4: Hockett-Sherby law in the form of:

$\sigma = A - Be^{-C*\epsilon_p{}^H}$,

where A, B, C, and H are material constants. Input variables defined as follows:

$P1 = A,\ P2 = B,\ P3 = C, P4 = H,$ **P5**: hardening curve contributing weighting factor.

ITYPE=5: Stoughton-Yoon hardening law in the form of:

$\sigma = A - Be^{-C*\epsilon_p{}^m} + D * \epsilon_p$,

where A, B, C, m and D are material constants, and,

$0 < m < 1.0$, and,

$D \geq 0.0$

Input variables defined as follows:

$P1 = A, P2 = B, P3 = C, P4 = M, P5 = D,$ **P6**: hardening curve contributing weighting factor.

According to Stoughton-Yoon, "with the exception of metals exhibiting Yield Point Elongation (YPE) effects, this function can represent the stress-strain response for BOTH mild and AHSS steel AND aluminum, from the initial yield point, throughout the small strain range, up to the highest strains realized in bulge tests".

Note that if $D = 0.0$, this function reduces to the Hockett-Sherby law (ITYPE 4). Also note that if $m = 1.0$ and $D = 0.0$, this function reduces to one of the Voce law (ITYPE 3).

ITYPE=11: A weighted combination of ITYPE=1 (first card) and any of the ITYPE=2, 3, or 4 (second card). ITYPE 1 becomes ITYPE 11 when P4 (a contributing weighting factor) is defined in the first card. The variable P4 (for ITYPE 2 and 3), P5 (for ITYPE 4) or P6 (for ITYPE 5) also needs to be defined in the second card, see an example below.

EXAMPLE

The following example shows a hardening curve (LCID 90903) will be created, which is the combination of 50% of Swift power law (ITYPE 1) and 80% of Hockett-Sherby law (ITYPE 4). In Figure 2, from a single element uniaxial tension test (Figure 1) in LS-DYNA, the hardening curves of the power law (ITYPE 1), Hockett-Sherby law (ITYPE 4) and the weighted combination of the two laws are shown. The weighted combination matches that from the hand-calculation.

```
*MAT_037
$      MID        RO         E        PR      SIGY      ETAN         R     HLCID
         1 7.900E-09 2.070E+05      0.30                         -1.45     90903
*DEFINE_CURVE_STRESS
$---+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8
$ ITYPE=1: power law. P1=K, P2=n, P3=e0, P4=0.5.
$ ITYPE=4: Hockett-Sherby law. P1=A, P2=B, P3=C, P4=H, P5=0.8.
$                      VOCE: sigma=A-B*exp(-C*eps**H)
$     LCID      TYPE        P1        P2        P3        P4        P5
     90903        11     350.0      0.22      0.01       0.5
     90903         4     162.2      72.2      4.34       1.2       0.8
```

Figure 3 shows an example of Stoughton-Yoon hardening law under uniaxial tension from LS-DYNA, compared with result from hand-calculation.

REVISION INFORMATION:

This feature is available starting from Revision 113640. ITYPE 5 (Stoughton-Yoon) is available starting from Revision 114803.

REFERENCE:

LS-DYNA User's Manual (draft).

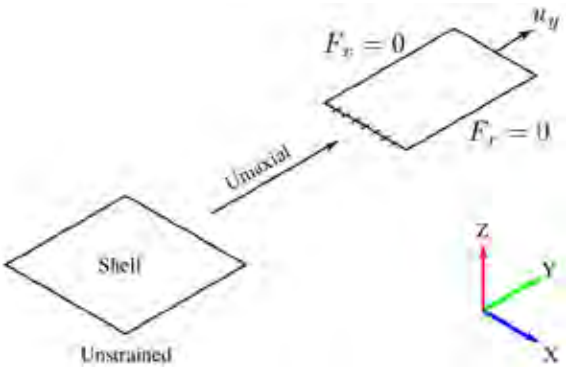


Figure 1 A single element in uniaxial tension

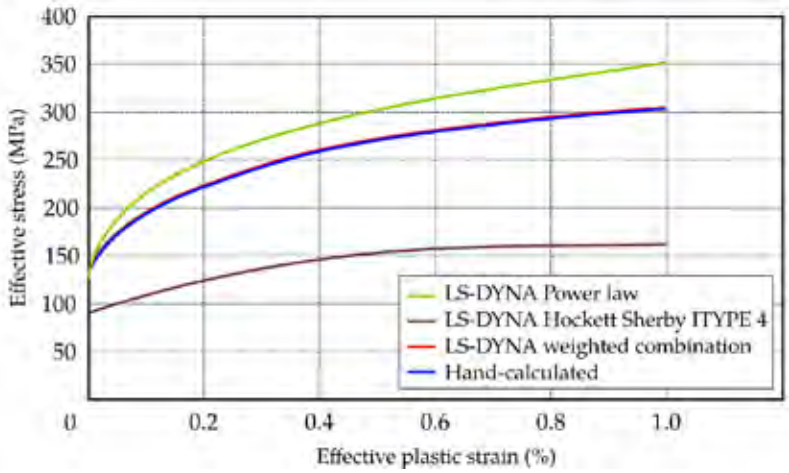


Figure 2 Resulting hardening curves from LS-DYNA comparison with hand-calculation.

Power law: $\sigma = 350.0\left(0.01 + \epsilon_p\right)^{0.22}$,

ITYPE 4 Voce law: $\sigma = 162.2 - 72.2e^{-4.34{\epsilon_p}^{1.2}}$,

Weighted combination: $\sigma = 0.5 * 350.0\left(0.01 + \epsilon_p\right)^{0.22} + 0.8(162.2 - 72.2e^{-4.34{\epsilon_p}^{1.2}})$.

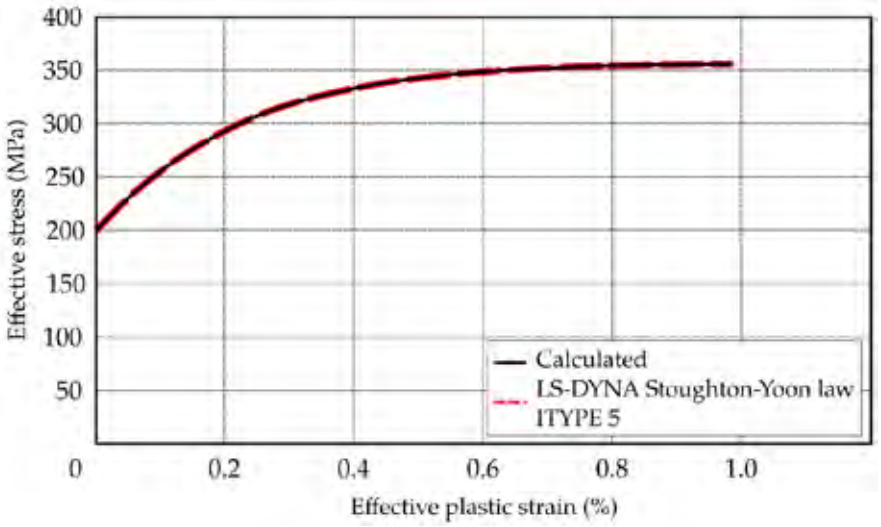


Figure 3 Comparison between Stoughton-Yoon results from LS-DYNA and hand- calculation.

($A = 160.8024$, $B = 71.109$, $C = 4.5058$, $M = 0.9989$, $D = 0.8$.)