32nd ANNUAL CONFERENCE

ILASS-Americas

Institute for Liquid Atomization and Spray Systems

2022 BOOK OF ABSTRACTS

22-25 May 2022, Madison, WI

.

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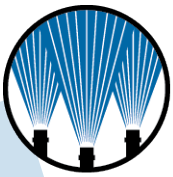
SPONSORS

ILASS-Americas is a non-profit organization committed to providing state-of-the-art spray information to our annual conference attendees and especially to our student visitors. Thanks to our sponsors, we are able to significantly reduce conference registration fees for students each year.



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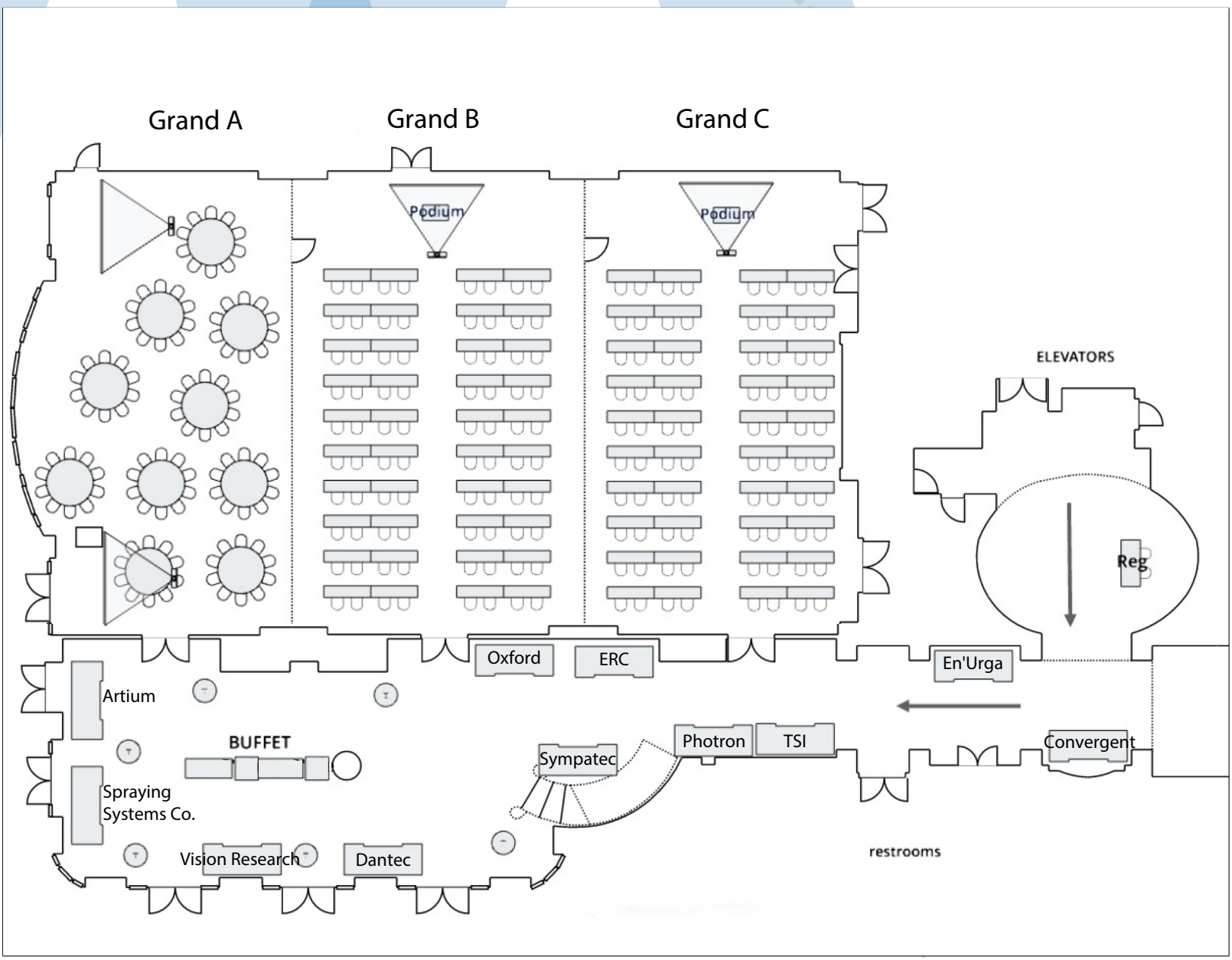
CONFERENCE MAPS

The ILASS-Americas 2022 conference will be held at the Edgewater Hotel. Please see the maps below highlighting the individual rooms which will be used for the conference, as well as locations of the rooms within the Edgewater .



1 GRAND PLAZA & ICEHOUSE
(Level 5, WI)

2 THE NOLEN GALLERY
(Level 5, WI) Private Event Space

3 THE STATEHOUSE *(Level 7, WI)*
7am - 11am Monday - Friday (Breakfast Service)
4pm - 10pm Monday - Friday(Dinner Service)
9am - 10pm Saturday (Brunch served until 2pm)
9am - 10pm Sunday (Brunch served until 2pm)

AUGIE'S TAVERN at THE STATEHOUSE
Featuring full Statehouse menu
4pm - 10pm Monday - Thursday
2pm - 1am Friday (Food served until 10pm)
9am - 1am Saturday (Food served until 10pm)
9am - 10pm Sunday (Food served until 10pm)

THE MARKET
Friday - Monday: 7am-6pm
Tuesday - Thursday: 7am-2pm
7am - 11am To-go breakfast sandwiches, 11am - 2pm
To-go lunch sandwiches, oatmeal, bagels, muffins & grab-and-go snacks

4 THE GRAND BALLROOM
(Level 5, WI) Private Event Space

5 THE MENDOTA BALLROOM
(Level 3, WI) Private Event Space

6 THE SKY BAR
(Level 15, WI) Private Event Space

7 THE BOATHOUSE
(Levels 1 & 2, Langdon)
Closed for the season

8 SPA & WELLNESS CENTER
(Levels 4 & 5, Langdon)
See website for hours

9 RED CROWN CLUB
(Level 11, Langdon) Private Event Space

Hotel Main Lobby, Concierge Desk & Business Center *(Level 6, WI)*
Temporarily closed. See Front Desk.

Tunnel Connecting Buildings *(Level 3)*

WiFi: Use Edgewater Public Wifi Enter Email Address

In Room Dining: Ext: 2499
Daily 4pm - 10pm
Saturday & Sunday 7am - 2pm

Property Parking: Self Parking, $18, includes unlimited in/out privileges using guest room keycard. Valet, $25.

SHOP THE EDGEWATER
Visit The Market in The Wisconsin Building for clothing, home decor, gift cards, and sun-dries including coffee, snacks, beverages, personal hygiene items, playing cards, and more.

CONFERENCE AND PROGRAM NOTES

These are some helpful notes for your time during ILASS-Americas 2022.

Registration takes place on Sunday, May 22 from 5-7pm outside the Grand Ballroom on Level 5 in the Wisconsin Building.

A Welcome Reception will take place on Sunday, May 22 from 5-7pm outside the Grand Ballroom on Level 5 in the Wisconsin Building followed by a **Focus Session** presentation from 7-8pm in Ballrooms B &C.

Breakfast (Continental) will be served every morning from approximately 7-8am outside the Grand Ballroom on Level 5 in the Wisconsin Building. Exhibitor booths will be open during this time.

Lunch will be served on Monday and Tuesday in Grand ballroom A. Lunch on Wednesday will be provided as a to-go box lunch.

The ILASS-Americas Annual Business Meeting will be held during lunch on Tuesday, May 24. All conference attendees are encouraged to attend.

Technical Committee Meetings will be held on Monday and Tuesday afternoons. Conference attendees are strongly encouraged to join the technical committee discussion(s) that match their interests. The meeting are open to all conference attendees.

The Atomization and Sprays Editorial Board Meeting will be held on Monday during lunch in the Sky Bar Lounge; this is closed meeting for editorial board members only.

Exhibitors' Displays are available each day from the start to the end of each day outside the Grand Ballroom on Level 5 in the Wisconsin Building.

Poster Session There are no posters at the the 2022 conference.

Program changes will be announced every morning, posted at the Registration Desk, and noted on the schedule poster outside each presentation room.

Lab Tours at the University of Wisconsin-Madison are organized for the afternoon on Tuesday, May 24. All conference attendees are encouraged to attend. Buses will be provided to and from the Edgewater Hotel; see the detailed program for timing.

The Conference Banquet and Awards Ceremony will be held at The Overture (Overture Center for the Arts, 201 State St, Madison, WI 53703), on the evening of Tuesday May 24 following the lab tours. The Overture is located 0.4 miles from The Edgewater Hotel, and is about 10 minute walk; bussing will not provided.

Paper numbers are provided on the list of abstract pages of this conference book, as well as in the Index of Authors.

Paper PDFs are provided for all registered conference attendees on a USB-drive which will be available at the registration desk, and will be provided with your name badge and registration packet.

SPONSORS

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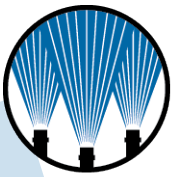

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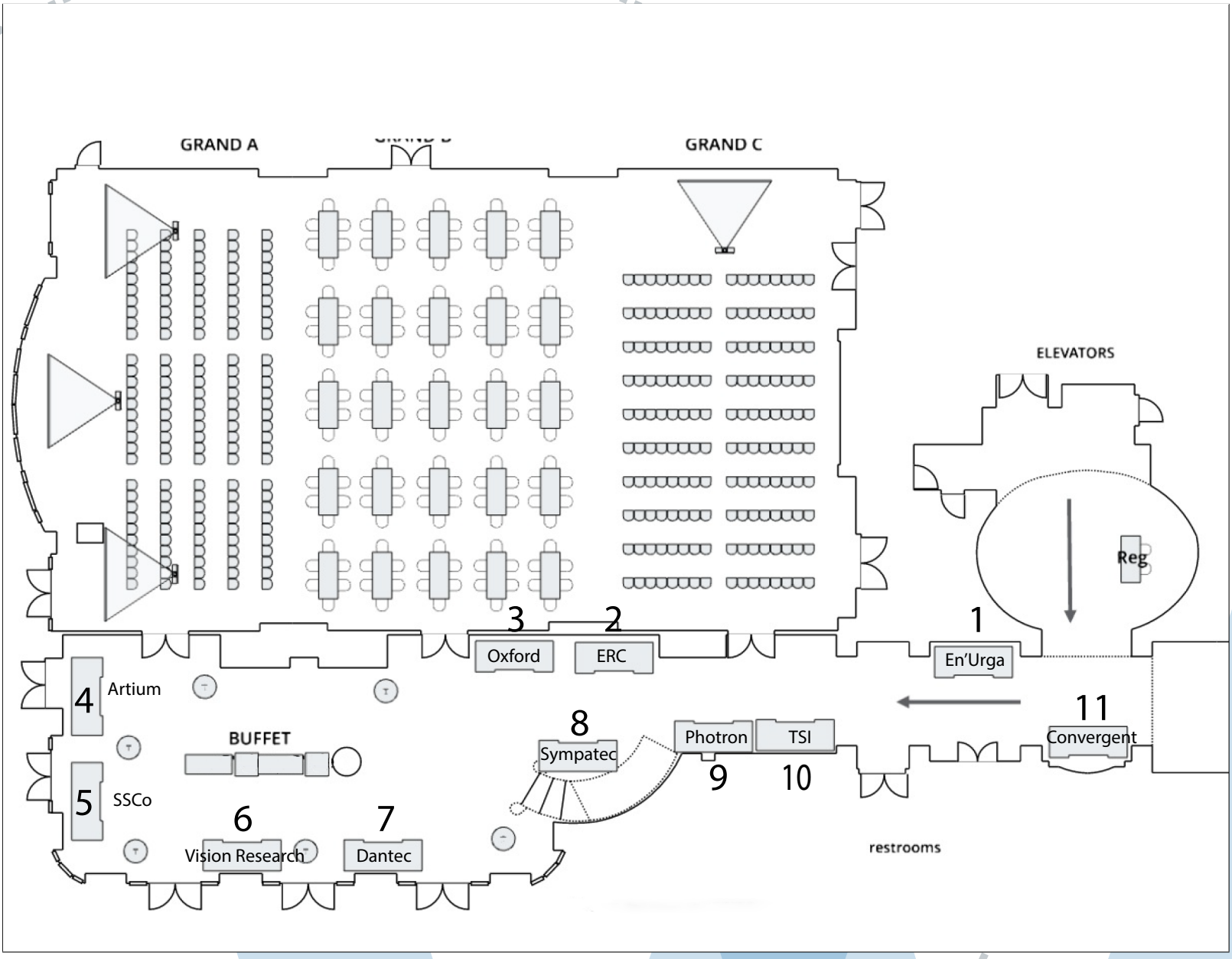
EXHIBITOR INFORMATION

The exhibitors at this year's conference offer an array of diagnostic instrumentation, services, software, and equipment and they look forward to discussions with the conference participants in the exhibitor showcase and break area. Specific details are outlined on the following pages with statements from each exhibitor.

The exhibitors at this year's conference are:

1	En'Urga	12
2	Energy Research Consultants (ERC)	13
3	Oxford Lasers	14
4	Artium Technologies	15
5	Spraying Systems Co.	16
6	Vision Research	17
7	Dantec Dynamics	18
8	Sympatec	N/A
9	Photron	19
10	TSI	20
11	Convergent Science	N/A

EXHIBITOR MAP



En'Urga Inc.

En'Urga Inc. is the industry leader in customized optical diagnostic equipment for the most challenging factory floor application. En'Urga Inc. has over 25 years of experience in optical diagnostics research, serving many Fortune 50 companies and Federal Government agencies. Our expertise in emission and absorption tomography in hostile environments enables the measurement and control of varied processes in a wide array of industries. We specialize in the research, design, development, calibration, and installation of instruments suitable for the measurement of temperatures, gas concentrations, emissivity, and particulate (liquid and powder) characteristics.

En'Urga Inc. has several products in its portfolio. The **SETscan** optical patternator obtains the distribution of droplets in sprays or particles in particulate-laden flows at a frequency of 10,000 Hz. The optical patternator is used for 100% quality audit of nozzles in a wide variety of industries ranging from aerospace to consumer products. Unlike laser sheet imaging patternators, the **SETscan** optical patternator provides quantitative information on various aspects of the spray such as spray angles, plume angles, % split in plumes, deviation, pitch, roll, and yaw angles. The **SETscan** patternator also provides the planar drop surface area density, the most useful quantity for ranking the performance of injectors for combustion and nozzles for spray drying. Custom units at 200 kHz are also available for studying transient sprays.

The **SPIvel v**elocimeter provides full planar axial and radial velocities from high-speed images obtained with any of the commercially available high-speed cameras.

The **PODscan** tomography system provides the tomographic mapping of drop sizes in sprays. In combination with the SPIvel velocimeter, the **PODscan** system can provide spatially resolved mass flux in spray in a matter of seconds.

All of En'Urga products can be leased or purchased from En'Urga Inc. En'Urga Inc. provides testing and consulting services for combustors, spray nozzles, heat sinks, and other engine-related components. We specialize in characterizing sprays (drop sizes, spray patterns, drop surface areas, velocities, mass fluxes, etc.) in ambient as well as high-pressure conditions. En'Urga Inc. has developed standardized test protocols for GDI injectors, urea dosers, consumer sprays, and paint sprays. These standardized test protocols ensure that the quality of the nozzle that is used in these applications conforms to the highest standards possible. At En'Urga Inc., customer service and innovation are our primary goals.

Contact info: 1201 Cumberland Avenue, Suite R, West Lafayette, IN 47906
Ph. (765) 497-3269; Email: info@enurga.com

Energy Research Consultants (ERC) was founded in 1990 to address a demand for application of state-of-the-art experimental and numerical modeling tools to problems associated with transportation, propulsion, and energy generation and use. Projects which require fast and confidential answers via advanced research tools which are not otherwise readily available are conducted by experienced personnel using a fully equipped research laboratory. Both experimental and numerical studies are conducted for clients that are addressing mission oriented, time critical projects. In addition, customer on-site work can be accommodated.

ERC has extensive experience with a wide variety of fluid dynamic, combustion, and spray system applications. In particular, ERC maintains expertise in the characterization of non-reacting and reacting flows such as those found in automotive combustion chambers and exhaust after-treatment systems, as well as those found in spray and gas fired gas turbine combustion systems and industrial processes. The expertise ranges from the basic science of liquid injection and sprays associated with a wide array of applications to study of complex practical configurations for atomization and spray formation, fuel/air mixing and combustion, swirl generation, and associated pollutant formation and operability performance and control.

Specialized measurement services are offered to both commercial and government clients. Available spray diagnostics include Phase Doppler Interferometry, Laser Diffraction, Planar Liquid Laser Induced Fluorescence (PLIF with continuous and pulsed lasers with intensified CCD cameras), planar and global OH* LIF, optical patternation, particle image velocity, tunable diode laser spectroscopy, liquid film thickness measurements, and high speed visualization. ERC has extensive experience applying these methods to wide array of customer systems. Other capabilities include CFD modeling, test facility development, and test plan development and execution using statistically designed experimental methods.

In addition to measurement services, ERC has also developed standalone design tools (for example, Advanced Spray Injection Phenomena Simulator--ASIPS; Flame Response Sensitivity Tool—FRST) and image analysis tools (for example, Automated Feature Extraction and Analysis Tool—AFEAT). ERC has also developed other products such as a specialized imaging system for inspection inside high temperature environments and a turn-key reference burner for calibration of laser diagnostics. Gaseous and liquid fired burners are also available.

Contact Information:

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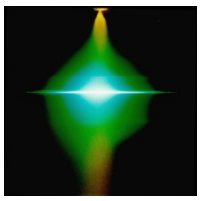
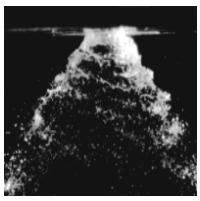
Laguna Hills, CA 92653-1422
Tel: (949) 583-1197 x 101 Fax: (949) 583-1198
Email: Brown@ERC-Ltd.com Website: www.ERC-Ltd.com


Phase Doppler Interferometry


High Speed Video


Reacting Spray Visualization

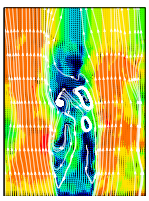
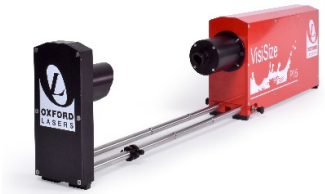

Particle Image Velocimetry

Figure 1 – Sample Data Sets (Many Other Measurements Are Available, Please Inquire).

OXFORD LASERS IMAGING DIVISION



Visi*Size* P15 sizing system

Portable

Class I system

Visi*Size* N60 sizing system

Operate in Extreme Conditions

Fire*FLY laser*

Flexible, Robust

As one of the most successful spin offs from Oxford University in 1977, Today the company operates two divisions. Oxford Lasers have been at the forefront of laser technology for over 40 years.

Today, Oxford Lasers operate two divisions of the business, Imaging and Industrial and have locations in America, France and the UK.

Imaging Division

Oxford Lasers Imaging Division offer **Fire*FLY* & Fire*BIRD*** Short Pulsed Laser systems, Contract Services, System rental, R&D and technical support for: High speed imaging applications with Short Pulsed lasers illumination and software to offer complete imaging solutions.

Oxford Lasers experience within the field of spray characterisation, providing information on droplet size, droplet velocity and droplet shape. The **VisiSize** range: **P15** portable system to the N60 CLASS I lasers safe system, operate in all environments, to provide a range of capability to suit the different measurement challenges present in the field.

Industrial Division

Oxford Lasers Industrial Division offer the full spectrum of fully automated Laser Micro-Machining Tools from Compact Laser Micromachining Tools; perfect for R&D and Pilot Production, through to Ultrafast Laser Micromachining Tools; utilising the highest precision industrial laser technology.

The Industrial Division also offer Subcontract Laser Micromachining Services, capabilities include micro-drilling, milling, patterning, scribing and cutting in a vast array of materials from Metals to Glass and have covered over 10,000 niche applications across a variety of sectors.

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USA
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F: (978)425 4487
E: oxford.inc@oxfordlasers.com

470 Lakeside Drive, Unit C
Sunnyvale, CA 94085

Artium specializes in developing and manufacturing advanced particle characterization instruments for the spray community. We offer a broad range of instruments for measuring sprays, clouds, and aerosol droplets. Our **Phase Doppler Interferometry (PDI)** instruments are based on the light scattering interferometry principle which was **invented and developed by our scientists**. This technology has been developed and evaluated over the past few decades and is acknowledged as the most reliable and accurate means for characterizing spray and aerosol droplet dynamics. Our goal over the past 20 years has been to further refine the method and its implementation to insure greater measurement reliability and accuracy while making the instruments much easier to use. We have now introduced advanced particle imaging systems to allow easy and economic characterization of spray formation and drop size distributions. This method is also used for measuring aircraft icing sprays with mixed phase (liquid and ice) particles as well as large droplets that may be highly deformed. Other applications include spray drying particle characterizations wherein particulate in liquid and solid irregular-shaped particles exist.

System automation (US Patent 7,564,564) has been one of our key goals. We have introduced advanced methods and algorithms **(US Patent 7,788,067)** to minimize the possibility for user setup errors even for the most complex measurement tasks**.** Advanced modern electronics and computers coupled with **software utilizing innovative signal processing algorithms** and validation strategies have resulted in significantly improved instrument performance even under the most difficult measurement conditions.

Our **newly developed flight probes based on the phase Doppler method and multi-beam imaging (patents pending) have been designed for atmospheric cloud monitoring and aircraft icing research.** These instruments are also used for a broad range of spray applications. They have undergone significant testing in the field. Testing at the **U.S. Air Force Eglin Air Force Base McKinley Climatic Laboratory**, General Electric's aircraft engine icing facility, and in the **NASA Glenn Research Center Icing Research Tunnel (IRT)** proved our instruments are capable of making reliable and accurate measurements in these challenging environments.

Under **U.S. Army SBIR Ph II and NASA SBIR Phase I, II and III programs**, we have developed PDI and **High Speed Imaging** (**HSI**) systems for icing research. The probes have been successfully tested on a **UH60 Black Hawk Helicopter** under the U.S. Army's helicopter icing research program. The high speed imaging (HSI) probe characterizes non-spherical particles (deformed droplets, ice crystals, and mixed phase conditions). We have also developed a line of **TurnKey (TK)** systems, an integrated PDI probe suitable for in-spray use. Our instruments are also used for quality control for inkjet printing of large OLED displays. Artium's other products include the **Laser Doppler Velocimeter (LDV)** and **Laser Induced Incandescence (LII)** which is used for measuring soot (black carbon) emission from engine exhaust and in ambient air.

We are proud to announce our new **STTP Award** (2020) with the **US Air Force Test Center** for **Characterization of Simulated Weather and Turbine Exhaust** which will involve extensive use and development of both our **HSI** and **LII** instrumentation.

Contact Information: Dr. William Bachalo, President and CEO
Artium Technologies, Inc.
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Email: info@artium.com
Website www.artium.com

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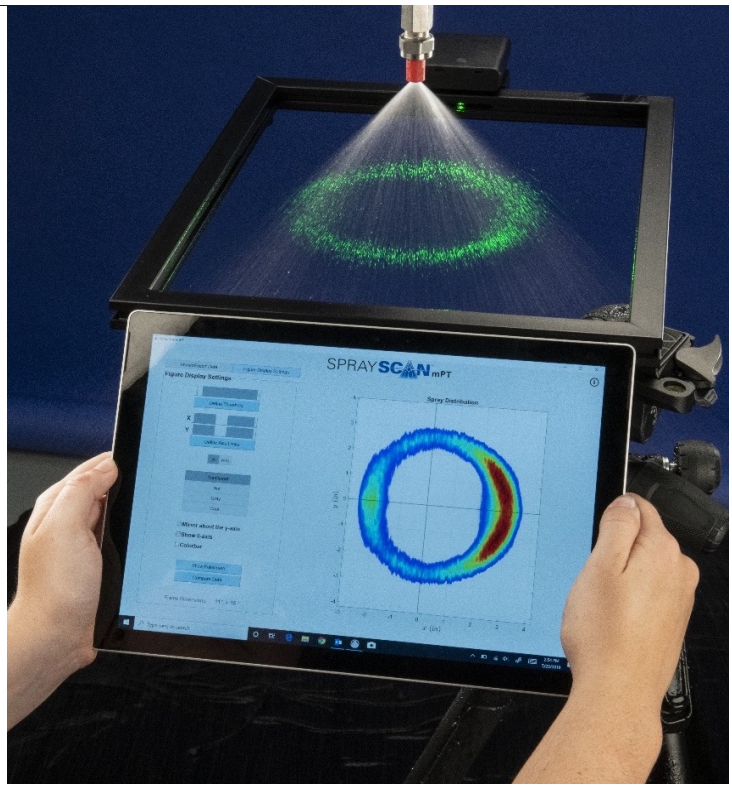

Spray Nozzles

We help our customers do more while spraying less. Our nozzles and systems will help you make your manufacturing processes safer, more sustainable, and more cost effective. As a leading expert in Spray Technology, we serve companies in automotive, aerospace, food, energy, chemical processing, and more.

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Scientists and Engineers in fluid dynamics and solid mechanics rely on measurements to make breakthroughs in applied research, technology development, and quality assurance.

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We deliver turnkey and customized solutions built on high-end laser optics, imaging, and sensor technologies. Our user-friendly software performs advanced data analysis and produces real-time results. Furthermore, we pride ourselves in providing our clients superior technical application support worldwide.

You gain accurate measurement results easily and quickly which help you accelerate the pace of discovery, innovation, quality control or NDT. Our distinct competence and experience in integrating measurement methods and technologies into the right solution for you, is unique.

Partnering with Dantec Dynamics helps you gain crucial knowledge from any test or measurement campaign.

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Photron

HIGH-SPEED CAMERAS FOR SLOW MOTION ANALYSIS

Photron is a worldwide leader in high-speed imaging. Used in internationally renowned research laboratories, industrial test facilities and universities in more than 30 countries, Photron FASTCAM high-speed cameras are trusted to provide high quality results in the challenging high-speed applications found in aerospace, automotive, military, manufacturing, and research environments.

Photron's comprehensive product range and ability to record video at up to 2.1M fps with unmatched light sensitivity make us the first choice of engineers, scientists, technicians, and other camera users around the world. Photron cameras set new standards for resolution, frame rate, and light sensitivity in small, lightweight, and High-G camera bodies.

Wide Range of High-Speed Cameras
Megapixel resolution (1024 x 1024) to 21,000fps
Reduced resolution to 2.1Mfps
4K resolution (4096 x 2304) to 1,250fps
HD resolution (1920 x 1080) to 5,280fps
Exceptional light sensitivity
Internal memory to 128GB
Fast download to PC or SSD
High-G options
Standard 2-year warranty

Typical Applications
Material Testing and Digital Image Correlation (DIC)
Fluidics and Particle Image Velocimetry (PIV)
Combustion
Ballistics & Explosives Testing
Onboard and Offboard Vehicle Testing
Welding and Electrical Testing
Biomechanics and Life Sciences
Microscopy

Knowledge Beyond Measure.

New Phase Doppler Particle Analyzer (PDPA) Systems from TSI®:

Accurately Measure High-Speed Spray for Droplet Size and Velocity

NEW BurstPro™ Software

acquires, analyses and presents your data as per your needs.

- New user interface for easy navigation of the software process from hardware set-up wizard to reports
- Intelligent selection of key parameters to analyze the data correctly and consistently
- Backward compatible with existing FSA 3500 and FSA 4000 signal processor based systems

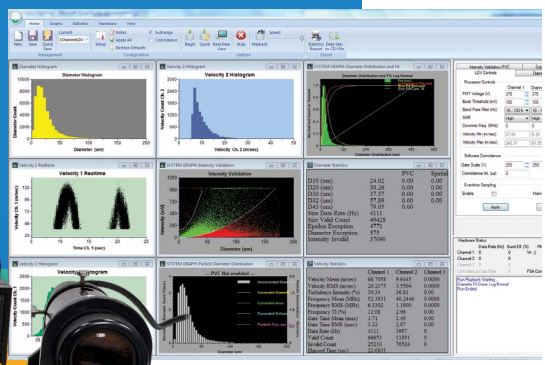
NEW Signal Processors FSA 4800 & FSA 5800

Ideal for high density pulsed spray

- Doppler frequencies up to 235 MHz to accurately measure super/hypersonic velocities
- Data rate up to 300 KHz sustained: getting the energy frequency spectra information from the spray nozzle
- Data rate up to 4 MHz instantaneous for transient events

NEW Integrated Solid-State Laser Solution Itasca

- Pre-aligned laser beams making it easy to couple with transmitting fiber optics probe for PDPA
- High laser power of 1 W for all 3 components, enabling measurement in the most challenging applications
- High laser beam quality to ensure high coupling efficiency and accurate phase information to determine the droplet size



The full system consists of the Itasca laser module as well as TSI fiber optic transmitting and receiving probes, FSA Signal Processor and FSA BurstPro™ - Particle and Flow Analysis software.

Ready for your challenging diagnostics of high density spray or pulsed spray?

Contact TSI® by phone **800-680-1220** / **+1 651-490-2860**, online at **www.tsi.com**, or stop by TSI's booth to learn more...

Detailed Program

Session Start Time			Sunday, May 22nd, 2022
S	5:00 PM	CDT	**Registration Opens** **Welcome Reception at The Edgewater**
S	7:00 PM	CDT	**Focus Session: "Measures to protect against aerosol transmission of viruses: Lessons learned during a pandemic"** **Prof. David Rothamer, UW-Madison** **Prof. Scott Sanders, UW-Madison** *Ballrooms B & C*
S	8:00 PM	CDT	**Meeting Adjourn**

Session Start Time			Monday, May 23rd, 2022	
M	7:00 AM	CDT	**Breakfast with the Exhibitors** *Ballroom A*	
M	8:00 AM	CDT	**Welcome and Opening Remarks** *Ballrooms B & C*	
M	8:15 AM	CDT	**Keynote Lecture - Keith Richards (Convergent Science)** **"A Brief History of Time-Dependent Spray Modeling"** *Ballrooms B & C*	
M	9:15 AM	CDT	**Exhibitor Showcase** *Ballrooms B & C*	
M	10:00 AM	CDT	**Break with the Exhibitors**	
			Advances in Numerical Methods Session Chairs: Noah Van Dam & Ambarish Dahale *Ballroom B*	**Atomization and Spray Simulations I** Session Chairs: Gina Magnotti & Mrugank Bhatt *Ballroom C*
M	10:20 AM	CDT	**35: A Dual Scale Approach to Modeling Sub-Filter Velocities due to Shear-Induced Instabilities** A. Goodrich, M. Herrmann Arizona State University	**22: A tabulated real-fluid model and surface density approach for LES of liquid jets primary atomization** H. Gaballa, C. Habchi, J.-C. de Hemptinne IFP Energies Nouvelles
M	10:40 AM	CDT	**47: Comparing Coupling Kernels for Stochastic Lagrangian-Eulerian Methods** J. Vanegas, N. Van Dam Univ. of Massachusetts Lowell	**27: High-fidelity simulation of a rotary bell atomizer with electrohydrodynamic effects** V. Krisshna, M. Owkes Montana State University
M	11:00 AM	CDT	**59: A Dual-Scale Modeling Approach for Simulating Atomization** D. Kedelty, M. Herrmann Arizona State University	**46: Independent Variation of Gas-to-metal Ratio and Supply Pressure in Close-coupled Gas Atomization: Numerical Exploration** F. Hugolino Hernandez Gaitan, J. Tiarks, I.E. Anderson Ames Laboratory
M	11:20 AM	CDT	**28: Improving residual convergence of steady-state spray simulations** R. Mandhapati, A. Dahale, X. Ge Convergent Science, Inc.	
M	11:40 AM	CDT	**Lunch** *Ballroom A*	**Atomization and Sprays Editorial Board Meeting** *Sky Bar Lounge*

			Alternative and Biofuels Session Chairs: Le Zhao & Meghnaa Paresh Dhanji *Ballroom B*	**Atomization and Spray Simulations II** Session Chairs: Mark Owkes & Lakshman Anumolu *Ballroom C*
M	**12:40 PM**	**CDT**	**60: Direct numerical simulation of e-fuel injection at relevant heavy-duty engine condition** A. Ceschin, F. E. Hernández Pérez, M. Battistoni, H. Jasak, H. G. Im King Abdullah University of Science and Technology, University of Perugia, University of Zagreb	**9: Secondary atomization of thin liquid sheets at varying Reynolds Numbers** D. Newton, G.G. Agbaglah Wayne State University
M	**1:00 PM**	**CDT**	**23: Real-fluid effects of primary methanol fuel on dual-fuel injection and mixing** H. Gaballa, C. Habchi, J.-C. de Hemptinne IFP Energies Nouvelles	**26: Efficient Extraction and Analysis of Atomization Statistics from High-Fidelity Simulations** B. Christensen, M. Owkes Montana State University
M	**1:20 PM**	**CDT**	**17: Comparative study of the transient spray characteristics of n-dodecane and OME using Large Eddy Simulation** M. Allehaibi, X. Liu, M. Benhouidi, H.G. Im Umm Al Qura University, King Abdullah University of Science and Technology	**31: Study of large scale modes in the break-up of 2D planar jets** M. Ananth, M.F. Trujillo University of Wisconsin-Madison
M	**1:40 PM**	**CDT**	**45: Thermally-induced secondary atomization of biofuel droplets** P. Guida, C. Canciani, A. Ceschin, H.G. Im, W.L. Roberts King Abdullah University of Science and Technology	**34: Volume-of-Fluid Lagrangian-Eulerian model for spray simulations** C.-W. Kuo, M.F. Trujillo University of Wisconsin-Madison
M	**2:00 PM**	**CDT**	**Technical Committee Meeting** ***Spray Measurements,*** *Ballroom B* ***Diesel & Automotive,*** *Ballroom C* ***Aerospace Propulsion,*** *Sky Bar Lounge*	
M	**2:50 PM**	**CDT**	**Break with the Exhibitors**	
			Spray Modeling Session Chairs: Marco Arienti & Maathangi Ganesh *Ballroom B*	**Droplet Phenomena and Spray-Wall Interactions** Session Chairs: Lyle Pickett & Kyle Bade *Ballroom C*
M	**3:10 PM**	**CDT**	**56: Examining the Underlying Equations of Two-Phase Flow** M.F. Trujillo University of Wisconsin-Madison	**37: Examining the dynamic Leidenfrost point of binary mixtures and F-24 jet fuel** R. Werner, J. Michael Iowa State University

M	**3:30 PM**	**CDT**	**55: Dynamic estimation of turbulence time scale factor for Sigma-Y model (ELSA)** C.R.L. Anumolu, A. Dahale, M. Ganesh Convergent Science, Inc.	**83: Implementation of a drop-wall interaction model considering high ambient pressure for engine simulations** S. Ahamed, Y. Cho, S.-C. Kong Texas Tech University, Iowa State University
M	**3:50 PM**	**CDT**	**50: An improved dispersion model for LES of highly dispersed spray jet** L. Angelilli, P.P. Ciottoli, F. Hernandez Perez, M. Valorani, H.G. Im King Abdullah University of Science and Technology, Sapienza University of Rome	**77: A Study of Thermal Characteristics and Fuel Film Evaporation of Fuel Sprays Impinging on a Surface** M. Dhanji, L. White, T. Nguyen, L. Pickett, J. Manin Sandia National Laboratories
M	**4:10 PM**	**CDT**	**20: A machine learning-assisted variable cone injector model to couple the simulation of internal nozzle flow with spray simulations** R. Mishra, P. Jangle, D. Jarrahbashi Texas A&M University	**12: Experimental study of water-in-oil droplet micro-explosion using LIF measurements: effect of radiative heating configuration** T. Naudin, D. Tarlet, P. Massoli, J. Bellettre Nantes University, CNR STEMS
M	**4:30 PM**	**CDT**	**76: Detailed evaporation modelling for gasoline direct injection: iso-octane vs. E30** M. Arienti, E. Wenzel Sandia National Laboratories	**48: Spray Impact Measurement Using Phase Doppler Interferometry** L.D. Marshall, K.M. Bade, R.J. Schick Spraying Systems Co.
M	**4:50 PM**	**CDT**	**Meeting Adjourn**	

Session Start Time			Tuesday, May 24th, 2022	
T	7:00 AM	CDT	**Breakfast with the Exhibitors** *Ballroom A*	
T	8:00 AM	CDT	**Opening Remarks** *Ballrooms B & C*	
T	8:15 AM	CDT	**Keynote Lecture - Prof. Terry Meyer (Purdue University)** **"Towards 4D Measurements in Complex Multiphase Flows"** *Ballrooms B & C*	
T	9:15 AM	CDT	**Break with the Exhibitors**	
			Spray Applications - Automotive I Session Chairs: Chi Young Moon & Ron Grover *Ballroom B*	**Spray Applications - Biomedical and Viral Transport I** Session Chairs: Olivier Desjardins & Kaushik Nonavinakere Vinod *Ballroom C*
T	9:30 AM	CDT	**7: Numerical simulations of stratification and charge cooling effects on a GDCI engine** H. Ge, S. Parameswaran, P. Zhao Texas Tech University, University of Tennessee	**81: Stem Cell Sprayer for Lung Bioengineering** A. Naqwi, T. Wiedmann, K. Pacello, S. Skolasinski, L. Nguyen, A. Ojha, C. Hogan, A. Panoskaltsis-Mortari University of St. Thomas, MN University of Minnesota, Twin-Cities
T	9:50 AM	CDT	**78: A Comparison of Thermal Management Simulations of End Ring Oil Cooling with Experimental Measurements from an Optically Accessible Electric Motor** R. Grover, C. Idicheria, X. Yang, S. Parrish, L. Nocivelli, K. Asztalos, S. Som, Y. Li, N. Attal, O. Avanessian, J. Van Gilder, C. Burns General Motors, Argonne National Laboratory, Convergent Science, Inc.	**65: Single Droplet Impact Testing of Common Cloth Face Covering fabrics to Study Filtration Performance** K. Nonavinakere Vinod, D. Kiryaman, E. DenHartog, T. Fang North Carolina State University
T	10:10 AM	CDT	**79: Confidence interval analysis of urea water solution spray measurement data from Phase Doppler Anemometry using numerical validations from a commercial CFD code** D. Khan, J. H. Bjernemose, I. Lund University of Southern Denmark	**66: A multi-scale computational model of droplet formation and dispersion during coughing** J. Giliberto, O. Desjardins Cornell University
T	10:30 AM	CDT	**Break with the Exhibitors**	

			Spray Applications - Automotive II Session Chairs: Chris Powell & Rohit Mishra *Ballroom B*	Spray Applications - Biomedical and Viral Transport II Session Chairs: Haiwen Ge & Gina Magnotti *Ballroom C*
T	10:50 AM	CDT	**32: Effect of Split Injection on Diesel Spray Droplet Size and Velocity Distributions - Periphery Region Results-** Q. Wu, Y. Jin, K. Nishida, Y. Ogata Hiroshima University	**4: Large-eddy simulation of face shield effects on an emitter during a cough process** H. Ge, P. Zhao, S. Parameswaran, Y. Feng, X. Cui Texas Tech University, University of Tennessee, Huazhong University of Science and Technology
T	11:10 AM	CDT	**43: Evaluations of Spray/Combustion Characteristics and Fuel Effect with ECN Single-hole Diesel Injectors** L. Zhao, Y. Pei, Y. Zhang, M. Ameen Aramco Americas: Aramco Research Center - Detroit Argonne National Laboratory	**5: Large-eddy simulation of a two-phase cough jet** H. Ge, P. Zhao, S. Parameswaran, Y. Feng, X. Cui Texas Tech University, University of Tennessee, Huazhong University of Science and Technology
T	11:30 AM	CDT	**82: Experimental and Computational Study of Evaporation and Mixture Formation Processes of Diesel Spray - Comparison between Single-Hole and Multi-Hole** Safiullah, K. Nishida, V. McDonell, S.C. Ray, Y. Ogata University of California, Irvine, Hiroshima University	**11: Investigation on Cooling Performance and Light Attenuation Characteristics during Transient Cryogen Spray in Laser Treatment of Ota's Nevus** J. Tian, B. Chen, J. Wang Jiangsu University, Xi'an Jiaotong University
T	11:50 AM	CDT	**Lunch / ILASS-Americas Annual Business Meeting** *Ballroom A*	
T	12:50 PM	CDT	**Technical Committee Meetings** ***Physics of Atomization,*** *Ballroom B* ***Computation & Modeling,*** *Ballroom C* ***Industrial & Agricultural Sprays,*** *Sky Bar Lounge*	
T	1:40 PM	CDT	**Break with Exhibitors**	
T	2:10 PM	CDT	**Board Buses for Lab Tour**	
T	2:30 PM	CDT	**UW Madison Lab Tour**	
T	5:00 PM	CDT	**Buses Return to Edgewater**	
T	6:15 PM	CDT	**Begin Walk to The Overture**	
T	6:30 PM	CDT	**Banquet and Awards Ceremony at The Overture**	
T	9:30 PM	CDT	**Banquet Ends**	

Session Start Time			Wednesday, May 25th, 2022	
W	7:00 AM	CDT	**Breakfast with the Exhibitors** *Ballroom A*	
W	8:00 AM	CDT	**Opening Remarks** *Ballrooms B & C*	
			Spray Applications - Aerospace I Session Chairs: Vince McDonell & Safiullah *Ballroom B*	**X-ray Diagnostics** Session Chairs: Alison Hoxie & Brandon Sforzo *Ballroom C*
W	8:20 AM	CDT	**15: A Computational Protocol for Simulations of Spray Flows: Air-Assist Injectors** B. Greenlee, J.E. Park, T.-W. Lee, H. Bellerova, M. Raudensky Arizona State University, Brno University of Technology	**67: Visualization of Internal Flow Dynamics in Counterflow Atomizers Using X-Ray Diagnostics and Laser Shadowgraphy** A. Hoxie, V. Srinivasan, A. Kastengren University of Minnesota, Duluth, Argonne National Laboratory
W	8:40 AM	CDT	**52: Multi-dimensional Detonations in Jet Fuel Sprays with Complex Chemistry** S.S. Dammati, Y. Kozak, A. Poludnenko Texas A&M University, Tel-Aviv University, University of Connecticut	**68: Near-nozzle Density of Pressure-swirl Atomizing Sprays in a Crossflow using Time-resolved X-ray Radiography** C.Y. Moon, Q. Peng, B. Sforzo, A. Kastengren, C. Powell Argonne National Laboratory
W	9:00 AM	CDT	**19: Optimum Length of Liquid-Air-Mixing Port in Twin Fluid Atomizer** W. Xing, K. Sato, K. Nishida, Y. Ogata, K. Hashiguchi University of Hiroshima, Mitsubishi Heavy Industries, Ltd.	**73: Simultaneous temperature and mixture fraction measurements of water/ethanol sprays through X-ray scattering** N. Rahman, T. Meyer, A. Kastengren Purdue University, Argonne National Laboratory
W	9:20 AM	CDT	**21: Evaluating Ignition-Assisted Combustion for High-Altitude Operation using Computational Fluid Dynamics** H. Sapra, R. Hessel, E. Amezcua, D. Rothamer, K. Kim, M. Kweon, S. Kokjohn University of Wisconsin-Madison, Army Research Laboratory	**14: White Beam Visualization of an Airblast Atomizer Under Various Ambient Pressures** T. Dahlstrom, T. Morgan, A. Kastengren, T. Heindel Iowa State University, Argonne National Laboratory
W	9:40 AM	CDT	**Break with the Exhibitors**	

			Spray Applications - Aerospace II Session Chairs: Terry Meyer & Kuo-Cheng Lin *Ballroom B*	**Trans/Supercritical Environments** Session Chairs: Hongyuan Zhang & Jordi Poblador Ibanez *Ballroom C*
W	**10:00 AM**	**CDT**	**61: A complete characterization of the Eulerian Multiphase Flow Modeling of Liquid Atomization in supersonic crossflow injection** R. Wang, J. Braun, G. Paniagua, T. Meyer, F. Falempin, T. Andre Purdue University, MDBA	**13: Investigation of transcritical shock-droplet interaction using vapor-liquid equilibrium (VLE)-based CFD simulation** H. Zhang, S. Yang University of Minnesota
W	**10:20 AM**	**CDT**	**18: Atomization of Liquid Film from an Airfoil in a High Speed Flow** B. Esquivas, B. Hickey, V. McDonell University of California, Irvine	**39: Temporal liquid decane jet flow through oxygen at transcritical conditions** J. Poblador Ibanez, W. Sirignano University of California Irvine
W	**10:40 AM**	**CDT**	**63: High-fidelity multi-scale simulation of air-blast atomization with drop size comparison against experiments** L. Vu, N. Machicoane, O. Desjardins Cornell University	**40: Vortex dynamics in the early deformation of a transcritical liquid jet** J. Poblador Ibanez, W. Sirignano, F. Hussain University of California Irvine, Texas Tech University
W	**11:00 AM**	**CDT**	**Boxed Lunch / Exhibitor Passport Drawing / Meeting Adjourn**	

Monday Keynote

"A Brief History of Time-Dependent Spray Modeling"

Keith Richards

Co-Owner and Vice President
Convergent Science

Tuesday Keynote

"Towards 4D Measurements in Complex Multiphase Flows"

Prof. Terry Meyer

School of Mechanical Engineering
Advanced Diagnostics and Propulsion Research Laboratory
Purdue University

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   Haiwen Ge, Peng Zhao, Siva Parameswaran, Yaning Feng, Xinguang Cui

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7. Numerical simulations of stratification and charge cooling effects on a GDCI engine
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9. Secondary atomization of thin liquid sheets at varying Reynolds Numbers
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11. Investigation on Cooling Performance and Light Attenuation Characteristics during Transient Cryogen Spray in Laser Treatment of Otaâ€™s Nevus
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14. White Beam Visualization of an Airblast Atomizer Under Various Ambient Pressures
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15. A Computational Protocol for Simulation of Spray Flows: Air-Assist Injectors
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17. Comparative study of the transient spray characteristics of n-dodecane and OME using Large Eddy Simulation
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18. Atomization of Liquid Film from an Airfoil in a High Speed Flow
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19. Optimum Length of Liquid-Air-Mixing Port in Twin Fluid Atomizer
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23. Real-fluid effects of primary methanol fuel on dual-fuel injection and mixing
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