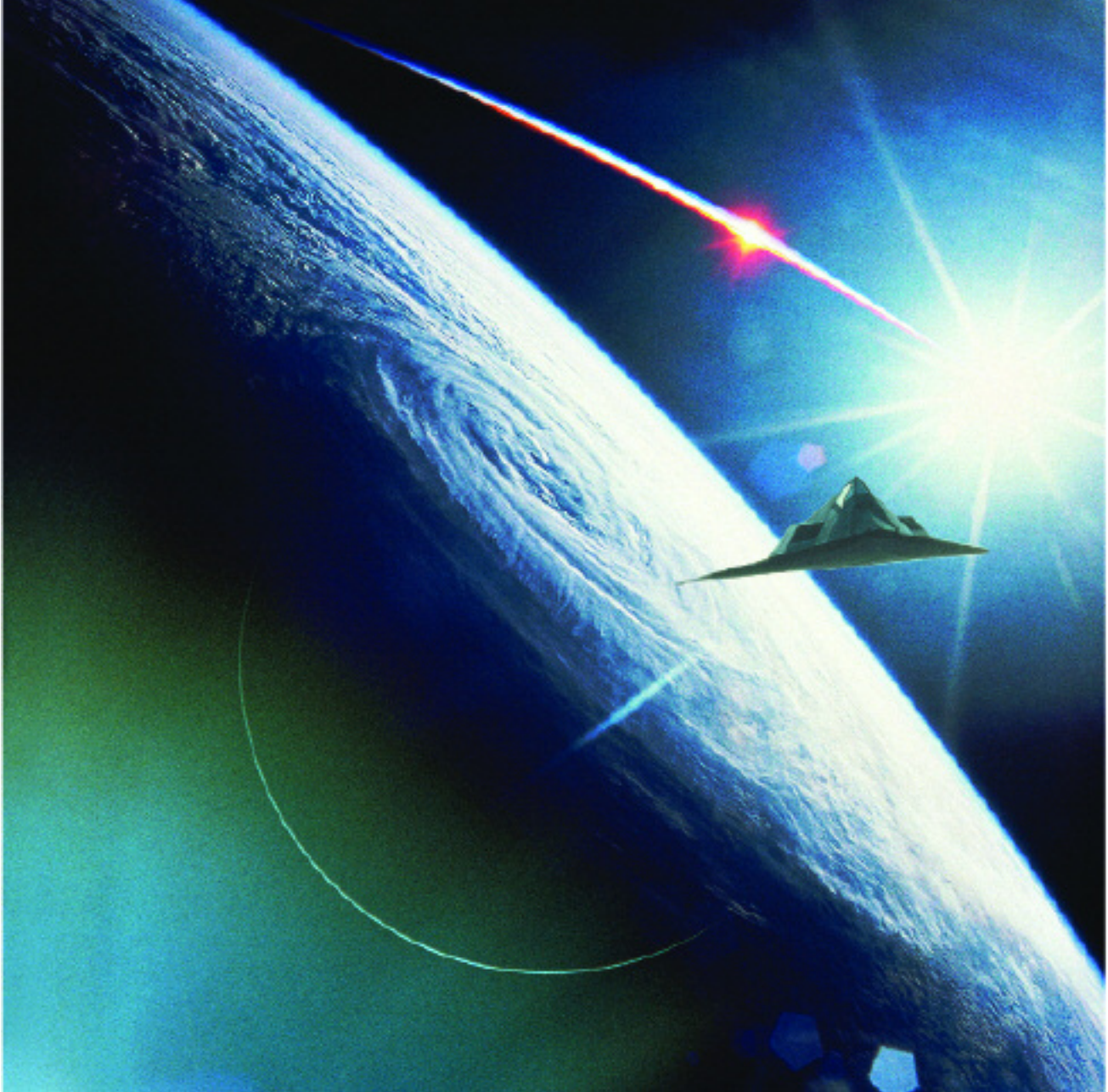


Welding in Aircraft and Aerospace Conference



September 19-20, 2006
Dayton, Ohio

Don't be left up in the air. Ground yourself in knowledge of the latest research findings and practical applications of welding in aircraft and aerospace environments. Join an outstanding team of experts from academia and industry to explore the state of the art in aircraft and space technology. This conference is a compelling opportunity for airframe designers, suppliers, researchers, educators, and administrators involved in aircraft procurement and construction.

TUESDAY, SEPTEMBER 19

CONTINENTAL BREAKFAST 7:30 AM – 8:30 AM

WELCOME 8:30 AM – 8:45 AM

Robert Irving, Conference Chair;
Karl Graff, Conference Co-Chair

1. AN UPDATE ON THE ECLIPSE 500 AIRCRAFT

8:45 AM – 9:25 AM

Brent Christner, Manager, M&P Engineering, Eclipse Aviation, Albuquerque, NM

The Eclipse 500 is the first aircraft to be largely assembled using friction stir welding technology. There are now five of these aircraft flying, with 1,000 flight hours. Testing of the static test article was completed. All of the welds exceeded expectation. This presentation will summarize the progress made on the Eclipse 500 program including the status of aircraft assembly, process and material property development, and aircraft certification.

2. ADDITIVE MANUFACTURING FOR AEROSPACE APPLICATIONS

9:25 AM – 10:05 AM

Mary E. Kinsella, PhD, Senior Materials Research Engineer, Materials and Manufacturing Directorate, Air Force Research Laboratory, Wright Patterson AFB, OH

Several additive manufacturing processes have emerged from the rapid prototyping arena and are under development for various potential applications, including aerospace systems. The metal additive processes have many similarities to welding processes. This presentation will overview some of these processes, with some examples related to projects within the Air Force Research Lab.

MORNING BREAK 10:05 AM – 10:25 AM

3. ADDITIVE MANUFACTURE AND WELDING DEVELOPMENTS AT SOUTHERN METHODIST UNIVERSITY

10:25 AM – 11:05 AM

Dr. Radovan Kovacevic - Director, Research Center for Advanced Manufacturing, Southern Methodist University, Richardson, TX

With support from such companies as Lockheed Martin, Rolls-Royce Allison, and Vought Aircraft, the Research Center for Advanced Manufacturing at Southern Methodist University has developed numerous additive manufacture and welding technologies of interest to the aircraft and aerospace industries. A key development in additive manufacture is the center's highly sophisticated Multi-Fab system, which has already won an award from NASA. Work is also under way using such processes as laser beam welding, friction stir welding, gas tungsten arc welding, and the plasma arc welding processes.

4. ULTRASONIC WELDING OF ALUMINUM AND OTHER AEROSPACE ALLOYS

11:05 AM – 11:50 AM

Karl Graff, Senior Engineer, Edison Welding Institute, Columbus, OH

The use of ultrasonic metal welding for copper electrical connections and joining thin foils is well known. Due to the solid-state nature of the ultrasonic bond, there is strong interest in extending the process to structural components in the aerospace and automotive industries, where the high thermal conductivity of some alloys can make joining by other methods difficult. Based on favorable results in joining lower-strength light alloys, work is in progress to extend the ultrasonic metal welding process to high-strength aluminums and other aerospace alloys.

LUNCH (PROVIDED) Noon – 1:00 PM

5. FRICTION STIR SPOT WELDING

1:00 PM – 1:40 PM

William J. Arbegast, Director, Advanced Materials Processing and Joining Laboratory, South Dakota School of Mines and Technology, Rapid City, SD

Friction stir spot welding (FSSW) is finding increased application as a fusion weld and rivet replacement technology in the aircraft and aerospace industries. It promises to increase product performance at reduced cost. This presentation will offer an overview of the state of the art in this solid-state technology, and the potential for its infusion into the welding and joining market.

6. HOW THE EFFECTS OF ALTERNATING SHIELDING GASES IN ARC WELDING IMPROVE WELD QUALITY AND PRODUCTIVITY

1:40 PM – 2:20 PM

Young H. Chang, Vice President, Bushitrol Corp., Alamo, CA

The presentation will review changes in arc characteristics and changes in weld pool behavior as shield gas alternates. It will review how the arc characteristics change and how the change in weld pool behavior takes place. Change in weld pool behavior causes stir action in the weld pool and what impact the stir action has on weld quality.

AFTERNOON BREAK 2:20 PM – 2:40 PM

7. FREE FORM DEPOSITION OF Ti-6Al-4V

2:40 PM – 3:20 PM

Dr. Kevin T. Slattery, Senior Principal Engineer, Boeing - Phantom Works, St. Louis, MO

Because of its ability to make complex shapes with minimal tooling or die costs, free-form deposition of Ti-6Al-4V is of great interest to the aerospace industry. A range of scale and a variety of energy sources, including laser, electron beam, and arc, are being investigated. This paper will compare the processes, their mechanical properties, and microstructures.

8. FRICTION STIR WELDING AND PROCESSING AT THE NATIONAL INSTITUTE FOR AVIATION RESEARCH

3:20 PM – 4:00 PM

Dr. Dwight Burford, Senior Research Scientist, Director, Advanced Joining Lab, National Institute for Aviation Research, Wichita State University, Wichita, KS

The Advanced Joining Lab (AJL) of the National Institute for Aviation Research at the Wichita State University actively conducts friction stir welding/processing research and development in support of the aviation industry. The 4000-square-foot lab facility is equipped with an MTS ISTIR PDS machine with five axes of motion and force control and has a work envelope of 120-inches x 25-inches x 40-inches. The AJL has recently joined forces with the Center for Friction Stir Processing (CFSP), an Industry/University Cooperative Research Center established by the National Science Foundation in 2004. Five universities and over 20 industry members collaborate in the CFSP on pre-competitive FSP research and development projects completed by graduate students. To ensure that the work is relevant to industry, all work is reviewed and coordinated with the center's Industrial Advisory Board.

WEDNESDAY, SEPTEMBER 20

CONTINENTAL BREAKFAST 8:00 AM – 9:00 AM

9. FIBER LASER WELDING

9:00 AM – 9:40 AM

Dr. Harald Kohn, Head of Dept. Industrial Applications, BIAS Bremer Institut für angewandte Strahltechnik GmbH, Bremen, Germany

The fiber laser is attracting widespread attention throughout this country and much of the rest of the world as competition for the high-powered CO₂ and YAG lasers. It has already been put to use in shipyards. In the automotive industry, the welding of car bodies seems feasible. More recently, the aerospace and aircraft industries have displayed interest in the technology. This presentation will describe the technology and discuss potential applications for the process in aircraft and aerospace.

10. THE LENS SYSTEM FOR ADDITIVE MANUFACTURE

9:40 AM – 10:20 AM

Robert P. Mudge, President, RPM & Associates, Inc., Rapid City, SD

At this site a high-power fiber laser is used for additive manufacture and repair of aerospace products which are made from titanium and nickel-base superalloys. The process is known as laser engineered net shaping or the LENS process. The basic process has been around for 20 years or so, but only recently has it been used to manufacture much larger parts than during its early days.

MORNING BREAK 10:20 AM – 10:35 AM

11. THE WELDING AND ADDITIVE MANUFACTURING RESEARCH CAPABILITIES OF CANADA'S INSTITUTE FOR AEROSPACE RESEARCH

10:35 AM – 11:15 AM

Dr. Mohammad Jahazi, Manager, Operations, Forming and Joining of Metallic Products, Institute for Aerospace Research, 5145 Decelles Ave., Montreal, QC

No one research organization has so much welding and additive manufacturing technologies in place as does the Institute for Aerospace Research in Montreal. Included are friction stir welding, linear friction welding, laser welding, electron beam welding, as well as various means of applying additive manufacture to a number of metals systems. The institute is working with numerous companies throughout Canada and the United States.

12. HYBRID LASER+GMA WELDING OF TITANIUM

11:15 AM – 11:55 AM

Paul Denney, Technology Leader for Lasers, Edison Welding Institute, Columbus, OH

Fabricated titanium structural components are a possible trend in aerospace applications to reduce weight, cost, and maintenance. However there are a number of obstacles. Electron beam is possible but not practical because of the size of the vacuum required. GTA welding is a common welding process for titanium alloys but for the thickness of materials the heat input results in too much distortion. GMA welding decreases the heat but the process is not stable and leaves an unacceptable weld bead. The technological marriage of two distinctly different welding processes - laser beam welding and gas metal arc welding - has resulted in many successful applications in shipbuilding as well as some in the automotive industry. The resultant hybrid process (laser+GMA) has been found to stabilize the arc and produce welds in titanium. The process looks very promising for a number of aerospace applications.

LUNCH (PROVIDED)

Noon – 1:00 PM

13. STRATEGIC PLANNING FOR SUCCESSFUL NEW MANUFACTURING TECHNOLOGY IMPLEMENTATION

1:00 PM – 1:40 PM

Dave Reynolds, Consultant, Edina, MN

In order to be able to use much of the cost effective new techniques and systems that are being worked on these days, the aircraft and aerospace industries are badly in need of well informed individuals on the inside who can introduce the technologies to the right people. Some companies are already addressing this problem, but most are not even aware that such a problem exists. This presentation will provide suggestions for companies to follow. Any weak link in the technological chain of command can kill a prospective process. A coherent strategy is needed. There is a need to identify the stakeholders; to assess the market and business case; and to manage the program so it will hit your window of opportunity. A coherent strategy will be presented, one that will include a roadmap/checklist using laser-assisted manufacturing plus some other processes as case studies.

14. WELDING OF SUPERALLOYS FOR AEROSPACE APPLICATIONS

1:40 PM – 2:20 PM

Donald J. Tillack, Tillack Metallurgical Consulting, Inc., Catlettsburg, KY

Superalloys comprise a majority of the weight of the modern aerogas turbine engine, with the largest percentage of that total being Alloy 718. The great success of this, and similar superalloys, is due to their high strength at elevated temperature and their ability to be fabricated or cast into complex shapes. This talk summarizes the essential points that lead to successful welding of these alloys.

AFTERNOON BREAK

2:20 PM – 2:40 PM

5. ADVANCED FUSION BASED JOINING PROCESSES

2:40 PM – 3:20 PM

Israel Stol, Senior Manufacturing Specialist, Joining and Assembly, Aluminum Company of America, Alcoa Center, PA; Dr. Richard P. Martukanitz, Applied Research Laboratory, Pennsylvania State University (ARL Penn State); and Kyle L. Williams, Senior Welding Technologist, Aluminum Company of America, Alcoa Center, PA

This presentation will describe two new patented welding processes, both of which appear to be especially useful for the welding of aluminum. The processes are known as the laser stir welding process and the gas metal buried arc welding of lap-penetration joints. This talk will present the principles of both processes, results from the investigations that demonstrate their feasibility and examples where these processes can be used in industry.

16. ELECTRON BEAM WELDING ON THE F-22 FIGHTER PLANE

3:20 PM – 4:00 PM

James K. McClafflin, Welded Side of Body Project Manager, Boeing Integrated Defense Systems, Renton, WA

This presentation will cover Boeing's F/A-22 experience with welded aircraft structure from a designer's viewpoint. Boeing has successfully used electron beam welding for the assembly of major portions of fracture critical structure. Gas tungsten arc welding was used extensively for the repair of detail and test hardware.

For questions, call 1-800-443-9353 ext 224

(305-443-9353 outside of N. America)

CONFERENCE REGISTRATION FEES

CONFERENCE CODE: COAAC

AWS members: \$550

Nonmembers: \$680

Each nonmember attendee will receive a two-year complimentary membership in AWS. Registration includes all conference sessions, two continental breakfasts, two lunches, and refreshment breaks. The registration fee does not include hotel accommodations. Hotel accommodations are subject to hotel regulations and are the responsibility of the attendee.

LOCATION AND ACCOMMODATIONS

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Take advantage of the specially negotiated rate of \$100 for single and double occupancy. This special rate is also extended to you three days before the conference and three days after the conference (depending on hotel availability). Be sure to mention the *American Welding Society*. The deadline for reservations at this special price is August 21, 2006. Each reservation must be guaranteed with a major credit card. Any room reservation cancelled via the website can be done 24 hours in advance. Any other reservations must be cancelled by 4:00 PM MST on the date of arrival and must be done directly with the hotel. Valet parking is \$8 per vehicle per day, unlimited access.

ACCOMMODATIONS FOR THE DISABLED

Pursuant to the Americans with Disabilities Act (ADA), AWS and the Doubletree Dayton – Downtown strive to ensure accessibility for all their guests. Please inform the hotel when you make your reservations, and also contact the AWS Conferences & Seminars Business Unit at 800-443-9353, ext. 224.

GUARANTEE

AWS guarantees that you will leave the conference a satisfied customer. If for any reason you are not satisfied, please send a letter as soon as possible to John Ospina, AWS Conferences and Seminars, 550 NW LeJeune Road, Miami, FL 33126.

UPCOMING AWS CONFERENCES & SEMINARS

The following are among the AWS conferences and seminars to be held at the 2006 Fabtech Int'l. & AWS Welding Show in Atlanta. For detailed descriptions, see www.aws.org/conferences.

AA/AWS Aluminum Welding Conference

October 30-31, 2006
Aluminum lends itself to a wide variety of industrial applications, but because its chemical and physical properties set it apart from the other metals, welding of aluminum requires special processes, techniques and expertise. At this conference, a distinguished panel of aluminum-industry experts will survey the state of the art in aluminum welding technology and practice.

Pricing and Profitability – Controlling the Costs of Welding

October 30, 2006
Learn how to compare costs associated with use of different weld joint geometries, processes, and filler metal combinations; application of code and standards documents when generating an estimate; how to document welding variables and the costs associated with them; and how economic order lot quantities affect the weld estimate.

Welding New Materials for the Automotive Industry Conference

October 31, 2006
How do you weld the avalanche of new materials targeted for use in tomorrow's automobiles? The lighter weight steels have moved up several notches in strength. Engineers are looking at the advanced high strength steels (AHSS), the TRIP steels, and the dual phase steels. Aluminum is another relative newcomer. A new generation of resistance spot welding plus laser welding is very much in the running as the main joining processes for these new materials.

Metallurgy Applied to Everyday Welding

October 31, 2006
Metallurgy of welds in carbon and low alloy steels doesn't need to be complicated. This short course will help you understand how welding affects the properties of base materials, and how weld defects occur.

Quality Control In Welding Conference

November 1, 2006
Quality control is something that must be kept up front in the planning of welds. It is not enough to rely solely on control charts, statistical process control or Taguchi methods to get the job done properly. The human factor must take front seat. This is where we begin to use aids such as certified material testing reports for electrodes and real time sensing and control of welding processes. This is how weld quality can be assured the first time around.

Welding of Stainless Steels (Basics and Avoiding Weld Defects)

November 1-2, 2006
The program focuses on the basic weldability of all types of stainless steels. If you need a comprehensive look at the weldability of stainless steels, particularly the 300 series, this course is for you.

The New Spot Welding Methods Conference

November 2, 2006
Resistance spot welding continues to dominate the automotive industry and other industries where sheet metal has to be joined. But recently, a host of new processes, all of which are capable of applying spot welds, are attracting all sorts of attention. This list includes the likes of laser weld bonding, ultrasonic welding, friction stir welding, and kinetic spot welding. Will these new methods make life difficult for the more established resistance welding systems? Resistance welding is fighting back with some innovations of its own.

CONFERENCE REGISTRATION FORM

FOUR EASY WAYS TO REGISTER:

- 1. Go online: <http://www.aws.org/conferences>
- 2. Call: 1-800-443-9353, Ext. 224, between 8 AM and 5 PM EDT.
Please have your AWS membership number and a purchase order number or credit card ready.

- 3. FAX form: 305-648-1655. Fax one copy per registrant.
- 4. Mail registration form to:
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P.O. Box 440367, Miami, FL 33144-0367
Mail one copy per registrant.

Note: Registrant information needed for each registrant

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AWS knows your plans can change and offers a flexible refund policy. If you notify AWS at least two weeks before a scheduled conference that you are unable to attend, you will receive a full refund less a \$75 administration/hotel attrition fee. Notification received less than two weeks before the conference will result in a refund less a \$175 administration/hotel attrition fee.
You may send a substitute with no additional fee. No refunds are given for no-shows.
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