

Society of Allied Weight Engineers, Incorporated

Serving the Aerospace • Marine • Offshore • Land Vehicle • Allied Industries



2015 WESTERN REGIONAL CONFERENCE MASS PROPERTIES TECHNICAL PROGRAM & TRAINING NOVEMBER 6-7, 2015

Crowne Plaza Ventura Beach, Ventura, California
450 East Harbor Boulevard, Ventura, CA 93001

Hosted by the Mojave Desert Chapter of SAWE



[Photo credit: Crowne Plaza Ventura Beach]

The Mojave Desert Chapter of SAWE welcomes members of SAWE, industry, and academia to the 2015 Western Regional Conference on Mass Properties Engineering

- Jim Valentine (Conference Chairman) james.valentine@lmco.com
- Roman Aman (Chapter President) roman.a.aman@lmco.com

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Exhibitors



Schedule:

- Thursday November 5th: Early Registration, Hospitality.
- Friday November 6th: Registration, Morning & Afternoon Technical Sessions, Vendor Exhibits, Luncheon, Hospitality
- Saturday November 7th: Training Classes: AWBS and Advanced Mass Properties Measurement

Registration & Fees:

On-line registration and credit card payment option will be available through the SAWE store at: <http://www.sawe.org/>. The last day for early registration for the conference and to guarantee the special hotel rate is October 15th, 2015. The hotel has a 48 hour cancellation policy.

- Conference Technical Session fee for SAWE members is \$100 (includes luncheon)
- Conference Technical Session fee is \$20 for retired & student members (includes luncheon)
- Additional \$100 fee for non-member registration for technical sessions. SAWE Membership and renewal is available on-line through SAWE store.
- Additional \$25 late fee for all registrations after October 15th, 2015 (by mail or in-person)
- Full day AWBS training class \$500, Full day Advanced Mass Properties Measurement class \$300

Registration POC: Megan Derrig (Chapter Secretary) megan.derrig@lmco.com

Hotel Reservations:

The Mojave Desert chapter has contracted for a limited number of guest rooms on Thursday night (Nov 5th), Friday night (Nov 6th) and Saturday night (Nov 7th) for this conference. Hotel reservations must be made before October 15th, 2015 by using the direct link below or by calling the hotel reservation department at (805) 648-2100 or (800) 842-0800. Please identify yourself as part of the Society of Allied Weight Engineers group/meeting to credit our room block and receive a special conference rate of \$129. An Executive King Suite is also available at \$223 per night. The conference rates will be available November 2 through 11 if you would like to extend your stay. Rates are subject to a local hotel tax but there are no additional parking fees. [Hotel Registration Link for SAWE](#)



Vendor Registration:

Vendors and suppliers are invited to participate in our conference. Exhibit space is available on Friday, November 6th to showcase your products, services and new technologies. Time will be allocated during the technical sessions for each vendor to give a brief presentation. Longer presentations may be coordinated through our technical coordinators. Vendor provided training in the use of a particular service or product can also be arranged. Please contact Richard Lidh at (661) 572-7760 or Richard.Lidh@lmco.com for information or to sign up as a vendor and/or sponsor.

Exhibitors:

A **\$500** Exhibitor fee is required to have a vendor display table at our conference. As an Exhibitor your company's name and logo will be included in our advertisements and Program. You will be provided

sufficient space within our Exhibit Area to display your products and/or literature.

Sponsorships:

As a Sponsor, your company's name and logo will be included in our advertisements and Program. Announcements will be made at the conference recognizing your company's sponsorship. Sponsorship opportunities include:

- **Platinum:** Conference level sponsorship @ **\$2,000**. Your company's name and logo will be prominently displayed at the entrance to the Conference. Advertisements will include the statement, "2015 Western Regional Conference Sponsored By <Your Company Name>." Recognition will be given at the conference opening, including the opportunity to give the keynote address.
- **Gold:** Friday hosted luncheon @ **\$1,500**. As the Gold Sponsor, your company will be the sole sponsor of the conference luncheon. Your representative will be publicly recognized and thanked at the beginning of the luncheon. Your company's name and logo will be prominently displayed in the Luncheon area.
- **Silver:** Hospitality Suite @ **\$500**. Your company's name and logo will be prominently displayed in the Hospitality Suite, the after-hours gathering place of the conference attendees.
- **Bronze:** Morning & afternoon coffee breaks @ **\$300 each**. Your company will be able to sponsor either or both of the AM or PM breaks on the day of the conference. Your company's name and logo will be prominently displayed in the break areas.

Technical Sessions

Please contact Glen Maijala (Chapter Director) at glen.maijala@lmco.com if you interested in making a 30 minute technical presentation during the technical sessions or to refer others. Please note, there will be no training on Friday.

2015 Western Regional Conference Technical Presentations (as of 9/15/2015)

Managing Project Variation by Tracking Uniqueness by Jerry Fleck, i.e.Solutions, Inc.

Abstract: Accounting for project variations is an essential aspect of managing project mass properties. Not only do we need to keep track of changes from one vehicle to the next, we also need to track various configurations for each. Many projects have requirements that include configurations that capture payload options, deployment states and fuel loading sequences. It doesn't take many of these variations before the complexity of tracking them can become overwhelming.

How we manage this complexity varies. Often large companies have sophisticated software packages that enable this capability. However, even within these companies, the complexity of their software systems is too cumbersome for smaller production projects. Then they, along with many others, are often left with rudimentary home grow tools and or resort to using spreadsheets. Whatever the case, a lucid discussion of the issues involved will illuminate our solutions.

In this presentation, we will take a look at how we have addressed the nature of this problem using graphical solutions techniques. This will be a dynamic engaging presentation on the subject.

Integrated Product Design and Weight Engineering by Dhiren Verma, Ph.D., Altair Engineering

Abstract: This paper is based on Altair Engineering's research & global experience in improving the product design process by the application of optimization and business analytics. The research focuses on improving the design of aircrafts and other low volume manufactured products by incorporating leading edge solutions towards influencing the earliest stages of design. This specific paper builds upon frameworks that have been built by other researchers, and implements them in a real world scenario.

Today's aircrafts are among the largest and most complex products made with long lifecycles. Building these requires tight collaboration between the manufacturer, supplier and airline fleet owners. Furthermore, they may be developed for a specific business for which components and requirements may change continuously. The aircraft design process suited to the above has been described by various frameworks – INCOSE 2006,

Spiral Design, Simultaneous Requirements and Design Development. Our research indicates that regardless of the process chosen, the key criteria for a successful project are:

- The ability to have optimized architectural and structural decisions upfront in the design cycle when the design is immature
- The ability to manage rapid design change due to evolving requirements
- The ability to rapidly highlight the effect of those design changes leading to timely corrective actions as needed, using business analytic principles

This paper shall show how engineers can derive optimum structures that meet design requirements with the minimum possible material mass. This results in a product that is less expensive to manufacture and maintain.

- Create efficient structural design using topology optimization to lead to mass-optimized designs with better stress distributions and longer fatigue life
- Optimize the thickness of steel plates and size of plate stiffeners automatically across the whole structure using size and shape optimization
- Improve performance by optimizing parameters for stability and aerodynamics.
- Quickly determine optimum composite ply layups and orientations

This paper shall also highlight how engineers can rapidly highlight the effect of these designs and their changes on product attributes such as weight and balance. Providing such process and tools for data consolidation, tracking and reporting, enables constituents of the extended enterprise to contribute more to product development by focusing on identifying, managing and improving mass properties and associated opportunities, risks and uncertainties.

Structural Analysis of a World War One Biplane by Scott Malaznik, Lockheed Martin

Abstract: During World War One, the dominant airplane configuration was the biplane, even though many monoplanes were developed before the war. Typical construction in those days consisted of a wood framework with wire bracing and fabric covering. The importance of structural strength was recognized from the beginning of aviation, but the formal analysis performed to verify that strength was minimal.

The Sopwith Camel was a famous British fighter aircraft of World War One. It was built in large quantities and scored many successes in combat. From an engineering point of view, it has been said that it was one of the first aircraft to have its structure properly analyzed. This makes the Camel a good example for an investigation into the analysis methods used at that time.

Using books and reports that were published at the time and now available on the internet, a structural analysis of portions of the Camel structure was re-created. Selected results will be presented, along with insights into the evolution of analysis methods and contrasts to methods that are used today.

The James Webb Space Telescope by Jeff Bautista, Northrop Grumman

Abstract: JWST Observatory is an infrared telescope with a 6.5-meter primary mirror that will be the size of a tennis court when fully deployed. JWST will study every phase in the history of our Universe, ranging from the first luminous glows after the Big Bang, to the formation of solar systems capable of supporting life on planets like Earth, to the evolution of our own Solar System. This presentation will review the Science Requirements, Architecture and Design, and Building and Testing of this great observatory.

Development of a Conceptual Flight Vehicle Design Weight Estimation Library and Documentation by Andy Walker, Lockheed Martin

Abstract: The state of the art in estimating the volumetric size and mass of flight vehicles is held today by an elite group of engineers in the Aerospace Conceptual Design Industry. This is not a skill readily accessible or taught in academia. When faced with the challenge of estimating flight vehicle mass properties, many aerospace engineering students are encouraged to read the latest design textbooks, learn how to use a few basic statistical equations, plunge into the details of parametric mass properties analysis. To manage the growing and ever-changing body of weight estimation knowledge, and bridge the gap in Mass Properties education, a standardized engineering “tool-box” of conceptual and preliminary design weight estimation methods was developed for future projects in the AVD Lab (Aerospace Vehicle Design) at the University of Texas at Arlington (UTA). It will also be used as a living document for use by future students in the AVD Lab. This “tool-box” consists of a weight estimation method bibliography containing unclassified, open-source literature for conceptual and preliminary flight vehicle design phases. To provide structure, a logic scheme based upon Society of Allied Weight Engineers (SAWE) Recommend Practice 8 (RP8) is in place to direct

users to the appropriate weight estimation methods for flight vehicle design problems. For each method library entry, specific data have been aggregated for organizational purposes such as applicable engineering design phase (conceptual, preliminary, and detail), mathematical techniques in use (empirical, semi-empirical, numerical, and analytical), applicable flight regimes (subsonic, transonic, supersonic, hypersonic), vehicle missions (altitude, speed, range, payload), customer (military, commercial, executive, etc.), and flight vehicle configuration (Tail-Aft, Tail Forward, All-Wing, Blended Wing-Body, Oblique Wing, etc.). The weight method library's organization and functionality has been vetted by a survey of industrial professionals well-practiced in flight vehicle weight estimation – the results of which indicate the needs of a weight engineer revolve around thorough documentation of flight vehicle applicability, weight method processes and equations, and uncertainty. Transport aircraft validation cases have been applied to each entry in the AVD Weight Method Library in order to provide a sense of context and applicability to each method. This generic specification of a method library will be applicable for use by other disciplines within the AVD Lab, Post-Graduate design labs, or engineering design professionals.

Weight and CG Curtailment by Patrick Brown, Northrop Grumman

Abstract: Without fail, weight and center of gravity (cg) change during every aircraft flight. In some aircraft, especially large passenger aircraft, the ability to determine the aircraft weight and cg can become problematic. There are unknown passenger and cargo weights. The crew and passengers often move large distances in the cabin and the cargo can shift radically during flight. There can also be large shifts in cg from fuel migration due to angle of attack and fuel burn. The complexity of the risk is enormous. Any one or combination of those events in flight can be catastrophic. However, the risk to crew, passengers, cargo and aircraft can be mitigated by the proper use of weight and cg curtailment. In fact, by applying proper weight and cg curtailment methods during flight planning, those risks can be entirely eliminated as a cause of incident, accident, or catastrophic failure. The only other possible way of eliminating those risks would be to know the weight and cg of every crewman, passenger, cargo, and gallon of fuel; completely limit their movement. Or, better yet, develop a 'smart' plane that senses cg movement and automatically compensates for it during flight. As yet, that technology does not exist, is too costly and or complex to implement in a commercial aircraft environment. Weight and cg curtailment uses quantitative methods to shrink the flight envelope so that every possible shift in weight and cg is accounted for in the given flight profile or mission. In fact, as the only viable solution, every large aircraft operator uses weight and cg curtailment in one form or another to dispatch their aircraft in a safe and timely manner.

SAWE Standards and Practices by Andreas Schuster, SAWE Standards and Practices Chairman

Abstract: The Society of Allied Weight Engineers is an international organization whose purpose is to promote the recognition of Weight Engineering as a specialized branch of engineering. This presentation will focus on the on the current activities of the Standards and Practices Committee and the Chairman's vision for the future.

Training:

Training POC: Roman Aman (Chapter President) roman.a.aman@lmco.com

Automated Weight and Balance System (AWBS) Training

Course Description: This one-day class will present all the new features of Version 10 of the US Air Force's Automated Weight and Balance Software in a hands-on training class. The class will begin with a discussion of the terms and developmental history of AWBS, minimum system requirements, and software installation. The basic approach of the class is to give computer demonstrations followed by student exercises that will provide the students with a good understanding of AWBS Version 10 features. Students will receive a complete overview of the software features to support weight control programs for military aircraft. The instructor will also allow time to address specific AWBS needs and questions of the students. **Students are required to bring their laptop computer. A demo version of AWBS 10.0 will be provided at the beginning of the class.**

Date: Saturday November 7th 2015

Length: Full day (8 hours)

Cost: \$500.00

Class size: 5 - 16

Class Details: <https://www.sawe.org/training/awbs>

Note: If the minimum class size is not reached the course may be canceled.

Advanced Mass Properties Measurement

Course Description: This one-day class will provide training in the measurement of moment of inertia, center of gravity, and product of inertia. The class will begin with a review of measurement terminology and definitions. Measurement methods will be presented with an emphasis on best practices and how to avoid common mistakes. This class is intended for anyone who has interest in mass properties measurement.

- Review of Mass Properties quantities & their units of measurement
- Review principles of mass properties measurement
- Calibration, Tare, & Part measurements
- Methods of measuring Center of Gravity Location
- Methods of measuring Moment of Inertia
- Error Sources
- Methods of measuring Product of Inertia
- Measurement Uncertainties Defined
- Introduction to a State-of-the-Art Mass Properties measuring Instrument
- Measuring 3D CG & MOI
- Fixtures

Date: Saturday November 7th 2015

Length: Full day (8 hours)

Cost: \$300.00

Class size: 5 - 16

Class Details: <https://www.sawe.org/node/2465>

Note: If the minimum class size is not reached the course may be canceled.

Crowne Plaza Ventura Beach



Ventura is located midway between Santa Barbara and Malibu, about 70 miles from LAX airport.

From the Ventura Mission to the historic Ventura Beach pier, the town has the vibe of the classic Southern California surfing community. Outdoor enthusiasts can enjoy nearly year-round whale watching, kayaking through the majestic sea caves in the Channel Islands, fishing and even taking surfing lessons on the beach in front of the hotel. Savor the Central Coast wineries and the nearby microbreweries and enjoy the many outdoor cafes, wine tasting rooms, fine dining and vibrant nightlife, all within a few steps of the hotel. The hotel offers 4-passenger surreys and bikes to tour the 8-mile boardwalk along the ocean where you can ride through San Buenaventura State Beach to savor succulent oysters and clam barbecues on the beach. With year-round temperatures averaging 70 degrees and more than 250 sunny days a year!

