SAE CORPORATE LEARNING CLIENTS

3M Co.                    ITT Industries Inc.          U.S. Coast Guard
Airbus Helicopters        Jet Propulsion Laboratory     U.S. Air Force
AlliedSignal Inc.          Labinal                          U.S. Army
American Airlines          Lockheed Martin                   U.S. Navy
Andover Industries         Materion Brush Inc                 Vought Aircraft
ASQ China                  Metaloyne Sintered Components UTC Aerospace Systems
ASC Exterior Technologies  MTS Systems Corp.                  Zodiac Seats California, LLC
BAE Systems                NASA                             
BendixKing by Honeywell    National Renewable Energy Laboratory  
Boeing Co.                 Naval Air Warfare Center Aircraft Div.  
Bombardier R&D             Northwire Inc                    
Cardell Corp.              Parker Aerospace - Hydraulic Systems Division  
Cardone Industries         Pilatus Aircraft Ltd.                 
Cessna                     PPG Industries                    
Cinch Connectors           Pratt & Whitney Canada               
Delphi Corp.               Purolator Products Co.                
Dixie Aerospace LLC        Rexnord Aerospace                 
Eaton Corp.                Saft America Inc.                   
Elbit Systems of America   Securaplane                        
Embry-Riddle Aeronautical University  SKF                  
Esterline/CMC Electronics  Stant Manufacturing Inc.          
FACC AG Austria            Southwest Research Institute       
Federal Mogul Corp.        Systems Research Laboratories Inc. Tactair Fluid Controls
Freudenberg-Nok            General Dynamics Corp.             TAIKOO Aircraft Engineering Co. Ltd. (TAECO)
Gables Engineering Inc.    Goodrich Aerospace Services LTD TEAM Industries
General Dynamics Corp.     Hamilton Sundstrand Power Systems  Teradyne Inc.
Goodrich Aerospace Services LTD  Henkel Technologies           Texas Instruments Inc.
Honeywell                  IMP Aerospace & Defense              Toray Composites America
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SAE Corporate Learning Solutions offers variety, customization, quality and convenience. Corporate Learning advisors will work with you to determine the best option to meet your training needs and develop solutions that fit your budget and your schedule.

**Through SAE Corporate Learning Solutions you can:**

- Select a SAE course for delivery at your site
- Purchase a corporate subscription for a few courses or the entire library of over 50 online courses (350+ hours of content available)

Contact SAE Corporate Learning Solutions today to discuss how SAE can best meet your training needs.
ABOUT SAE INTERNATIONAL

STANDARDS DEVELOPMENT AND LIFELONG LEARNING.

SAE International is a global association committed to being the ultimate knowledge source for the mobility engineering professional. By uniting over 135,000 engineers and technical experts, we drive knowledge and expertise across a broad spectrum of industries. We act on two priorities: encouraging a lifetime of learning for mobility engineering professionals and setting the standards for industry engineering.

SAE International is the world’s leader in mobility engineering knowledge. We are trusted by engineers and other professionals around the globe to provide a broad, multi-sector source for information and solutions. The SAE International Professional Development program offers access to over 300 live online and classroom, and online, on demand learning opportunities—learning opportunities that supply the right content to help solve your specific challenges.
This resource guide is designed specifically to help companies address their learning needs through a variety of SAE Professional Development options.

**Options**

For 8 - 100+ employees, SAE works with companies like yours to design and deliver customized training at your site.

Through SAE Corporate Learning Solutions you can:

- Select an existing SAE course for delivery at your site
- Subscribe to a single online, on demand course for one or many employees
- Purchase a corporate subscription to the entire library of over 50 online courses (more than 350 hours of content available)
- Customize a learning experience to address your specific business needs

**Advantages**

With as few as eight employees who have the same learning need, SAE Corporate Learning Solutions offers multiple advantages:

- **Variety** — Choose from a comprehensive course list of over 300 titles.
- **Personalization** — If you can’t find the specific topic you need or if the course content does not exactly match your requirements, SAE can customize a training program. We can also integrate online learning for a “blended solution.”
- **Quality** — SAE courses are conducted by leading academic and industry instructors. All courses and instructors undergo a review and approval from objective industry experts. This assures course content is relevant and accurate.
- **Convenience** — We schedule the instructor, supply the comprehensive course materials for each attendee, and coordinate other administrative details like instructor travel and accommodation or online connections.

- **Cost Effective** — The instructor comes to you! No staff travel expenses and no time away from the office, save time and money. Also, our extensive network and existing course list makes our pricing extremely competitive!
- **Timeliness** — SAE International is the world’s leader in mobility engineering knowledge. Our programs are developed and refined to stay ahead of industry trends; and we offer only the most up-to-date and knowledgeable instructors.

**What is included in a Corporate Learning Solutions Program?**

- **Customization** — Most courses can be tailored to address your company’s specific business or training objectives. Often this involves incorporating company data, generating case problems, or developing completely new content.
- **Administrative Coordination** — SAE staff contracts with the instructor, supplies all course materials, and provides attendance and post-course evaluation forms. All you do is provide the facility and audio-visual equipment!
- **Pre-training Communication with the Instructor** — SAE arranges communication with the instructor and relevant company representatives to review the learning objectives and ensure understanding of the scheduled training. This is another opportunity to gear the program to your specific needs.
- **Continuing Education Units** — SAE awards Certificates of Completion with IACET approved Continuing Education Units (CEUs) to all attendees. One CEU is granted for every 10 learning contact hours.

Contact SAE Corporate Learning:
1-724-772-8529 or corplearn@sae.org
What determines the Corporate Learning Solutions cost?

- The length of the program (number of days or hours of learning contact time)
- The learning materials. Some courses include textbooks or other learning aids
- The number of attendees
- Any customization required
- The instructor’s travel expenses or connection fees

These variables are used to calculate a base fee, which is typically based on 10 attendees. The fee increases proportionally as more attendees are added. Companies are additionally responsible for instructor travel expenses or connection fees, transfer fees, and living expenses.

What amenities does your company provide?

- A suitable meeting room or classroom
- Audio-visual equipment and computers (if required)
- Refreshment breaks and meals (if desired)
- Information on local hotels and airports along with directions to your facility

Explore State Resources for Training Dollars

Often states and local economic development groups have grant dollars available for training. Contact your state’s Department of Labor or other groups in your area to research funds available for your organization.

For example, Michigan residents can visit www.michigan-works.org and enter their zip code to find local offices and Michigan Works! contacts in the area.

ACCREDITATIONS

The IACET CEU

SAE International is recognized as an Authorized Provider by the International Association for Continuing Education and Training (IACET). All SAE Professional Development seminars, e-Seminars, web seminars, and engineering academies meet eligibility requirements for IACET Continuing Education Units (CEUs) according to the ANSI/IACET 1-2013 Standard. To receive CEUs, attendees are required to be engaged in the entire class and demonstrate mastery of the learning objectives by successfully completing a knowledge assessment.

Many organizations offer some form of continuing education credit, but only the IACET CEU is held to the strict, research-based IACET Criteria and Guidelines for Continuing Education and Training. Only IACET Authorized Providers, who undergo a strict application and site-review process, can award the IACET CEU. IACET Authorized Providers are required to re-apply and be reauthorized every five (5) years.

The Continuing Education Unit (CEU) was created by IACET as a measurement of continuing education. One (1) IACET CEU is equal to ten (10) contact hours of participation in an organized continuing education experience under responsible sponsorship, capable direction, and qualified instruction. Under IACET’s care, the IACET CEU has evolved from a quantitative measure to a hallmark of quality training and instruction. For more information on IACET, visit www.iacet.org.

To obtain official transcripts, please contact SAE Customer Service at 1-877-606-7323 (U.S. and Canada only) or 1-724-776-4970 (outside U.S. and Canada)
SAE offers a variety of learning formats to accommodate diverse learning styles. Explore classroom, live and online, or online and on demand courses. Many courses are offered in multiple formats so be sure to watch for the icons that identify the format for each course.

Seminars or workshops available as similar live, online Web Seminars will feature both icons and the course description for the Web Seminar will be listed immediately following the classroom title.

Live, online or classroom courses that have a similar course offered online and on demand will include both icons – watch for those descriptions or notes on where to get additional information.

SAE International offers over 200 seminar and classroom titles in 100 separate technology and business skill topics. These seminars and workshops range from one-to three-days and are led by highly-qualified, industry or academic experts. SAE live, classroom courses are interactive and encourage skill-development and problem solving. Each course includes comprehensive course materials to assist the learner in implementing the knowledge gained in the course.

Additionally, we offer nearly all courses throughout the year at the SAE International Office in Troy, Michigan; or at sights across the US and the world including SAE International Engineering Events.

SAE’s award-winning Engineering Academy format is an intensive “boot camp” experience that immerses attendees in a focused technology area. The Engineering Academy is a comprehensive training experience on core engineering topics. Multiple instructors team up to provide interactive lecture, discussion, and practice – all designed to aid learning and application.

The Engineering AcademySM is perfect for newly hired engineers or those changing technical disciplines who need to quickly develop a new skill set in order to become productive on the job. The Engineering Academy format earned the prestigious Award of Excellence from the American Society of Association Executives.

For a current schedule of upcoming Academies, visit training.sae.org/academies

Learners can take advantage of the convenience and cost effectiveness offered by e-Learning from SAE. SAE maintains a growing menu of learning products delivered online. These programs are listed throughout the catalog. Look for the icons that denote live online or online on demand.

Informative and content-rich, SAE live, online courses are instructor-led programs delivered via the internet and telephone. Schedules and budgets can make it difficult to attend a classroom offering so SAE has developed this alternative format to deliver technical courses directly. Participants can log in to the live event from anywhere there is a telephone and a PC with Internet access. Delivered in one or a series of 90 to 120-minute sessions, Web Seminars feature audio delivered by telephone,
web-based presentations, interactive question-and-answer, and
course-specific online forums for posting of supplemental ma-
terials, networking and course activities. Comprehensive course
materials are also provided in PDF format. CEU’s are awarded
when course requirements have been met. Look for the live,
online icon throughout the catalog.

**Online, On demand courses**

Avoid travel expenses and time out of the office, and make
learning fit into your schedule. Access one of our online, on
demand courses right from your desktop through the internet.
There are more than 50 courses with over 300 hours of online
content. Many of our online, on demand courses are based on
classroom offerings or are captured recordings of our most pop-
ular Web Seminars. We also provide short-courses designed to
bring team members quickly up-to-speed on a specific subject
or topic. Look for the symbol in the course description to identi-
fy those titles that are delivered online and on demand.

Your company can subscribe to the entire collection for just a
few employees or all of the programs for every employee. Please
contact the Corporate Learning Solutions hotline,
1-724-772-8529 for additional information or to receive a
proposal.

**Online, on demand courses INCLUDE:**

- **e-Seminars** – self-paced online courses based on our most pop-
  ular instructor-led seminars
- **Fast Tracks** – Faster, targeted learning in short-duration online
courses
- **Web Seminar RePlays** - a selection SAE Web Seminars are
  archived and providing anytime access to instructor-led online
programs
- **CALISO International Standards Courses** - a series of online
courses provide information on international standards including
ISO 9001, ISO 14001, ISO/TS 16949, ISO 19011 including Auditor
and Lead Auditor training insights and best practices; six sigma
and Sarbanes-Oxley
- **Metallurgy Online Courses** - in partnership with Industrial
  Metallurgists, Inc.
- **Ford Online Courses** - six of Ford’s most popular online courses
  on powertrain and problem solving topics extend Ford engineer-
ing knowledge across the global industry

There are varying equipment requirements for the different
online, on demand options. Visit the webpage for each course to
determine if your system meets the course equipment
requirements.
SAE CERTIFICATION & CERTIFICATE PROGRAMS

SAE CREDENTIALING - ELEVATING KNOWLEDGE
Show the industry the depth of your organization’s expertise. SAE offers focused topic-specific credentialing programs for engineers and other professionals in ground vehicle and aerospace. Shine a light on their knowledge and expertise through SAE Credentialing.

Your team can earn an SAE Certification by passing industry-created and vetted exams. Get more information at training.sae.org/credentialing

How does it work?
• Complete established eligibility requirements (typically educational background and work experience)
• Pass an industry-developed, vetted, and proctored exam that tests mastery of an industry-defined body of knowledge
• Earn your industry recognized credential endorsing your experience and knowledge of the technology, and establishing a solid foundation on which to build a successful career.

Certifications must be maintained over 3-year period of time by fulfilling established maintenance requirements.

Or, expand their knowledge and build your organization’s reputation as an expert through industry-advised Certificate of Competency programs.

How does it work?
• Complete a course in a focused content area
• Pass an industry-vetted exam that verifies your understanding of the material
• Earn a Certificate of Competency or Certificate of Mastery

SAE Certification or Certificate of Competency – how does it benefit the ENGINEER?
• Validates their mastery of industry-driven training and learning objectives or confirms mastery of an industry-generated body of knowledge
• Imparts international recognition of experience and skills
• Provides a portable credential that is recognized across industry
• Demonstrates their commitment to continued growth and improvement

What is the value to the ORGANIZATION?
• Recognizes the capabilities of your people and enhances your company’s credibility with the industry as a supplier OR OEM through an independent assessment
• Contributes to the hiring and promotion process – quickly illustrates the capabilities and experience of potential new hires or those you’d like to advance
• Encourages employee commitment to growth and opportunity
• Supports the promotion of professional competence

SAE currently offers the following Credentialing Programs:
Design Review Based on Failure Modes (DRBFM) Program: offering a Certificate of Competency, DRBFM Professional Certification and DRBFM Expert Certification. The DRBFM program focuses on competency and application of philosophy, preparation, change point FMEA, design review, and actions results and feedback.
SAE INTERNATIONAL ALSO OFFERS CURRICULUM-BASED, MULTI-COURSE CERTIFICATES IN SPECIFIC TECHNICAL AREAS.

Intended to provide a guide towards deeper knowledge in a specific area, SAE’s multi-course certificates outline required courses that offer foundational knowledge of the subject. Some certificate programs also feature additional electives designed to broaden your exposure to more specific aspects of the technology studied.

In addition to the Continuing Education Units (CEUs) awarded, successful completion heightens your expertise within the field and earns you an SAE credential recognizing your achievement.

PLUS—completion of many of the multi-course certificate programs equates to graduate credits towards the SAE/Kettering University 20-credit Certificate in Automotive Systems and Kettering’s 40-credit M.S in Mechanical Engineering. Visit training.sae.org/collegecredit for more information.

Watch for the certificate icon to indicate course titles that are part of an SAE multi-course certificate.

General Management and Leadership Certificate Program

This program focuses on four core management and leadership competencies: management capability, team leadership, project management, and finance providing a basis for growth into a leadership or management role.

All of the following courses are required:

- Managing Engineering & Technical Professionals (I.D.# C0608)
- Engineering Project Management (I.D.# 99003)
- Principles of Cost and Finance for Engineers (I.D.# C0828)
- Leading High Performance Teams (I.D.# C0410)

Attending the Engineering Management Academy serves as a substitute for Managing Engineering and Technical Professionals, and Leading High Performance Teams required courses.

Product Engineering Tools and Methods Certificate Program

This program focuses on the study, development, management and implementation of product engineering principles, methodologies and techniques. When used properly, these tools and methods become powerful productivity enhancers reducing product development time and cost through improved communication, documentation, problem-solving, and quality.

All of the following courses are required:

- Design of Experiments (DOE) for Engineers Web Seminar (I.D.# WB0932) OR classroom seminar - Design of Experiments for Engineers (DOE) (I.D.# C0406)
- Finite Element Analysis (FEA) for Design Engineers Web Seminar (I.D.# WB1241)

- Fundamentals of Geometric Dimensioning & Tolerancing (GD&T) Web Seminar or Web Seminar RePlay (live, online: I.D.# WB0933; online, on demand I.D.# PD PD330933ON) or classroom seminar - Geometric Dimensioning & Tolerancing (I.D.# C0133)
- Tolerance Stack-up Fundamentals Web Seminar or Web Seminar RePlay - (live, online: I.D.# C0842; online, on demand I.D.# PD PD330842ON) OR classroom seminar - Tolerance Stack-Up Analysis (I.D.# C0022)
- Root Cause Problem Solving: Methods and Tools Web Seminar or Web Seminar RePlay (live, online: I.D.# WB0931; online on demand I.D.# PD PD330931ON)

Choose one elective:

- Accelerated Test Methods for Ground and Aerospace Vehicle Development (classroom: I.D.# C0316 or online, on demand: I.D.# PD130524ON)
- All three advanced web seminar/web seminar rePlay titles in the Geometric Dimensioning & Tolerancing Series (I.D.#s WB1319, WB1320, & WB1321)
- Design for Manufacturing & Assembly (DFM/DFA) (I.D.# 92047)
- Design Review Workshop (I.D.# C1306)
- Finite Element Analysis for Design Engineers - Hands-on FEA Workshop (I.D.# 93006)
- Introduction to Design Review Based on Failure Modes (DRBFM) Web Seminar or Web Seminar RePlay (live, online I.D.# WB1047; online, on demand I.D.# PD331047ON)
- Introduction to Failure Mode and Effects Analysis for Product and Process (I.D.# C1201)
- Robust Design (I.D.# C1201)
- Statistical Tolerance Design (I.D.# 88033)
- Weibull-Log Normal Analysis Workshop (I.D.# 86034)

Professional and Legal Issues Certificate Program

This program focuses on legal and risk management issues critical for engineers to master to facilitate the successful design and deployment of products from a safety and reliability perspective.

All of the following courses are required:

- Patent Law for Engineers (I.D.# 88007)
- Product Liability and The Engineer (I.D.# 82001)
- The Role of the Expert Witness in Product Liability Litigation (I.D.# 92054)
- Program and Risk Management (I.D.# C0409)

Here’s how you obtain your SAE Certificate

Once you complete all required courses in any of the certificate programs, contact SAE Customer Service, 1-877-606-7323 (or 1-724-776-4970 outside U.S. & Canada) or email: customerservice@sae.org and request your Certificate. Your SAE transcript will be reviewed to verify completion of required courses and your Certificate will be mailed to you within 30 days.

SAE Certificate Programs can also be conducted at your company site for groups of employees. For a price quote, call our Corporate Learning Solutions hotline, 1-724-772-8529.
MyLearn.sae.org houses information on all of SAE’s professional development opportunities including live classroom, live online, and online, on demand. Use MyLearn.sae.org to quickly locate learning solutions designed to meet the educational and training needs of technical professionals in your organization.

MyLearn.sae.org offers learners:
• Access to transcripts
• The option to plan and schedule training and to register or purchase any course
• Ability to enroll in certificate or certification programs
• A spot to check out what’s new in SAE professional development activities,
• And download a full catalog of programs

Visit MyLearn.sae.org and see how SAE International is the one-stop shop for your ongoing professional development needs!
SHAPE YOUR EDUCATION.
CREATE YOUR FUTURE.

SAE International offers you education and training resources in the areas that are shaping the mobility industry and your career.

• Instructor-led programs taught by respected and expert industry professionals
• Online courses that supply the technical content you expect without the expense of travel or time away from your office
• Customized onsite training designed for your organization’s specific needs

Stay current on the latest technology, increase your knowledge, and positively affect your organization’s bottom line with professional development from SAE International.

Visit training.sae.org to view all SAE International professional development opportunities, schedules and course information.
ARP4761 and the Safety Assessment Process for Civil Airborne Systems

2 Days
I.D.# C1245

ARP4761 describes guidelines and methods for performing safety assessments. This recommended practice is associated with showing compliance with certification requirements (14CFR/CS Parts 23 and 25, section 1309) and assisting a company in meeting their own internal safety standards. The safety processes described are primarily associated with civil airborne equipment but the processes and tools may be applied to many applications.

This 2 day seminar provides attendees with the guideline information for conducting industry accepted safety assessments consisting of Functional Hazard Assessment (FHA), Preliminary System Safety Assessment (PSSA), and System Safety Assessment (SSA). Discussion on various safety analysis methods needed to conduct the safety assessments is included. Safety analysis methods including Fault Tree Analysis (FTA), Dependence Diagram (DD), Markov Analysis (MA), Failure Modes and Effect Analysis (FMEA) and Common Cause Analysis (CCA). CCA is composed of Zonal Safety Analysis (ZSA), Particular Risks Analysis (PRA), and Common Mode Analysis (CMA) and will be covered in this seminar.

In addition to the seminar handout, a copy of the ARP4761: Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment standard will be provided to each attendee.

Learning Objectives
By attending this seminar, you will be able to:
• Identify multiple safety assessment methods and tools
• Relate the key attributes of ARP4761 FHA, PSSA, SSA, FTA, DD, MA, CCA
• Identify the applications for safety tools
• Identify the interaction between the safety processes and the development processes
• Apply multiple safety methods in completing a PSSA or SSA
• Evaluate future tools and methods for inclusion in ARP4761A

Who Should Attend
This course is designed for engineers and professionals, working at all levels, who are involved in or interact with the aircraft and/or aircraft system safety assessment processes.

Topical Outline
Day One
• Course Overview
• Key Definitions
• Introduction and overview of ARP4761 course material
• Safety / Development Process
• Functional Hazard Assessment (FHA)
• Preliminary System Safety Analysis (PSSA)
• Fault Tree Analysis (FTA)
• Dependency Diagram (DD)
• Markov Analysis (MA)

Day Two
• Failure Modes & Effects Analysis (FMEA)
• Common Cause Analysis (CCA)
• Particular Risks Analysis (PRA)
• Zonal Safety Analysis (ZSA)
• Common Mode Analysis (CMA)
• System Safety Analysis (SSA)
AS5553 and Counterfeit Electronic Parts Avoidance

1 Day
I.D.# C1302

Counterfeit electronic parts have been found in almost every sector of the electronics industry and continue to be an increasing threat to electronic hardware. This threat poses significant performance, reliability and safety risks. Aerospace industry organizations, in particular, must produce and continually improve safe and reliable products that meet or exceed customer and regulatory authority requirements. The SAE AS5553 standard was created in response to the significant and increasing volume of counterfeit electronic parts entering the aerospace supply chain and standardizes requirements, practices and methods for counterfeit parts risk mitigation. The resulting document presents solutions to address counterfeit electronic parts issues across a large cross-section of the electronics industry.

This comprehensive one-day seminar introduces participants to AS5553 Rev A and specifically addresses counterfeit part risk mitigation methods in electronic design and parts management, supplier management, procurement, part verification, material control, and response strategies when suspect or confirmed counterfeit parts are discovered. The seminar will provide information and guidance in each of these key requirement areas. The latter part of the course will highlight counterfeit detection techniques and part compliance verification methods. Several examples of counterfeit parts will be reviewed in detail. The course will conclude with a hands-on learning exercise in identifying characteristics that can be found in counterfeit electronic parts.

In addition to the seminar handout, a copy of the AS5553 Rev A - Fraudulent/Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition standard is provided to each registrant.

Learning Objectives

By attending this seminar, you will be able to:
- Understand the terms and definitions used in counterfeit parts risk mitigation
- Identify the various elements of the electronics supply chain
- Comprehend the magnitude and impact of suspect, fraudulent and counterfeit parts
- Introduce AS5553A and provide information and guidance in counterfeit part risk mitigation methods
- Pilot the development of a Counterfeit Parts Control Plan per AS5553A

Who Should Attend

This seminar will benefit a wide range of individuals and experience levels across the electronics industry and supply chain. Anyone who designs, specifies, buys, receives, assembles and tests electronic hardware will benefit from this seminar. This includes electronic design engineers, parts engineers, quality assurance engineers, buyers, auditors, inspectors, assemblers, electronic test engineers, microelectronic non-destructive test engineers, destructive test analysts, and supplier managers. Additionally, this seminar will benefit individuals in various levels of management that influence electronic hardware.

Topical Outline

- Introductions
- Terms and Definitions
- Identifying Distributor Types
- Legislative and Regulatory Issues
- Magnitude and Impact of Counterfeiting
- AS5553A
  - Rationale
  - Application
  - Contents
  - Requirements
- Case Study
- How You Can Help
- Summary

Instructor: Phil Zulueta
Fee $815 .7 CEUs
Design Considerations for Electrohydrostatic Actuators

.5 Day
I.D.# C1304

SAE International is pleased to offer this professional development seminar in conjunction with the SAE A-6 Aerospace Actuation, Control and Fluid Power Systems Committee meeting September 29 - October 3, 2013 in Broomfield, Colorado. This four hour short course will provide an overview of design considerations for electrohydrostatic actuation for transport and business aircraft applications. The instructors will present the critical topics of electrohydrostatic actuation (EHA) from a systems development perspective (V-Approach). Beginning with aircraft system requirements, the instructors will then guide participants through EHA subsystem requirements, component design, component verification test, aircraft integration, and use. Also included will be a short history of the evolution of EHA technology, and an overview of the advantages and system tradeoffs for selection of electrohydrostatic actuation on aircraft.

Learning Objectives
By attending this seminar, you will be able to:
- Describe the evolution of EHA for aircraft flight controls
- Evaluate the unique advantages/disadvantages of EHA in flight control applications
- Establish an awareness of high level aircraft system and requirements for EHA
- Explain basic design considerations for EHA
- Identify unique test and verification methodologies for EHA
- Describe important considerations for aircraft integration
- Evaluate key lessons learned about EHA development and aircraft usage

Who Should Attend
This seminar is intended for engineers and other key personnel involved in the design and specification of hydraulically powered flight and utility control actuation systems including fluid power, electrical, and systems engineering disciplines and those involved with aircraft certification. In addition, this seminar will benefit other key personnel desiring an understanding of aircraft electrohydrostatic actuation systems.

Topical Outline
General topics covered in this seminar include:
- Introduction and History of EHA for Flight Control Applications
- Aircraft System Requirements and System Safety
- Types of Electrohydrostatic Actuation
  - EHA
- EBHA
- IAP
- System Architectures
- EHA Specification Unique Requirements
- EHA Performance Attributes
- Duty Cycle and Thermal Management
- EHA Components
- EHA Design Considerations
- EHA Verification Testing and Qualification
- EHA System and Aircraft Integration
- Lessons Learned
- Future Trends
- SAE International and ISO Specific Documents

Instructor: Dominique van den Bossche and Jérôme Socheleau

Fee $295 .4 CEUs

Design Considerations for Electromechanical Flight Control Actuation Systems

.5 Day
I.D.# C1207

This four-hour short course intends to present an overview of electrically powered flight control actuation systems, covering commercial applications. The scope covers issues related to the mechanical design of actuators themselves, with limited reference to their control electronics. Additionally, this course will provide participants an understanding of the design considerations behind these actuation systems.

Learning Objectives
By attending this seminar, you will be able to:
- Explain electromechanical actuation systems in aircraft flight control systems
- Identify key design considerations of electromechanical actuators
- Identify a few key design considerations of electric actuator control electronics
- Evaluate overall design considerations of electromechanical flight control actuation systems

Who Should Attend
This seminar is designed for engineers and other key personnel with little or no previous electromechanical flight control actuation knowledge.
Topical Outline

• EMA Configurations
  • Rotary
  • Linear
  • Redundancy schemes
• Typical Requirements
  • Operating modes
  • Loads (applied, generated, and duty cycle)
  • Stroke
  • Rates
  • Life
  • Stiffness
  • Other typical requirements from ARP5812
• Actuator Components
  • Motors
  • Gears
  • Ball Screws
  • Roller Screws
  • Stops
  • Brakes
  • No-backs
  • Torque Limiters
  • Sensors
  • Failure Mechanisms
  • Dampers
  • Controllers - a few leading considerations
• Considerations
  • Jams
  • Efficiency
  • Back-drivability and load holding
  • Uncommanded motion
  • Sealing vs venting
  • Latency
  • Heat dissipation, temperature, and cooling
  • Materials, processes, and allowables
  • Test duration and acceleration
  • Space, envelope, form factor
• Performance Analysis
  • Static
  • Dynamic

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Design Considerations for Hydraulically Powered Fly-By-Wire Flight Control Actuation Systems

.5 Days
I.D. # C1132

This four-hour short course will present an overview of hydraulically powered flight control actuation systems used on fly-by-wire aircraft, covering both military and commercial applications. The scope this course covers the issues related to the mechanical design of actuators themselves, as well as their control electronics. Additionally, this course will provide participants an overview of the design considerations behind these flight control actuation systems.

Learning Objectives

By attending this training program you will be able to:
• Explain flight control actuation systems in military and commercial aircraft fly-by-wire systems
• Identify key design considerations of control actuators
• Identify the design considerations of actuator control electronics
• Evaluate overall design considerations of flight control actuation systems

Who Should Attend

This seminar is designed for engineers and other key personnel with little or no previous flight control actuation knowledge.

Topical Outline

• Actuation System Architectures
  • Centralized electronics
  • Remote electronics
  • Redundancy schemes (hydraulic and electronic)
• Typical Requirements
  • Operating modes
  • Hinge moment (stall force)
  • Stroke
  • Rates
  • Position accuracy
  • Dynamic response and stability
  • Static stiffness
  • Dynamic stiffness
  • Endurance
  • Leakage
  • Safety and Reliability
  • Interfaces
  • Envelope
  • Weight
  • Design Considerations

Instructor: David Manzanares
Fee $295 .4 CEUs
### ELECTRICAL, ELECTRONICS, AND AVIONICS

- Balanced versus unbalanced piston areas
  - Piston sizing
  - Stroke
  - Servovalve parameters
  - Flow passages
  - Sensor selection
  - Logic valves
  - Seal selection
  - Control loops, position and load sharing
  - Loop gain
  - Monitors

**Topical Outline**

- Overview of Electrohydraulic Servovalves
  - History of development of servovalves
  - Control function (flow vs. pressure control)
  - Architecture (single vs. two-stage)
- Servovalve Specific Terminology
  - Electrical characteristics
  - Steady-state performance characteristics
  - Dynamic performance characteristics
- Specification Considerations
  - Typical Requirements
  - Effects of tolerances
  - Test methods and equipment
  - Quality assurance considerations

**Electrohydraulic Servovalves in Flight Control and Utility Actuators**

**.5 Days**

**I.D.# C1303**

This four-hour short course intends to present an overview of electrohydraulic flow control servovalves commonly used in flight control and utility actuators. The scope of this course covers the history and design of servovalves, as well as their most common performance characteristics. This course will provide participants an understanding of the application of electrohydraulic servovalves in hydraulically powered actuators and preparation of the servovalve procurement specification.

**Learning Objectives**

By attending this seminar you will be able to:

- Recognize differences between various types of electrohydraulic servovalves.
- Understand terminology specific to electrohydraulic servovalves.
- Identify key performance characteristics.
- Evaluate effects of the servovalve characteristics on performance of a control actuator.
- Prepare design specification for electrohydraulic servovalve.

**Who Should Attend**

This seminar is designed for engineers and other key personnel involved in the design and specification of hydraulically powered flight and utility control actuation systems including fluid power, electrical, and systems engineering disciplines and those involved with aircraft certification. In addition, this seminar will benefit other key personnel desiring an understanding of power distribution through electrically powered valves and aircraft actuation systems.

**Instructor:** W. Scott Schaefer

**Fee:** $295 .4 CEUs

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**Flight Control Systems for Transport Aircraft**

**.5 Day**

**I.D.# C1130**

This four-hour short course will provide an overview of the flight control system design of recent transport aircraft. Topics will include the principles, system architectures, power sources, and main components of various technologies of flight control systems including mechanical, hydromechanical, fly-by-wire, power-by-wire, and high-lift systems. Additionally, future trends in flight controls will be discussed.

**Learning Objectives**

By attending this seminar, you will be able to:

- Explain the operating principles of various flight control systems
- Identify the various system architectures, including normal and back-up where applicable
- Identify power sources for flight control systems
- Identify the various components of flight control systems

**Who Should Attend**

This seminar is designed for engineers, executives, and other key personnel with little or no previous flight control knowledge or experience.

**Topical Outline**

- Generals
  - Flight control surfaces
  - Cockpit controls

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ELECTRICAL, ELECTRONICS, AND AVIONICS

• Mechanical Flight Controls
  • Principles (mechanical linkages, tabs, horns...)
  • System Architecture
  • Components

• Hydromechanical Flight Controls
  • Principles (mechanical linkages, hydro mechanical servo actuator)
  • System Architecture
  • Power sources (hydraulic systems)
  • Components (servo actuators, feel units, trim actuators...)

• First Generation: Fly-by-Wire Systems
  • Principles (electro-hydraulic servovalve, computer architectures)
  • System architecture (normal and back-up)
  • Power sources (hydraulic systems)
  • Components (side stick, conventional controls columns, servo actuators, sensors, digital computers, control law overview)

• New Generation: Hybrid Power Sources and Full Fly-by-Wire Systems
  • Principles (reduced number of hydraulic systems, electro-hydrostatic actuators)
  • System architecture (normal and back-up)
  • Power sources (hydraulic and electric systems)
  • Components (EHA, EBHA, back-up control)

• High-Lift Systems
  • Leading edge and trailing edge high lift devices
  • System architecture
  • Components (PCU, actuators, transmission, computers)

• Future Trends: More Electric Systems

Instructor: Dominique van den Bossche
Fee $295 .4 CEUs

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Implementation of SAE AS6081-Counterfeit Electronic Parts for Distributors

2 Days
I.D.# C1135

A similar course is available as a live online Web Seminar - Implementing SAE AS6081 – Counterfeit Electronic Parts Avoidance for Distributors Web Seminar - See course description below

Through the years there has been a significant and increasing volume of fraudulent and counterfeit electronic parts entering the aerospace supply chain. Left undetected, these parts can pose significant performance, reliability, and safety risks. In response to these threats, the SAE AS6081 Counterfeit Electronic Parts Avoidance - Distributors standard was developed to provide uniform requirements, practices, and methods to mitigate the risk of electronics distributors purchasing and supplying these counterfeit electronic parts throughout the aerospace supply chain.

This two-day seminar will begin with background information on the proliferation of counterfeit electronics and the development of a consensus standard for the procurement, detection, reporting, and disposition of these parts. The instructor will then guide participants through a comprehensive overview of the requirements of AS6081, including detailed information on the certification scheme and implementation strategies. The information presented in this seminar will assist participants and their organizations in establishing and maintaining a counterfeit electronic parts avoidance program that is in conformance with the requirements of the standard and also serves as an integral component of a comprehensive quality management system.

All attendees will receive a copy of SAE AS6081-Counterfeit Electronic Parts for Distributors.

Learning Objectives

By attending this training program you will be able to:
• Summarize the impact and pervasiveness of counterfeit electronic components in the supply chain
• Identify the requirements of AS6081
• Explain the process for certification to the AS6081 standard
• Incorporate AS6081 into an existing quality management system
• Identify the various counterfeit detection test methods included in AS6081
• Develop a plan for implementation of an AS6081 compliant quality system
Who Should Attend
This seminar is designed for electronics distribution personnel involved with establishing and maintaining a Fraudulent/Counterfeit Electronic Parts Avoidance Program in conformance with the requirements of AS6081. Additionally, OEM, contract manufacturer, government agency, and other key industry personnel that want to know and understand the requirements of the standard, including flow-down and contracting requirements, will benefit from the information presented in this seminar.

Topical Outline
Day One
• Counterfeit Electronics in the Electronics Industry
  • Background
  • Department of Commerce Study
• Quality Management Systems for Distributors
  • Workshop: Critical Processes for a Distributor
• AS6081 Requirements
  • Workshop: Processes needed to meet AS6081 requirements

Day Two
• Test Methods
  • Overview of each test method
• Certification to AS6081
  • ANAB Certification Scheme
  • Certification Process
• Implementation of AS6081
  • Implementing AS6081 within an AS9120 or ISO 9001 Quality Management System
  • Gap Assessment
  • Implementation Plan
• Next Steps
  • Developing the implementation
  • Workshop: Resources needed to meet AS6081 requirements

Instructor: Anne Poncheri

Fee $1345 1.3 CEUs

Implementing SAE AS6081 – Counterfeit Electronic Parts Avoidance for Distributors
Web Seminar
11 Hours
I.D.# WB1355

A similar course is available as a classroom seminar - Implementation of SAE AS6081-Counterfeit Electronic Parts for Distributors - See course description above.

Through the years there has been a significant and increasing volume of fraudulent and counterfeit electronic parts entering the aerospace supply chain. Left undetected, these parts can pose significant performance, reliability, and safety risks. In response to these threats, the SAE AS6081 Counterfeit Electronic Parts Avoidance - Distributors standard was developed to provide uniform requirements, practices, and methods to mitigate the risk of electronics distributors purchasing and supplying these counterfeit electronic parts throughout the aerospace supply chain.

This course will begin with a one-hour, pre-recorded session that covers background information on the proliferation of counterfeit electronics. Made available prior to the start of the live sessions, the on demand recording will also discuss the development of a consensus standard for the procurement, detection, reporting, and disposition of these parts. Through the series of five, live sessions, the instructor will guide participants through a comprehensive overview of the requirements of AS6081, including detailed information on the certification scheme and implementation strategies.

The information presented in this Web Seminar will assist participants and their organizations in establishing and maintaining a counterfeit electronic parts avoidance program that is in conformance with the requirements of the standard and also serves as an integral component of a comprehensive quality management system. All participants will receive a copy of SAE AS6081-Counterfeit Electronic Parts for Distributors.

Learning Objectives
By connecting with this Web Seminar, you will be able to:
• Summarize the impact and pervasiveness of counterfeit electronic components in the supply chain
• Identify the requirements of AS6081
• Incorporate AS6081 into an existing quality management system
• Identify the various counterfeit detection test methods included in AS6081
• Develop a plan for implementation of an AS6081 compliant quality system
• Prepare a plan for obtaining certification to the AS6081 standard

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**ELECTRICAL, ELECTRONICS, AND AVIONICS**

**Who Should Attend**

This Web Seminar is designed for electronics distribution personnel involved with establishing and maintaining a Fraudulent/Counterfeit Electronic Parts Avoidance Program in conformance with the requirements of AS6081. Additionally, OEM, contract manufacturer, government agency, quality, internal auditors and other key industry personnel that want to know and understand the requirements of the standard, including flow-down and contracting requirements, will benefit from the information presented in this Web Seminar.

**Topical Outline**

Pre-Recorded Session (required prior to the start of the live sessions)
- Counterfeit Electronics in the Electronics Industry
  - Background
  - Department of Commerce Study
- SAE G-19 Committee
  - Participants
  - Development of a consensus standard

Session 1
- Quality Management Systems for Distributors
  - Workshop - Critical Processes for a Distributor
- AS6081 Requirements
  - Workshop - Processes needed to meet AS6081 requirements

Session 2
- AS6081 Requirements
  - Section 4.0 through 4.2.5

Session 3
- Test Methods
  - Overview of each test method; Section 4.2.6

Session 4
- AS6081 Requirements
  - Section 4.2.7 through 4.2.11

Session 5
- Certification to AS6081
  - ANAB Certification scheme
  - Certification process
- Implementation of AS6081
  - Implementation within an AS9120 or ISO 9001 Quality Management System
  - Gap assessment
  - Implementation plan

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**Introduction to DO-178C**

2 Days
I.D.# C1410

The international standard titled **DO-178C - Software Considerations in Airborne Systems and Equipment Certification** is the primary standard for commercial avionics software development. This standard provides recommendations for the production of airborne systems and equipment software. Compliance with the objectives of DO-178C is the primary means for meeting airworthiness requirements and obtaining approval of software used in civil aviation products.

This two-day seminar will introduce attendees to industry best practices for real-world software development and how to avoid common DO-178C mistakes. This seminar is intended to present the information necessary to help minimize DO-178C risks and costs, while also maximizing software quality during avionics development. The instructor will guide attendees through topics such as aircraft safety, systems, software planning, software requirements, and software design/code/test. The entire ecosystem of aviation avionics software development will be summarized including DO-178C’s relationship to other industry standards including the SAE standards ARP-4761 for Safety and ARP-4754A for Systems Development.

**Learning Objectives**

By attending this seminar, you will be able to:
- Evaluate the premise of DO-178C
- Identify how DO-178C fits into the avionics development ecosystem
- Examine software planning and standards
- Identify software requirements, design, code, and testing for avionics
- Describe basic configuration management and quality assurance
- Analyze how to mitigate common DO-178C risks and minimize cost while applying industry-best practices

**Who Should Attend**

This course is designed for Avionics Software Managers and Engineers seeking a higher level of understanding of the requirements and practices of using DO-178C in software development. In addition, other personnel in need of a greater understanding of this standard will benefit from the information presented in this seminar.

**Topical Outline**

Day One
- DO-178 Basics
  - Avionics Ecosystem
  - Relationship to ARP-4754A and ARP-4761

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**Instructor:** Anne Poncheri

**Fee:** $875 1.1 CEUs
ELECTRICAL, ELECTRONICS, AND AVIONICS

- Avionics Safety
- Avionics Systems
- Software Planning
  - Criticality levels
  - Plan for Software Aspects of Certification (PSAC)
  - Software Quality Assurance Planning (SQAP)
  - Software Configuration Management Planning (SCMP)
  - Software Development Planning (SDP) - Requirements, Design, Code, and Integration
  - Software Verification Planning (SVP) - Reviews, Tests, and Analysis

Day Two
- DO-330 Tool Qualification and DO-331 Modeling
  - Why DO-330 - Tool qualification for DO-178C
  - Why DO-331 - Software Modelling for DO-178C
- DO-332 OOT and DO-333 Formal Methods
  - Object Oriented Technology and DO-178C’s DO-332
  - Formal Methods and DO-178C’s DO-333

Who Should Attend
This seminar is designed for engineers, in particular “mechanical” engineers, executives, and other key personnel with little or no previous electronics knowledge or experience. The information presented in this course will also benefit individuals from the production and support disciplines, including airlines and maintenance repair organizations.

Topical Outline
- Design Theory
  - Fundamentals of Power Electronics
  - Typical motor control architecture
- Component Functions and Technologies
  - Active components
  - IGBT, MOSFET
  - Passive components
- Harsh Environments
  - Aircraft context
  - Main design drivers for PE equipment
  - Some examples of applications
- Other Environmental Constraints
  - EMI, Lightning
  - Thermal management
  - Aircraft quality electrical network
- Best Practices
  - Multidisciplinary approach
  - Lessons learned examples
  - Best practices for PE
- Future Trends

Instructor: Vance Hilderman
Fee $1275 1.3 CEUs

Power Electronics for Mechanical Engineers
.5 Day
I.D.# C1420

SAE International is pleased to offer this professional development seminar in conjunction with the SAE A-6 Aerospace Actuation, Control and Fluid Power Systems Committee meeting Oct. 20-23 Santa Barbara, CA. This 4 hour short course provides an overview of Power Electronics (PE) in use in modern transport aircraft. This course includes the context, principles, design drivers, and the main PE components of various flight applications, including those for harsh environments. This course is designed to deliver and demystify the basic theories and best practices of mechanical, electronics, thermal management, safety, reliability and maintainability disciplines. In addition, future trends in Power Electronics will be discussed.

Learning Objectives
By attending this seminar, you will be able to:
- Explain and evaluate the use of the power electronics in various aircraft systems
- Identify and explain the various PE architectures
- Identify the main requirements and technical drivers to develop PE units
- Identify the various components of PE equipment
- Evaluate lessons learned from existing PE products flying in various commercial aircraft

Instructor: Michel Todeschi
Fee $295 .4 CEUs
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Accelerated Concept to Product (ACP) Process for Design Optimization

4 Hours
I.D.# WB1402

Today’s transportation industries are facing multi-disciplinary challenges. The product design and development process challenges often contradict each other, for example cost, weight, quality and performance. A central challenge is the need for cost and mass reduction to compete in the global market, while continuing to meet all new and existing requirements for quality and performance. Accelerated Concept to Product (ACP) Process is a performance-driven, holistic, product design development method intended to create a balance between structure and strength, synchronizing the individual facets of the product development process. It takes advantage of design, material and manufacturing experience using multiple CAD, CAE and CAO tools to reduce product design and development time and costs, as well as to reduce product mass and improve product performance.

This two-session web seminar will offer information for those who would like to start with the design of initial product structure from a general design space, a shape, or ideas available, or knowledge of design space and constraints. The instructor will show how you can use and locate the first initial load path (material) using topology optimization and special CAD tools. You will also learn how to generate your first initial pre-concept structure, with general shape of all necessary and required structures, based on your Load Path. As an illustration, the course will go through vehicle body in white (BIW) pre-concept development.

This web seminar is complementary to the Accelerated Concept to Product (ACP) Process using a 3G Design Approach Web Seminar, but is not a mandatory prerequisite. It details how to develop pre-concept designs with topology optimization and size the components based on the material alone. The 3G course uses the design that is generated in this course, or any current design concept, and applies a holistic 3G design approach for the product system and details designs for sub-systems.

Learning Objectives
By participating in this web seminar, you will be able to:
• Explore Accelerated Concept to Product (ACP) Process in today’s product design environment
• Apply holistic key enablers for efficient design and weight reduction in the ACP-Concept process
• Use Multidisciplinary Design (MD) Topology Optimization to solve design problems incorporating a number of disciplines and assess the material load path based on multidisciplinary loading assumptions
• Generate and design the initial geometry of a design concept based on the topology optimization skeleton and early manufacturing requirements
• Identify a Load Path Mapping (LPM) process

Who Should Attend
Chief engineers, product and design managers, principal engineers, program managers and lead design/CAE engineers will benefit most from this advanced course. A solid understanding of mechanical engineering concepts, as well as an understanding of CAD, CAE and design is required. Knowledge of Optimization software tools and capabilities is a plus.
turing experience using multiple CAD, CAE and CAO tools to reduce product design and development time and costs, as well as to reduce product mass and improve product performance.

This three-session web seminar will offer information on how to design a concept model from a clean sheet using a holistic 3G design approach (ACP-3G), where material types and its properties (Grades and Gauges), Geometry (shape), and manufacturing process can work together for the optimum weight and performance. The instructor will show how to use a systemic design process approach addressing the concept design for system structure for general design shape (section and size it based on manufacturing constraints). How to then design structural components in detail using sub-system design optimization and traditional design approaches will be covered. The process will use leading CAE, Optimization and CAD design tools for illustration. ACP-3G will show the design of structures with the most efficient resources (Design and CAE head counts) and optimum shape and material (Grade and Gauges) for the minimum cost for manufacturing. The course will also go through vehicle body-in-white (BIW) design process. It will identify the sizes and shape of the major components of a vehicle (Low Fidelity 3G) and finally, high-fidelity design of the components for manufacturing in both a sub-system and full system.

This web seminar is complementary to the Accelerated Concept to Product (ACP) Process for Design Optimization Web Seminar, but it is not a mandatory prerequisite. Both courses will begin with a foundational discussion of the ACP Process and design methodology. While the complementary course takes the material load path into consideration during topology optimization, this course explores a completely holistic design approach. The approach is based on existing or current design concept geometry, in which the material types and its properties (Grade and Gauges), Geometry (shape) and manufacturing processes all work together for the optimum weight and performance.

**Learning Objectives**

By participating in this web seminar, you will be able to:

- Explore Accelerated Concept to Product (ACP) Process in today’s product design environment
- Apply holistic key enablers for efficient design and weight reduction in the ACP-Concept process
- Define 3G design optimization of a structure that incorporates the optimal Geometry (shape) and material (Grade and Gauges), at the lowest cost for manufacturing
- Define and incorporate an efficient Load Management System (LMS)
- Describe and complete Full System MD (Multidisciplinary) 3G, Low Fidelity 3G (LF3G) optimization
- Describe decoupling process and identify the optimal design sub-system concept based on 3G
- Optimization for manufacturing requirements and cost con-
ENGINEERING TOOLS AND METHODS

**Who Should Attend**
Chief engineers, product and design managers, program managers and lead design/CAE engineers will benefit most from this advanced course. A solid understanding of mechanical engineering concepts, as well as an understanding of CAD, CAE and design is required. Knowledge of Optimization software tools and capabilities is a plus.

**Topical Outline**

**Session 1**
- Accelerated Concept to Product Design Process Methodology - Overview
- Low Fidelity 3G (LF3G) Optimization Process
  - Load Path Management (LPM) evaluation under multi-disciplinary loading condition
  - Design targets setting and calibrations
  - Design space, design variables, constraints and objectives (Performance and Mass) based on load paths, Geometry, Grade and Gauge (3G) and manufacturing constraints
  - LF3G FE model parameterization, LF3G design and monitoring processes
  - 3G Optimization communication (CAD/CAE, Optimization and the solver software)
  - Load path optimization results study, Load Path Mapping (LPM) based on multidisciplinary loadings (static, dynamic and impact)
  - Load path driven design and sub-systems functions
  - LF3G Process outputs; new improved load paths, overall components section sizes (geometry) and grades and gauges for Decoupling and Sub-System Optimization
- Apply Load Path Mapping (LPM) analysis of a Low Fidelity Concept Design (LFCD) Model

**Session 2**
- Decoupling Process 3G Sub-System Optimization
  - Sub-systems for detailed component design
  - Sub-system boundaries, loadings and constraints based on the full system
  - Design components based on the manufacturing process
  - Sub-system and full system comparison study
  - Sub-System 3G optimization process (same as LF3G Process)
  - Objectives, performance, design variables and manufacturing constraints (cost) in the 3G optimization process

**Session 3**
- Integration of 3G Sub-System Optimization, Full system 1G/2G Optimization and Final
- Design Evaluation
- 3G Sub-system Optimization and manufacturing feasibility
- Final Design Evaluation based on performance, mass and cost (manufacturing, tooling and equipment)
- The optimized sub-system into new design for full system evaluation
- 1G/2G optimization for system correction
- DFMA and full system evaluation for all attributes
- Design sensitivity study
- BOM, Joining Process, Assembly Process and Manufacturability confirmation
- Final design evaluation

**Instructor:** Akbar Farahani

**Fee:** $535.6 CEUs

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**Advanced GD&T Competencies: Composite Positioning Web Seminar and Web Seminar RePlay**

**1.5 Hours**

**Web Seminar:** I.D.# WB1321
**Web Seminar RePlay:** I.D.# PD331321ON

While the basics of position are covered in a standard Geometric Dimensioning & Tolerancing (GD&T) course, and sometimes a lone example of composite position is given, those discussions often overlook the variations allowed that enable more accurate control based on part function. This advanced Web Seminar will clarify the proper use of “double-decker” position controls in GD&T. There are two distinct types: composite position (one symbol) and two single-segment position controls (two symbols). These are commonly used to locate patterns of features (bolt circles, etc.), but they are rarely taught in any depth. In this course, participants will learn the difference in showing one vs. two position symbols and the importance of the datum references in understanding each meaning, per the ASME Y14.5-2009 standard. Many samples will be shown of the proper tolerancing of patterns of holes and pins that use each method. Examples and exercises will be provided to allow participants to practice several calculations. Learning these advanced techniques will permit better communication of part and assembly requirements between designers and manufacturers.

**Learning Objectives**
By connecting with this Web Seminar, you will be able to:
- Explain composite positioning tolerancing
- Explain two single-segment tolerancing
- Apply the appropriate callout based on functional requirements
- Describe gages for each and calculate gage sizes
**Who Should Attend**

This advanced-level course is intended for designers, product engineers, manufacturing engineers, manufacturing personnel, and quality/gaging inspectors with a basic knowledge of GD&T concepts. It is a companion to the *Advanced GD&T Competencies: Profile of a Surface* and *Advanced GD&T Competencies: Datum Usage* Web Seminars.

**Prerequisites**

For those new to GD&T, the *Fundamentals of Geometric Dimensioning & Tolerancing Web Seminar* is a recommended prerequisite. See course description on page 26.

**Topical Outline**

- Brief review of position and bonus tolerance
- Explanation of composite tolerancing
- The need to control orientation vs. location
- Adding secondary and tertiary datums to the lower tolerance
- Two single-segment position tolerancing
- Functional gaging and CMM gaging perspectives

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**Advanced GD&T Competencies: Datum Usage Web Seminar and Web Seminar RePlay**

1.5 Hours  
Web Seminar: I.D.# WB1319  
Web Seminar RePlay: I.D.# PD331319ON

Standard Geometric Dimensioning & Tolerancing courses cover the basics of datums but can overlook the variations that enable usage in complex ways. This advanced Web Seminar details the proper use of datums, showing their full potential to make your drawings as effective as possible. Most people who use GD&T are familiar with traditional datums derived from flat surfaces, and have adequate knowledge of the principle of establishing 3-2-1 contact points. Participants learn to select, identify, simulate, and describe datums and datum features for special uses such as irregular shapes, flexible parts, and datum references that use the maximum material modifier. Web Seminar also covers several new modifiers and options given in the ASME Y14.5-2009 standard. Learning these advanced techniques will allow designers to better communicate certain requirements.

**Learning Objectives**

By connecting with this Web Seminar, you will be able to:  
- Explain the difference between a datum and a datum feature  
- Select appropriate datums for irregularly shaped parts such as body or interior panels  
- Properly simulate given datums  
- Explain effects of a modified datum on a geometric tolerance  
- Interpret new datum tools such as translation and custom degrees of freedom

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**Who Should Attend**

This advanced-level course is intended for designers, product engineers, manufacturing engineers, manufacturing personnel, and quality/gaging inspectors with a basic knowledge of GD&T concepts. It is a companion to the *Advanced GD&T Competencies: Composite Positioning* and *Advanced GD&T Competencies: Profile of a Surface* Web Seminars.

**Prerequisites**

For those new to GD&T, the *Fundamentals of Geometric Dimensioning & Tolerancing Web Seminar* is a recommended prerequisite. See course description on page 26.

**Topical Outline**

- Brief review of traditional datum usage  
- Selecting datums: surface vs. feature of size  
- Use of the MMB modifier (formerly MMC)  
- Using a pattern as a single datum  
- The new translation modifier  
- Applying the “M” modifier to a surface  
- Customized degrees of freedom  
- Irregular feature of size datums  
- Moveable datum targets

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**Advanced GD&T Competencies: Profile of a Surface Web Seminar and Web Seminar RePlay**

1.5 Hours  
Web Seminar I.D.# WB1320  
Web Seminar RePlay: I.D.# PD331320ON

Basic Geometric Dimensioning & Tolerancing courses cover profile but often ignore the variations allowed with these symbols that enable usage in complex ways. This advanced Web Seminar clarifies the proper use of the profile tolerances in GD&T and uncover the nuances of these two symbols. Profile of
a surface is arguably the most powerful GD&T symbol, so its full potential is explored. It can be used to control size, form, orientation, and location and its relationship to datums can be varied. Learning these advanced techniques allow designers to better communicate certain requirements. The examples given in the course will also illustrate several of the new options for profile that were introduced in the ASME Y14.5-2009 standard.

Learning Objectives
By connecting with this Web Seminar, you will be able to:
• Explain when profile tolerances require a datum reference
• Determine which aspects of GD&T a given profile tolerance controls
• Interpret unilateral, bilateral, and nonuniform tolerances
• Describe how to properly measure profile tolerances

Who Should Attend
This advanced-level course is intended for designers, product engineers, manufacturing engineers, manufacturing personnel, and quality/gaging inspectors with a basic knowledge of GD&T concepts. It is a companion to the Advanced GD&T Competencies: Datum Usage and Advanced GD&T Competencies: Composite Positioning Web Seminars.

Prerequisites
For those new to GD&T, the Fundamentals of Geometric Dimensioning & Tolerancing Web Seminar is a recommended prerequisite. See course description on page 26.

Topical Outline
• Review of profile of a surface and profile of a line
• Using profile without datums
• All around and all over
• Locating a profile zone with tolerated dimensions
• Using the MMB modifier with profile
• Composite profile
• The “U” modifier
• Nonuniform tolerancing

Instructor: John-Paul Belanger
Fee $210 .15 CEUs

Design for Manufacturing & Assembly

1 Day
I.D.# 95032

2 Days
I.D.# 92047

Design for Manufacturing and Assembly (DFM+A), pioneered by Boothroyd and Dewhurst, has been used by many companies around the world to develop creative product designs that use optimal manufacturing and assembly processes. Correctly applied, DFM+A analysis leads to significant reductions in production cost, without compromising product time-to-market goals, functionality, quality, serviceability, or other attributes. This seminar will include information on how DFM+A fits in with QFD, Concurrent Engineering, Robust Engineering, and other disciplines. Each participant will receive and use the hard-bound authoritative reference textbook Product Design for Manufacture and Assembly, written by Geoffrey Boothroyd, Peter Dewhurst and Winston Knight.

You are also asked to bring a calculator capable of making simple calculations.

Learning Objectives
Upon successful completion of this course, you will be able to:
• Perform Design for Assembly (DFA) Analysis using the BDI Manual (Worksheet) Method
• Perform DFM Analysis (manufacturing cost estimation)
• Apply Design for Service (DFS) Principles
• Reduce your company’s production costs by analyzing and eliminating the factors that greatly affect the time, cost, and quality of manufacturing, assembly and service processes
• Utilize effective analysis, brainstorming, and trade-off techniques for redesigning assemblies and subassemblies

Who Should Attend
You should attend if you are a product designer, product engineer, or manufacturing engineer. Individuals involved in a new or ongoing product development process will benefit by learning how to help synchronize and optimize fabrication and assembly activities. This course is most effective when attended by product development teams. However, this is not a requirement for attendance.

Topical Outline
• Welcome and Introduction
• What is DFM+A
  • The history of DFM+A
  • The various “Design fors”
  • Why companies are using DFM+A
• DFM+A success stories
ENGINEERING TOOLS AND METHODS

• DFM+A benefits
• Key factors in ensuring DFM+A success
• DFA Good Design Principles
  • The Boothroyd Dewhurst Design for Manual Assembly Method
  • Using the manual handling and insertion tables
  • Determining theoretical minimum part count
  • Filling in the BDI DFA worksheet
  • Computing the DFA Index
• DFA Baseline Analysis Exercise (Pneumatic Piston)
• Redesign Project (Pneumatic Piston Assembly)
  • Developing design concepts
  • Identifying conservative and “stretch” designs
  • Selecting the best DFA concept
  • Analysis of redesign
  • Presentation of team results
• General Approach to Manufacturing Cost Estimation
  • Manufacturing cost drivers
  • Estimating piece cost
  • Cost calculation exercise
• BDI Design for Manufacture (DFM) Cost Estimation
  • Injection molding cost algorithms
  • Sample calculation
  • Exercise (analyzing part from pneumatic piston)
• Brief Design for Service (DFS) Overview
• DFM+A Workshop Checklist
• Institutionalizing DFM+A in Your Organization
  • How DFM+A fits in with other strategies
  • Lessons learned from other companies
  • Ideal workplace implementation plan
  • Wrap Up
• Course Evaluation

Instructor: Kevin Zielinski
Fee (95032) $895 .7 CEUs
Fee (92047) $1445 1.3 CEUs

Design of Experiments (DOE) for Engineers

2 Days
I.D.# C0406

A similar course is available as a live, online Web Seminar – Design of Experiments (DOE) for Engineers Web Seminar – see course description below.

Design of Experiments (DOE) is a methodology that can be effective for general problem-solving, as well as for improving or optimizing product design and manufacturing processes. Specific applications of DOE include identifying proper design dimensions and tolerances, achieving robust designs, generating predictive math models that describe physical system behavior, and determining ideal manufacturing settings. This seminar utilizes hands-on activities to help you learn the criteria for running a DOE, the requirements and pre-work necessary prior to DOE execution, and how to select the appropriate designed experiment type to run. You will experience setting up, running, and analyzing the results of simple-to-intermediate complexity, Full Factorial, Partial Factorial, and Response Surface experiments utilizing manual methods as well as a hands-on computer tool that facilitates experimental design and data analysis. You will also receive an overview of Robust DOE, including the Taguchi DOE Method.

Participants will be given information on how to receive, install and configure a fully-functional 30-day trial version of Minitab™ for their use in class, and/or for their personal evaluation. While some computers will be available, attendees are encouraged to bring a laptop computer and/or a calculator to the seminar to provide additional hands-on time.

Learning Objectives
By attending this seminar, you will be able to:
• Decide whether to run a DOE to solve a problem or optimize a system
• Set-Up a Full Factorial DOE Test Matrix, in both Randomized and Blocked forms
• Analyze and Interpret Full Factorial DOE Results using ANOVA, (when relevant) Regression, and Graphical methods Set-Up a Fractional (Partial) Factorial DOE, using the Confounding Principle
• Analyze and Interpret the results of a Fractional Factorial DOE
• Recognize the main principles and benefits of Robust Design DOE
• Decide when a Response Surface DOE should be run
• Select the appropriate Response Surface Design (either Plackett-Burman, Box-Behnken, Central Composite, or D-Optimal)
• Interpret Response Surface Outputs
• Utilize the MiniTab™ Software tool to analyze data

SAE PRODUCT ENGINEERING TOOLS AND METHODS CERTIFICATE PROGRAM
Watch for the certificate icon to indicate course titles that are part of an SAE multi-course certificate program.

This program focuses on the study, development, management and implementation of product engineering principles, methodologies and techniques—powerful productivity enhancers that facilitate the reduction of product development time and cost. training.sae.org/certificate/engineering_tools.
ENGINEERING TOOLS AND METHODS

Who Should Attend
This seminar will benefit engineers, designers and quality professionals in research, design, development, testing and manufacturing who are interested or active in one or more of the applications listed above. Individuals should have an engineering degree or equivalent coursework in math, statistics and computers.

Topical Outline
- Icebreaker: Team Problem Solving Exercise Using Engineering Judgment
- What is DOE?
  - Types of Designed Experiments
  - Application Examples
  - Where DOE Fits in with Other Tools/Methods
- DOE Requirements: Before You Can Run an Experiment
  - Writing Problem and Objective Statements
  - Ensuring DOE is the Correct Tool
  - Selecting Response Variable(s) and Experimental Factors
  - Actual vs. Surrogate Responses
  - Attention to Experiment Logistics
  - Test Set-up and Data Collection Planning
  - Selecting and Evaluating a Gage
- Full Factorial Experiments
  - Introduction to Cube Plots for 3- or 4-factor 2-level Experiments
  - Experiment Set-Up
  - Factor Levels, Repetitions, and “Right-Sizing” the Experiment
  - Experiment Terms to Estimate (Main Effects and Interactions)
  - High-Level Significance Evaluation
- DOE Statistical Analysis
  - ANOVA Principles for Simple Full Factorial Experiments
    - Statistics Basics; Significance Test Methods; Effect of Non-Random Experiments; Estimating Significance Test “Power”; Confidence Intervals; Estimating Random Error
  - Analysis Plots — Normal and Half-Normal Plots; Main Effect and Interaction Plots
  - Regression Analysis of Simple Full Factorial Experiments
  - Using MiniTab™ for Full Factorial DOE Experiments
- Fractional (Partial) Factorial Experiments
  - The Confounding Principle — How it Works; What Information We Lose with Confounding (and why we might not care!)
  - Selecting and Using Generators (Identities) to Set Up Confounding Strings
  - Determining Which Factor Combinations to Run
  - Analyzing Fractional Factorial Experiment Data
  - Using MiniTab™ for Fractional Factorial Experiments
- Robust Design Experiments (Overview)
  - What is Robustness?

- Control and Noise Factors
- Classical and Taguchi Robust DOE Set-Up
- Robustness Metrics
- Analytical and Graphical Output Interpretation
- Response Surface Modeling
  - What Response Surface Models do BEST
  - Available Response Surface DOEs (Plackett-Burman, Box-Behnken, etc.) — Ideal Situation(s) to Use Each Response Surface DOE Type; Cube Plot Set-up of Each Response Surface DOE
  - Analyzing Response Surface Experiment Data
  - Methods for Finding Optimum Factor Values
  - Using MiniTab™ for response Surface Experiments
- Miscellaneous Notes and Wrap-up

Instructor: Kevin Zielinski
Fee $1345 1.3 CEUs

Design of Experiments (DOE) for Engineers Web Seminar
12 Hours
I.D.# WB0932
A similar course is available as a classroom seminar – Design of Experiments (DOE) for Engineers— see course description above.

Design of Experiments (DOE) is a methodology effective for general problem-solving, as well as for improving or optimizing product design and manufacturing processes. Specific applications of DOE include, but are not limited to, identifying root causes to quality or production problems, identifying optimized design and process settings, achieving robust designs, and generating predictive math models that describe physical system behavior. This competency-based Web Seminar utilizes a blend of reading, discussion and hands-on to help you learn the requirements and pre-work necessary prior to DOE execution, how to select the appropriate designed experiment to run, DOE execution, and analysis of DOE results. You will experience setting up, running, and analyzing simple-to-intermediate complexity Full Factorial and Partial Factorial experiments both by hand and using computer software. You will also set-up and analyze Robust/Taguchi and Response Surface experiments utilizing computer software. Each participant will receive a 30 day Minitab™ product trial copy for use in the Web Seminar. Due to the nature of the Web Seminar format, each participant will be expected to dedicate approximately one hour to complete “homework” and/or short reading assignments in preparation for each session.

3 ways to get a no-obligation price quote to bring a course to your company • Call SAE Corporate Learning at 1-724-772-8529
• Fill out the online quote request at training.sae.org/corplearning • Email us at Corplearn@sae.org
Learning Objectives
• Determine when DOE is the correct tool to solve a given problem or issue
• Select the appropriate DOE experiment type (DOE Goal) for a given application
• Set up simple Full Factorial DOEs by hand, using cube plots
• Set up and analyze any Full Factorial DOE using Minitab™
• Identify appropriate partial factorial design(s) based on one’s application
• Set-up and analyze Partial Factorial DOEs, simple Robust Design (Taguchi) DOEs, and simple Response Surface DOEs using Minitab™
• Recognize the structured process steps recommended when executing a DOE project

Who Should Attend
This Web Seminar will benefit engineers involved in product design and/or optimization; process design and/or optimization; quality improvement efforts such as defect elimination, warranty avoidance or similar initiatives; and technicians, analysts and managers who support engineers in these efforts. This course has no specific course prerequisites. However, participants are expected to have some math background, that includes elementary statistics. Since the course includes demonstration and hands-on use of Minitab™, participants should have some familiarity with Windows-based personal computer applications.

Topical Outline
Session 1
• Introduction
• What is DOE (with Initial Data Collection Exercise)
• Full Factorial Experiments using Cube Plots
  • Identifying main effect and interaction terms
  • Determining effects for all terms
• Estimating How Much Experiment Data is Enough
• Assignment for Session 2: Review of Web-Based Demo of Minitab™ - Full Factorial DOE Set-up and Analysis; and Reading, Overview of DOE Statistics
Session 2
• Set up and Analysis of a Full Factorial Experiment using Minitab™
• Minitab™’s DOE Results (High Level Overview of Minitab™ Outputs)
• Review of Methods for Determining ‘Significance’
• ANOVA and Regression Overview
• Assignment for Session 3: Hands-on Exercise in the use of Minitab™ using Simulator to Generate Data, and Reading on the Structured DOE Process
Session 3
• Review of Exercise Assigned at the End of the Session 2
• Review and Additional Information on DOE Statistics and Interpretation of DOE Output
• Best Practice: The Problem Solving Process
• Best Practice: The Structured DOE Process
• Assignment for Session 4: Reading on Overview of Confounding and Partial Experiments
Session 4
• The Confounding Principle and Partial Factorial Experiments
• How Confounded Occurs in a DOE, including Identity Usage and Resolution
• Setting up Partial Factorial Experiments using Minitab™
• Assignment for Session 5: Partial Factorial Exercise using Minitab™ and a Simulator to Generate Data for the DOE; Reading on Robust/Taguchi DOE
Session 5
• Review of Exercise Assigned at the End of the Session 4
• When Robust/Taguchi DOE is Appropriate
• How Robust/Taguchi DOE is Different
  • Two-Step Optimization Concept
  • Control vs. Noise
  • Importance of Control-by-Noise Interactions
  • Signal-to-Noise (S/N) and Loss Statistics
• Some Taguchi DOE Success Stories (incl. Set-up and Analysis in Minitab™)
• Demonstration of Minitab™ for Setting Up a Taguchi DOE
• Assignment for Session 6: Robust/DOE Exercise using Minitab™ and a Simulator to Generate Data for the DOE; Reading on Overview of Response Surface Methodology
Session 6
• Review of Exercise Assigned at the End of the Session 5
• When Response Surface DOE is Appropriate
• How Response Surface DOE is Different
  • Box-Behnken Concepts (with Demonstration of Minitab™ Set-up)
  • Central-Composite Concepts (with Demonstration of Minitab™ Set-up)
• Class Exercise: Response Surface Set-up and Analysis
• High-level Overview of Other Designs/Application: Plackett-Burman and Mixture
• FAQ Review
• Summary

Instructor: Kevin Zielinski
Fee $810 1.2 CEUs
In today's highly competitive and liability-minded environment, Design Reviews (DR) are a must for all major mobility industries such as Automotive, DOD, Aerospace, Agriculture, Recreation, Marine, and Rail. While Design Reviews are becoming increasingly important in product liability litigation, they also serve as an effective way to transfer organizational best practices for specific concerns and issues.

This hands-on workshop describes how formal Design Reviews can be used in conjunction with other new product development methods to improve product designs by uncovering potential problems before they are discovered at a later stage of development or application when the costs of correction are much higher. A range of effective techniques for organizing and conducting Design Reviews will be presented. Participants will receive specific guidance and tools to assist them in tailoring Design Reviews to reflect their own organization's requirements. Topics are applicable to a broad range of new product development programs, ranging from components to complete systems, for both OEMs and suppliers.

**Learning Objectives**

By attending this seminar, you will be able to:
- Describe the relationship of the process to concurrent engineering and knowledge management
- Establish the requirements for a successful Design Review process
- Describe the types and timing of reviews
- Organize a typical Design Review
- Conduct a review and get positive results

**Who Should Attend**

The workshop is designed for individuals who are involved in the development of new products and who seek to improve that process. Product development team members including, but not limited to, directors, manager, project and program managers, design, development, process, product, quality, and application engineers will find the course valuable. It is aimed primarily at engineers and managers who will be facilitating or leading such reviews, but will also benefit manufacturing, marketing and purchasing personnel.

**Topical Outline**

**DAY ONE**

**Design Review Process**
- Why Design Reviews Should be Part of a Product Development Process
  - Market and quality drivers
  - Schedule and cost drivers
  - Litigation considerations
- Outline of the Design Review Process
  - Design reviews as part of an overall risk management process
  - What design reviews are and are not
- Types and Timing of Reviews
  - Concept reviews
  - Preliminary reviews
  - Critical reviews
  - Production readiness reviews
  - Other types of reviews
- Scope of Design Reviews
  - Design review vs gate (or phase) review
  - Formal and informal reviews
  - Key ingredients for a successful review
  - Implementing a DR process

**DAY TWO (ends at 12:30)**

**Design Review Hands-on Workshop**
- Organizing an Effective Design Review
  - Roles during the DR
  - Selecting participants
  - Preparing for the DR
  - Assignments leading to a DR
  - Duration of a review
- Conducting a Design Review
  - Conflict Management
  - Closure and follow-up
  - Using check lists to build organizational knowledge
  - Handling problem participants

**Instructor:** Angelo Mago  
**Fee $1265** 1.0 CEUs
Failure Modes and Effects Analysis (Product & Process) in Aerospace

2 Days  
I.D. C0939

This interactive Failure Modes and Effects Analysis (FMEA) product and process seminar introduces the participant to the analytical process by which potential failure modes, failure effects and causes of failure are identified. Engaging in a systematic method of studying failure can improve future outcomes. The severity, occurrence and probability of detection of a failure mode are used to prioritize which failure modes are most critical. Methodology is introduced for dealing with the effects of failure. The Design FMEA link to manufacturing is explained and amplified in terms of downstream Process FMEA. This course is based on “learning by doing” with interactive, in-class Design and Process FMEA generation and analysis in a lively team environment. This course will also detail relevant portions of the SAE Aerospace Recommended Practice for FMEA, ARP 5580 which is included in the course materials.

Learning Objectives

By attending this seminar, you will be able to:
• List the benefits, requirements and objectives of an FMEA (both Product Design & Process)
• Explain the steps and methodology used to analyze a Design or Process FMEA
• Demonstrate the application of a variety of tools utilized in conjunction with performing an FMEA
• Identify corrective actions or controls and their importance in minimizing or preventing failure occurrence
• Interpret the objectives of the SAE Aerospace Recommended Practice for FMEA, ARP 5580

Who Should Attend

This seminar is designed for the design engineer, process assurance engineer, reliability engineer, test engineer, quality engineer, development engineer, logistics/support engineer, manufacturing engineer and their management or anyone responsible for the design and development of design or manufacturing, assembly or service processes in the completion of a Design or Process FMEA. Attendees should possess a basic understanding of the design principles/process and manufacturing/assembly process.

Topical Outline

DAY ONE
• Introduction and Overview
  • Definition
  • Requirements for an FMEA (both Design & Process) - Who drives the requirements?
  • FMEA detail
  • Design and Process FMEA similarities and differences--performing and FMEA
  • Prerequisites
  • Basic analysis methodology -- approach; sequence
  • Prioritization of failure modes
  • Typical forms used: examples and recommendations
• Other Quality Tools to Aid in FMEA Development
  • Pareto chart
  • Fishbone diagram
  • Design review
  • Checklists
  • Lessons learned
  • Design of Experiments (DOE)
  • Statistical process Control (SPC)
  • Fault Tree Analysis (FTA)
  • Monte Carlo simulation
• Design FMEA: Class Exercise
  • What’s the requirement?
  • Forming the team
  • Process flow
  • Brainstorm design failure modes
  • Use FMEA form to document failure modes, severity, occurrence, detection
  • Prioritize failure modes
  • Work corrective actions
  • How good are these corrective actions?
  • Redo prioritization to compare to requirement
  • Modify product based on analysis, for objective testing

DAY TWO
• Complete Design FMEA exercise (continued)
• Process FMEA: Class Exercise
  • What’s the requirement?
  • Forming the team
  • Process flow/Value Stream map
  • Brainstorm process failure modes
  • Use FMEA form to document failure modes, severity, occurrence, detection
  • Prioritize failure modes
  • Work corrective actions
  • How good are these corrective actions?
  • Redo prioritization to compare to requirement
  • Control Plan development
  • Modify product based on analysis, for objective testing

• FMEA software overview
• FMEA and Product Liability

Instructor: Jim Breneman
Fee $1225 1.3 CEUs
Finite Element Analysis for Design Engineers - Hands-on FEA Workshop

2 Days  
I.D.# 93006

A similar course is available as a live, online Web Seminar – Finite Element Analysis (FEA) for Design Engineers Web Seminar – see course description below.

The Finite Element Analysis (FEA) has been widely implemented by automotive companies and is now used by design engineers as a design tool during the product development process. Design engineers analyze their own designs while they are still in the form of easily modifiable CAD models to allow for quick turnaround times and to ensure prompt implementation of analysis results in the design process. When used properly, the FEA becomes a tremendous productivity tool helping design engineers reduce product development time and cost. On the contrary, misapplication of FEA may lead to erroneous design decisions, which are very expensive to correct later in the design process.

This seminar provides design engineers with skills necessary for proper use of FEA in the design process and to ensure that this powerful tool is implemented in the most efficient and productive way.

The seminar offers hands-on exercises focusing on the analysis of FEA errors and proper modeling techniques. Attendees study different types of analyses typically performed by design engineers, discuss common misconceptions and traps in the FEA and review Implementation of Management of FEA in the design environment. The seminar provides opportunities to discuss and exchange FEA experiences. The seminar layout allows for some customization so problems of particular interest to students can be discussed in class. All topics are illustrated by hands-on exercises using FEA software SolidWorks Simulation. However, acquired skills are not software specific and no prior exposure to any FEA software is required.

The SAE book, Finite Element Analysis for Design Engineers, by Paul Kurowski is included in the course materials.

Learning Objectives

By attending the seminar, you will be able to:
• Select preferable modeling approaches
• Analyze errors inherent to FEA results
• Identify FEA advantages and shortcomings
• Avoid mistakes and pitfalls in FEA
• Produce reliable results on time
• Request FEA project and use FEA results

• Provide effective FEA project management
• Ensure quality and cost-effectiveness of FEA projects

Who Should Attend

Mechanical engineers in research and development, designing or project management that wish to upgrade their skills in FEA will benefit by attending this seminar. The seminar also addresses the needs of managers in charge of FEA projects performed by design engineers.

Topical Outline

DAY ONE
• Basic concepts in the FEA and their influence on FEA accuracy
• Origins and types of FEA errors
• Influence of mesh on quality of results
• Types of finite elements
• Types of boundary conditions
• Useful modeling techniques
• Linear static analysis
• Modal analysis

DAY TWO
• Thermal analysis
• Buckling analysis
• Nonlinear analysis
  • nonlinear geometry
  • nonlinear material
  • contact stresses
• Interfacing between CAD and FEA
• FEA implementation
• FEA project management
• FEA traps and misconceptions
• FEA assessments

Instructor: Paul Kurowski
Fee $1425 1.3 CEUs

SAE Multi-Course Certificate Programs

Watch for the certificate icon to indicate course titles that are part of an SAE multi-course certificate.

Intended to provide a guide towards deeper knowledge in a specific area, SAE’s multi-course certificates outline required courses that offer foundational knowledge of the subject. Some certificate programs also feature additional electives designed to broaden your exposure to more specific aspects of the technology studied.

training.sae.org/credentialing/certificate
Finite Element Analysis (FEA) for Design Engineers Web Seminar

12 Hours
I.D.# WB1241

A similar course is available as a classroom seminar – Finite Element Analysis for Design Engineers - Hands-on FEA Workshop- see course description above.

The Finite Element Analysis (FEA) has been widely implemented by automotive companies and is used by design engineers as a tool during the product development process. Design engineers analyze their own designs while they are still in the form of easily modifiable CAD models to allow for quick turnaround times and to ensure prompt implementation of analysis results in the design process. While FEA software is readily available, successful use of FEA as a design tool still requires an understanding of FEA basics, familiarity with FEA process and commonly used modeling techniques, as well as an appreciation of inherent errors and their effect on the quality of results. When used properly, the FEA becomes a tremendous productivity tool, helping design engineers reduce product development time and cost. Misapplication of FEA however, may lead to erroneous design decisions, which are very expensive to correct later in the design process.

This six-session Web Seminar provides design engineers with the skills necessary for proper use of FEA in the design process and to ensure that this powerful tool is implemented in the most efficient and productive way. Participants will study different types of analyses typically performed, discuss common misconceptions and traps in the FEA, and review Implementation of Management of FEA in the design environment. The Web Seminar format will allow for some customization so problems of particular interest to participants and an exchange of FEA experiences may be discussed during the live sessions. Hands-on exercises focusing on the analysis of FEA errors and proper modeling techniques will be assigned.

All topics are illustrated by hands-on examples using FEA software SolidWorks® Simulation for which participants will be provided a Student License (compatible with Windows XP, 7; IE 7,8,9; MS Excel and Word 2007 or 2010). Acquired skills, however, are not software specific and no prior exposure to FEA software is required. The eBook, Engineering Analysis with SolidWorks® Simulation by Paul Kurowski, will also be included in the course materials. In-class, hands-on exercises and between-session assignments will provide an opportunity to put what is learned into practice.

Learning Objectives
By connecting with this Web Seminar, you will be able to:
• Select preferable modeling approaches
• Analyze errors inherent to FEA results
• Identify FEA advantages and shortcomings
• Avoid mistakes and pitfalls in FEA
• Produce reliable results on time
• Request FEA analysis and use FEA results
• Provide effective FEA project management
• Ensure quality and cost-effectiveness of FEA projects

Who Should Attend
This course addresses the needs of design engineers who are not specialized analysts but need to use the Finite Element Analysis to analyze new product during the design process. Also non-specialist FEA users, R&D engineers and managers, project engineers, and product engineers will benefit from its coverage of different FEA formulations, tools for error analysis, common errors, traps and misconceptions, and an introduction to FEA project management.

Topical Outline
Session 1
• Fundamental Concepts in the FEA
• Finite Element Analysis Process
• Origins and Types of FEA Errors
• Finite Element Mesh
• In-class Exercises

Session 2
• Control of Discretization Error - Convergence Process
• Verification and Validation of FEA Results
• In-class Exercises
• Homework Assignment

Session 3
• Control of Modeling Error
• Types of Finite Elements
• Types of Boundary Conditions
• Useful Modeling Techniques
• In-class Exercises
• Homework Assignment

Session 4
• Modal Analysis
• Buckling Analysis
• In-class Exercises
• Homework Assignment

Session 5
• Nonlinear Geometry Analysis
• Nonlinear Material Analysis
• Contact Stress Analysis
• 2-3 in-class exercises
• Homework Assignment
ENGINEERING TOOLS AND METHODS

Session 6
- Steady State Thermal Analysis
- Transient Thermal Analysis
- FEA Implementation
- FEA Project Management
- FEA Traps and Misconceptions
- Quiz in preparation to post-course learning assessment

Instructor: Paul Kurowski
Fee $845 1.2 CEUs

FMEA for Robust Design: What, Why, When and How

12 Hours
I.D.# WB1422

Failure Modes and Effects Analysis (FMEA) is an integral part of product design activity applicable to any type of product or service. It is a quantitative and qualitative step-by-step approach for identifying and analyzing all actual and potential points of failure in a design, product or service. A successful team-based FMEA activity can use their collective experience with similar products to dramatically improve not only product performance but also reduce manufacturing issues at both a component and system and processing level. This web seminar introduces the five basic types of FMEAs with emphasis on constructing a Design FMEA. Each column of the FMEA form is clearly explained using a typical FMEA example. This example can be a provided sample or a company sample provided candidate. The course covers various methods for clearly identifying product function at three levels, and associating distinct failure modes, effects and causes related to each function level. Special attention is given to Severity, Occurrence, and Detection and how to develop effective Risk Priority (RPN) strategies and Recommended Actions for significant RPNs.

All material is in conjunction with current industry standards.

Learning Objectives
Upon completion, the participant should have developed a completed FMEA and, thus, be able to understand and apply the following:
- Relating Product Development, Voice of the Customer (VOC) and the FMEA
- Why and when to use System and Design FMEAs
- The FMEA as a risk management technique
- The five types of FMEAs
- Organizing effective FMEA development teams and meetings

- The steps to generating a quality FMEA, including a column by column review of the Design FMEA form
- Basics of Root Cause Analysis
- Design Control techniques, Detection Strategy, Risk Priority strategies and Risk Ranking tables
- Assignment of recommended actions

Who Should Attend
The course is designed for individuals who are involved in the development of new products and who seek to improve that process. Product development team members including, but not limited to, project and program managers, design and development, process, product, quality, and application engineers will find the course valuable. It is aimed primarily at these managers and engineers who will be facilitating or leading such FMEA activities. Directors, marketing and purchasing personnel will also benefit by understanding why the FMEA process is important to developing a safe and effective product.

Topical Outline
Session 1
- FMEA Introduction
  - Background and History
  - The FMEA Standards - MIL-STD_1629, SAE J1739, AIAG
  - Relationship of Design and Process FMEA in a design & manufacturing environment

Session 2
- Five Types of FMEAs

Session 3
- FMEA and Risk Management
  - Defining Risk Management
  - FMEA and Robust Design
  - FMEA as part of Design to Cost
  - FMEA as Product Liability Protection

Session 4
- Managing the FMEA Process
  - Assembling the FMEA Team
  - Facilitator Role during the FMEA Process
  - Capturing the 6 Levels of Voice of the Customer (VOC)
  - The FMEA Database and FMEA Templating
  - Tips for standardizing concise expression of failure modes, effects and causes

Session 5
- Column By Column Review of the FMEA - Part 1
  - Header
  - Item/Function - Primary, Secondary and Customer Satisfaction
  - Failure Mode
  - Effects and Severity
  - Causes and Occurrence
  - Controls and Detection
Session 6
• Column By Column Review of the FMEA - Part 2
  • Calculating and Assessing RPN
  • Risk Tables and RPN assignment strategies
  • Recommended Actions
  • Responsibility and Target Dates
  • Verification

Instructor: Angelo E. Mago
Fee $810 1.2 CEUs

Fundamentals of Geometric Dimensioning & Tolerancing (GD&T) Web Seminar and Web Seminar RePlay
16 Hours
Web Seminar: I.D.# WB0933
Web Seminar RePlay: PD330933ON

A similar course is available as a live classroom seminar – Geometric Dimensioning & Tolerancing— see course description below.

Geometric dimensioning and tolerancing (GD&T) is used as a symbolic way of showing specific tolerances on drawings. GD&T is a valuable tool that effectively communicates the design intent to manufacturing and inspection. It is governed by the technical standard ASME Y14.5M-2009. This course introduces participants to the GD&T system, providing a working knowledge of the correct interpretation and application of each symbol, general rules, the datum system, and ‘bonus’ tolerance and highlighting some of the changes in the updated Y14.5 standard. The material is reinforced with many practice exercises.

Learning Objectives
By connecting with this Web Seminar, you will be able to:
• Explain the benefits of geometric tolerancing
• Identify datum features and determine their order of precedence
• Identify and interpret each of the characteristic symbols
• Describe the material condition modifiers and how “bonus” tolerance occurs
• Correctly interpret GD&T feature control frames, and explain the impact on manufacturing and inspection

Who Should Attend
This course is ideal for anyone who has a need to apply or interpret geometric tolerances on a product print. Product engineers, manufacturing engineers, CAD designers, quality inspectors, and other engineering and manufacturing personnel will all benefit from a better understanding of design requirements; improved communication with customers and suppliers; and improving designs by taking advantage of bonus tolerance and other GD&T benefits. Participants should have an understanding of basic blueprint reading.

Topical Outline
Session 1
• Why Use GD&T?
  • Review of traditional dimensioning
  • Benefits of GD&T
  • Technical standards
  • Definitions
  • Basic dimensions
  • How to read the feature control frame
Session 2
• Rules and the Form Symbols
  • Rule #1: Size controls form
  • Rule #2: Assume RFS
  • Flatness
  • Surface straightness
  • Circularity
  • Cylindricity
Session 3
• Bonus Tolerance
  • GD&T applied to a feature of size
  • Bonus and the MMC modifier
  • Virtual condition
  • Gaging and inspection of GD&T
Session 4
• Datums
  • Datum vs. datum feature
  • The datum reference frame
  • Primary, secondary, and tertiary datums
Session 5
• Profile and Orientation
  • General definition of profile
  • Profile of a line
  • Profile of a surface
  • Use of datums with profile
  • Perpendicularity; Angularity
  • Parallelism
Session 6
• Position Tolerance I
  • True position; Position tolerance RFS
  • Using MMC or LMC
  • The “boundary” concept
  • The pitch diameter rule
Session 7
• Position Tolerance II
  • Projected tolerance zone
ENGINEERING TOOLS AND METHODS

- Inspecting parts for position
- Calculating tolerance values
- Composite position tolerance

Session 8
- Symmetry and Coaxial Controls
  - Concentricity
  - Symmetry
  - Circular runout
  - Total runout

Instructor: John-Paul Belanger
Fee $965 1.6 CEUs

Geometric Dimensioning & Tolerancing (GD&T)

A similar course is available as a live online Web Seminar – Fundamentals of Geometric Dimensioning & Tolerancing Web Seminar – see course description above.

This in-depth course covers the GD&T system per ASME Y14.5-2009, including why it reduces costs, how to interpret the symbols, and how to apply these tolerances correctly. Participants will learn the basic definitions and rules, the importance of datums, the meaning of each tolerance, and sample ways of gaging geometric tolerances. The class is mainly lecture, with many practice exercises. Participants are encouraged to bring sample parts and/or prints (with or without GD&T already applied) to class for questions. Time is reserved for discussing the application of GD&T to your parts/prints.

Learning Objectives
By attending this seminar, you will be able to:
- Describe the tolerance zones defined by each symbol
- Determine when to use Rule #1 to control form and when other controls are appropriate
- Recognize correct syntax for feature control frames
- Relate common gaging and inspection methods to geometric tolerance zones and feature control frames
- Correctly apply and interpret the MMC modifier and other modifiers
- Assess various datum schemes against product functionality and manufacturing and inspection performance
- Recognize the need for product-specific GD&T guidelines and list the steps required to create them
- List the changes in the 2009 standard from previous editions

Who Should Attend
This course is ideal for anyone who has a need to apply or interpret geometric tolerances on a product print. Product engineers, manufacturing engineers, CAD designers, quality inspectors, and other engineering and manufacturing personnel will all benefit from becoming fluent in GD&T.

Topical Outline
- Drawings and Dimensioning
  - Importance of engineering drawings
  - Fundamental dimensioning rules
  - Review of coordinate dimensioning and tolerancing
  - Benefits of using GD&T
  - History of GD&T
  - Quality issues - how GD&T fits into other standards
  - GD&T standard: ASME Y14.5-2009
- Introduction to GD&T Symbols and Terms
  - Definitions
  - Material conditions — MMC, LMC, RFS
  - Radius and controlled radius
  - Reading a feature control frame
- Rules and Concepts of GD&T
  - Rule #1- Size controls form
  - Inspecting a part for size limits
  - Rule #2 - Implied RFS
  - Virtual condition
  - Bonus tolerance
  - Gaging GD&T-fixtures; special gages; CMMs
- Form Tolerances
  - Flatness applied to a surface
  - Straightness applied to a surface
  - Circularity
  - Cylindricity
  - Straightness and flatness applied to a feature of size
  - Per-unit form control
- Datums
  - Purpose of datums in GD&T
  - Single planar datum
  - The datum reference frame
  - Datum targets
  - Feature-of-size datums
  - Compound datums
  - How to select datums for a part
  - Simulating datums on gage fixtures and CMMs
- Profile Tolerances
  - General definition of profile
  - Profile of a line
  - Profile of a surface
  - Profile with datum references
  - Composite profile control
  - Tolerance stacks; calculating min/max wall thickness
Reverse Engineering: Technology of Reinvention

2 Days
I.D.# C0559

During the past decade reverse engineering has become a common and acceptable practice utilized by many original equipment manufacturers and suppliers. This course focuses on the application of modern technologies used to decode the design details and manufacturing processes of an existing part in the absence of the original design data. It emphasizes the real-life practice of reverse engineering in the aerospace industry from both scientific and legal points of view. Attendees will learn the applicability and limitations of reverse engineering through case studies and hands-on exercises.

Various measurement instruments, ranging from traditional micrometers to computer-aided laser probes, will be compared for their merits and shortcomings. The statistics of dimensional measurements and the acceptable tolerance of variations, with emphasis on industrial standards in real-life practice will be discussed. Material identification, manufacturing process verification and the system compatibility of the subject part to be reverse engineered will be covered in substantial detail. In addition, the materials specifications will be exemplified as useful supporting documents for substantiation data.

Note: Participants should bring a calculator for in-class exercises.

Learning Objectives

By attending this seminar, you will be able to:
• Define the critical elements of reverse engineering
• List the measurements and analyses required to duplicate/reproduce an OEM part by reverse engineering
• Recognize if an OEM part can be duplicated/reproduced by reverse engineering
• Judge if a “duplicated” part will meet the design functionality of the OEM part
• Evaluate the feasibility of a reverse engineering proposal/project
• Describe and implement a process to duplicate/reproduce a part by reverse engineering

Who Should Attend

This seminar is designed to assist individuals in various industries including, but not limited to, automotive, aerospace, off-highway, motorsports and parts brokerage firms. Corporate senior executives, engineering managers, engineers, technicians, government inspectors, sales managers, salespersons, lawyers and legal counselors will find the course relevant and informative.

Topical Outline

DAY ONE
• Introduction
  • Historical background
  • Reverse engineering vs. machine design
  • Three basic requirements: form, fit and function
• Geometrical Form
  • Dimensional measurement
  • Precision instruments of measurement
  • Tolerance
  • Virtual exercise of geometrical modeling
• Material and Process Identification
  • Chemical composition identification
  • Manufacturing process verification
Robust Design

2 Days
I.D.# C1231

Robust Design

Engineers are taught to create designs that meet customer specifications. When creating these designs, the focus is usually on the nominal values rather than variation. Robustness refers to creating designs that are insensitive to variability in the inputs. Much of the literature on robustness is dedicated to experimental techniques, particularly Taguchi techniques, which advocate using experiments with replications to estimate variation. This course presents mathematical formulas based on derivatives to determine system variation based on input variation and knowledge of the engineering function. If the function is unknown, experimental techniques are presented to efficiently estimate a function.

The concept of designing for both nominal values and variability is expanded to multiple outputs and designing to minimizing costs. Traditionally, if the output variation is too large to meet requirements, the tolerances (variation) of the inputs are reduced. Using the approach presented in this course, the equations presented can be used to identify the contribution of each of the inputs to the output variation. The variation of the components with the largest contribution can be reduced which will reduce output variation. At the same time, the variation of the components contributing the least to the variation of the output can be increased which will reduce costs. A system of equations can be created that will allow an optimization routine to create a design optimized for total cost including the cost of poor quality and component cost.

Participants should bring a laptop computer for in-class exercises.

The book, “Probabilistic Design for Optimization and Robustness for Engineers” by Bryan Dodson, Patrick Hammett, & Rene Klerx is included in the course materials.

Learning Objectives

By attending this seminar, you will be able to:
• Create designs that have a minimal sensitivity to input variation
• Reduce design costs
• Determine which design parameters have the largest impact on variation
• Optimize designs with multiple outputs

Who Should Attend

This course is relevant to design and manufacturing engineers, researchers and those interested in cost reduction. This methodology can link manufacturing to engineering design and help design engineering solve manufacturing problems.

Topical Outline

DAY ONE
• Basics of Variation - unique problems facing engineers; small sample sizes and the inability to obtain random samples; techniques for overcoming these problems
• Distributions
  • Normal, Lognormal, and Weibull
• Process Capability
  • Measuring process capability
  • Process capability indices
  • Estimating process capability for design inputs
• Robustness Concept
  • Statistical bias that results from input variation in a non-linear system
  • Modeling output variation
  • Circuit exercise
  • Projectile exercises
• Simulation
  • Determining the variability of the inputs
  • Random number generators
  • Verification & validation
Root Cause Problem Solving: Methods and Tools Web Seminar and Web Seminar RePlay

8 Hours
Web Seminar: I.D.# WB0931
Web Seminar RePlay: I.D.# PD330931ON

Tough times require searching for things that we can change and making them better. But so often problems are solved with ‘band-aids’ and not root cause solutions. This approach is getting too expensive and at best only helps companies tread water. To combat these issues and adopt a fresh approach, teams can use the methods and tools of Root Cause Problem Solving to view problems as opportunities for improvement, identify root causes and implement solutions to prevent recurrence.

Benefits include improved quality and customer satisfaction, reduced operation costs, and greater employee knowledge of work processes.

This proven 8-step approach to problem solving will help improve operational and financial performance by identifying causes and implementing solutions to significant or recurring problems. This approach to problem solving is used by many major automotive manufacturers.

Learning Objectives
By connecting with this Web Seminar, you will be able to:
• Describe the 8-Step Problem Solving Methodology
• Define the difference between Symptom and Root Cause
• Use tools and techniques to solve problems
• Evaluate effectiveness of problems solving efforts

Who Should Attend
This course is applicable to those directly working in or responsible for performance improvement of any definable, repetitive process, e.g. manufacturing, design, logistics, purchasing, sales, or distribution, including:
• Manufacturing managers, supervisors and team leaders
• Manufacturing engineers
• Design engineers
• Quality engineers and technicians
• Technical managers
• Project team leaders
• Problem solving and quality improvement facilitators
• Anyone whose role includes problem solving; therefore all supervisors and lead personnel

Topical Outline
Session 1
• Overview
  • Following a process approach
  • What is a problem?
  • Inhibitors to effective problem solving
  • 8-step problem solving process overview
• Step 1: See the Problem as an Opportunity
  • Framing the problem solving effort
  • Identifying team members
  • Team roles
• Step 2: Describe the Problem
  • Symptoms vs. Causes
  • Methods for describing the problem
  • Using and charting data
  • Problem Is/Is-Not analysis
Session 2
• Step 3: Implement Containment
  • Protect the Customer
  • Process Control Plan
• Step 4: Recognize Potential Root Causes
  • Identifying possible causes
  • Process Maps
  • Cause-Effect diagrams
  • 5-Why tool
Session 3
• Step 5: Design Solution
  • Solutions that don’t work
  • Process Controls and Error Proofing
  • Standardized Work
• Step 6: Implement Permanent Corrective Actions
  • Plan the work
  • Complete system changes

Instructor: Bryan Dodson
Fee $1335 1.3 CEUs
ENGINEERING TOOLS AND METHODS

• Verify effectiveness
Session 4
• Step 7: Prevent Recurrence
  • Was the problem eliminated?
  • Layered audits
  • Leverage learnings with FMEA
• Step 8: Recognize Efforts
  • Team debrief and lessons learned
  • Evaluate and celebrate success
• Summary
  • Sufficiency checklist for effective problem solving
  • Continuous Improvement

Who Should Attend
This seminar is intended for engineers and educators who would like to have a good working knowledge of applying statistics to product design in order to better predict and improve product quality.

Topical Outline
• Review of Tolerancing Methods, Tolerance Stack-Ups and the Relationship between Tolerancing and Quality. A High-Level Overview of Geometric Dimensioning & Tolerancing (GD&T) and Process Capability Measurement is Provided
• Tolerance Synthesis (Allocation) Versus Tolerance Analysis
• Overview of the Worst Case (non-statistical) Tolerancing Method for Comparison with Statistical Tolerancing Results
• Probability & Statistics Concepts Required for Statistical Tolerancing Methods
• Tolerance Allocation Based on “Risk of Misassembly”
• Statistical Tolerancing Using the Root-Mean-Square (RMS) Method
  • With bilateral tolerances
  • With unilateral and/or asymmetrical tolerances
  • In 2-D and 3-D applications
  • Participant exercises
• Statistical Tolerancing Using Monte Carlo Simulation
  • Performing Monte Carlo Analysis by hand
  • Demonstrations of computer software for Monte Carlo Simulation and analysis (VSA-2D, VSA-3D and others, if time permits)
• Analyzing Part Tolerances using Main Effect and Sensitivity Analysis Methods — Methods for Determining the Contribution of Process Variables to Overall Process Variation. A Brief Description of Partial and Full-Factorial Analysis is Also Provided
• Overview of Design of Experiments (DOE) and Tolerance Optimization Techniques — Their Benefits in Effective Tolerancing of Parts and Assemblies
• Tolerance Management Program Guidelines — For the Benefit of Participants Interested in Establishing a Comprehensive Quality Assurance Program in Their Organization

Statistical Tolerance Design

1 Day  
I.D.# 88033

This seminar will include a review of statistical theory and present statistical methods, which are used to better select and/or analyze Tolerance Stack-ups. The Probability (RMS) Method, the Monte Carlo Simulation Technique and tolerance optimization techniques will be discussed along with guidelines on which method(s) to use in given situations. Attendees will also view a demonstration of a microcomputer Monte Carlo Simulation program that analyzes the effects of form and assembly variation on the quality of a finished product. This seminar will provide an overview of Design of Experiments (DOE) methods, which enable effective analysis of critical product dimensions and tolerances. Note: Participants should bring a scientific calculator for several in-class exercises.

Learning Objectives
By attending in this seminar, you will be able to:
• Apply worst case, root-mean-square, and Monte Carlo simulation methods for the allocation of analysis of simple-to-intermediate complexity tolerancing schemes
• Use the “Risk of Misassembly” approach for tolerance allocation, and the “Main Effect” approach for determining dimensional variables tolerance which exhibit the greatest impact on build variation
• Understand and be exposed to various computer tools which can greatly improve their statistical tolerancing efforts, given the intricacies of GD&T, plus-minus tolerancing, and various datum schemes

Instructor: Murray Sittsamer  
Fee $620 .8 CEUs

Instructor: Kevin Zielinski  
Fee $805 .7 CEUs
**Engineering Tools and Methods**

**Tolerance Stack-Up Analysis**

2 Days  
I.D.# C0022

*A similar course is available as a live, online Web Seminar. Tolerance Stack-Up Fundamentals Web Seminar – see course description below.*

This course is designed to help product design personnel create tolerance stacks for parts and assemblies that use Geometric Dimensioning & Tolerancing. Those who will benefit most are designers and engineers who are responsible for creating the GD&T callouts for engineering drawings and product models, and who want to be more confident in how the assigned geometric tolerances interact and stack up. The course begins with a quick review of Y14.5 concepts, and then introduces the benefits and uses of a tolerance stack spreadsheet. Participants then learn detailed procedures for performing tolerance stacks on parts and assemblies, beginning with coordinate tolerances and moving on to geometric tolerances.

The course will eliminate confusion over how to include the bonus and shift in a tolerance stack: for example, when using tolerance of position with the MMC modifier. The simple, manual spreadsheet method used throughout the course produces a straightforward documentation trail that is easily interpreted, and readily adaptable to any company's electronic spreadsheet program. Results can be quickly and easily checked, and revisions can be made with ease. Students receive extensive practice at creating stacks, and should bring a calculator or laptop computer equipped with MS Excel for the numerous student exercises.

Each attendee will receive a copy of the *Tolerance Stack Analysis Using GD&T* textbook and an Excel template for generating stacks.

**Learning Objectives**

By attending this seminar, you will be able to:  
• Correctly calculate and apply bonus, shift, virtual condition, and resultant condition  
• Perform and develop a tolerance stack-up analysis  
• Correctly enter geometric feature control frame data into a tolerance stack

**Who Should Attend**

This course is intended for designers and engineers who are currently generally familiar with the principles, concepts and practices contained within Y14.5, and who are looking for a comprehensive step-by-step process for getting GD&T into a tolerance stack.

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**Topical Outline**

- Introduction to Tolerance Stacks  
- Review of GD&T and the Y14.5 Standard  
- Review of Virtual Condition and Resultant Condition concepts  
- Introduction to Tolerance Stack-up Analysis Procedure for parts (part stacks) using coordinate dimensions and tolerances*  
- Introduction to Tolerance Stack-Up Analysis Procedure for assemblies (assembly stacks) using coordinate dimensions and tolerances (100% interchangeability)*  
- Tolerance Stack-up Analysis for runout and concentricity*  
- Tolerance Stack-up Analysis for surface profile: bilateral and unilateral*  
- Tolerance Stack-up Analysis for tolerance of position: RFS*  
- Tolerance Stack-up Analysis for tolerance of position: MMC-bonus*  
- Tolerance Stack-up Analysis for tolerance of position: MMC-shift*  
- Tolerance Stack-up Analysis for form and orientation controls: surface and feature of size*  
- Use of Statistical Methods in Stack-up Analysis: Root-Sum-Square and its Derivatives

*Indicates hands-on practice exercises immediately follow lecture

**Instructor:** John-Paul Belanger

**Fee:** $1445  
1.3 CEUs

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**Tolerance Stack-up Fundamentals Web Seminar and Web Seminar RePlay**

6 Hours  
Web Seminar: I.D.# C0842  
Web Seminar RePlay: I.D.# PD3308420N

*A similar course is offered as a live, classroom seminar. Tolerance Stack-Up Analysis – see course description above.*

Analysis of tolerance stacks varies widely. This Web Seminar introduces the basic tools to create a common methodology for tolerance stack-ups, and ensure seamless documentation. Participants will create 1-D tolerance stacks for parts and assemblies that use geometric dimensioning and tolerancing using a tolerance stack spreadsheet. This simple, manual spreadsheet method produces an easily interpreted and checked documentation trail, and is easily adaptable to common electronic spreadsheet programs. Multiple examples will be provided to assist engineers in applying tolerance stack-up fundamentals to Y14.5 issues.
Learning Objectives
By connecting with this Web Seminar, you will be able to:
• Perform and develop a tolerance stack-up analysis
• Correctly enter geometric feature control frame data into a tolerance stack
• Apply a common step-by-step methodology to tolerance stack analysis

Who Should Attend
Engineers familiar with concepts and practices contained within Y14.5 and who are looking for a fundamental step-by-step process for getting geometric dimensioning and tolerancing (GD&T) into a tolerance stack will benefit from this course. A basic understanding of GD&T symbols and concepts is required.

Topical Outline
Session 1
• Introduction and review
  • Introduction and tolerancing review
  • Tolerancing strategies
  • Review of G D & T
Session 2
• Stack fundamentals
  • How to identify the stack path
  • The two-column stack spreadsheet
  • Entering dimensions into the spreadsheet
  • Examples with coordinate dimensions
Session 3
• Factoring G D & T into a Stack
  • Location and runout tolerances
  • Profile tolerances
  • Form and orientation tolerances
Session 4
• Bonus and shift tolerance in a stack
  • Overview of bonus and shift tolerance
  • Part vs. assembly stacks
• Wrap-up

Instructor: John-Paul Belanger
Fee $620 .6 CEUs

Vibration Analysis Using FEA: A Hands-on Workshop
2 Days
I.D.# C0830

A similar course is available as a live, online Web Seminar - Vibration Analysis Using Finite Element Analysis (FEA) Web Seminar - see course description below.

FEA has been used by engineers as a design tool in new product development since the early 1990’s. Until recently, most FEA applications have been limited to static analysis due to the cost and complexity of advanced types of analyses. Progress in the commercial FEA software and in computing hardware has now made it practical to use advanced types as an every day design tool of design engineers. In addition, competitive pressures and quality requirements demand a more in-depth understanding of product behavior under real life loading conditions.

This seminar introduces one of the advanced types of FEA: vibration analysis. By considering time dependent loads and inertial effects, vibration analysis allows for a more in-depth product simulation thus reducing product development cost and time. The course reviews basic concepts of vibration analysis and illustrates how they are implemented in FEA to simulate product behavior. The most common types of vibration analysis such as modal, time response, frequency response and random vibrations are covered. Participants will have the opportunity to practice skills learned utilizing the commercial FEA software SolidWorks Simulation.

Learning Objectives
By attending this seminar, you will be able to:
• Evaluate the importance of dynamic effects in product simulation
• Analyze inertial and damping effects in structural response
• Use vibration analysis as a design tool
• Perform time response, frequency response and random vibration analyses
• Apply proper FEA modeling techniques to model system dynamic

Who Should Attend
The seminar will be of interest to any design engineer who already uses Finite Element Analysis (FEA) as a design tool and would like to explore if and how vibration analysis with FEA may benefit the design process. It builds on participants’ experience with static FEA and on knowledge of mechanical vibrations common to any mechanical engineer.
Vibration Analysis Using Finite Element Analysis (FEA) Web Seminar

12 Hours
I.D.# WB1401

A similar course is available as a classroom seminar and workshop - Vibration Analysis Using FEA: A Hands-on Workshop - see course description above.

Finite Element Analysis (FEA) has been used by engineers as a design tool in new product development since the early 1990’s. Until recently, most FEA applications have been limited to static analysis due to the cost and complexity of advanced types of analyses. Progress in the commercial FEA software and in computing hardware has now made it practical to use advanced types as an everyday design tool of design engineers. In addition, competitive pressures and quality requirements demand a more in-depth understanding of product behavior under real life loading conditions. This Web Seminar will enable participants to expand the scope of FEA to vibration analysis to simulate product behavior under those conditions.

This six-session Web Seminar introduces vibration analysis performed with Finite Element Analysis (FEA). By considering time-dependent loads and inertial and damping effects, vibration analysis allows for a more in-depth product simulation thus reducing product development cost and time. The course reviews basic concepts of vibration analysis and illustrates how they are implemented in FEA to simulate product behavior. The most common types of vibration analysis such as modal, time response, and frequency response will be covered.

All topics are illustrated using FEA software, SolidWorks® Simulation, for which participants will be provided a student license and opportunity to practice skills learned. Acquired skills, however, will not be software specific and no prior exposure to FEA software is required.

Learning Objectives

By connecting with this Web Seminar, you will be able to:
- Evaluate the importance of dynamic effects in product simulation
- Analyze inertial and damping effects in structural response
- Perform modal analysis, time response analysis and frequency response analysis
- Apply proper FEA modeling techniques to model system vibration
- Use vibration analysis as a design tool
ENGINEERING TOOLS AND METHODS

Who Should Attend
The Web Seminar will be of interest to design, R&D, project, and product engineers who already use Finite Element Analysis (FEA) as a design tool and would like to explore if and how vibration analysis with FEA may benefit the design process. It builds on participants’ experience with static FEA and on knowledge of mechanical vibrations common to any mechanical engineer.

Topical Outline
Session 1
- Structure vs. Mechanism
- Simulation Process with the FEA
- Verification and Validation of FEA Results
- Discrete and Distributed Systems
- Mode of Vibration
- Modal Analysis
- Eigenvalues and eigenvectors
- In-class Exercises/Home Assignment

Session 2
- Modal Analysis
- Convergence of Frequencies
- Rigid Body Modes
- Properties of Lower and Higher Modes
- Modes of Vibration of Single Degree of Freedom Oscillator (1DOF) and Two Degrees of Freedom Oscillator (2DOF)
- In-class Exercises/Home Assignment

Session 3
- Modal Analysis
- Modeling Techniques in Modal Analysis
- Modes Separation
- Modal Analysis as a Tool to Find “Weak Spots”
- Modal Analysis as a Diagnostic Tool
- In-class Exercises/Home Assignment

Session 4
- Modal Analysis with Pre-Stress
- Buckling Analysis
- Analogies between Modal Analysis and Buckling Analysis
- Modes of Vibration
- Modal Superposition Method
- In-class Exercises/Home Assignment

Session 5
- Time Response Analysis
- Load Excitation and Base Excitation
- Impulse Load
- Static vs. Dynamic Response
- Time Response of a 1DOF and 2DOF Systems Time Response of a Distributed System
- In-class Exercises/Home Assignment

Session 6
- Frequency Response Analysis
- Steady State Harmonic Response
- Force and Base Excitation
- Resonance
- Modal Damping
- Frequency Response of a 1DOF and 2DOF Systems
- Frequency Response of a Distributed System
- Linear vs. Non-linear Vibration Analysis
- Summary for Post-Course Learning Assessment

Instructor: Paul Kurowski
Fee $850 1.2 CEUs

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Aerospace Product Support: Sustainment Throughout the Life Cycle

2 Days
I.D.# C0945

In today's aerospace industry, product life-cycles are often being extended far beyond a product's original design expectations. With fewer and fewer new aerospace products being introduced into the marketplace, there is a dramatic need for increased emphasis on supporting these products in the most efficient and effective manner possible throughout the entire product life-cycle. In addition to the initial product acquisition cost, customers are becoming more aware and sensitive to the product's total life-cycle cost. The long-term costs to operate, maintain, and otherwise sustain these products are often a determining factor in the initial product acquisition.

This two day seminar is intended to introduce participants to the various approaches, technologies, and tools available to support a product throughout the product's total life-cycle in the most efficient manner possible. Major topics presented and discussed during this seminar include The Elements of Logistics, Performance Based Logistics, Product Support Integration, and regulatory requirements. Collectively, the information presented in this seminar will equip attendees with the skills and techniques needed to help them comfortably and confidently develop the best tailored support package, satisfying the needs of both the customer and the provider.

Learning Objectives

By attending this seminar, you will be able to:
• Identify and apply basic concepts of Product Support, including Contractor Logistics Support, Total System Performance Requirements, Performance-Based Logistics, and Primary Support Integration
• Evaluate elements of cost associated with life-cycle support/sustainment opportunities
• Compare and contrast the different approaches that may be taken to provide total life-cycle support in aerospace programs
• Assess relative risks to both the provider and the customer in the various approaches
• Determine how to best integrate sustainment activities within the OEM as well as after-market provider business plans

Who Should Attend

Technical professionals, as well as current and prospective Program/Project managers, Product Support Managers, and Sustainment Specialists will benefit by attending this seminar. This seminar will also be of value to individuals in other disciplines, including marketing and general management, that require an understanding of the concepts and strategies of effective life-cycle sustainment programs.

Topical Outline

DAY ONE
• Introduction to Aerospace Product Support
• Developing the class definition of product support -- Attributes; Shared experiences
• Setting expectations
• Elements of Product Support Offerings
• Characteristics of Product Support
• Compare and Contrast -- Logistics Support; Product Support; Customer Support
• "Bits and pieces" of product support
• What constitutes success?
• Support Integration
• How Support Integration works
• Primary Support Integrator -- How PSI works
• Third-Party Logistics Provider -- Definition; How 3PL works

DAY TWO
• Contractor Logistics Support
  • How CLS works
  • Customer and contractor roles
  • Constructing a CLS proposal -- Estimating costs
• Performance-Based Logistics
  • How PBL works
  • Customer and contractor roles
  • Constructing a PBL proposal -- Estimating costs
• Regulatory and Guidance Document Identification
  • Regulatory documents and reports
  • Development and use of metrics
  • Notification of problems and re-plans to stakeholders
• Seminar Review and Open Dialog

Instructor: Drexel L. Rutledge
Fee $1225 1.3 CEUs

Aerospace Program Management - It’s More than Scheduling and Delivery
3 Days
I.D.# C0818

Effective and efficient management of today’s complex and integrated programs requires both the refinement of interpersonal and basic leadership skills as well as the application of appropriate technologies and tools. This seminar is intended to introduce basic program management skills and techniques to first-line and mid-level leaders to help them comfortably and confidently assume their role and to aid in ensuring program success.

Areas of special concentration will include: role of project management, communication, interpersonal skills, schedule management, interfacing with other units, Task Scoping (Estimating, Pricing, Financial Measures, etc.), project management software use, compliance reporting, risk management and more. This seminar will include lecture, dialog, and case-study approaches. Active participation of the class attendees will ensure a dynamic baseline for learning and honing valuable skills.

Learning Objectives
By attending this seminar, you will be able to:
• Communicate more effectively in all media - verbal, written, and electronic modes
• Refine interpersonal skills as they relate to dealing with diverse personal perspectives, attitudes, and motivational techniques
• Develop and utilize task schedules
• Demonstrate effective management of all resources (people, tools, and budgets)
• Apply techniques for scoping programs/projects (resource needs, schedules, level of tasking, etc.) and effectively monitor and measure progress
• Identify critical milestone events and how to develop alternate schedule recovery plans
• Utilize basic project management tools and techniques more effectively

Who Should Attend
This course is designed for current and prospective Program/Project Managers with a level of experience ranging from in-training to mid-level program management leadership.

Topical Outline
DAY ONE
• Introduction to Program/Project Management
• Clarifying and Giving Identity to Tasks
  • Who are the stakeholders? What do they want?
  • What are the resource allocations? (budgets, tools, facilities, personnel)
  • What constitutes program/project success?
• Communication Skills Essentials
  • Elements of effective presentations (verbal, e-mail, internet)
  • Appreciation of differing perspectives and how to integrate them
  • Interpersonal skills
• Interfacing with Other Units
  • Use of integrator personnel
  • Importance of shared goals as well as shared responsibilities

DAY TWO
• Establishing and Developing of Performance Schedules
  • Ensuring dependencies are identified and commitments are defined
  • Determining critical milestones and potential impacts
  • Introduction to use of commercial software tools
• Creating Meaningful Performance Metrics and Monitoring Techniques
  • The “critical life signs” of a program/project (cost, schedule, quality)
  • Role of program/project integrator and methods of in-process performance monitoring
  • Keeping all stakeholders informed and satisfied
• Compliance Reporting, Test Plans, and Contingencies
  • Regulatory documents and reports
  • Test plans and configuration control
  • FAA certification
  • Use of “critical life signs”, milestones, and monitoring
  • Notification of problems and re-plans to stakeholders
  • Refining the art of asking for and receiving help

3 ways to get a no-obligation price quote to bring a course to your company
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• Email us at Corplearn@sae.org
MANAGEMENT AND PRODUCT DEVELOPMENT

DAY THREE

- Managing the Individual Components of the Program/Project
  - Financial aspects (pricing, ROI, ROIC, etc.)
  - Marketing coordination, warranties, and after-market support
  - Using metrics to correct “critical life sign” deficiencies
  - Risk - assessment, abatement, and management
- Motivation and Rewards
  - Effective use of non-financial rewards for team members
  - Ensuring full participation and best contribution from each team member
  - Valuing others and letting them know it
- Workshop
  - Using program/project management techniques and tools, perform trial tasks as assigned
  - Discuss and critique workshop tasks
- Conclusion
  - Importance of “unlearned” leadership attributes (integrity, honesty, people sensitivity)
  - Business and personal ethics

Instructor: Drexel L. Rutledge
Fee $1545 2.0 CEUs

ARP4754A and the Guidelines for Development of Civil Aircraft and Systems

2 Days
I.D.# C1118

ARP4754A substantially revises the industry guidance for the development of aircraft and aircraft systems while taking into account the overall aircraft operating environment and functions. This development process includes validation of requirements and verification of the design implementation for certification and product assurance. ARP4754A provides the practices for showing compliance with regulations and serves to assist companies in developing and meeting its own internal standards though application of the described guidelines.

This two day seminar will provide attendees with an in-depth presentation of the guidelines introduced in the revised recommended practice for aircraft and systems development as well as the critical concepts used in aircraft and systems development processes for certification. The aircraft/systems development process and its interactions with the safety, hardware development and software development processes will be discussed along with the incorporated changes, with special emphasis on new material and development concepts. Additionally, the relationship and key interactions between the aircraft/system guidance material established in ARP4754A and the guidance material in DO-254 for hardware and DO-178B for software will be reviewed to ensure attendees gain insight into the expectations being established for aircraft certification.

In addition to the seminar handout, a copy of ARP4754A: Guidelines for Development of Civil Aircraft and Systems will be provided to each attendee.

Who Should Attend

This seminar is designed for engineers and other key personnel working in the design, development, and safety assessments of aircraft and aircraft systems.

Learning Objectives

By attending this seminar, you will be able to:
- Identify the changes between the legacy ARP4754 and ARP4754A,
- Explain the aircraft/systems development process and its interaction with the safety assessment process,
- Identify the key aircraft/systems development processes and their interrelationships,
- Discover and be able to apply new guidelines on Functional and Item Development Assurance Levels (FDAL & IDAL)
- Apply the new guideline material within your own company context.

Topical Outline

DAY ONE

- Introduction
  - Overview of seminar material
- ARP4754A Development History
  - How we got here.
  - Who contributed to the revision?
- ARP4754 to ARP4754A Change Highlights
  - Chapter by chapter change review
- Aircraft / Systems Development Process
  - Overview of Process
  - Discussion of Interactions with safety processes
  - Discussion of Interactions with hardware and software development processes
- Integral Processes
  - Safety Assessment
  - Development Assurance Level Assignment

DAY TWO

- Integral Processes
  - Requirement Management
  - Implementation Verification
  - Configuration Management
  - Process Assurance
  - Certification / Regulatory Authority Coordination
Creating and Managing a Product Compliance Program

2 Days
I.D.# C1213

Around the world, and more often than not, government bodies require formal certification of products. As product developers expand into new markets, they will be confronted with new standards, regulations, and customer expectations that may require new compliance processes. A properly run compliance program improves your product’s quality and safety, broadens your product’s market, ensures compliance with regulations and laws, and helps provide protection from future product liability issues.

This two-day seminar presents a process development methodology that can be used repeatedly as new compliance requirements emerge. You will learn best practices in creating a compliance program for your products and markets, and how to use this program at all stages of product development and production. Sample spreadsheets will be used to demonstrate tailoring the program to your product, your markets, and your organization. A properly managed compliance program simplifies the certification or approval of your product, and ensures that you regularly apply and document good engineering practices for product safety and reliability.

Learning Objectives

By attending this training program you will be able to:
• Summarize how a formal compliance program adds value to your goods and services
• Develop a compliance checklist
• Identify effective strategies for researching compliance requirements
• Describe how to manage the ongoing compliance process
• Explain the importance of documenting compliance and retaining records

Who Should Attend

This seminar is designed for managers with implementation authority for product safety and compliance; product development engineers, designers and managers; new business development managers; risk managers and compliance or certification managers. Companies considering expanding or modifying their product line, or attempting to enter new export markets, will especially benefit. Suppliers who are involved in product development and compliance, regulatory agency representatives, industry safety organization representatives, and corporate compliance lawyers will also benefit.

Prerequisites

Prior experience in product development, and/or product testing, and/or product certification is beneficial. The course content is geared for individuals with previous academic or work related experience in these fields.

Topical Outline

DAY ONE
• Introduction to Compliance
  • What do we mean by compliance
  • The 3 basic forms of compliance
  • Why we need to show compliance: Legal requirements in different countries; Commercial advantages; Product liability risks
• What is a formal compliance program
• Creating a compliance checklist - getting started
  • An introduction to the compliance process
  • Defining your markets in terms of compliance requirements
  • Finding applicable regulations, standards, and guidelines
  • Documenting best practices in the compliance checklist

DAY TWO
• Completing the compliance checklist
  • Extracting relevant requirements from the regulations, standards and guidelines
  • Selecting methods of compliance
  • Assigning tasks from the checklist
  • Sorting and presenting the blank checklist
• Applying the checklist to a development project
  • Introducing the checklist within your organization: Integrating the checklist process into existing policies and procedures; Identifying key players, and getting them on your side
  • When and how to start the product specific checklist
  • Sharing and controlling the checklist
  • Sidebar: discoverable documents and document retention
• Managing the compliance program over a product’s life
  • Storing and sharing the final checklist
  • Using the checklist as the product grows and develops
  • How the checklist gives your product a unique identity:
MANAGEMENT AND PRODUCT DEVELOPMENT

Learning from the checklist for your next project; the checklist as “corporate memory”; identifying and retaining best practices beyond minimum compliance requirements

- The standards development process
  - How standards are written
  - An introduction to global standards development organizations
  - How and why to get involved in standards development

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<thead>
<tr>
<th>Instructor:</th>
<th>R.W. (Bill) Walker</th>
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<td>Fee $1275</td>
<td>1.3 CEUs</td>
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Leading High Performance Teams

2 Days
I.D.# C0410

Product development is organizationally a complex undertaking that requires effective coordination within a company and between companies. During product development, teams are confronted with a number of ongoing organizational challenges and there is a high potential for conflict between participants in the process.

This course addresses teamwork and other “soft-side” factors that largely determine whether product development programs are successfully completed on schedule. The content is relevant for both OEMs and suppliers.

Learning Objectives

By attending this seminar, you will be able to:
- Explain the importance of effectively managing ‘soft-side’ issues that cause problems and delays during product development programs
- Employ successful practices of chartering and launching teams
- Implement techniques to successfully lead and facilitate effective teams
- Effectively troubleshoot problems on a team and employ techniques to remain productive
- Implement proven tips for conducting effective team meetings

Who Should Attend

Engineers and business people involved in various product development team activities will find the subject matter practical and useful. The content is of particular value to professionals from engineering, manufacturing, purchasing, quality, marketing, and finance functions in ground vehicle OEMs and suppliers.

Topical Outline

- Designing High Performance Team
  - Characteristics of effective teams
  - Systems aspects of team design
- Addressing systemic variables
- Identifying key stakeholders
- Establishing the team’s charter
- Leadership and Group Dynamics
  - Responsibilities of the team leader
  - Understanding human behavior in groups
  - Motivating team members
  - Establishing a productive team culture
  - Developing team support
  - Productive and destructive team roles
  - Effective communications
  - Influence of personality styles
- Launching the Team
  - Stages of team development
  - Pre-meeting considerations
  - Selecting the team
  - Common reasons meetings fail
  - Managing the first team interface
  - Establishing group norms
  - Structuring the agenda
- Making Sound Decisions
  - Situational analysis: problems, decisions and polarities
  - Common errors in decision making
  - Essential steps in the decision process
  - Quality and acceptance factors in decision making
  - When to use and avoid group consensus
  - Identifying the decision makers
  - Facilitating consensus decisions
- Flawless Facilitation
  - Recognizing and defusing common group problems
  - Managing conflict and providing feedback
  - Mind mapping, story boarding and other techniques
  - Making work assignments
  - Assessing group performance
  - Concluding the meeting

Instructor: Joseph Doyle
Fee $1285 1.3 CEUs

Managing Engineering & Technical Professionals

3 Days
I.D.# C0608

In the fast paced and competitive environment of today’s global economy, the work of technical professionals is often the difference between success and failure in an organization. Providing leadership for engineers is uniquely challenging, and the transition from working engineer to first-line technical supervisor is one of the most difficult career challenges that an engineer may
Managing and Product Development

face. First-time engineering supervisors and mid-level managers who wish to sharpen their skills and learn new techniques for guiding, coaching, and motivating working engineers, technicians, and designers will find this seminar valuable. A mix of lecture and attention-grabbing exercises are used to develop intense and lasting learning results.

Learning Objectives

By attending this seminar, you will be able to:
• Describe the basic value proposition of management: what managers bring to an organization that makes them worthwhile
• Avoid the most common errors of supervisors and managers
• Describe the evolution of management thought, and utilize the latest proven concepts for improving the performance of people in complex organizations
• Explain the issues that drive the psychology of effective leadership and develop greater emotional intelligence
• Implement strategies to enhance your skills in meeting management, coaching, and performance review that are essential in today’s professional workplace

Who Should Attend

Engineers and technical professionals who are either recently promoted into a management position, or have some experience as a manager but would like to learn how to become more effective will benefit from attending this workshop. The concepts and skills developed during this interactive experience will be of interest to those involved in product development, manufacturing, service, or quality engineering, and all related technical activities in automotive, aerospace, manufacturing, and off-highway industries.

Topical Outline

DAY ONE
• The Management Perspective - How Managers Earn Their Keep
  • The value proposition of management
  • The “Peter Principle” and how to avoid this trap
  • Understanding the most important errors that managers commonly make - and how to steer clear of major supervisory pitfalls
  • Why people usually struggle to cooperate, and how you can reduce this
• What You Need to Know about Today’s Workforce
  • The evolution of leadership thought, and why recent events have significantly changed effective leadership methods
  • Understanding what leadership is really about
  • Why teamwork and cooperation are necessary in modern corporate structures
  • How you can generate consistent focus and daily commitment among technical and engineering professionals
  • Playing “The Tower Game” - applying focus and commitment
  • The Psychology of Successful Modern Leadership

• Process centered leadership: getting sustained results
• Task and relationship balances
• Why “Output Leadership” is ineffective and counter-productive
• Different kinds of team models - and which is most effective
• How to reduce the influence of “bad” politics in an organization through constructive decision making processes

DAY TWO
• The Psychology of Change
  • Why change is often stressful
  • Five stages of change
  • How to make change exciting and interesting
• Emotional Intelligence: Building an Effective Leadership Style
  • Why “emotional intelligence” is important - the research results
  • The five elements of emotional leadership
  • How to practice and develop greater emotional intelligence
  • Solving typical meeting problems with emotional intelligence
• Coaching in Supervision
  • Building trust
  • Coaching roles
  • Improving communication for constructive coaching
• Using Meeting Time Effectively
  • Five key issues for successful meetings
  • How teamwork breaks down in meetings, and how to correct this

DAY THREE
• Dealing with Practical Issues
  • Dealing with difficult people
  • Learning how to delegate effectively
• Basic Negotiation Principles
  • Soft & hard negotiating approaches
  • Win-win negotiation
  • Positions, interests, & goals
• How to Make Performance Reviews Constructive
  • Legal requirements
  • Style issues
  • 360 reviews

Instructor: Eric Timmis
Fee $1775 2.0 CEUs

Patent Law for Engineers

1 Day
I.D.# 88007

This information-packed seminar focuses on the intricacies of patents, patent infringement litigation and patent licensing. Attendees will explore the important subjects of obtaining U.S. and foreign patents, maintaining U.S. and foreign patent rights, enforcing patent rights, defending against patent rights asserted by competitors, and licensing patent rights for revenue. After this seminar, you will effectively understand patents and ways to
MANAGEMENT AND PRODUCT DEVELOPMENT

protect your company’s valuable inventions. Your new knowledge will help your company maintain and enhance its position in the marketplace.

Learning Objectives
By attending this seminar, you will be able to:
• Obtain an overview of U.S. patent litigation
• Understand the basic legal principles for liability and damages in patent cases
• Gain insights into how patent disputes are resolved
• Predict the fees and expenses associated with bringing and/or defending a patent case in the U.S.
• Anticipate the scope of discovery in, and/or business disruption arising from, a U.S. patent case
• Peek into the future of potential patent law reform

Who Should Attend
Participants should have a mid- to upper-level managerial role. Research and development, in-house legal staff members such as in-house lawyers, patent agents, or patent liaisons will especially benefit.

Topical Outline
• Overview of Patent Litigation
  • Issues the Patent-Owner Has to Prove
  • Issues the Accused Infringer Has to Prove
• Who Decides Liability and Damages
  • Jury
  • Judge
  • Mediator/Arbitrator
• How Long Does it Take From Filing to Trial
  • District Courts
  • ITC
• How Much Does It Cost
  • Fees and expenses
  • Contingency Fees
  • Recovery of fees and expenses
• What is the Scope of Discovery
  • Documents, including e-documents
  • Depositions
  • Third parties (e.g. customers, suppliers)
  • Confidentiality of discovery materials
• What Changes are on the Horizon
  • Supreme Court
  • Patent law reform

Instructor: William Cory Spence
Fee $775 .7 CEUs

Patent Litigation in the U.S.: What You Need to Know Web Seminar and Web Seminar RePlay

4 Hours
Web Seminar: I.D.# WB0940
Web Seminar RePlay: I.D.# PD330940ON

In today’s economic environment, patents have become an increasingly important asset for both individuals and corporations. More and more, individuals and corporations, including those in the automotive and aerospace industries, are recognizing that revenue can be generated from their patent rights, whether those rights consist of a single patent, a family of patents or an entire portfolio. Indeed, some companies do not make or sell products; their entire revenue is derived from the licensing of their patents. Suffice it to say, licensing revenue has become a significant source of value in the global intellectual property economy.

This Web Seminar will tell you what you need to know about U.S. patent litigation and will provide in-depth insights into the practical realities of patent disputes in the U.S. You will learn what’s involved in a patent case, including the issues that the patent owner has to prove, e.g. infringement, and the issues the accused infringer has to prove, e.g., invalidity. You will increase your awareness of the role of the judge and the jury in patent cases and you will hear about the increasing use of alternative dispute resolution mechanisms, such as mediation, to resolve patent disputes. Among other topics, this course also will increase your appreciation for the time it typically takes to go from the filing of a case to trial, and the fees and expenses associated with the case.

Learning Objectives
By connecting with this Web Seminar, you will be able to:
• Obtain an overview of U.S. patent litigation
• Explain the basic legal principles for liability and damages in patent cases
• Gain insights into how patent disputes are resolved
• Predict the fees and expenses associated with bringing and/or defending a patent case in the U.S.
• Anticipate the scope of discovery in, and/or business disruption arising from, a U.S. patent case
• Peek into the future of potential patent law reform

Who Should Attend
This course is geared toward executives, in-house counsel, in-house patent agents, and senior managers across industries, such as automotive and aerospace. Participants may be both U.S. and non-U.S. -- anyone who needs help in understanding what to expect and what the realities are should they become involved in U.S. patent litigation.
SAE PROFESSIONAL AND LEGAL ISSUES CERTIFICATE PROGRAM

Watch for the certificate icon to indicate course titles that are part of an SAE multi-course certificate program.

This program focuses on legal and risk management issues critical for you to master to facilitate the successful design and deployment of products from a safety and reliability perspective. View the list of required and elective courses and more information on enrolling in this SAE certificate program--training.sae.org/certificate/legalissues

Topical Outline

Session 1

• Overview of Patent Litigation
  • Issues the patent-owner has to prove
  • Issue the accused infringer has to prove
• What is the Scope of Discovery?
  • Documents, including e-documents
  • Depositions
  • Third parties (e.g. customers, suppliers)
  • Confidentiality of discovery materials
• Who Decides Liability and Damages?
  • Jury; Judge; Mediator/Arbitrator

Session 2

• How Long Does it Take from Filing to Trial?
  • District Courts
  • ITC
• How Much Does it Cost?
  • Fees and expenses
  • Contingency fees
  • Recovery of fees and expenses
• What Changes are on the Horizon?
  • Supreme Court
  • Patent law reform

Principles of Cost and Finance for Engineers

3 Days
I.D.# C0828

In today’s corporate environment of shrinking budgets, required structural cost reductions, sharing of global designs/services, and pricing pressures, it is critical that engineers possess a working knowledge of engineering economics principles. To fully understand the economic viability of engineering decisions, engineers need to find the appropriate balance between design alternatives, resulting costs, and impact on their enterprise. This seminar introduces participants to the cost, finance and economic concepts and their applications to products and services. This three-day course provides you with practical information normally obtained through university level economics and business management courses and will help you to maximize efficiencies from both an engineering and business perspective.

Note:
Attendees are requested to bring with them a business or scientific calculator capable of doing exponential calculations.

Learning Objectives

By attending this seminar, you will be able to:
• Understand the hierarchy of economics, finance and cost in making financial decisions
• Review financial statements and ratios in assessing the financial state of a business
• Select the best decision-making criteria in making project decisions and allocating capital
• Implement a benchmarking plan to establish a competitive market position
• Determine the enterprise costs of raising capital through debt and equity offerings
• Analyze make-buy and buy-lease options and other alternative decisions based on the best financial strategies
• Understand the financial sensitivity of project decisions and the use of decision tools for integrating business requirements
• Determine and optimize all costs in the production process
• Select the optimum cost accounting strategy and inventory plan
• Identify the appropriate cost estimation methodology for metallic, electronic & plastic components
• Select cost control alternatives from marketing, engineering, commercial & geographic options

Who Should Attend

This seminar will benefit engineers having responsibilities in manufacturing, maintenance, research, design, product and pro-
cess development, program and project management, troubleshooting, and materials management. Additionally, individuals in non-engineering disciplines, including marketing and general management, will benefit from an introduction to the engineering perspective.

**Topical Outline**

**DAY ONE - Principles of Economics & Finance**
- Process & Responsibility for Determining Cost
- Economics, Finance & Cost Principles
  - Macroeconomics and Growth
  - Microeconomics, Supply & Demand
  - International Economics & Comparative Advantage
- Finance & Accounting: Corporate
- Finance
  - Financial Statements & GAAP
  - Financial Analysis & Ratios, Case Analysis
  - Capital Sources & Allocation
- Time Value of Money and Decision Making
  - Interest: simple and compounded
  - Inflation
  - Worth: present and future values
- Decision Making
  - Net Present Value, Payback Period
  - AAR, Internal Rate of Return, Profitability Index
  - Case Analysis
- Benchmarking Module

**DAY TWO - Cost Impact & Enterprise Decisions**
- Cost Impact on the Enterprise
  - Cost of capital, cost of equity and debt, WACC, Case Analysis
  - Cost of Ownership, Depreciation; Accelerated cost recovery; Depletion
  - The influence on tax obligations
- Alternative Financial Decisions Using Case Analysis
  - Make-Buy: Buy-Lease
  - Repair-Replace
  - Investments of Unequal Life
- Sensitivity & Scenario Analysis
- Matrix Priority Rating Systems

**DAY THREE - Cost Management**
- Production Cost Relationships
  - Break-even Point
  - Marginal Costing
- Elements of the Production Process
  - Pricing influences -- Quality; Competition
  - Elasticity of Demand
- Cost Principles & Definition
  - Accounting, Opportunity, Estimating
  - Fixed, Variable, Cost Function, Transfer Pricing
  - Economies of Scale
  - Managerial & Cost Accounting

- Cost Volume Profit Analyses
- Standard Costing
- Throughput Costing & Case Analysis
- Activity-based
- Inventory Management
  - Types
  - Accounting
- Cost Estimating Methodology
  - Activity-based costing
  - Cost analysis process examples (metallic, electronic, plastic)
- Cost Control Alternatives
  - Marketing & content evaluation
  - Engineering & redesign (DFSS, DFMA, VE, Benchmarking)
  - Commercial Decisions (Purchasing, Economies of Scale)
  - Regions of manufacture & transportation

**Instructor:** James Masiak

**Fee:** $1645 2.0 CEUs

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**Product Liability and The Engineer**

**1.5 Days**
**I.D.# 82001**

In the past few decades, product liability law has dramatically changed the manufacturer’s outlook in the design and manufacture of product. The concept of safety and reliability has been altered from a purely engineering/manufacturing concept to a legal/manufacturing approach. This new approach requires an understanding of legal concepts as related to the manufacturing and design process. The engineer’s role has shifted to include a safety audit analysis to minimize the existence of a product defect and/or to defend the product in a way that is responsive to the legal concerns. An overnight assignment will be made by the instructor. It will consist of problems drawn from actual cases and a group project that examines the design, instructions, and warnings of a product.

**Learning Objectives**

By attending this seminar, you will be able to:
- Relate legal concepts as they apply to the manufacturing/design process
- Use safety audit analysis techniques to minimize or eliminate product defects during design, thus reducing product liability
- Discuss defense of product from a legal perspective
- Recognize the importance of potential liability as it relates to the manufacturer

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**Catalog Key**

- **Classroom**
- **Live, online**
- **Online, on demand**
- **Certificate**
MANAGEMENT AND PRODUCT DEVELOPMENT

Who Should Attend
Persons responsible for product design, including managers and designers; corporate risk managers; persons responsible for developing and approving product instructions and warnings; marketing personnel; production and quality assurance managers and personnel; personnel responsible for product safety and those persons, including lawyers, who oversee and manage product liability issues.

Topical Outline
(Day two will end at approximately 1:00 p.m.)
• Legal Concepts
  • Negligence: elements, defenses
  • Strict liability: section 402A (elements, defenses)
  • Warranties: express, implied
• Analysis of Defect
  • Meaning of unreasonable danger
  • Production defect
  • Design defect
  • Defect by words
• Designing for Reasonable Safety
  • Products’ use, users & environment
  • Product safety audit
• The Role of Standards in Design
• Warnings
  • Guidelines for design & warnings
  • Functions & use
• Problem Analysis by Participants
• Review of a Product Design by Participants

Instructor: Charles F. Seyboldt
Fee $1275 1.0 CEUs

SAE GENERAL MANAGEMENT AND LEADERSHIP CERTIFICATE PROGRAM
Watch for the certificate icon to indicate course titles that are part of an SAE multi-course certificate program.

This program focuses on four core management and leadership competencies: management capability, team leadership, project management, and finance providing a basis for growth into a leadership or management role. View the list of required and elective courses and more information on enrolling in this SAE certificate program--training.sae.org/certificate/management_leadership

Strategic Leadership
3 Days
I.D.# C0620

As a strategic leader, it is your responsibility to ensure that your organization is moving in the right direction. Executives and high-level managers must have the practical insight necessary to address competitive business challenges. Each segment of this three day course is designed to impart simple, but powerful lessons that will equip participants to more fully engage in strategic discussions, ask pertinent questions, facilitate critical decisions and shape high performing organizations. In addition, the course provides students with a personal leadership profile that illustrates their strengths and potential limitations. Participative exercises assist emerging executives with practical and effective methods of gaining organizational credibility and avoiding common errors in strategic leadership.

Learning Objectives
By attending this seminar, you will be able to:
• Describe the role and responsibilities of strategic leadership
• Manage the critical factors that drive the success and failure of business strategies
• Anticipate the longer term impact of strategic initiatives
• Attain credibility and support as you assume the helm of a new operation
• Avoid common errors made by leaders in transitioning to higher levels of responsibility
• Select the most effective approaches when framing strategic decisions
• Think strategically and systemically as you plan organizational change
• Influence the emergence of a more positive and functional corporate culture
• Eliminate turf battles, dropped balls and organizational duplication of effort
• Analyze and correct dysfunctional organizational dynamics
• Manage the strengths and limitations of your personal leadership style

Who Should Attend
This seminar is designed for executives, senior level managers, and engineering managers or technical specialists who are called upon to formulate or provide input into strategic decisions and business strategies.

Topical Outline
• Introduction to Strategic Leadership
  • What exactly do we mean by leadership?
  • Who is and is not a leader?
  • At what point do we become leaders?
MANAGEMENT AND PRODUCT DEVELOPMENT

- Critical elements of leadership support
- Managing versus leading - is there really a difference?
- Critical factors in assessing leadership performance
- The relationship between leadership, strategy, human behavior, decision-making and organizational systems

Understanding the Human Dimension
- Similarities between animal behavior and human behavior
- Influence of brain structure on human behavior
- Creating long term employee motivation
- Rules of thumb for predicting human behavior in organizations
- Recognizing the symptoms of pathological leadership
- Managing and defusing dysfunctional behavior

Assuming the Helm
- Managing the transition to a new workgroup
- Common and avoidable errors of leadership
- Developing and maintaining the support of your workgroup
- Simple, but effective steps to improve workgroup performance

Shaping Corporate Culture
- Understanding the critical components of corporate culture
- Forming productive organizational norms
- How leaders contribute to dysfunctional cultures
- Establishing a high performance work environment

Creating Organizations that Work
- Creating an organizational charter
- Selecting an effective management team
- Thinking systemically
- Importance of managing image and expectations
- Creating meaningful performance indicators
- Eliminating turf battles and duplication
- Limitations on the application of common systems

Facilitating Strategic Decisions
- Critical distinctions between problems, decisions and polarities
- How to properly frame a decision
- Selecting the decision makers
- Common errors in decision making process
- Essential elements of effective decision making process
- Knowing when the decision has been made

The Leader’s Role in Creating Effective Strategies
- What exactly is a strategy?
- Why business strategies fail
- Internal and external considerations
- What constitutes effective strategy?
- Anticipating the impact of adaptive responses
- Framing strategic initiatives
- Barriers to strategy implementation

Leading Strategic Change
- Planning a change initiative
- Critical variables in organizational change
- The leader’s role in fostering change
- Anticipating and dealing with resistance
- Culture as a barrier to change
- Political Reality versus Dysfunctional Idealism
- Gaining credibility in executive circles
- Sources of leadership power
- How power is gained and lost
- The importance of building networks and relationships
- How to avoid getting derailed

Lessons of History for Strategic Leaders
- Developing a Leadership Profile
- Charting your personal leadership profile
- Identifying your leadership assets and liabilities
- Creating a plan of action

Instructor: Joseph Doyle
Fee $1655 2.0 CEUs

Success Strategies for Women in Industry and Business
1 Day
I.D.# C1202

It is a well-known fact that the number of women in science, engineering and business fields is growing, yet men continue to outnumber women, especially at the upper levels of these professions. Many women appear to encounter a series of challenges at early or midcareer stages that contribute to them leaving their careers prematurely due to feelings of isolation, an unsupportive work environment, extreme work schedules, and unclear rules about advancement and success.

This program serves as a unique opportunity to obtain both formal and informal mentoring tips from a successful woman engineer who spent over 25 years in the petrochemical/specialty chemical industry. She has seen and has experienced significant changes in the number of professional women active in the technical/scientific field and is convinced that more positive change can happen in the future.

This seminar will provide detailed guidance, based on real life examples, on how female professionals can become proactive in creating career opportunities via self-assessment, self-motivation, an objective view of one’s own abilities, and continuous steps in self-improvement. The program will take participants beyond theory to case studies and real life examples exemplifying potential for immediate use.
MANAGEMENT AND PRODUCT DEVELOPMENT

Learning Objectives
By attending this seminar, you will be able to:
• Identify obstacles and common challenges that hold you back in your career
• Develop and utilize critical communication skills
• Define your professional relationships with clear boundaries and respect
• Create a flexible career plan
• Handle criticism and difficult situations with composure

Who Should Attend
This seminar will benefit professional women who want to positively impact their careers. Recent engineering graduates, as well as experienced female engineers and/or scientists having responsibilities in research, design, product and process development, manufacturing, quality, information technology, sales/marketing, and management will learn skills to help them navigate these male-dominated fields. Additionally, individuals currently working in non-engineering disciplines, including general management, human resources, academia, business, and law as well as current engineering students, will also benefit from this unique perspective.

Topical Outline
• Course Motivation: Why are you here?
• Historical Perspective - Women in Engineering and Scientific Professions
  • Dr. Ewa Bardasz - personal story
  • Survey data - status of women professionals: tenure, promotions, salary trends, recognitions, etc
• Case Study #1: What holds you back in your career?
• Common Challenges
• Case Study #2: Career Goals: Success Defining Questions
• Work Climate Changes
• Definition of Professional Success
  • Technical know-how
  • Leadership skills
• Refining Critical Verbal Communication Skills
  • Presentations/ public speaking
  • Negotiations/ conflict communications
  • Getting your points across
  • How to speak up without coming across as to aggressive
  • How to find balance between “being to nice” and “coming on too strong”
  • How you can say “no” without feeling guilty
• Case Study #3: How can you successfully negotiate with a group of aggressive men?
• Refining Critical Written Communication Skills
  • Reports, technical papers
  • Email, social media

Networking
• Behaviors and Relationships
  • Handling emotions at work
  • Mentors/Advisors - pros and cons
• Work-Life Balance
• Key Resources
  • Professional organizations
  • Community activities
• Reflections and Final Thoughts
• Take Away Message
• Case Study #4: What will I do next?

Instructor: Ewa Bardasz
Fee $575 .7 CEUs

The Role of the Expert Witness in Product Liability Litigation
1.5 Days
I.D.# 92054

According to the Federal Rules of Evidence, an expert witness is anyone who can assist the trier of fact (the jury) in understanding any issue in dispute at trial. The witness’ ability to give this assistance can be derived from any specialized training, education, background, or experience. To be effective in providing this assistance, however, requires that the expert witness understand the true role that he or she is to play both before and at the trial.

This seminar will address the critical issues that every person who may be, has been, or is, an expert witness must understand to assist both the attorney and the product manufacturer, regardless of which side the expert serves.

Learning Objectives
By attending this seminar, you will be able to:
• Employ the risk/utility balancing process necessary for effectively addressing the issue of design defect
• Recognize the critical elements that govern the interaction between human behavior and product behavior
• Apply the technical/legal elements that will enhance your effectiveness as an expert witness

Who Should Attend
This seminar is intended for anyone who is or may become an expert witness in product liability litigation. In-house experts typically have engineering, engineering management or field technician responsibilities. In addition, insurers, risk managers, corporate product safety personnel, attorneys and those who manage product liability litigation will benefit from insight into
selecting and using expert services and witnesses more effectively and efficiently.

**Topical Outline**

(Day two ends at 1:00 p.m.)
- The Legal Framework of Negligence and Strict Liability
- The Relationship Between the Attorney and the Potential Expert Witness
- Investigation of an Accident Years After an Occurrence
- Developing the Background Necessary to Understand the Product and its Environment
- Understanding How to Allege or Refute the Existence of a Product Defect
- Analyzing the Role of Human Behavior and its Relationship to the Cause of an Accident
- Guidelines for Effective Presentation Before Trial and on the Witness Stand
- The seminar will also include overnight problem assignments and a demonstration of direct and cross-examination of an expert witness.

**Instructor:** Charles F. Seyboldt  
**Fee** $1275  1.0 CEUs

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**Understanding the FAA Aircraft Certification Process**

2 Days  
I.D.# C0821

The task of certifying an aircraft or part can be overwhelming given the lengthy process and the many steps that are required. Understanding the process can greatly enhance the outcome and reduce unnecessary delays or frustrations. This course will provide an overview of the Federal Aviation Administration (FAA) organizational structure, its policies, guidelines and requirements leading to Type and Supplemental Type airworthiness approvals. It will also cover the rule-making process and rules applicable to aircraft parts and products. The course will define the roles and responsibilities of the Aircraft Certification Office (ACO), Manufacturing Inspection District Office (MIDO), Flight Standards District Office (FSDO), and the Aircraft Evaluation Group (AEG). Type and Supplemental Type Certification (TC and STC) processes, and Change Product Rule for alterations and modifications to previously type certified aircraft will be discussed. FAA rule-making process will be examined including review of FAA Orders, Notices, Advisory Circulars and other guidance material.

**Learning Objectives**

By attending this seminar, you will be able to:
- Manage certification programs more efficiently, schedule the required milestones accordingly, and identify problems and address them promptly
- Describe the principles of Type Certification and Supplemental Type Certification requirements and process
- Converse intelligently and enter negotiations with others involved in FAA certification programs
- Describe the FAA system, FAA orders, Advisory Circulars, FAA rule making process
- Define what exemptions and special conditions are and how to obtain them
- Identify the difference between airworthiness standard and operational rules

**Who Should Attend**

This course is designed for engineering and certification managers, design engineers, airworthiness and certification engineers, quality assurance inspectors and engineers, program managers, consultants, Federal Aviation Administration designated engineering and airworthiness representatives (DER and DAR) and other technical administrative personnel involved in FAA certification activities. The course will help newcomers to aircraft certification as well as experienced attendees better understand the certification process and be able to present and negotiate certification matters with the Federal Aviation Administration Aircraft Certification Office.

**Topical Outline**

**DAY ONE**
- FAA History, Organization and Hierarchy
  - FAA certification “lingo”
  - FAA system organizational chart and hierarchy
  - How regulations are developed
- FAA Roles and Responsibilities
  - Aircraft Certification Office
  - Manufacturing Inspection District Office
  - Flight Standard District Office
  - Aircraft Evaluation Group
- Issue Papers - What They Are and How They Are Used
  - Exemptions; Special conditions
  - Equivalent level of safety
- Certification Basis
- Change Product Rule

**DAY TWO**
- Type Certificate Data Sheet - The “Birth Certificate” of an Airplane
- Documents and How to Develop Them
  - Airplane Flight Manual Supplements
  - Instructions for Continued Airworthiness
  - Type Inspection Authorization
MANAGEMENT AND PRODUCT DEVELOPMENT

- Request For Conformity
- Certification Plan; Conformity Plans
- FAA Advisory Materials
- Support Documents
  - Parts Manufacturing Authorization
  - Technical Standard Order
  - Field approvals
  - FAA Form 337 approvals
  - 8110-3 approvals
- Type and Supplemental Type Certification Process
  - Certification Plans and FAA coordination
  - Data generation and approvals
  - Conformity inspections; Testing; Approvals

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<thead>
<tr>
<th>Instructor:</th>
<th>Ken Farsi</th>
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<td>$1325 1.3 CEUs</td>
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CATALOG KEY

You will see the following icons alongside the course descriptions. These icons indicate:
- delivery formats available for the course
- the course is part of an SAE certificate

Many courses are available in multiple formats. See page VII to get more information on the learning formats offered by SAE. In addition to finding courses that fit your technology need, look for courses with icons that fit the way you want to learn.

- Classroom – indicates the course is an instructor-led seminar or workshop offered in a classroom setting
- Live, online – indicates the course is an instructor-led web seminar offered live and online via telephone and internet connection
- Online, on demand – indicates the course is available online anytime the participant would like to access the course through the internet
- Certificate – indicates the course is part of an SAE International curriculum-based, multi-course certificate. See a list of the multi-course certificates on page XI
Aerospace Precision Forging Design and Quality Control

2 Days
I.D.# C1348

One of the main advantages of the precision forging process is the reduction in material consumption due to the achievement of close tolerances and the reduction of machining requirements to meet final component specifications. However, to achieve these results comes at a cost. One of the primary issues with precision forging is the reduction in life of the tools used in the forming process. Manufacturers can mitigate some of these concerns by better understanding how tools can be designed specifically for the precision forging process and how personnel can effectively apply precision forging techniques.

This two day seminar will introduce participants to tooling design practices that can be successfully applied to precision forging methods. The instructor will guide participants through critical die design requirements to optimize die life. Participants will be provided detailed information related to inspection and calibration techniques and requirements. The instructor will then provide participants the requirements of an effective quality control system, including the rigorous requirements for aerospace and medical parts manufacturing.

Learning Objectives
By attending this seminar, you will be able to:
• Identify key die design requirements and best practices
• Identify and evaluate gage requirements and techniques
• Analyze set-up requirements and processes
• Describe accepted inspection techniques and related devices
• Identify required components of an approved aerospace quality system

Who Should Attend
This seminar is intended for engineers desiring a comprehensive understanding of the requirements to implement precision forging processes. Individuals involved with design, materials, manufacturing, special processes, tooling, quality, and inspection and testing will benefit most from the information presented.

Topical Outline
DAY ONE
• Die Design for:
  • Upset
  • Extrusion
  • Bending
  • Pre-final and final forging
  • Trimming
  • Hot sizing
  • Cold sizing
• Related Tooling Design for:
  • Die holders & Heating system
  • Kissing plate
  • Thickness sort
  • Glass coating
• Die Repair
  • Tooling and equipment
• Gage Designed Related Technologies
  • Special gages for all forging steps (ten steps)
  • Final inspection gages and Coordinate Measuring Machine (CMM) program
  • Raw materials
  • Block
  • High speed CNC and CNC program
  • Cutter choice
  • Manufacture tolerance
  • Surface finish requirements and inspection
Aerospace Precision Forging Processes and Technology

3 Days
I.D.# C1347

The advancement of forging technologies and processes has enabled the increased use of forged products to meet the demanding requirements of strength, durability, and reliability. While forgings are commonly used in aerospace manufacturing, the ability to make use of precision forging processes and techniques is critical when manufacturing gas turbine components. Realizing the benefits of accuracy and quality that precision forging brings to product manufacturing requires those involved with design and manufacturing have an understanding of industry accepted technology and processes.

This three day seminar will introduce participants to the precision forging processes and technologies currently in use in industry. The instructor will begin with an overview of the benefits of precision forging and the various manufacturing industries that currently make use of this approach. The instructor will discuss equipment, processes, and quality control requirements. Using examples derived from gas turbine engine rotor blade and vane manufacturing, the attendees will then be presented with the technical requirements to set-up precision forging and the various special processes. The instructor will also provide attendees with the information required to analyze customer drawings, key parameters, raw material requirements, and forging press selection.

Learning Objectives

By attending this seminar, you will be able to:

• Identify the key characteristics and advantages of precision forging
• Identify requirements for equipment and layout
• Analyze set-up requirements and processes
• Evaluate and identify special process requirements
• Analyze customer drawings and related material requirements

Who Should Attend

This seminar is intended for engineers desiring a comprehensive understanding of the requirements to implement precision forging processes. Individuals involved with design, materials, manufacturing, special processes, tooling, quality, and testing will benefit most from the information presented.

Topical Outline

DAY ONE

• Precision Forging Overview
  • When precision forging is needed
  • Industry and components that require precision forging processes
  • Requirements: Equipment; Engineering Staff; Process Technology; Quality Control
• Requirements for Accepted Parts
  • Requirements
  • Influencing factors
• Quality System
  • Basic quality procedures
  • Classroom examples

DAY TWO

• Set-Up of Precision Forging Processes
  • Rotor blades
  • Vanes blades
• Set-Up of Special Processes
  • Cutting, vibro-milling, blasting, polishing, hot sizing, cold sizing, graphite lubrication
  • Glass coating, chemical surface treatment, NDT, heat treat, upset, extrusion
  • Pre-final forging, final forging, trimming, bending
• Defects
  • Prevention and removal at each step

DAY THREE

• Analyzing Customer Drawings and Process Set-Up
  • Key parameters in blade and structure drawings
    • Raw materials
    • HT requirements
    • NDT requirements
    • Airfoil tolerance
    • Thickness tolerance
    • Twist angle
Manufacturing

- Bow tolerance
- Surface finish
- Precision forging work areas
- Machining areas
- Calculation of forging energy
- Forging press selection
- Related equipment
- Design Drawings and Raw Material Requirements
  - Diameter calculations
  - Surface finish requirements
  - Supplier requirements
  - Metallurgical requirements for raw material
  - Forging and machining inspection processes

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<tr>
<th>Instructor:</th>
<th>Canghuai Li</th>
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Automated Systems for Aerospace and Space Applications

2 Days
I.D.# C1313

The rapidly evolving demand for cost reductions and shrinking budgets makes the application and use of automated processes within the aerospace and space industries a necessity. While some view aerospace automation as the solution to reducing costs, others view automation technologies and processes as something that should be avoided when possible. Misunderstandings and assumptions about these complex systems can result in the improper selection and application of these systems, often leading to undesirable interactions with other elements of the assembly process and potentially, project failure. This two-day seminar introduces participants to the critical components of automation necessary to be informed and knowledgeable about the acquisition, installation, and maintenance of automated systems for aerospace and space applications. The instructor will guide participants through the types, components, operation, application, cost benefits, laws, strengths, and limitations of automation. The information presented in this seminar will cover the breadth and scope necessary for participants to be an effective participant in the decision process when automation has become a consideration to replacing tasks previously done by hand.

Attendees will receive a copy of the textbook, Automated/Mechanized Drilling and Countersinking of Airframes, by instructor George (Nick) Bullen.

Learning Objectives

By attending this seminar, you will be able to:
- Understand the function of automation in an aerospace factory
- Decide if automation is right for your factory or application
- Select the right automation for your application
- Install, transition to production, and maintain the selected automation
- Perform a feasibility analysis and an Return on Investment (ROI) for factory automation

Who Should Attend

This course is designed for all personnel interested in acquiring an understanding of the power and pitfalls of automation before purchase and how to select and install the right automation.

Topical Outline

DAY ONE
- Historical Perspective: Why Airframes Have Holes
  - The Airframe
  - Aluminum
  - Rivets
  - Assembly Tooling
  - Titanium
  - Hand Tools and Drills
  - Composites
  - Tooling and Composites
  - On-Assembly Drilling
- Airframe Manufacturing Cost Drivers
  - Why Reduce Cost
  - Defining Cost
  - Identifying Manufacturing Related Costs
- Incentives and Disincentives to Automate
  - Military Automation Disincentive
  - Military Producers Incentives to Automate
  - Commercial Disincentives
  - Commercial Incentives
- Types of Automation
  - Motion
  - Action
  - Controller
  - Calibration
  - Sustainability
- Considerations before Replacing Hand operations with Mechanization or Automation
  - Before the Decision to Automate
  - “Go- Ahead” Decision Criteria
- How to Choose the Right Automation
  - Three Don’ts
  - References
  - Requirements Document
MANUFACTURING

- DAY TWO
- Installation Steps
  - Mapping the Existing Process
  - Mapping the New Process
  - Requirements Document
  - Platform Specification
  - Request for Proposal
  - Manufacturing Readiness level (MRL) Consideration
  - Performance Measurement Tools
  - Factory Acceptance
  - Installation and Test
- Test Procedures
  - Unique Tests
  - Volatile Organic Compounds (VOC)
- Transition To Production
  - TTP Document and Transfer of Responsibility, Accountability, and Authority.
  - TTP Technology Readiness Levels
  - TTP Manufacturing Readiness Level
  - TTP and Product Delivery Team Composition and Selection
  - TTP Document
  - TTP Risk Identification and Assessment
  - Validation of System to Production Requirements: Exit Criteria
- Training
  - Who to Train
- Maintenance
  - Complexity-New Normal
  - Impact Prevention
  - Predictive Maintenance (PdM)
  - Prognostic Health Monitoring (PHM)
  - Maintenance
  - Buying Maintenance
  - Troubleshooting
- Social Impact
  - Pacifying the Human Capability-Machine Experience
  - Perception of ubiquitous automation
  - Safe, secure, and ethical automation
  - Management for Automated Systems
  - Organizations
  - Customers
- Future State of Airframes and Automation Summary
  - Economics
  - Manufacturing Exodus
  - Exit the autoclave
  - Automation or Labor
  - Fastener alternatives

Corrosion of Metals

5 Hours
I.D.# PD261328ON

This online course teaches about corrosion of metals. The physics of corrosion is explored as a background for the discussion of seven common types of corrosion (uniform, galvanic, crevice, pitting, intergranular, stress corrosion cracking, and dealloying). Students will learn why and how corrosion occurs and methods for controlling corrosion. It includes eleven modules followed by a quiz.

Major topics include:
- Introduction to electrochemical corrosion
- Aqueous corrosion
- Uniform corrosion
- Galvanic corrosion
- Crevice corrosion
- Pitting corrosion
- Intergranular corrosion
- Stress corrosion cracking
- Dealloying
- Course review

Is this Metallurgy Online Course for You?
This course is targeted to design engineers, manufacturing engineers, and quality engineers. It is suggested that, as a prerequisite, you either take our Principles of Metallurgy (I.D.# PD261322, page 58) online course or have basic knowledge of the following topics: grains, grain boundaries, crystal lattice, substitutional solid solution, diffusion, phases, precipitation, precipitation hardening, microstructure, tensile testing.

What You Will Receive
- Three months of online access (from date of purchase) to the five hour presentation
- Integrated knowledge checks to reinforce key concepts
- Proof of Participation (Transcript)

Author: Industrial Metallurgists, LLC
Fee $290

Instructor: George (Nick) Bullen
Fee $1265 1.3 CEUs

3 ways to get a no-obligation price quote to bring a course to your company • Call SAE Corporate Learning at 1-724-772-8529
• Fill out the online quote request at training.sae.org/corplearning • Email us at Corplearn@sae.org
Corrosion of Metals: Chemistry of Corrosion

1 Hour
I.D.# PD261334ON

This online course covers the fundamental mechanisms involved in the aqueous (water based chemicals) corrosion of metals. The factors that influence the inherent corrosion behavior of a metal and the factors that influence metal corrosion rate will be discussed. The course takes one hour to complete.

Major topics include:
• Parts of an electrochemical corrosion cell
• Corrosion reactions
• Factors that influence the corrosion behavior of a metal
• Factors that influence the corrosion rate of a metal

Is this Metallurgy Online Course for You?
This course is targeted to design, manufacturing, and quality engineers, and sales people and purchasing agents with technical backgrounds. It is suggested that, as a prerequisite, you should be familiar with chemistry concepts such as ions, electrons, and chemical reactions.

What You Will Receive
• Three months (from date of purchase) of online access to the one hour presentation
• Integrated knowledge checks to reinforce key concepts
• Course workbook (.pdf, downloadable)
• Proof of Participation (Transcript)

Author: Industrial Metallurgists, LLC
Fee $70

Corrosion of Metals: Uniform Corrosion

1 Hour
I.D.# PD261335ON

This online course teaches about uniform corrosion of metals. Participants will learn why and how uniform corrosion occurs and methods for controlling it. References of textbooks and handbooks for more information are also provided. The course content can be completed in one hour.

Major topics include:
• Uniform corrosion mechanism
• Why uniform corrosion occurs
• Appearance of uniform corrosion
• Methods for controlling uniform corrosion

Is this Metallurgy Online Course for You?
This course is targeted to design, manufacturing, and quality engineers, and sales people and purchasing agents with technical backgrounds. It is suggested that, as a prerequisite, you have knowledge of the concepts covered in our Corrosion of Metals: Chemistry of Corrosion (I.D.# PD261334ON, page 53) online course.

What You Will Receive
• Three months (from date of purchase) of online access to the one hour presentation
• Integrated knowledge checks to reinforce key concepts
• Course workbook (.pdf, downloadable)
• Proof of Participation (Transcript)

Author: Industrial Metallurgists, LLC
Fee $70

Corrosion of Metals: Galvanic Corrosion

1 Hour
I.D.# PD261336ON

This online course teaches why and how galvanic corrosion occurs and methods for controlling galvanic corrosion. The course content can be completed in one hour.

Major topics include:
• Galvanic corrosion cell components
• Factors that influence galvanic corrosion rate
• Galvanic series and its use
• Methods to control galvanic corrosion

Is this Metallurgy Online Course for You?
This course is targeted to design, manufacturing, and quality engineers, and sales people and purchasing agents with technical backgrounds. It is suggested that, as a prerequisite, you have knowledge of the concepts covered in our Corrosion of Metals: Chemistry of Corrosion (I.D.# PD261334ON, page 53) online course.

What You Will Receive
• Three months (from date of purchase) of online access to the one hour presentation
• Integrated knowledge checks to reinforce key concepts
• Course workbook (.pdf, downloadable)
• Proof of Participation (Transcript)

Author: Industrial Metallurgists, LLC
Fee $70
Introduction to Composites Fabrication and Assembly in Aerospace, Space, and Transportation

1 Day
I.D.# C1311

The challenges associated with using composites as a replacement for aluminum reside primarily in the complex manufacturing processes and technologies for fabricating composite parts. The high cost of composites material and its manufacturing complexity have been inhibitors to the wide transfer of this technology to the non-aerospace market. The search for solutions to high manufacturing costs and efficient manufacturing processes have resulted in intense research by government, aerospace industry companies, and space agencies worldwide. This one day seminar will introduce participants to composites technologies that have applications beyond aerospace, including such markets as trucks, automobiles, and wind turbines. The instructor will define, illustrate, and describe the innovative manufacturing processes and technologies that have been used to solve the “composite challenge” for aerospace and space vehicles. The information presented in this seminar, derived from the successful application and demonstration of these technologies and processes on flight hardware, will serve to provide solutions for the manufacturing processes and technology challenges that have slowed the migration of this technology beyond the aerospace and space industries.

Attendees will receive a copy of the textbook, Automated/Mechanized Drilling and Countersinking of Airframes, by instructor George (Nick) Bullen.

Learning Objectives

By attending this seminar, you will be able to:

- Define the current state of composites manufacturing
- Evaluate critical emerging technologies that will enable expansion of composites
- Identify innovative manufacturing processes that enable low cost composite manufacturing
- Determine the critical features for successful composite part assembly
- Evaluate the key characteristics of various composites manufacturing processes

Who Should Attend

This seminar is intended for individuals looking for information related to efficient solutions for composites manufacturing and includes engineering disciplines from manufacturing, design, industrial, tooling, quality, and mechanical. In addition, non-engineering management and staff will benefit from information presented in this seminar.

Instructor: George (Nick) Bullen
Fee $855 .7 CEUs

Topical Outline

- Composites in Aerospace and Space Launch Vehicles
  - Introduction
  - Advantages
  - Disadvantages
  - Design Considerations
  - Manufacturing Considerations
- Composites in Inhabited and Uninhabited Aerial and Space Vehicles
  - Introduction
  - Advantages
  - Disadvantages
  - Design Considerations
  - Manufacturing Considerations
- Max Launch Abort System (MLAS): An Example of Innovation
  - Concept of Operations
  - Major Structural Components
  - Innovative Manufacturing of Structural Components
- Quality Assessment (Parts)
  - Introduction
  - Forensic Engineering
  - MLAS Forensic Engineering
  - Collecting Data
  - Defect Determination (Cause)
  - Defect Resolution (Corrective Action)
- Vehicle Assembly
  - Innovative Assembly Process
  - Mass Properties Alignment
  - Assembly Fit and Function
- Vehicle Flight or Launch
  - Transport
  - Launch Stand
  - Performance
- Recovery
  - Retrieval
  - Forensics
  - Composites Performance Assessment
- Future Applications
  - Unified Structure
  - In-situ Manufacturing
  - In-flight and In-Space Composite Concerns and Considerations
  - ALTAIR
- Extensibility
  - Road Vehicles
  - Wind Turbines
  - Lifting and Support Devices

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Introduction to Welded Joints

2 Days
I.D.# C1343

Welding is one of the most important and widely used of the joining processes, providing distinct advantages in mechanical performance, ease of implementation, cost and adaptability. This seminar will provide engineers with applicable knowledge related to metallurgy, stress analysis and welding processes which will enable them to consider design, analysis, implementation and inspection of welds for their respective products. The course will cover the fusion operation of welding involving casting, heat treatment and metallurgical processes as well as additional complexities such as residual stress and distortion, introduction of various defects and sensitivity of materials, considerations related to static strength, fatigue behavior and resistance to corrosion. The primary focus of the seminar will be arc welds, but there will also be discussion of other welding processes important to the mobility industry including resistance spot, laser and friction stir. The seminar will make extensive use of case studies and will discuss appropriate codes and standards.

Learning Objectives

By attending this seminar, you will be able to:

• Recognize and list the benefits of the DFM/DFA method in creating product designs which support manufacturing processes leading to short and long term product cost savings
• Outline a Robust Manufacturing Plan that optimizes and simplifies product design without sacrificing quality
• Objectively determine which designs would be suitable as DFM/DFA candidates
• Perform the essential stages of a Design for Manufacture process including the analysis required to overcome typical manufacturing difficulties encountered in product design
• Construct an actual DFM/DFA worksheet and calculate design efficiency using an instructor provided project

Who Should Attend

Product Engineers, Designers and Managers, Manufacturing and Tooling Engineers, and Project Managers who desire to understand DFM/DFA as a product design tool to increase manufacturability of product assemblies. The course is best suited for individuals in the manufacturing industry and is beneficial to OEMs and Tier suppliers.

Topical Outline

DAY ONE

• Arc Welding Processes
  • TIG, GMAW, SAW, etc.
  • Strengths, weaknesses, typical applications

• Overview of Key Considerations
  • Description of the casting process
  • Weld as a thermal gradient
  • Weld can change microstructure
  • Weld can introduce defects

• Engineering Properties of Welds
  • Strength and ductility
  • Hardness
  • Toughness

• Welded Connection
  • Types of joints
  • Considerations: weldability, strength and inspection

• Material Considerations
  • Mild steel
  • Medium and high strength steel
  • Stainless steel
  • Aluminum

• Residual Stress and Distortion
  • Sources of residual stress
  • How to minimize distortion

• Source of Defects and Cracking
  • Porosity and inclusions
  • Undercut, lack of fusion and lack of penetration
  • Hot and cold cracking
  • Hydrogen damage
  • Methods to limit defects

DAY TWO

• Failure Modes, Static, Fatigue and Fracture Considerations
  • Design for Static Strength
  • Basic principles
  • Codes and Standards
  • Loading of the joint
  • Determining weld size

• Fracture Mechanics
  • Causes of brittle behavior
  • Behavior of sharp notches
  • Overview of Fracture Mechanics
  • Analysis of welds

• Non-Destructive Inspection
  • Methods, application and limitations

• Fatigue Considerations
  • Overview of fatigue mechanism
  • Improving fatigue behavior of welds
  • Analysis methods: global and local approaches

• Other Welding Processes
  • Resistance spot, laser and friction stir
  • Description of method, limitations and applications

Instructor: Jess J. Comer
Fee $1275 1.3 CEUs
MANUFACTURING

Hardness Testing

30 Minutes
I.D.# PD261331ON

This online course focuses on Rockwell and Brinell hardness testing and Vickers and Knoop microhardness testing. Participants will learn about how the tests are performed, test sample requirements, test parameter selection, and testing requirements. The course can be completed in 30 minutes.

Major topics include:
• Rockwell hardness testing
• Brinell hardness testing
• Knoop and Vickers microhardness sample preparation and testing

Is this Metallurgy Online Course for You?
This online course is targeted to design, manufacturing, and quality engineers, and sales people and purchasing agents with technical backgrounds. It is suggested that, as a prerequisite, you have knowledge of the concepts covered in our Corrosion of Metals: Chemistry of Corrosion (I.D.# PD261334ON, page 53) online course.

What You Will Receive
• Three months (from date of purchase) of online access to the thirty minute presentation
• Integrated knowledge checks to reinforce key concepts
• Course workbook (.pdf, downloadable)
• Proof of Participation (Transcript)

Author: Industrial Metallurgists, LLC
Fee $39

Metallurgy of Precipitation Strengthening

2 Hours
I.D.# PD261329ON

This online course teaches about the microscopic changes that take place in a precipitation strengthened alloy and their effects on the properties of the alloy. The effects of the different heat treating steps (solution treatment, quench, and aging) and heat treating process parameters (solution treatment temperature and time, quench rate, and aging temperature and time) on the alloy microstructure and the effects on alloy strength are discussed. The course is divided into five modules followed by a quiz.

Major topics include:
• Introduction
• Phase diagrams
• Precipitation strengthening heat treatment
• Heat treatment details
• Quality control and course review

Is this Metallurgy Online Course for You?
This course is targeted to design, manufacturing, and quality engineers. It is suggested that, as a prerequisite, you have knowledge of the concepts covered in our Principles of Metallurgy (I.D.# PD261322, page 58) online course.

What You Will Receive
• Three months (from date of purchase) of online access to the one hour presentation
• Integrated knowledge checks to reinforce key concepts
• Course workbook (.pdf, downloadable)
• Proof of Participation (Transcript)

Author: Industrial Metallurgists, LLC
Fee $125

Metallurgy of Steel Case Hardening

1 Hour
I.D.# PD261333ON

This online course discusses common steel case hardening processes and how they are used to modify the surface layers of steels to obtain specific mechanical properties. Participants will learn about the process parameters and how they affect case composition, depth, microstructure, and properties. The course takes one hour to complete.

Major topics include:
• Carburizing
• Carbonitriding
• Nitriding
• Nitrocarburizing
• Flame hardening
• Induction hardening

Is this Metallurgy Online Course for You?
This course is targeted to design, manufacturing, and quality engineers, and sales people and purchasing agents with technical backgrounds. It is suggested that, as a prerequisite, you have knowledge of the concepts covered in our Principles of Metallurgy (I.D.# PD261322, page 58) and Metallurgy of Steel: Principles (I.D. PD261326ON, page 57) or knowledge of the concepts covered in those courses.

What You Will Receive
• Three months (from date of purchase) of online access to the one hour presentation

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Metallurgy of Steel Heat Treating

5 Hours
ID # PD261327ON

This online course teaches about common heat treating processes and how they are used to modify the microstructure of steels to obtain specific mechanical properties. You will learn about the metallurgy of steel, the effects of heat treating temperature and cooling rate on microstructure properties, and the effects of the interaction between heat treating process parameters and steel composition on steel microstructure and strength. It includes eleven modules followed by a quiz.

Major topics include:
• Introduction
• Metallurgy of Steel
• Steel Phase Diagram
• Phase Transformations in Steel
• Annealing and Normalizing
• Through Hardening
• Case Hardening

Is this Metallurgy Online Course for You?
This course is targeted to design engineers, manufacturing engineers, quality engineers, and sourcing specialists. It is suggested that, as a prerequisite, you either take our Principles of Metallurgy (I.D.# PD261322, page 58) online course or have basic knowledge of the following topics: solid solution, substitution, interstitial, diffusion, effects of process temperature and time on diffusion and metallurgical changes, metallurgical phase, grain, grain boundary, precipitates and precipitation, tensile testing, and hardness testing.

What You Will Receive
• Three months (from date of purchase) of online access to the five hour presentation
• Integrated knowledge checks to reinforce key concepts
• Course workbook (.pdf, downloadable)
• Proof of Participation (Transcript)

Author: Industrial Metallurgists, LLC
Fee $70

Metallurgy of Steel Through Hardening

1 Hour
I.D.# PD261330ON

This online course teaches about the metallurgy of the following steel through hardening processes: quench and temper, martempering, and austempering. Participants will learn about the effects of heat treating temperature and cooling rate on steel microstructure and properties, and the effects of the interaction between heat treating process parameters and steel composition on through hardened steel microstructure and strength. This course takes one hour to complete.

Major topics include:
• Quench and temper
• Steel hardenability
• Common problems associated with quenching (distortion, cracking, retained austenite)
• Martempering
• Austempering

Is this Metallurgy Online Course for You?
This course is targeted to design, manufacturing, and quality engineers, and sales people and purchasing agents with technical backgrounds. It is suggested that, as a prerequisite, you have knowledge of the concepts covered in our Principles of Metallurgy online course.

What You Will Receive
• Three months (from date of purchase) of online access to the one hour presentation
• Integrated knowledge checks to reinforce key concepts
• Course workbook (.pdf, downloadable)
• Proof of Participation (Transcript)

Author: Industrial Metallurgists, LLC
Fee $70

Metallurgy of Steel: Principles

3 Hours
I.D.# PD261326ON

This online course teaches the phases and microstructures that form in steels, their effects on steel properties, the microstructure changes that occur when steel is heated and cooled, and the effects of carbon content and cooling rate on the microstructures that form. Also, how to read the iron-carbon phase diagram will be discussed. All this information is applicable to understanding the effects of steel heat treating processes and
heat treating process parameters on the microstructure and properties of heat treated plain carbon, low-alloy, and tools steels. The course is divided into six modules followed by a quiz.

**Major topics include:**
- Steel types and designations
- Metallurgical phases that form in steel and their effects on properties
- Steel phase diagram
- Metallurgical changes in carbon steel during cooling
- Metallurgical changes in carbon steel during heating
- Course Review

**Is this Metallurgy Online Course for You?**

This online course is targeted to design, manufacturing, and quality engineers, and sourcing specialists. It is suggested that, as a prerequisite, you have basic knowledge of solid solution, substitutions, interstitials, diffusion, effects of process temperature and time on diffusion and metallurgical changes, metallurgical phases, grains, grain boundaries, dislocations or the concepts covered in our *Principles of Metallurgy* (I.D.# PD261322, page 58) online course.

**What You Will Receive**
- Three months (from date of purchase) of online access to the two hour presentation
- Integrated knowledge checks to reinforce key concepts
- Course workbook (.pdf, downloadable)
- Proof of Participation (Transcript)

**Author:** Industrial Metallurgists, LLC

**Fee:** $180

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**Principles of Metallurgy**

4 Hours

I.D.# PD261322ON

This online course teaches the basic microscopic structures present inside of metals, how these structures and metal composition influence metal strength, and how these structures can be modified using common manufacturing processes to obtain specific mechanical properties. Several examples are presented to demonstrate how common alloying and manufacturing methods are used to modify the microscopic structures and properties of metals. It includes twelve modules that are five to 25 minutes in length, followed by a quiz.

**Major topics include:**
- Composition
- Microscopic structures
- Crystal defects
- Diffusion
- Cold Working
- Annealing
- Solid Solution strengthening
- Precipitation Strengthening Heat Treatment
- Steel and Steel Heat Treating

**Is this Metallurgy Online Course for You?**

This online course is targeted towards design, manufacturing, and quality engineers, and sales people and purchasing agents with technical backgrounds.

**What You Will Receive**
- Three months (from date of purchase) of online access to the four hour presentation
- Integrated knowledge checks to reinforce key concepts
- Course workbook (.pdf, downloadable)
- Proof of Participation (Transcript)

**Author:** Industrial Metallurgists, LLC

**Fee:** $225

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**RFID Selection, Application, and Use in Aerospace, Space, and Transportation**

1 Day

I.D.# C1310

Radio Frequency Identification (RFID) is an enabling technology that has been widely adopted in the retail industry. The powers of RFID are acknowledged by many, but a lack of understanding of the technology, its limitations, and how to select the right plan for its target installation has slowed efforts to migrate the technology into the aerospace, space, and transportation industries. While RFID is not a new technology, the rate at which it has been integrated into the aerospace industry has been slow due to unique considerations regarding qualification, regulations, and safety. New Department of Defense (DoD) policies requiring an integrated materiel supply chain process that fully supports military operational requirements will further advance the use of RFID technologies. In addition the laws and regulations regulating its use are relevant for the proper application of this valuable technology. As industry strives for further cost reducing technologies, individuals will need to be able to identify, select, install, and operate the proper system for its application in these critical industry segments.

This one-day seminar will introduce participants to the technology of RFID and how it can be properly integrated into the aerospace, space, and transportation industries. With knowledge
obtained as a project manager for the installation of over 30 successful systems, the instructor will begin with the technical aspects of RFID. The instructor will then guide participants through the business case for RFID followed by the selection, acquisition, and installation processes.

Learning Objectives
By attending this seminar, you will be able to:
• Identify the different types of RFID systems and their applications (RFID, GLS, RTLS, GPS)
• Explain the different RFID components and their function within the system.
• Identify the key areas within a factory for optimal success of an RFID system
• Evaluate the laws and regulations for using RFID in your facility
• Develop a RFID Return On Investment (ROI) for your application
• Apply a technology application roadmap for an RFID installation.
• Identify testing criteria for tag placement and optimal read rates.
• Identify the terms, power, and limitations of RFID

Who Should Attend
This seminar is intended for individuals requiring the critical knowledge that will assist them in understanding and participating in decision processes when RFID is being considered for their specific application.

Topical Outline
• Welcome, Introduction, and Assessment of Expectation
  • Overview of seminar material
  • Review of pre-submitted expectation forms Introduction to RFID
  • What is RFID
  • Types of RFID
  • RFID System Components
• RFID Applications and Limitations
  • Retail applications
  • Aerospace applications
  • Transportation applications
  • Manufacturing applications
• Feasibility Analysis: Will RFID Work for You
  • How to perform a feasibility analysis
  • How to test feasible targets and optimize for success
  • Establishing expectations and accuracy
  • Participation exercise
• Developing Return On Investment (ROI)
  • Identifying current operating cost
  • System cost
  • Cost benefits analysis (ROI)
  • Participation exercise
• System Selection and Acquisition
  • Selecting the right system
  • Determining how much system to buy
  • Acquiring the system
  • Summation: Out-Briefing
  • RFID technology review
  • Selection, acquisition, and installation review

Instructor: George (Nick) Bullen
Fee $745 .7 CEUs

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Visit training.sae.org/credentialing/certificate for more information
Corrosion Engineering and Prevention

2 Days
I.D.# C1217

The transportation industry, including motor vehicles, aircraft, rail, marine, commercial, off-road and defense vehicles, as well as infrastructures, energy sectors, raw materials, manufacturing, health and food industries all experience significant issues with corrosion which results in billions of dollars of loss each year. Corrosion education and prevention is essential to improve and increase the service life of parts and components which may have a significant impact on the economy of various industries and nations.

The focus of this course will be on the fundamentals of corrosion engineering and corrosion prevention of metallic and alloy structures as well as non-metallic composites and hybrid materials. Recent challenges and opportunities in corrosion of advanced composites used in the automotive, aerospace, and marine industries as well as for underground structures for oil, gas, geothermal and tidal wave technologies will also be included. Different types of corrosion, methods of corrosion protection and prevention, optimum engineering design of corrosion resistance parts and components, standard corrosion tests, responsibilities of corrosion engineers, and a process for setting-up an advanced corrosion laboratory will be discussed. This course also covers most traditional and non-traditional tests for corrosion studies, including real-time characterization techniques and analysis of corrosion phenomenon and corrosion monitoring principles.

Learning Objectives

By attending this seminar, you will be able to:

• Describe the basic electrochemical concepts of various corrosion processes
• Articulate and utilize corrosion prevention strategies and estimate corrosion behavior of materials and components
• Describe the role of ion-diffusion, crystal structure, and grain size on corrosion of metals and alloys
• Design and engineer corrosion resistive components for different industries
• Define methods of corrosion protection and interpret corrosivity maps
• Perform standard corrosion tests, in-depth analyses of test results
• Define anodic/cathodic protections and coatings specifications for various components
• Formulate corrosion prevention coatings materials for metallic and non-metallic structures

Who Should Attend

This course is designed for engineers working in automotive, commercial vehicle, off-road, aerospace, marine, rail, energy sectors, electronics and related industries who are interested in corrosion and corrosion prevention. Engineers working for chemical companies on the production of corrosion resistive materials and chemicals and scientists working for government and national laboratories working in the area of conservation, national infrastructures, and advanced energy technologies, as well as academicians will benefit from this course.

Topical Outline

DAY ONE
• Fundamentals of Corrosion and Corrosion Prevention
- Overview of corrosion problems and their economic impacts
- Basic electrochemical principles of corrosion and corrosion prevention
- Types of corrosion and role of electromotive force, ion diffusion, crystal structure, and grain size
- Corrosion of composite materials and impact of combined cyclic loading and corrosion
- Standard corrosion tests, and recent software and hardware for corrosion testing
- Mechanisms and Prevention of Corrosion
  - Automotive components
  - Aerospace components
  - Marine and underwater infrastructures
  - Electronics and energy related systems
- Corrosion Engineering and Coating Technologies
  - Design principles to minimize corrosion
  - Passive and active coating technologies

DAY TWO
- Surface Coating Technologies for Corrosion Prevention
  - In-situ surface coating and coating optimization
  - Anodic and cathodic protections and engineering principles
  - Application of metal oxides, carbides, nitrides and composite coating
- Supply and Manufacturing of Corrosion Prevention Materials
  - Inorganic base coating materials and their applications
  - Organic based coating materials and mode of operation
  - Composite coatings and their applications in auto and aerospace industries
- Corrosion and Corrosion Prevention of EVs and HEVs with Batteries, Supercapacitors and Fuel Cells
  - Corrosion prevention and role of high voltage, electromagnetic sources
  - Corrosion in fuel cells and component design to optimize corrosion
  - Corrosion in renewable alternative energy sectors

Instructor:  Gholam-Abbas Nazri
Fee $1245  1.3 CEUs

Fundamentals of Metal Fatigue Analysis
3 Days
I.D.# 94024

There is a potential for metal fatigue in any situation where a component is subjected to cyclic loads. Fatigue failures of various types are a key concern in increasing the reliability of products. Problems involving fatigue have become more severe with the demand for lighter weight structures and components. The effective use of fatigue analysis and predictive tools is critical for reducing the development time of new products. Two methods of metal fatigue analysis will be covered. The first is the stress-life approach. This method is used for high cycle or very long life fatigue problems where loads have fairly constant amplitude. Applications of this method include engine components, gears and shafts. The second method is the strain life approach, which is used for cases involving low cycle fatigue where loads may have a variable amplitude. Applications of this method include suspension and chassis components. The strain-life approach is also more useful when dealing with non-ferrous alloys. Other key topics to be addressed include residual stress, shot peening, cycle counting methods and environmental effects. Extensive use of example problems and case studies will be used. The overall objective of the course is for participants to gain an understanding of the phenomenon of metal fatigue and most importantly learn what methods are available to predict and prevent failures.

Learning Objectives

By attending this seminar, you will be able to:
- Differentiate various fatigue analysis methods
- Identify factors which can adversely affect fatigue behavior
- Apply processes which can be used to improve fatigue behavior
- Describe methods for analyzing fatigue at notches
- Indicate the steps necessary to determine the life of components subjected to variable amplitude loading

Who Should Attend

This course is intended for design, analysis or test engineers who deal with fatigue problems.

Topical Outline

DAY ONE

- Overview of Metal Fatigue and Analysis Methods
- The Stress-Life Approach
  - The S-N diagram and endurance limit
- Modifying Factors
  - Size and shape
  - Surface finish and treatments
- Types of loading
- Mean Stress Effects
MATERIALS

- Residual Stress and Shot Peening
- Example Problems

DAY TWO
- The Strain-Life Method
  - Limitations on the stress-life method
  - Cyclic stress-strain behavior
  - The strain-life diagram and parameters
- Mean Stress Effects
- Variable Amplitude Loading
- Damage Summing Methods
  - The Miner-Palmgren Rule
  - Non-linear methods
- Example Problems

DAY THREE
- Cycle Counting Methods
- Analysis of Notches
  - Stress-life method; Strain-life method
- Example Methods
- Environmental Effects

Hydraulic Installation Design: Materials, Rules, and Routings

0.5 Days
I.D.# C1305

This four hour course provides an overview of hydraulic tubing installations, principles, and design criteria. Although the primary focus is airplanes, the requirements and principles covered are valid for use in other types of flight vehicles and industries.

Learning Objectives

By attending this seminar, you will be able to:
- Select materials and connections appropriate for the desired usage
- Develop routing strategies that minimize the impact of costs, weight, maintenance, and structure
- Provide installations that ensure manufacturability, reliability and safety
- Reference standards, recommended practices, and information reports to support the design decision

Who Should Attend

This seminar is intended for personnel involved in the design and selection of fluid transport routing, installation, and material selection for hydraulically powered aircraft systems including design and fluid power engineers, system engineers, and those involved with certification.

Topical Outline

- Overview of aircraft fluid installations
  - History
  - Environments that impact installation designs
- Fluid Transport Design
  - Materials selection (past and present)
  - Couplings and end fittings (common and special use)
  - Application for non-hydraulic uses
- Fluid Transport Routing
  - Lessons learned
  - Tube restraint systems
  - Specials designs (drains, vents, and reservoirs)

<table>
<thead>
<tr>
<th>Instructor:</th>
<th>Timothy Neff</th>
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<tbody>
<tr>
<td>Fee: $295</td>
<td>.4 CEUs</td>
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Sound Package Materials for Vehicle Noise Control

2 Days
I.D.# 92032

A similar course is available as a live, online Web Seminar - Vehicle Sound Package Materials Web Seminar - see course description below.

The sound package materials for vehicle noise control seminar provides a detail and thorough analysis of three different classes of acoustical materials – namely absorbers, barriers, and dampers, how they are different from each other, and acoustical properties that materials should possess for optimum vehicle noise control. The seminar addresses new advances in acoustical materials, primarily in absorption materials that impact the vehicle acoustics. The seminar covers ways to evaluate the acoustical performance of these materials using different test methods, including material, component, and vehicle level measurements. The two day seminar starts with the fundamentals of NVH and sound quality related to sound package materials and discusses the importance of various noise sources that impact the development of sound package treatments in a vehicle.

Learning Objectives

By attending this seminar, you will be able to:
- Identify various descriptors that are used in NVH and sound quality while working with sound package materials
- Recognize various noise sources and paths in a vehicle
- Identify three different classes of acoustical materials
- Describe ways that acoustical materials work and how they differ from each other
• Road map for vehicle sound package development
• Distinguish test methods used to evaluate the acoustical performance of material

Who Should Attend

Designed for OEM or supplier employees responsible for various noise activities, such as design, evaluation, trouble-shooting, procuring, supplying, and/or manufacturing noise control treatments and parts, this seminar will also benefit those with responsibilities including the areas of manufacturing, design, engineering, process, noise and release engineering, supervision or management. Attendees should have an undergraduate engineering degree and/or a working knowledge of noise control and automotive acoustics.

Topical Outline

• Fundamentals of NVH and Sound Quality
  • Defining acoustical performance of acoustical parts
  • Definition of terms
  • Human response to sound
  • Various noise and vibration instrumentation
• Vehicles Noise Sources and Solutions
  • The noise system
  • Vehicle noise sources
  • Road and wind noise
  • Miscellaneous noise sources
  • Noise control solution - source, path, receiver
  • Noise control system using sound package materials
• Materials for Vehicle Noise Control
  • Absorber, including case studies and test methods
  • Barrier, including case studies and test methods and the effect of holes
  • Damper, including case studies and test methods
  • Isolator
• Different Automotive Measurements
  • Vehicle
  • Component
  • Material

Instructor: Pranab Saha
Fee $1325 1.3 CEUs

Vehicle Sound Package Materials Web Seminar and Web Seminar RePlay

8 Hours
Web Seminar I.D.# WB1204
Web Seminar RePlay I.D.# PD331204ON

A similar course is available as a classroom seminar - Sound Package Materials for Vehicle Noise Control - see course description above.

This four-session Web Seminar provides a detailed understanding of the source – path-receiver relationship for developing appropriate sound package treatments in vehicles, including automobiles, commercial vehicles, and other transportation devices. The Web Seminar provides a detailed overview of absorption, attenuation (barrier), and damping materials and how to evaluate their performances on material, component, and vehicle level applications. A significant part of this course is the case studies that demonstrate how properly designed sound package materials successfully address vehicle noise issues.

Learning Objectives

By connecting with this Web Seminar, you will be able to:
• Identify various descriptors that are used in acoustics while working with sound package materials
• Identify three fundamentally different sound package materials that are used in the industry
• Explain how these materials work and how to improve their performance
• Describe how various measurements are made and why they are necessary on a material level, component level, and vehicle level
• Prescribe appropriate sound package materials for specific NVH issues
• Construct proper protocols for combining different sound package materials for different components so that the final vehicle meets the required acoustic target

Who Should Attend

This Web Seminar will be especially valuable for those new to the vehicle sound package area and those interested in how absorbers, barriers, and dampers work, how they are different from each other, how they interact with each other in an application, and what one needs to be aware of while making measurements so the results are meaningful. The Web Seminar is also designed for OEM or supplier engineers and those in roles involved with design, evaluation, trouble-shooting, procuring, releasing, supplying, and/or manufacturing noise control materials and parts for passenger cars and light trucks, heavy trucks, off-highway
MATERIALS

vehicles, farm machinery, and other transportation systems including aircraft, watercraft and rail transit. An undergraduate degree and familiarity with basic acoustics and vibration, or acoustical materials would be beneficial.

Topical Outline

Session 1
• Vehicle Noise Sources and Solutions
  • The noise system – sources
  • Ranking noise paths
  • Source-path-receiver relationship
  • The noise control system using sound package materials
  • Calculating Onboard Energy Storage Needs
• Sound Package Material – Absorber
  • Application
  • Primary function
  • Effect of various parameters

Session 2
• Sound Package Material – Absorber (cont’d)
  • How it works
  • How to improve performance
  • Case studies
  • Measurements

Session 3
• Sound Package Material – Barrier
  • Application
  • Primary function
  • How it works
  • How to improve performance
  • Case studies
  • Measurements

Session 4
• Sound Package Material – Damper
  • Application
  • Primary function
  • How it works
  • How to improve performance
  • Case studies
  • Measurements
• Component and Vehicle Level Noise Measurements
  • Why
  • How
  • The need for standards and

Instructor: Pranab Saha

Fee $620 .8 CEUs

CATALOG KEY
You will see the following icons alongside the course descriptions. These icons indicate:
• delivery formats available for the course
• the course is part of an SAE certificate

Many courses are available in multiple formats. See page VIII to get more information on the learning formats offered by SAE. In addition to finding courses that fit your technology need, look for courses with icons that fit the way you want to learn.

Classroom – indicates the course is an instructor-led seminar or workshop offered in a classroom setting

Live, online – indicates the course is an instructor-led Web Seminar offered live and online via telephone and internet connection

Online, on demand – indicates the course is available online anytime the participant would like to access the course through the internet

Certificate – indicates the course is part of an SAE International curriculum-based, multi-course certificate. See a list of the multi-course certificates on page XI
Aircraft Hydraulic Pumps - Application, Design and Integration

.5 Day
I.D.# C1419

SAE International is pleased to offer this professional development seminar in conjunction with the SAE A-6 Aerospace Actuation, Control and Fluid Power Systems Committee meeting Oct. 20-23 Santa Barbara, CA. This 4 hour short course offers an overview of aircraft hydraulic pumps focusing on their application in hydraulic systems, design and performance characteristics, and integration issues. These topics will examine the various pump technologies available for aircraft system applications, their design, performance and operational characteristics and limitations, and discuss the challenges and lessons learned in the integration of pumps in hydraulic systems.

Learning Objectives
By attending this seminar, you will be able to:

- Identify the various pump and pump control technologies used in common hydraulic systems
- Evaluate the design characteristics and limitations inherent in applying the various technologies of pumps in their application in hydraulic systems
- Evaluate the critical aspects of integration of pumps in hydraulic systems, such as controlling air entrainment, heat removal, and back-up strategies
- Evaluate the interfaces between pumps, hydraulic systems and other aircraft systems

Who Should Attend
This seminar is designed for engineers, executives, and other key personnel with some experience in hydraulic pump design or application and integration of pumps, while the latter will benefit in understanding the complexities and limitations of current pump designs.

Topical Outline

- General
  - Hydraulic systems overview
  - Brief history of aircraft hydraulics
  - Hydraulic pump technologies overview
- Application of Hydraulic Pumps
  - Engine Driven Pumps
  - Electric Driven Pumps
  - Others, such as Air Driven and Hydraulic Driven Pumps (PTU’s)
- Design of Hydraulic Pumps
  - Pumping Technologies
    - Fixed / Variable displacement
    - Axial piston inline; Bent axis
  - Critical Design Factors
    - PV factors
    - Dynamic characteristics
    - Inlet conditions
    - Control of pumps
  - Flow / Pressure / Torque performance characteristics
- Integration Challenges and Lessons Learned
  - Starting Issues
  - Air ingestion control
  - Fluid conditioning
  - Heat rejection / Case drain flow
  - Pressure ripple control
- Overview of Industry Specifications and Other Reference Material

Instructor: Peter A. Stricker
Fee $295 .4 CEUs
Aerospace Hydraulic Components

.5 Day
I.D.# C1421

SAE International is pleased to offer this professional development seminar in conjunction with the SAE A-6 Aerospace Actuation, Control and Fluid Power Systems Committee meeting Oct. 20-23 Santa Barbara, CA.

This 4 hour short course will provide an overview of the hydraulic components used on aircraft. There will be a brief overview of hydraulics, aircraft hydraulic systems, and aircraft flight controls. You will learn the function of each component used within the hydraulic system, and then look in depth at each component’s design.

Learning Objectives
By attending this seminar, you will be able to:
- Explain how a hydraulic system is used in an aircraft
- Identify the various components used in a hydraulic system
- Explain the functions of hydraulic components
- Identify the design styles of hydraulic components
- Explain the strengths and weaknesses of hydraulic components

Topical Outline
- General
  - A History of Hydraulics
  - Hydraulics in Aircraft Systems
- The Aerospace Hydraulic System
  - Principles
  - System Architecture
  - Hydraulic Actuation
  - Hydraulic Issues (Contamination, Air, Cavitation)
- Hydraulic Power Sources
  - Pumps, Accumulators, RAT
  - Theory of Operation
  - Designs
  - Filtration
  - Restrictors
  - Check Valves; Relief Valves
  - One Way Restrictors
  - Pressure Regulating Valves; Thermal Relief Valves; Selector Valves; Solenoid Valves; Shuttle Valves
- Future Trends
  - Power Sources (EHA, EBHA)

Instructor: Jeffrey C. Dickey
Fee $295 .4 CEUs

Damage Tolerance for Gas Turbine Engines

2 Days
I.D.# C1323

The simultaneous demands for reliability and minimum weight for aircraft and propulsion systems offer some of the most challenging technical problems that structural and safety engineers can encounter. Although much information is available on fracture mechanics and aircraft damage tolerance, this course specifically relates to damage tolerance for gas turbine engines. The need to consider damage tolerance more broadly in new engine designs has just recently been written into FAR 33.70 and new EASA guidelines. With an increasing need for education, both in the U.S. and internationally, this seminar relates directly to the growing interest and priority the AIA, FAA, and engine OEM’s have placed on turbine engine damage tolerance.

This two-day seminar offers a broad survey of damage tolerance, one of the many principles behind one of the safest industries in the world. Although the basics of fracture mechanics will be covered, this is not an advanced fracture mechanics course. Attendees will be presented information on how experts in the propulsion community use the principles of prevent, quantify, and improve to keep air travel safe. The instructor will guide participants through notable historical events as well as experiences within a leading engine manufacturing company. The basics of fracture mechanics will be covered with a view towards practical application. Traditional deterministic and the newest probabilistic approaches will be introduced. Finally, attendees will be exposed to a broad range of improvements that have been made to address specific threats within the propulsion business.

Learning Objectives
By attending this seminar, you will be able to:
- Evaluate the sensitivity of structures to different types of damage
- Explain what it means for a design to be “damage tolerant”
- Identify three pronged approach of prevent, quantify, and improve aimed at safety
- Discuss basic principles of fracture mechanics
- Identify steps involved in deterministic and probabilistic approaches

Who Should Attend
This seminar is intended for engineers working in the gas turbine industry. In addition, employees at overhaul shops and individuals involved in product certification will also benefit from the information presented in this seminar.
Filtration and Contamination Control for Aerospace Hydraulic Systems

.5 Days  
I.D.# C1206

This four-hour short course provides an introduction to contamination control principles in aircraft hydraulic systems. Topics covered include an introduction to the types of contamination in aircraft hydraulic systems, contaminant measurement, and reporting methods. In addition, the impact of contamination on hydraulic components is discussed in detail. Along with an introduction to filtration mechanisms, information on testing, rating, and specifying filters will be provided.

Learning Objectives

By attending this seminar, you will be able to:

- Associate the types of contaminant in aircraft hydraulic systems and the problems that uncontrolled contamination can cause
- Interpret a particle count or contamination level report
- Identify how filters work and are evaluated
- Explain filter ratings
- Formulate a basic specification for hydraulic filters

Who Should Attend

This course is intended for engineers with some basic knowledge of hydraulic systems, but with minimal experience with the impact of contamination and specifications of filtration products for controlling it.

Topical Outline

- Contamination fundamentals
  - What is particulate contamination and what are its sources
  - How are contamination levels measured
  - Reporting contamination levels in aerospace hydraulic systems
  - Measuring and reporting water contamination
- Contamination damage
  - Types of wear that occur in hydraulic components: Abrasive; Erosive; Fatigue; Adhesive; Corrosive
  - Critical clearances and wear in hydraulic components
  - Benefits of controlling particulate contamination
  - Benefits of controlling water contamination
- Filtration fundamentals
  - Types of filters
  - Filter construction
  - Mechanisms of filtration (how they work)
  - Water removal principles
- Filter efficiency testing and rating basics
  - Nominal rating
  - Absolute rating
  - Gravimetric efficiency
  - Filtration (Beta) ratio [Multi-pass test]
  - Cyclic flow Multi-pass test (Stabilized cleanliness rating)
- Other types of filter tests
- Writing a comprehensive filter specification

Instructor: Leonard E. Bensch
Fee $295  .4 CEUs
POWER AND PROPULSION

Introduction to Aircraft Hydraulic System Design and Certification

.5 Day
I.D.# C1205

This four-hour short course provides an overview of hydraulic system design of recently developed business and commercial aircraft. Topics will include hydraulic principles, system architectures, power sources, and the main components and technologies of hydraulic systems including hydraulic power generation, filtration, fluid storage, distribution, sensing and control. The step by step process of designing a hydraulic system will also be reviewed. Finally, the instructor will guide participants through a discussion of future trends in aerospace hydraulic systems.

Learning Objectives
By attending this seminar, you will be able to:
• Explain the operating principles and design process of an aircraft hydraulic system
• Identify system architectures attributes, including those that affect aircraft safety
• Identify power sources for hydraulic systems and how they operate
• Identify the various components of hydraulic systems
• Describe the hydraulic system design and certification process

Who Should Attend
This seminar is designed for engineers, executives, and other key personnel with little or no previous hydraulic system knowledge or experience.

Topical Outline
• General Introduction to Aircraft Hydraulic Systems
• Hydraulic System Terminology and Standards
• System Engineering - principles and practices
• Hydraulic System Design and Certification
  • Proposal Phase
  • Preliminary Design Phase
  • Detail Design Phase
  • Aircraft Production Build and Test Phase
  • Flight Test and Certification Phase
• Fluid Conveyance System Design
• Introduction to Hydraulic Fluids
• Market Trends and Future Technologies

Instructor: Jon R. Jeffery
Fee $295 .4 CEUs

Introduction to the Planetary Gear Train:
Principles and Practices

1 Day
I.D.# C1350

The planetary gear train is a core component of the automatic transmission system. The ability of the planetary gear train to deliver reliable gains in power, durability, higher torque-to-weight ratios, and configuration flexibility has enabled this gear set to become a key component of the automotive powertrain. A fundamental understanding of planetary gear trains is critical for individuals working in the automotive and industrial transmission fields.

In this introductory one-day seminar on the basic principles of the planetary gear train, the instructor will guide participants through the basic structure and the various types of planetary gear trains. In addition, participants will be introduced to ratio calculation methods, gear train arrangements and power flow, component life estimation, and related NVH issues. Together, the principles and practices presented in this seminar will provide participants a fundamental and practical understanding of this important technology.

Learning Objectives
By attending this seminar, participants will be able to:
• Identify key components of the planetary gear train structure
• Explain relevant terms and theories
• Evaluate gear train arrangements
• Identify issues surrounding gear stress and NVH
• Evaluate ratio calculation methods and ratio change mechanisms

Who Should Attend
This course is intended for all individuals interested in gaining a fundamental understanding of automobile planetary gear train design, development, and application in the automotive and industrial transmission fields.

Topical Outline
• Planetary Gear Train Structure
• Gear Terms and Theories
• Planetary Gear Types and Ratio Calculation Methods
• Automatic Vehicle Planetary Geartrain Arrangements
• Geartrain Power Flow
• Ratio Change Mechanism
• Gear Component Load/ Stress and Associated Durability Life Estimation
• Geartrain NVH (Noise, Vibration and Harshness) Issues

Instructor: Joseph Chen
Fee $755 .7 CEUs

3 ways to get a no-obligation price quote to bring a course to your company • Call SAE Corporate Learning at 1-724-772-8529
• Fill out the online quote request at training.sae.org/corplearning • Email us at Corplearn@sae.org
Liquid Atomization, Sprays, and Fuel Injection

3 Days I.D.# 98019

Liquid fuel atomization and spray formation is the heart of the majority of stationary and mobile power generation machines that we rely on. This seminar focuses on the process of liquid atomization and spray formation and how it relates to fuel injection systems and emission of pollutants in modern engines. The seminar begins with background coverage of terminology, the purposes of liquid atomization and spray formation, and different designs of atomizers and nozzles employed in various industries. The focus is then directed to gasoline and diesel fuel injections, injector designs, and performance requirements for optimum engine operation with lowest possible emission of harmful pollutants. Based on the idea that knowledge of technical practices and advances in one area (i.e. diesel fuel injection) is beneficial to engineers in other areas (gasoline direct injection, rocket engines), this seminar takes an interdisciplinary approach. Attendees will understand the technology and logic behind different injector designs, and gain the knowledge to judge, adapt and transfer technology advances from one discipline to another.

Learning Objectives
By attending this seminar, you will be able to:

• Explain important terminology commonly used in atomization and sprays
• Describe important processes in atomization and spray formation
• Articulate the effects of injection system design and operating conditions on engine performance, combustion, and emission of pollutants
• Describe different injector designs and the rationale for the use of each
• Define the role the injection system plays in combustion and emission and how it is used to provide guidance in design of low-emission combustion systems
• Implement appropriate design concepts and logic in the design of critical components such as intake valves and induction systems
• Evaluate future trends and technology developments in fuel injection

Who Should Attend
Automotive and aerospace engineers, technical and project managers, researchers and academicians will benefit by attending this seminar. Automotive engineers working on the design of combustion engine components, reduction of harmful pollutants emissions, software development and application for modeling of thermal-fluid, combustions and emissions and engineers and managers directly involved in fuel injection systems will also benefit. Aerospace engineers involved in the design of gas turbine or rocket engines' combustion chambers will benefit as well.

Topical Outline

DAY ONE
• Description of the Atomization Process
• Disintegration of the Liquid Jets
  • Rayleigh criterion (no viscosity)
  • Weber’s criterion (effects of viscosity)
  • Ohnesorge criterion for atomization (Ohnesorge Number)
  • Rayleigh, first and second wind-induced breakup and atomization regimes
  • Influence of some parameters -- jet velocity profile; nozzle length-to-diameter ratio; ambient pressure
  • Disintegration of liquid sheets
  • Drop breakup in air flow, turbulent flow, and viscous flow
• Types of Atomizers: Pressure, Air-Assist, Air-Blast, Effervescent, Electrostatic, Ultrasonic, Diesel Injector and Gasoline-Fueled Injectors
• Drop Size Distribution and Measurements
  • Graphical and mathematical representation of drop size distribution
  • Averaged diameter and representative diameters
  • Measurement techniques -- patternation; drop size measurements and spray characterization
  • Mechanical methods -- drop collection on slides; molten-wax and frozen-drop approach; cascade impactors; electrical; charged-wire and hot-wire methods; optical methods; imaging - photography and holography; single-particle light scattering (Phase Doppler Particle Analyzer, etc.); diffraction size analyzer
  • Drop evaporation

DAY TWO
• Diesel Fuel Spray, Injector and Injection System
  • Fuel injection system -- pumps: in-line injection, distributor-type injection, single-barrel injection, and unit injector & unit pumps; injector designs: nozzle holder, nozzles, others
  • Overall spray structure
  • Liquid fuel atomization
  • Spray angle
  • Intact core length
  • Spray evaporation
  • Ignition delay
  • Mixing-controlled combustion
  • HC emission mechanisms in diesel engines and its relation to fuel injection
  • Soot formation and fuel sprays
  • Advanced topics (details of split injection, common-rail injection, interacting-sprays injection, ultra-high pressure fuel injection, effects on performance and emissions, and others)
Microbial Contamination in Aviation Fuel and Aircraft Fuel Systems

1 Day
I.D.# C0728

Microbial contamination in aviation fuel creates biomats that clog filters and scavenge systems, coat fuel quality indicator systems (FQIS) probes, and lead to structural corrosion, impacting the operational and economical aspects of turbine powered fixed wing and rotary wing aircraft. From inaccurate fuel level readings to aborted take-offs and air interrupts, microorganisms can wreak havoc on the entire aircraft and the system operations. Attendees will learn how microorganisms enter and survive in the fuel distribution and storage network, and how a routine surveillance program can manage risk and mitigate lost profits. Students will have the opportunity to experience hands-on techniques to detect and remediate contamination in aviation fuel systems.

Learning Objectives
By attending this seminar, you will be able to:
• Describe the impact of microorganisms on aircraft fuel systems
• Explain how microorganisms survive in an aviation fuel environment
• Determine how microorganisms enter the fuel storage and distribution system
• Detect and remediate microbially contaminated fuel systems
• Improve the overall operational reliability of aircraft and reduce maintenance costs

Who Should Attend
This seminar is appropriate for aircraft fuel systems design engineers, aviation fuel quality managers in manufacturing, storage and distribution facilities, aircraft fuel quality managers, and aircraft maintenance technicians.

Topical Outline
• Microorganisms
  • Brief overview of the operational and economic impact of microorganisms to the aviation industry
  • Regulatory, FAA Flight Standards Information Bulletin for Airworthiness (FSAW) FSAW 05-08A “Air Carrier Implementation of Inspections for Fuel Microbial Contamination”
  • Brief description of microorganisms related to aviation fuel
  • Requirements for microorganisms to survive in a fuel storage system
  • Aircraft fuel system water scavenger maintenance and periodic aircraft fuel tank sump draining
• Aviation Fuel Storage and Distribution
  • Entry and movement of microorganisms throughout the aviation fuel storage and distribution network
  • The impact of Microorganisms on Aircraft
  • Detection of Microorganisms
    • Types of detection equipment and procedures
    • Practicum - test methods and equipment -- Culture test; Immuno assay test; Bioluminescence test
  • Remediation of Microorganisms
    • Microbial pesticides approved for use in aviation fuel
    • USEPA regulations governing the sale of microbial pesticides in the U.S.
    • Characteristics of an efficacious microbial pesticide
    • Methods for treating storage and distribution systems
    • Industry practice for introducing a microbial pesticide into aircraft
• Surveillance Program
  • Benefits of a routine surveillance program
  • Developing a surveillance program
Planetary Geartrain Design, Development, and Applications for Automatic Transmissions

2 Days  
I.D.# C1351

A comprehensive and practical understanding of planetary gear trains is critical for individuals involved with the design and development of automatic transmissions. A key component of the automatic transmission system, the planetary gear train is able to deliver reliable gains in power, durability, higher torque-to-weight ratios, and configuration flexibility.

This two-day seminar will provide participants an advanced and comprehensive presentation on the topics of planetary gear train design, development, and applications for automatic transmissions. The instructor will guide participants through an increasingly complex set of topics including planetary gear train requirements, case study, and future trends in advanced transmission design and development.

Learning Objectives
By attending this seminar, participants will be able to:
• Explain relevant terms and theories
• Identify and select key components of the planetary gear train structure
• Evaluate ratio calculation methods and ratio change mechanisms
• Evaluate and compare gear train arrangements
• Identify and solve gear stress and NVH issues
• Anticipate and address manufacturing concerns
• Identify future trends in gear train design and development

Who Should Attend
This course is intended for all individuals desiring an advanced and comprehensive understanding of automobile planetary gear train design, development, and application in the automotive and industrial transmission fields.

Topical Outline
DAY ONE
• Planetary Carrier Arrangement for Installation
• Planetary Gear Train Construction and Ratio Selection Case Study
• Gear Ratio Change and Shifting Mechanisms
• Planetary Gear Train Design- Stress and Life Calculations
• Planetary Gear Train System Simulation
• Power Flow Issues in Complicated Drive Train Systems
• Ratio Change Mechanisms and Related Control Methods
• Planetary Pinion Speed, G-Load, Thrust Washer and Bearing Subsystem Design

DAY TWO
• Planetary Gear Train Testing and Failure Mode Analysis
• Multiple Pinion Arrangements with Assessment
• Lube Method and its Effect on Planetary Gear Train Life
• Planetary Efficiency and Fuel Economy Estimation
• Planetary Pinion Pin Location, Carrier Deflection, and Load Sharing
• Planetary Gear Train NVH Issues
• Duty Cycles and System Reliability
• Planetary Component Manufacturing and Process Issues
• Future Trends in Advanced Transmission Development
• Course Summary and Conclusion

Instructor: Joseph Chen
Fee $1275  1.3 CEUs

Seals and Sealing System Design of Actuation Systems in Military and Commercial Aircraft

.5 Day  
I.D.# C1131

1 Day  
I.D.# C1212

These seminars present an overview of seals and sealing system design for military and commercial aircraft. It is aimed to provide engineers having some previous actuator and control valve design background with an understanding of the general hardware groove standards, standard parts for static applications and how seal designs and sealing systems can be best used in dynamic reciprocating and rotary applications. Information will be provided regarding seal material and fluid compatibility, friction drag, expected wear rates depending on operating conditions and duty cycle, hardware surface finish and topography. Also included will be information on seal installation procedures and potential pitfalls to avoid.

Learning Objectives
By attending this seminar, you will be able to:
• Identify the standards relevant to seals and seal systems
• Summarize key characteristics of dynamic reciprocating applications
• Summarize key characteristics of rotary applications
• Evaluate seal material characteristics and proper applications

Who Should Attend
This seminar is designed for engineers and other key personnel with some actuator and control valve design knowledge.
POWER AND PROPULSION

Topical Outline

- First O-Ring Patent
  - 1932-Niels A. Christensen
- Parker: Development of Range of Sizes
  - Tables
- AS568
  - Range of sizes
  - Cross sections
  - Tolerances to Class 2- Tables
- History and Application of Aerospace Gland Dimensional Standards for Seals and
- Scrapers
  - MIL-P-5514 Revs A and B
  - MIL-P-5514 Revs C, D, and E
  - MIL-G-5514 Rev F
  - AS4716, AS5857, MS33675, AS4088, AS4052
- History of Backup Ring Standards
  - MIL-R-8791, MS28774, MS27595, MS28782, MS28783
  - AS8791, AS5781, AS5782, AS5860, AS5861
- EPDM History and Applications
  - NAS1613, NAS1611, NAS1612, AECMA specs
  - prEN 6111, prEN 6075, prEN6076
- Elastomer Materials and Applications
  - In red oils; In fuels; In turbine oils
  - Properties
- Storage of Elastomers
  - ARPS316
- Plastic Materials and Applications
  - AMS3678 and slash sheets
  - Effects of fillers on PTFE materials
- High Modulus Plastics
  - PEEK; PEKEKK
  - Carbon fiber composites
  - Properties and uses
- Reciprocating Seals for AS4716 grooves
- Piston Seals
  - Bi-directional – to fit std. and non-std grooves - examples
  - Uni-directional – to fit std. and non-std grooves - examples
- Rod Seals
  - Bi-directional – to fit std. and non-std grooves - examples
  - Uni-Directional – to fit std. and non-std grooves - examples
- Scrapers for MS33675, AS4088, and AS4052
- Reciprocating Sealing Systems
  - Tandem and tertiary sealing systems with scrapers
- Face Seals
  - Types for internal and external pressure
- Seal Design Notes: An Appreciation
  - Low/High temperature considerations
  - Friction calculations: C of F for PTFE compounds
  - Friction calculations: Elastomers
  - Consideration of elastomer shear strength
  - Consideration of elastomer tensile strength
  - Consideration of elastomer elongation percentage
  - Thermal cycling: Reciprocating PTFE seal components
- Rotary shaft seals
  - Metal can types: Elastomeric lip(s)
  - Metal can types: PTFE lip(s)
  - Flanged spring energized seals: Thermal cycling
- Hardware Surfaces, Coatings, and Roughness Finishes
  - Dynamic
  - Static
- Installation Tools and Procedures
- Hardware Design Tips: Avoiding Installation and Performance Catastrophes
- Pump/Motor Function Applications

Instructor: Alan Schofield

I.D.# C1131: $295 .4 CEUs
I.D.# C1212: $725 .7 CEUs

SAE MULTI-COURSE CERTIFICATE PROGRAMS

Watch for the certificate icon to indicate course titles that are part of an SAE multi-course certificate.

Intended to provide a guide towards deeper knowledge in a specific area, SAE’s multi-course certificates outline required courses that offer foundational knowledge of the subject. Some certificate programs also feature additional electives designed to broaden your exposure to more specific aspects of the technology studied. PLUS—completion of many of the multi-course certificate programs equates to graduate credits towards the SAE/Kettering University 20-credit Certificate in Automotive Systems and Kettering’s 40-credit M.S in Mechanical Engineering. Visit training.sae.org/collegecredit for more information.

SAE offers these multi-course certificate programs:

- Transmission/Drivetrain
- General Management and Leadership
- Professional and Legal Issues
- Diesel Technology
- SI Engine
- Vehicle Dynamics
- Product Engineering Tools and Methods

Visit training.sae.org/credentialing/certificate for more information.
Aircraft Cabin Safety and Interior Crashworthiness

2 Days  
I.D.# C0926

The certification of transport category cabin interiors requires a thorough understanding of Part 25 Transport Category aircraft cabin interior safety and crashworthiness regulations and compliance requirements. Regardless of whether it is a simple modification, a specialized completion (VIP or VVIP) or airline passenger configuration, engineers, designers, and airworthiness personnel must understand and adhere to these requirements.

This two day seminar will begin with a discussion of Commercial off the Shelf (COTS) test requirements. The instructor will then guide participants through the various cabin interior emergency provisions and their requirements such as supplemental passenger oxygen, emergency equipment, seats, flammability, emergency exits, emergency lighting and escape path markings, and various other cabin interior systems. Additionally, DO-160 environmental, cooling and ventilation requirements will be discussed to provide participants a comprehensive introduction to cabin interior safety and crashworthiness requirements as specified in the CFR Part 25 Airworthiness Standards.

Learning Objectives

By attending this seminar, you will be able to:

• Identify key strategies to managing certification programs effectively
• Recognize cabin safety and design problems in a timely manner so they may be addressed in advance
• Communicate intelligently on the requirements and effectively negotiate with others involved in FAA certification programs
• Interpret and identify the reasoning behind cabin safety rules and regulations
• Demonstrate an understanding of cabin safety and crashworthiness regulations
• Examine and evaluate current cabin safety issues and their solutions through open discussions between instructor and attendees

Who Should Attend

This course is designed for engineering and certification managers, design engineers, airworthiness and certification engineers, program managers, consultants, Federal Aviation Administration designated engineering representatives (DER) interested in gaining interior arrangement authorization added to their delegated functions and authorized areas, and other technical and administrative personnel involved in FAA certification activities.

Topical Outline

DAY ONE

• Introduction to Part 25 Airworthiness Standards Requirements
• Commercial Off The Shelf equipment (COTS) and Super COTS
• Galley
  • Electrical disconnects
  • Water shut-offs
  • Latches
• Passenger Oxygen and Oxygen Masks
  • Reach (5th percentile female)
  • Quantity and duration requirements
• Emergency Equipment
  • Ditching requirements -- Life rafts; Life vests; Survival kits
  • First aid kits
  • Defibrillators
  • Fire extinguishers
  • Smoke detectors
SAFETY AND QUALITY

- Access
- Placards
- Seats
  - Dynamic (C127a)
  - Static (C39b)
- Divans
- Seat belts and shoulder harness
- Head strike
- Oxygen mask requirements
- Recline and rotations at exit rows
- Exit access
- Foot/leg rests
- Beds
- Latches and Secondary Latches
- Placards
  - Visibility; Contrast; Size; Locations
- Flammability
  - Bunsen Burner flammability tests and materials
  - Fire blocking on seat and back cushions and markings
  - Fire containment -- COTS; Lavatory and galley waste containers
- Smoking and ash trays
- Smoke Detection and Penetration for Cabin Accessible Baggage Compartments

DAYS TWO
- Emergency Exit Types and Requirements
  - Floor level
  - Window
  - Flight deck
- Exit Signs and Requirements
  - Size -- Equivalent safety
  - Visibility
  - Types and requirements -- Bulkhead; Locator; Marker
- Aisle Clearance Requirements
  - Cabin main aisles -- Cross aisles
- Exit Passageways
- Emergency Lighting Systems
  - Luminosity tests -- Cabin color contrast
  - Fuselage transverse separation
  - Emergency Escape Path Markings (EEPM) -- Luminous; Incandescent; Visibility; Seat baggage bars
- Crew Areas
  - Crew assist space
  - Crew assist handle
  - Crew visibility
  - Crew rest area
  - Oxygen
  - Communication
- Flight Deck Door
- Cabin Doors and Curtain Dividers
- Ordinance Signs
  - Visibility
- Legibility
- Cross Aisle Visibility
- Passenger Address (PA) System
- Cabin Hand Sets and Egress Issues
  - Constant retention cord reels
  - Ratcheting
- EMI/RFI Tests
- DO-160 Environmental, Cooling and Ventilation Requirements
- Lithium Ion batteries
- Water systems

Instructor: Ken Farsi  
Fee $1285 1.3 CEUs


2 Hours  
I.D.# WB1425

In a global economy, aviation, space and defense organizations are presented the challenge of producing and delivering safe and reliable products across a wide range of customer requirements and expectations. In an effort to address diverse quality requirements and expectations while also reducing costs throughout the supply chain, the AS9100 family of standards was developed by international aerospace industry representatives to standardize international aerospace quality management system requirements. This two-hour live online course will provide insights into the ISO 9001 and AS9100 significant changes as they adopt the common management system structure. It will include material on standards development process including timelines, new Common Management System Structure, proposed AS9100 requirements that will drive improvements, and future AS9100 concepts.

While this course offers an early look into the new common management system structure and concepts in the forthcoming AS9100:2016 standard, you may also be interested in an overall understanding of the current AS9100:2009 (Rev. C) standard through SAE’s Introduction to AS9100: Requirements and Value-Added Implementation web seminar.

Learning Objectives

By participating in this web seminar, you will be able to:
- Define the timeline for AS9100 and ISO 9001 revision and transition period
- Recognize the impact to new Quality Management Principles on the revision to the standards
- De-mystify the new 10-clause Common Management System structure and understand the impact on your organization

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SAFETY AND QUALITY

• Realize the Aviation, Space & Defense proposed additions to understand benefits
• Grasp the new language like organization and its context, interested parties, documented information, and risk-based thinking

Who Should Attend
The course is designed for quality managers, management representatives, auditors, engineers, supply chain managers and other professionals. AQMS Implementers will comprehend AS9100:2016 (Rev. D) requirements for initial insights for application at your organization. AQMS Internal Consultants will understand the intent to apply value-added implementation of the requirement. AQMS Auditors will comprehend requirements to confidently audit requirements at your organization. AQMS Executives and Management Representatives will better understand how to use AS9100:2016 (Rev. D) requirements to drive cost savings improvement. Individuals wanting an improved AQMS process understanding to integrate AS9100:2016 (Rev. D) requirements into company processes will also benefit.

Topical Outline
• Standards Development Process
  • How standards are revised and on what timeline
  • The state of the ISO 9001 and AS9100 standards
• Introduction to the International Aerospace Quality Group (IAQG) including background, strategic goals, structure and certification statistics
• New Common Management System Structure
  • New 10 clause ISO 9001 structure
  • Language changes
  • Where to find existing requirements
  • Upcoming changes to QMS standards
• Proposed AS9100 Requirements
  • Introduction of potential additions to the standard
  • What is driving change
  • Impact of new AS9100 requirements on your business
• Future AS9100 concepts
  • Aviation, space and defense industry direction regarding QMS standards
• Summary
  • Techniques to ensure the QMS is effective in meeting customer expectations
  • Reference resources for successful implementation

Aerospace Supplier Quality: Common Training for Self-Release Delegates

3 Days
I.D.# C1501

In the aerospace industry, supplier self-release is a process whereby a supplier has been provided the authority to act on behalf of a delegating organization to verify and release products without additional oversight from that delegating organization. Currently, each of these delegating organizations manages and conducts a unique training program for individuals responsible for their self-release overcheck process. For suppliers producing products for multiple delegating organizations, each must then manage the multiple training requirements. The delegating organizations, recognizing there is commonality among the various training programs, have come together to consolidate their training into a single, common training standard.

This three day course will provide self-release delegates with a comprehensive and standardized set of requirements for the self-release process. This course is designed to cover the key elements of the process along with a detailed explanation of self-release overcheck activities. Beginning with the role and responsibility of the self-release delegate and its importance to flight safety, the instructors will guide participants through the various self-release activities including a review of documentation, visual inspection, dimensional overcheck, part marking and serialization, and release documentation requirements. In addition to attending and participating in the full three days, attendees must take and pass a comprehensive learning assessment to successfully complete this course.

When the AS13001: Supplier Self-Release Training Requirements standard is imposed from a delegating organization as a requirement, this foundations course is recognized as satisfying the respective customer training requirement for initial self-release delegate qualification. In addition to this self-release foundations course, delegating organizations may also require the completion of their company specific training prior to beginning self-release activities for their respective supplier organization. Upon successful completion of this course and while the qualification remains valid, a self-release delegate’s personal qualification is recognized by all participating delegating organizations and is transferable between supplier organizations. The initial qualification is valid for a duration of three years, at which time the individual must then complete the necessary recertification training in order to maintain the qualification.

Learning Objectives
By attending this seminar, you will be able to identify and explain:

| Instructor: | L.L. ‘Buddy’ Cressionnie |
| Fee | $260 | .2 CEUs |
SAFETY AND QUALITY

- The role of the self-release delegate
- Legal, ethics, and code of conduct
- Applicable airworthiness regulations and standards
- History of quality in the aerospace industry
- Human Factors and the importance of effective communication
- Customer requirements, flowdown, and compliance with material definition
- Key characteristics
- First article inspection reporting
- Dimensional over-inspection
- Visual inspection
- Part marking and serialization
- Nonconformance control and concession
- Subtier control
- Counterfeit, suspect, and unapproved parts awareness
- Packaging, labeling, preservation, handling, and storage
- Required documentation

Who Should Attend
This credentialing course is intended, as stated in AS13001, to meet the initial training requirements for designated personnel within aerospace supplier organizations that have been identified and approved as operating a self-release process as a delegated activity.

Topical Outline
DAY ONE
- Role of the Self-Release Delegate
  - Duties
  - Responsibilities
- Airworthiness Regulations and Standards
  - Industry oversight
  - Self-release oversight
  - Quality standards
  - Government source inspection
- Legal, Ethics, and Code of Conduct
  - Industry expectations
  - Legal obligations
  - Ethical behavior
  - Code of Conduct
- Human Factors and the Importance of Effective Communication
  - Human factors concepts
  - Internal and external factors
  - Communication
  - Delegate’s role
- Quality History
  - Importance of supplier quality
- Aerospace Products
  - Industry products
  - Aircraft engine technology
- Flight Safety
  - Defining flight safety
  - Delegate’s role
  - Potential impact
  - Key Characteristics
    - Definition
    - Identifying key characteristics and how they originate
    - Key characteristics and your responsibilities
    - Relationship between key characteristics and critical items
  - Customer Requirements, Flowdown, and Compliance with Material Definition
    - Definition of customer requirements and where they originate
    - Types of customer requirements
    - Tracking and implementation of requirements
    - Definition of flowdown, where they originate, and expectations
    - Flowdown activities and potential risk
    - Definition of compliance with material definition
    - Importance of materials compliance management

DAY TWO
- Subtier Control
  - Activities related to flowdown of sub-tier control at every level
  - Approved sources
  - “Certs” and common requirements
  - Receiving inspection
- Review Router/Traveler, OPS Complete
  - Purpose and requirements of Review Router / Traveler
  - Relationship to traceability,
  - Scope of OPS Complete and requirements
- First Article Inspection Reporting
  - Definition and when it is required
  - Applicability
  - Core components of FAIR activity
  - Delegate’s responsibilities
- Dimensional Over-Inspection
  - Definition of dimensional over-inspection
  - Independence of inspection
  - Customer specific requirements
  - Key activities of measurement systems analysis
  - Additional safety related requirements
  - Critical features
  - Hidden characteristics
  - Sampling requirements
- Visual Inspection
  - Visual inspection best practices
  - Inspection techniques
  - Influence of environmental factors
  - Foreign object debris/damage (FOD)
  - Visual compliance verification
  - Workmanship examples
- Suspect, Unapproved, and Counterfeit Parts Awareness
SAFETY AND QUALITY

• Terms and definitions in counterfeit parts risk mitigation
• Proliferation of counterfeit/fraudulent parts
• Supply chain
• Part Marking and Serialization
  • Importance of part marking
  • Key attributes of part marking
  • Requirements for verifying traceability marking
  • Delegate’s responsibilities

DAYS THREE
• Nonconformance Control and Concession
  • Definition of nonconformance
  • Responding to unplanned nonconformances
  • Waivers and deviations
  • Required documentation
  • Escaped product disposition
• Packaging, Labeling, Preservation, Handling, and Storage
  • Applicable regulations and standards
  • Packaging and labeling best practices
  • Product preservation
  • Product handling, storage, and accepted practices
• Documentation requirements
• Learning Assessment* The order in which the topics are presented is subject to change.

Instructor: Paul J. Kunder and Philip F. Klukas, et al.
Fee $895 2.0 CEUs

AS9100C Internal Auditor Training
3 Days
I.D.#CT120

Internal audits are a requirement of the AS9100 Rev C standard and one of the fundamental requirements of the internal audit program is to verify the compliance of the organization’s quality management system to the AS9100 standard. Internal auditors must be knowledgeable of these requirements and the expectations as identified in the standard. In addition, the requirements of AS9101Rev D have significantly changed the way audits are expected to be performed in the Aviation, Space and Defense industries.

This three-day internal auditor training program is designed to provide potential and existing internal auditors with the knowledge necessary to understand and successfully audit an organization against AS9100 Rev C: Quality Management Systems - Requirements for Aviation, Space and Defense Organizations. Additionally, attendees will participate in a detailed examination of the requirements of AS9101 Rev D: Quality Management Systems Audit Requirements for Aviation, Space, and Defense Organizations. An overview of AS9101D Quality Management Systems Audit Requirements for Aviation, Space, and Defense Organization will also be provided to identify the effect this standard has on the way internal audits should be conducted. Case studies and classroom exercises will also be presented in this class to provide participants the comprehensive knowledge and practical skills necessary to be an effective internal auditor.

Who Should Attend
This training program is designed for quality professionals in the Aviation, Space and Defense industries who are involved in the internal audit program and/or management of quality systems seeking compliance to the AS9100 and AS9101 Standards.

Learning Objectives
By attending this training program you will be able to:
• Identify the basic elements of a quality management system
• Summarize the impact ISO 9000:2005 has on the application of other Standards
• Identify and explain the requirements of AS9100:2009 Rev C including process approach, project planning, risk management, configuration management, and work transfer
• Identify and explain the key requirements of AS9101:2010 Rev D Auditing a QMS
• Demonstrate the knowledge and skills required to independently perform a quality management system audit
• Identify the tools and techniques necessary for carrying out an effective audit
• Document the outcomes of an audit

Topical Outline
Day One
• Module 0: Agenda and Introductions
• Module 1: Introduction to the basics of Quality Management Systems
• Module 2: ISO-9000:2005 Overview
  • Terms and Definitions
• Module 3: AS9100:2009, Rev C Overview
  • Quality Management System with emphasis on the Process Approach
  • Management Responsibility with emphasis on Customer Focus
  • Resource Management
• Product Realization, with emphasis on: Project Management; Risk Management; Configuration Management; Work Transfer
• Measurement, Analysis and Improvement

DAY TWO
• Module 3: Continued
• Module 4: AS9101:2009, Rev D Overview
  • Quality Management System with emphasis on the Process Approach
  • Management Responsibility with emphasis on Customer Focus
  • Understanding the new Aviation, Space & Defense 3rd
SAFETY AND QUALITY

Party Auditing Focus
- Use of AS9100C Audit Forms
- Module 5:
  - Overview of the Audit Life Cycle
  - Understand Audit Tools & Techniques
  - Effectively prepare to conduct an Audit
  - Effectively conducting QMS Audits
  - Writing effective audit documentation
  - Day Three
- Module 5: Continued
- Module 6:
  - Prepare to conduct an Audit (case studies)
  - Conduct an audit (simulated)
  - Report on the outcome of an audit

Instructor: Paul J. Kunder OR Phil Klukas
Fee $1615 2.0 CEUs

Good Laboratory Practices (GLP) Training – CALISO Online Course

8 Hours
I.D.#GLP

GLP refers to a Quality Systems of management controls for laboratories and research organizations to ensure the consistency and reliability and reproducibility of results. The original regulatory enforcement was first published by FDA and then a few years later by EPA. It is also outlined in the Organization for Economic Co-operation and Development (OECD) Principles of GLP in 1992 and has since been added to many national regulations. Your company, and all who partake in the daily activities of running a laboratory or a research and testing center, will benefit from this course. This 8-hour GLP (.8 CEU) overview is particularly adapted for training all levels of an organization on the requirements of this standard.

Major topics include:
- Scope; Definitions
- Inspection of a testing facility
- Personnel
- Testing facility management
- Quality assurance unit
- General
- Animal care facilities

This SAE/CALISO course is for you if you:
- Want to quickly and efficiently get a comprehensive training of GOOD LABORATORY PRACTICES (GLP)
- Want to improve your CV and career opportunities with qualifications in quality assurance

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $185.95 .8 CEU

Implementing AS9100C: Understanding and Transitioning to the New Requirements

2 Days
I.D.# C1119

Individuals responsible for quality management system, implementation, and transition to the AS9100:2009 series of standards for Aviation, Space, and Defense will require an understanding of the requirements for the preparation and execution of the audit process as defined in these revised standards. Management and implementers of AS9100:2009 Rev. C within these organizations must also be aware of what these changes may mean for their company.

This two-day seminar will begin with an in-depth review of changes in AS9100 Rev. C: Quality Management Systems - Requirements for Aviation, Space and Defense Organizations and the intent of the revised requirements. Included is a detailed discussion of the standard, with special emphasis on the process approach, project planning, risk management, configuration management, and work transfer. Additionally, AS9101 Rev D: Quality Management Systems Audit Requirements for Aviation, Space, and Defense Organizations and AS9104-1: Requirements for Aviation, Space, and Defense Quality Management System Certification Programs will be examined so that individuals responsible for AS9100 Rev. C implementation understand the system and audit requirements and the immediate influence these changes will have on their certificate transition.

Learning Objectives
By attending this seminar, you will be able to:
- Summarize the International Aviation, Space & Defense standards change process and why changes to the standards were required.
- Identify key changes between AS9100 Rev. B and Rev. C and how these changes will impact an organization’s certificate transition.
- Identify the requirements of AS9100:2009 Rev. C with emphasis on the process approach, project planning, risk management, configuration management, and work transfer.
- Identify and understand AS9101:2010 Rev. D Audit Requirements for conducting and reporting audits and the impact
these requirements will have on organizations and implementers involved in transitioning to Rev. C.
• Identify key components of AS9104-1 Certification Process Overview and the influence this standard will have in the transition and certification process.

Who Should Attend
This seminar is intended for Aviation, Space and Defense industry professionals who desire a detailed understanding of the requirements of AS9100 Rev. C in order to manage, implement, and perform internal audits to the standards. Additionally, trainers, consultants, and other individuals that maintain a significant interest in AS9100 standards will benefit from the information presented in this seminar.

Topical Outline
DAY ONE:
• Overview of AS&D Standards
  • Rationale for changes and the revision process
  • AS9100:2009 Rev C Changes Overview
  • AS9100:2009 Rev C Detailed Discussion
    • Quality Management System and the Process Approach
    • Management Responsibility with emphasis on Customer Focus
    • Resource Management
    • Product Realization with emphasis on: Project Management; Risk Management; Configuration Management; Work Transfer
  • Measurement, Analysis and Improvement
DAY TWO:
• AS9100:2009 Rev C Detailed Discussion (continued)
• AS9101:2010 Rev D
  • Aviation, Space & Defense 3rd Party Auditing Focus
  • Enhanced audit processes
  • Process based management systems
  • Phases of the audit process
  • Customer focus and feedback
  • Conformity AND effectiveness
  • New forms and their impact--Non Conformity Report (NCR); Objective Evidence Record (OER); Process Effectiveness Assessment Report (PEAR)
• AS&D AS9104/1 Certification Process Overview
  • Summary of Certification Body requirements and expectations--NCR requirements; Audit day table; Audit report generation

Instructor: L.L. “Buddy” Cressionnie
Fee $1335 1.3 CEUs

Integrated Vehicle Health Management: Technical Perspectives and Business Case
3 Days
I.D.# C1238

Integrated Vehicle Health Management (IVHM) is an end-to-end capability that transforms system data into operational support information. This information has the ability to optimize vehicle maintenance actions, enhance vehicle safety and reliability, and extend product life. Already changing aerospace vehicle design and transforming aerospace organizations’ manufacturing and operating aircraft, IVHM continues to develop rapidly for use in ground vehicles and marine craft.

In cooperation with Cranfield University, SAE International is pleased to offer this three-day seminar on IVHM. Cranfield University, in partnership with major industry partners (Boeing, BAE Systems, Rolls-Royce, Meggitt, Thales, MoD, Alstom) and the East of England Development Agency (EEDA) launched the IVHM Centre at Cranfield in 2008. The Centre’s mission, as a global leader in IVHM, is to enable the incorporation of IVHM technology into businesses to realize benefits in productivity, environmental impact, and vehicle performance.

This course provides an introduction to this significant area of technology and provides participants with a comprehensive overview of IVHM technology and its role in business. Drawing heavily from experience and knowledge gained in the aerospace industry, information will be presented as relevant to all mobility industry sectors. Included in this seminar is the book titled Integrated Vehicle Health Management: Perspectives on an Emerging Field, recently published by SAE International and edited by Ian K. Jennions.

Learning Objectives
By attending this seminar, you will be able to:
• Analyze and evaluate the business case for IVHM
• Evaluate the impact of IVHM on business models and processes
• Identify current approaches in IVHM as used by leading practitioners
• Explain the context in which individual technologies are applied to enable full exploitation of IVHM opportunities
• Summarize the individual IVHM technologies
• Evaluate approaches to IVHM systems integration
• Through industry case studies:
  • Evaluate strategies used by others for making the business case
  • Identify current technologies
  • Identify approaches for IVHM integration
SAFETY AND QUALITY

Who Should Attend
The course is intended for engineers desiring a technical overview of this rapidly developing field. Additionally, this seminar will benefit management and other support staff responsible for introducing new technologies and developing new business that makes use of IVHM.

Topical Outline

DAY ONE
• Business
  • Introduction to the Course
  • Introduction to IVHM
  • Role of Maintenance in Businesses
  • Cost/Benefit Analysis of IVHM
  • Operations & Management with IVHM
  • PSS and IVHM links
  • IVHM Centre Case Study
  • Regulatory Environment

DAY TWO
• Technology
  • Sensors, Instrumentation, and Signal Processing
  • Reasoning Technologies
  • Failure Diagnostics
  • Failure Prognostics
  • Structural Health Monitoring
  • IVHM and Rotating Machinery
  • Industrial Case Study - BAE Systems

DAY THREE
• Integration
  • OSA-CBM Architecture
  • Design for IVHM
  • IVHM Metrics and V&V Methods
  • Flight Data Monitoring / Aviation Safety and IVHM
  • Systems Engineering
  • Examples / IVHM Centre Case Study
  • Industrial Case Study - Boeing

Instructors:
- Dr. Ian K. Jennions
- Dr. Peter Sandborn
- Felix Heimes
- Robab Safa-Bakhsh
- Dr. Fatih Camci

Fee $1635 2.0 CEUs

Introduction to AS9100: Requirements and Value-Added Implementation Web Seminar and Web Seminar RePlay

3 Hours
Web Seminar I.D.# WB1244
Web Seminar RePlay I.D.# PD331244ON

In a global economy, aviation, space and defense organizations are presented the challenge of producing and delivering safe and reliable products across a wide range of customer requirements and expectations. In an effort to address diverse quality requirements and expectations while also reducing costs throughout the supply chain, the AS9100 family of standards was developed by international aerospace industry representatives to standardize international aerospace quality management system requirements.

This three-hour Web Seminar will provide a starting point for participants to gain an overall understanding of AS9100:2009 (Rev. C). The instructor will provide AS9100 background, management principles, overview, and value-added implementation strategies.

Learning Objectives
By connecting with this Web Seminar you will be able to:
• Define and apply Aerospace Quality Management Systems (AQMS) principles as basis to AS9100:2009 (Rev. C) requirements
• Cite and apply AS9100:2009 (Rev. C) requirements to better apply them to your organization
• Explain the intent of the AS9100:2009 (Rev. C) requirements

Who Should Attend
AQMS Implementers will comprehend AS9100:2009 (Rev. C) requirements for application at your organization. AQMS Internal Consultants will understand the intent to apply value-added implementation of the requirement. AQMS Auditors will comprehend requirements to confidently audit requirements at your organization. AQMS Executives and Management Representatives will better understand how to use AS9100:2009 (Rev. C) requirements to drive cost savings improvement. Individuals wanting an improved AQMS process understanding to integrate AS9100:2009 (Rev. C) requirements into company processes will also benefit.

Topical Outline
• AQMS
• Standard Background
• AQMS Management Principles
• AQMS Overview
SAFETY AND QUALITY

- The Process Model
- Process Effectiveness & Results
- AQMS Documentation Requirements
- AQMS Management Responsibility Requirements
- AQMS Resource Management Requirements
- AQMS Product Realization Requirements
- AQMS Measurement, Analysis and Improvement Requirements

Instructor:  L.L. `Buddy' Cressionnie
Fee $335 .3 CEUs

Introduction to Weibull Engineering Fast Track

80 Minutes
I.D.#PD230946ON
The Weibull engineering technique is the starting point for solving most issues related to product reliability, maintainability, supportability, quality, safety, test planning, and cost control. Weibull Analysis is popular worldwide as the best method for predicting modeling variability and failure of designs, products, and systems. In this 80-minute course, instructor Wes Fulton will provide a solid overview of Weibull Engineering capabilities. This Fast Track should be considered a prerequisite for participation in a Weibull project or for attending additional SAE training that covers advanced Weibull applications.

Major topics include:
- Introduction and Background
- Basic Weibull Plotting and Interpretation
- Case Studies of Successful Weibull Applications
- Overview of Weibull Extensions
- Course Summary

Is this Fast Track for You?
The Introduction to Weibull Engineering Fast Track is designed for the engineer - from automotive, aerospace, electrical, biomedical, and nuclear. The knowledge gained in this course can serve as a prerequisite to more advanced Weibull projects.

What You Will Receive
- Three months of online access to the 80 minute presentation
- Integrated knowledge checks to reinforce key concepts
- Proof of Participation

Instructor:  Wes Fulton
Fee $152

ISO 9001:2008 Training – CALISO Online Course

8 Hours
I.D.# ISO9001TRAINING
ISO 9001 is a quality management standard developed by the International Organization for Standardization (ISO). The ISO 9001 standard is generic and can be used for any organization, whether it provides physical products or services. The requirements must be carefully interpreted to make sense within a particular organization. The ISO 9001 standard, because it is business and management oriented, can be applied to any activity. It is the most widely used quality management standard in the world. This four-hour ISO 9001 overview is particularly adapted for training top management on the high level requirements.

This SAE/CALISO course is for you if you:
- Want to quickly and efficiently get a comprehensive overview of ISO 9001:2008
- Want to improve your CV and career opportunities with qualifications in ISO 9001
- Want to upgrade your expertise from auditing ISO 9001:2000 to ISO 9001:2008
- Want to upgrade your expertise from auditing with ISO 10011-1 to ISO 19011:2002

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $159.95 .2 CEUs
the business will benefit from taking ISO 9001 training. This eight-hour ISO 9001 (.8 CEU) overview is particularly adapted for training all levels of an organization on the requirements of this standard.

Major topics include:
- General Requirements of ISO 9001
- ISO 9001 Vocabulary
- Management Responsibility
- Resource Management
- Product Realization
- Measurement, Analysis and Improvement

This SAE/CALISO course is for you if you:
- Want to quickly and efficiently get a comprehensive training of ISO 9001:2008
- Want to improve your CV and career opportunities with qualifications in quality assurance
- Want to upgrade your expertise from ISO 9001:2000 to ISO 9001:2008

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $229.95 .8 CEUs

ISO 9001:2008 Auditor Training – CALISO Online Course

8 Hours
I.D.# ISO9001AUDITOR

ISO 9001 is a quality management standard developed by the International Organization for Standardization (ISO). Your company and all who partake in the daily activities of running the business will benefit from taking ISO 9001 training. The eight-hour (.8 CEU) ISO 9001 Auditor course provides training on the standard itself and on how to lead or conduct internal audits and supplier audits using ISO 19011, the guideline standard on how to audit management systems.

Major topics include:
- General Requirements of ISO 19011
- Auditing techniques
- QMS Auditing Case Studies

This SAE/CALISO course is for you if you:
- Want to quickly and efficiently learn how to lead an ISO 9001:2008 audit
- Want to quickly and efficiently be trained on ISO 9001 (the standard), and ISO 9000 (the vocabulary for the standard)
- Want to be a lead auditor to conduct internal audits and supplier audits for your company
- Want to improve your CV and career opportunities with qualifications in quality assurance and leading 1st part audits
- Want to upgrade your expertise from auditing ISO 9001:2000 to ISO 9001:2008
- Want to upgrade your expertise from auditing with ISO 10011-1 to ISO 19011:2002

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $229.95 1.6 CEUs

ISO 9001:2008 Lead Auditor – CALISO Online Course

22 Hours
I.D.# ISO9001LEADAUDITOR

As described in the previous ISO 9001 Overview description, ISO 9001 is a quality management standard developed by the International Organization for Standardization (ISO). Your company and all who partake in planning, leading and conducting the audit activities of running the business will benefit from taking ISO 14001 Auditor training. The 22-hour (2.2 CEU) ISO 9001 Auditor course provides training on the standard itself and on how to lead or conduct internal audits and supplier audits using ISO 19011, the guideline standard on how to audit management systems.

Major topics include:
- General Requirements of ISO 9001
- Management Responsibility
- Resource Management
- Product Realization
- Measurement, Analysis and Improvement
- General Requirements of ISO 19011
- Auditing techniques
- QMS Auditing Case Studies

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SAFETY AND QUALITY

This SAE/CALISO course is for you if you:

- Want to quickly and efficiently learn how to conduct an ISO 9001:2008 audit
- Want to quickly and efficiently be trained on ISO 9001 (the standard), and ISO 9000 (the vocabulary for the standard)
- Want to conduct internal audits and supplier audits for your company
- Want to improve your CV and career opportunities with qualifications in quality assurance and leading 1st part audits
- Want to upgrade your expertise from auditing with ISO 10011-1 to ISO 19011:2002

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $355.95  2.2 CEUs

ISO 9001 Business Strategy – CALISO Online Course

Hours  I.D.#BSI

This is the ideal course for the CEO, Executive, other senior management team member, or corporate development department (strategy) staff who must design the vision for the company and chart the course and strategy for the management team to follow. This course was designed by expert partner-level management consultants with an average 15-years of experience with the top tier global strategic management consulting firms as consultants to Fortune 500 companies and financial institutions.

Major topics include:

- Vision, what does it do and how important is it?
- Selecting market segments where the company will compete
- Understanding market segments and capturing with tactical strategy and brand
- Figuring out the capabilities the company needs to have to win
- Enabling the needed set of capabilities at your company
- Performance metrics and aligning the firm to successfully execute the strategy

This SAE/CALISO course is for you if you:

- Are an employee or manager and want to quickly and efficiently become familiar with business strategy for implementation
- Want to understand Business Strategy in order to knowledgeably assess and contract Business Strategy services from a management consulting firm
- Want to improve your CV and career opportunities with Business Strategy knowledge and qualifications
- Are interested in learning world-class best practice methodology which will help increase your value to your company and help you think strategically
- Need to develop a competitive strategy for your company
- If the vision and strategy for your company is unclear or possibly in need of further enhancement
- Are uncertain that you have the correct organization design, processes, technology, and performance metrics needed to successfully execute the company’s business strategy
- Are restructuring or implementing quality programs but, so far, have not seen desired results
- Noticed that legacy processes, policies, and organization structures at your company don’t change although they seem inadequate, out of date, or inconsistent with the business strategy

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $219.95  1.2 CEUs

ISO 14001:2004 Training – CALISO Online Course

8 Hours  I.D.#ISO14001

ISO 14001 is an environmental management standard (EMS) developed by the International Organization for Standardization (ISO). The ISO 14001 standard is generic and can be used for any organization, whether it provides physical products or services. The requirements must be carefully interpreted to make sense within a particular organization. Developing automotive products and the environmental impact of this activity is not like producing food products or offering consulting services; yet the ISO 14001 standard, because it is business and management oriented can be applied to any activity. It is the most widely used EMS standard in the world.

Your company and all who partake in the daily activities of running the business will benefit from taking ISO 14001 training. This eight-hour ISO 14001 (.8 CEU) overview is particularly adapted for all members of the organization.
SAFETY AND QUALITY

Major topics include:
- General Requirements of ISO 14001
- ISO 14001 Vocabulary
- Environmental Policy
- Planning
- Implementation and Operation
- Checking
- Management Review

This SAE/CALISO course is for you if you:
- Want to quickly and efficiently get a comprehensive training of ISO 14001:2004
- Want to improve your CV and career opportunities with qualifications in EMS
- Do NOT have time to allocate two full days to take an environmental management class
- Want to train more of your staff on auditing economically and without having to immobilize them in a class for a full day

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $219.95 .8 CEUs

ISO 14001:2004 Auditor Training – CALISO Online Course

8 Hours
I.D.#ISO14001AUDITOR

ISO 14001 is an environmental management standard (EMS) developed by the International Organization for Standardization (ISO). The ISO 14001 standard is generic and can be used for any organization, whether it provides physical products or services. The requirements must be carefully interpreted to make sense within a particular organization. Developing automotive products and the environmental impact of this activity is not like producing food products or offering consulting services; yet the ISO 14001 standard, because it is business and management oriented can be applied to any activity. It is the most widely used EMS standard in the world.

Your company and all who partake in the daily activities of running the business will benefit from taking ISO 14001 training. This eight-hour (.8 CEU) ISO 14001 Auditor course provides training on the standards and how to conduct internal audits and supplier audits using ISO 19011, the guideline standard on how to audit management systems.

Fee: $229.95 .8 CEUs

Major topics include:
- General Requirements of ISO 19011
- Auditing Techniques
- EMS Auditing Case Studies

This SAE/CALISO course is for you if you:
- Want to quickly and efficiently learn how to lead an ISO 14001:2004 audit
- Want to quickly and efficiently be trained on ISO 14001 (the standard) and ISO 14000 (the vocabulary for the standard)
- Want to be a lead auditor to conduct internal audits and supplier audits for your company
- Want to improve your CV and career opportunities with qualifications in EMS and leading first part and second party audits
- Want to upgrade your expertise from auditing with ISO 10011-1 to ISO 19011:2002
- Do NOT have time to allocate two full days to take an ISO 14001 auditor class
- Want to train more of your staff on auditing economically and without having to immobilize them in a class for a full day

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

ISO 14001:2004 Lead Auditor – CALISO Online Course

22 Hours
I.D.#ISO14001LEADAUDITOR

As described in the previous ISO 14001 course description, ISO 14001 is an environmental management standard (EMS) developed by the International Organization for Standardization (ISO). Your company and all who partake in planning, leading and conducting the EMS audit activities of your business and managing its environmental program will benefit from taking ISO 14001 training. The 22-hour (2.2 CEU) ISO 14001 Lead Auditor course is the most comprehensive training on the subject. It provides training on the standard itself but also on how to lead or conduct internal audits and supplier audits using ISO 19011, the guideline standard on how to audit management systems.

Major topics include:
- General Requirements of ISO 14001
- ISO 14001 Vocabulary

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SAFETY AND QUALITY

- Environmental Policy
- Planning
- Implementation and Operation
- Checking
- Management Review
- General Requirements of ISO 19011
- Auditing Techniques
- EMS Auditing Case Studies

This SAE/CALISO course is for you if you:
- Want to quickly and efficiently learn how to lead an ISO 14001:2004 audit
- Want to quickly and efficiently be trained on ISO 14001 (the standard), and ISO 14000 (the vocabulary for the standard)
- Want to be a lead auditor to conduct internal audits and supplier audits for your company
- Want to improve your CV and career opportunities with qualifications in EMS and leading first party and second party audits
- Want to upgrade your expertise from auditing with ISO 10011-1 to ISO 19011:2002

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $319.95 2.2 CEUs

ISO/TS 16949:2009 Training – CALISO Online Course
8 Hours
I.D.# ISO16949

The ISO/TS16949 is an ISO technical specification for the automotive industry aiming to the development of a quality management system that provides for continual improvement, emphasizing defect prevention and the reduction of variation and waste in the supply chain. The requirements must be carefully interpreted to make sense within a particular organization. Your company and all who partake in the QMS and supplier audit activities will benefit from taking ISO/TS 16949 training. The eight-hour (.8 CEU) ISO/TS 16949 Auditor course is the most comprehensive training on the subject. It provides training on the standard itself but also on how to lead or conduct internal audits and supplier audits using ISO 19011, the guideline standard on how to audit management systems.

Major topics include:
- General Requirements of ISO 19011
- Auditing techniques
- QMS Automotive Auditing Case Studies

This SAE/CALISO course is for you if you:
- Want to quickly and efficiently learn how to lead an ISO/TS 16949:2009 audit
- Want to quickly and efficiently be trained on ISO/TS 16949 (the standard), and ISO 9000 (the vocabulary for the standard)

Fee: $229.95 1.0 CEUs
SAFETY AND QUALITY

• Want to be a lead auditor to conduct internal audits and supplier audits for your company
• Want to improve your CV and career opportunities with qualifications in quality assurance and leading 1st part audits
• Want to upgrade your expertise from auditing QS 9000 to ISO/TS 16949:2009
• Want to upgrade your expertise from auditing with ISO 10011-1 to ISO 19011:2002

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $239.95 1.6 CEUs

ISO/TS 16949:2009 Lead Auditor Training – CALISO Online Course

22 Hours
I.D.# ISO16949LEADAUDITOR

The ISO/TS16949 is an ISO technical specification which forms the requirements or application of ISO 9001 for automotive production and relevant service part organizations. It is essentially ISO 9001 with additional automotive specific requirements and is require by most major automotive manufacturers. Once your company implements processes and procedures that comply with the requirements listed in ISO/TS 16949, you can be audited by a third party organization called a Registrar, which will certify your organization to this standard.

This lead auditor course provides management representatives, QA managers or supervisors and others not only the information needed to conduct an audit for ISO/TS 16949, but also to organize, implement and lead it. All audit teams need a leader, and the body of knowledge of this course covers all of the lead auditing aspects.

Major topics include:
• Statistical Process Control (SPC)
• APQP/CP: Advanced Product Quality Planning and Control Plans
• PPAP: Product Part Approval Process
• FMEA: Failure Mode and Effects Analysis
• MSA: Measurement Systems Analysis

This SAE/CALISO course is for you if you:
• Want to quickly and efficiently be trained on the TS 16949 specification
• Want to be a lead auditor to conduct internal audits and supplier audits for your company
• Want to improve your CV and career opportunities with qualifications in quality assurance and leading 1st part audits
• Want to upgrade your expertise from auditing QS 9000 to ISO/TS 16949
• Want to upgrade your expertise from auditing with ISO 10011-1 to ISO 19011:2002

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $369.95 2.2 CEUs

ISO 19011:2011 Auditor Training – CALISO Online Course

4 Hours
I.D.#ISO19

ISO 19011 is a guideline developed by the International Organization for Standardization (ISO). The ISO 19011 standard is generic and can be used for auditing any type of management standard: quality, environmental, health and safety and others.

Your company and all who partake in the daily activities of running the business will benefit from taking ISO 19011 training for its auditing activities. The four-hour (.4 CEU) ISO 19011 course is the most comprehensive training on the subject. It provides training on the standard itself but also on how to lead or conduct internal audits and supplier audits using ISO 19011, the guideline standard on how to audit management systems.

Major topics include:
• General Requirements of ISO 19011
• Auditing techniques
• Auditing Case Studies

This SAE/CALISO course is for you if you:
• Want to quickly and efficiently learn how to audit management systems
• Want to be a lead auditor to conduct internal audits and supplier audits for your company
• Want to improve your CV and career opportunities with qualifications in quality assurance and leading 1st part audits
• Want to upgrade your expertise from auditing with ISO 10011-1 to ISO 19011:2002
SAFETY AND QUALITY

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $159.95 .4 CEUs

Principles of ISO 9000, ISO/TS 16949, and AS9100 Fast Track

25 Minutes
I.D.#PD230824ON

Understanding the purpose and intended use of standards, directives and requirements sets the foundation for developing a functional management system. This 25-minute, online short course is intended to present ISO 9000, ISO/TS 16949 and AS9100 as purpose driven management systems that are necessary for companies to survive in our fast-moving economy.

**Major topics include:**
- The history leading to the development of ISO/TS 16949 and AS9100
- The cost of poor quality
- Management system principles
- Plan-Do-Check-Act
- Process based quality system model
- Terms and Definitions
- ISO/TS 16949 and AS9100 Sections

Is this Fast Track for you?

In all three standards, paragraph 6.2.2 states the need for competence, awareness and training. Management and personnel in all departments from sales and marketing to engineering, purchasing, production, customer service, receiving, packaging, storage, shipping, and beyond will benefit from the purpose driven management systems that are necessary to deliver customer satisfaction and survive in the global economy. This course is not intended for those already familiar with the purpose and benefits of the standards.

**What You Will Receive**
- Three months of online access to the 25 minute presentation
- Integrated knowledge checks to reinforce key concepts
- Proof of Participation

Instructor: Joseph Sorrentino
Fee $60

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Sarbanes-Oxley (SOX) Training – CALISO Online Course

4 Hours
I.D.#SOX

This is the ideal course for employees or managers who want to get a comprehensive training on Sarbanes-Oxley (SOX) compliance requirements, practical applications, and how ISO 9001 business management methodologies can be used, applied and combined to implement Sarbanes-Oxley. This is the ideal course for individuals who you want improve their résumé and career opportunities in SOX, by adding this course to the education or training section of your CV.

**Major topics include:**
- Sarbanes-Oxley, what is it?
- Sarbanes-Oxley (SOX) Certification Requirements
- Sarbanes-Oxley Section 302 - a big concern; Section 906 - the biggest concern
- What’s a CEO to do? How to most easily implement SOX without the CEO having to do everything?
- Minimal levels of SOX compliance, Risk Analysis
- How to avoid defrauding of the auditors by the business
- Whistle blower program
- What to do if something is already wrong (non-compliance)?
- Top steps to Sarbanes-Oxley compliance

This SAE/CALISO course is for you if you:
- Want to quickly and efficiently become familiar with Sarbanes-Oxley to understand, implement Sarbanes-Oxley compliance as an employee or a manager
- Want to understand Sarbanes-Oxley compliance in order to knowledgably assess and contract Sarbanes-Oxley services
- Want to improve your CV and career opportunities with Sarbanes-Oxley knowledge and qualifications
- Want to protect your company from financial fraud and related legal, criminal and financial liability

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $269.95 .4 CEUs
SAFETY AND QUALITY

Six Sigma Overview – CALISO Online Course

8 Hours
I.D. #SIGMA

Six-Sigma is a systematic way to improve a product, process and/or service. This is the ideal course for employees or managers who want to get a basic training on Six-Sigma concepts, methodology and techniques.

Six-Sigma methodology can be used for any size organization, whether it provides physical products (i.e. hardware or software) or services. Developing and maintaining profitable products and services require continuous improvement in numerous key areas such as quality, performance and efficiency. Six-Sigma techniques can help any company achieve these goals.

This is the ideal course for individuals who you want improve their résumé and career opportunities in Six-Sigma, by adding this industry-wide recognized course to the education or training section of your CV.

The course covers Six-Sigma process improvement techniques; it is a stepping stone for Six Sigma Green and Black-belt certifications.

Major topics include:
- Six-Sigma, what is it?
- Six-Sigma, why use it?
- International quality standards and Six-Sigma
- Six-Sigma Core Concepts, How to use Six-Sigma
- Six-Sigma application example and Case Study “JFS”
- Another Case Study “BBB”
- Top steps to Six-Sigma
- Sigma Table, Spread Sheet Tips

This SAE/CALISO course is for you if you:
- Want to quickly and efficiently become familiar with Six-Sigma to understand and launch Six-Sigma projects as an employee or a manager
- Want to improve your CV and career opportunities with Six-Sigma knowledge and qualifications
- Want to systematically improve the profitability and customer satisfaction of your product or service by improving numerous key areas such as quality, performance and efficiency

This is an internet-delivered course featuring graphical presentation screens with text-based instruction, videos, and on-going quizzes to reinforce learning and retention and gauge your understanding of a topic before you move forward. An online training certificate will be issued upon successful completion of the course and obtaining 70% or above on the final average of the ongoing quizzes.

Fee: $159.95 .8 CEUs

Understanding and Supporting Aircraft Accident Investigation and Reconstruction

2 Days
I.D. # C1143

Aircraft accident and incident investigations should be supported by all engineering disciplines and departments involved with design, manufacturing, certification, and field operations. For individuals called upon to serve as advisors or technical representatives to official aircraft accident investigation (AAI) teams, an understanding of aircraft accident investigation and reconstruction methodology and processes is critical to success in this supportive role.

This two-day seminar will begin with the basic requirements for conducting proper accident investigations, including investigative philosophies and procedures. The instructor will then guide participants through various data gathering methods and cover several specific types of accident investigations including those related to human factors, crashworthiness, inflight breakups, and mid-air collisions. Presentations are based on actual accidents and real-life investigation experiences and accident investigation case studies are integrated throughout the course to provide participants the knowledge required to effectively support aircraft accident investigation and reconstruction.

Learning Objectives

By attending this seminar, you will be able to:
- Identify the key requirements and steps in the AAI process.
- Identify and evaluate analytical procedures used in an AAI.
- Identify and analyze potential complications that arise during an AAI.
- Construct and contribute analysis in support of an AAI.

Who Should Attend

This course will benefit individuals seeking a fundamental understanding of the aircraft accident investigation and reconstruction process, particularly engineers within the aerospace industries that may be called upon to serve in a supportive role as a technical advisor to an official aircraft accident investigation team.

Topical Outline

DAY ONE
- Introduction
- Investigative Attitudes and Behaviors
- Approach to an Investigation
  - Simple vs complex
  - Collecting evidence
  - Reconstructing evidence
- Basic Analytical Procedures
  - Intuitive methods
SAFETY AND QUALITY

- Formal methods
- Results of Incomplete Investigation Processes
- Human Factors Analysis
- G-load tolerance
  - Recognition and reaction time
  - Spatial and situational disorientation
  - Visual illusions
  - Cockpit warnings and control issues
  - Identifying hazards
  - Technologically advanced aircraft
- Aging Aircraft
- Witness Interviews
- Photo Documentation
- In-Flight Breakups
  - Sequence
  - Radar data
  - Trajectory analysis
  - Flutter
- Crashworthiness and Survivability
  - Design aspects
  - Implementation
  - Impact analysis
- Mid-Air Collisions
  - Operational/environmental aspects
  - Wreckage evaluation
- Nine-Box Matrix Exercise
- Wreckage Reconstruction Exercise

SAE MULTI-COURSE CERTIFICATE PROGRAMS

Watch for the certificate icon to indicate course titles that are part of an SAE multi-course certificate.

Intended to provide a guide towards deeper knowledge in a specific area, SAE’s multi-course certificates outline required courses that offer foundational knowledge of the subject. Some certificate programs also feature additional electives designed to broaden your exposure to more specific aspects of the technology studied.

training.sae.org/credentialing/certificate

Understanding the FAA Parts Manufacturer Approval Process

2 Days
I.D.# C1324

The requirements for producing an FAA approved replacement part can be daunting. Understanding the steps required in the FAA Parts Manufacturer Approval (PMA) process can greatly streamline the approval life-cycle and reduce unnecessary costs and delays, thereby shortening the time and cost to market. This course is designed for those organizations and individuals interested in designing and manufacturing replacement parts for civil aviation aircraft.

This two-day course covers the crucial subjects and steps of the FAA-PMA approval process. The instructor will begin with an overview of the Federal Aviation Administration (FAA) organizational structure. The instructor will then guide participants through the roles and responsibilities of the PMA applicant, Aircraft Certification Office (ACO), Manufacturing Inspection District Office (MIDO), Flight Standards District Office (FSDO), and the Aircraft Evaluation Group (AEG) as outlined in FAA policies, guidelines, and requirements leading to FAA-PMA approvals. In addition, the instructor will present the necessary topics to be covered in all PMA engineering analyses including Approval by Identicality, Licensing Agreement, and Test and Computation. Throughout this course the instructor will combine classroom lecture with real-world examples to provide participants both a formal as well as practical learning experience.

Learning Objectives

By attending this seminar, you will be able to:

- Understand the PMA process throughout the product life-cycle
- Recognize the roles and responsibilities of the PMA applicant
- Identify the roles and responsibilities of the FAA and FAA Designees
- Manage the PMA approval process with respect to schedules and time-lines
- Identify the required content for an acceptable Engineering Design Analysis

Who Should Attend

This course is designed for engineering and manufacturing managers, design engineers, airworthiness and certification engineers, quality assurance inspectors and engineers, program managers, consultants, Federal Aviation Administration designated engineering and airworthiness representatives (DER and DAR) and other technical administrative personnel involved in FAA-PMA certification activities. The course will help both newcomers to civil aircraft parts certification as well as experienced attendees better understand the PMA certification process.

Instructor: Donald F. Knutson
Fee $1275 1.3 CEUs
SAFETY AND QUALITY

Topical Outline

DAY ONE
• Introductions
• The purpose of this Course
• The FAA / Design & Production Approvals
• The Purpose for FAA-PMA
  • Who Needs a PMA?
  • What are the Exceptions to PMA?
  • Fabrication Inspection System
  • PMA and Older Products
• The Roles of the FAA and Applicant
• Project Specific Certification Plans (PSCP)
• What to Expect From Applicants
  • Who Gets Application Letter?
  • Content of Application Letter
  • Basis for Design Approval
  • Draft PMA Supplements
  • Applicant’s Data Package
• Special Requirements for Test and Computation Applications
  • Identicality by Other Than Licensing Agreement
  • Part Marking Requirements
  • Use of Designees
• Establishment of the Fabrication Inspection System (FIS)
• Responsibilities of PMA Holders After Approval
• Deviations

DAY TWO
• Aircraft Certification Office (ACO) Responsibilities
  • General Responsibilities
  • Applicant Approaches
  • Review of Applicant’s Abilities
  • Coordination with Certificate Management ACO (CMACO)
  • Verification of Installation Eligibility
  • Service History Considerations
  • Life-Limited Parts
• Special Considerations—Identicality Without a License Agreement
• Special Considerations—Test and Computation
• Evaluating the Drawing Package
• Conformity Inspections
• Design Approval
• Revising the PMA Supplement
• Non-Compliance
• Manufacturing Inspection District Office (MIDO) Responsibilities
  • PMA Activities
• Designated Engineering Representatives (DER) and Organization
  • Designation Authorization (ODA)
• DER Roles in the PMA Process
• Test and Computation

- Identicality Provisions
- Findings of Identicality
- ODA Role in PMA
- Engineering Analysis Tools
- Material Analysis Tools

Instructor: George J. Ringger
Fee $1265  1.3 CEUs

Weibull-Log Normal Analysis Workshop

3 Days
I.D.# 86034

RMS (Reliability-Maintainability-Safety-Supportability) engineering is emerging as the newest discipline in product development due to new credible, accurate, quantitative methods. Weibull Analysis is foremost among these new tools. New and advanced Weibull techniques are a significant improvement over the original Weibull approach. This workshop, originally developed by Dr. Bob Abernethy, presents special methods developed for these data problems, such as Weibayes, with actual case studies in addition to the latest techniques in SuperSMITH® Weibull for risk forecasts with renewal and optimal component replacement. Class work is used to reinforce key concepts, lectures are based on actual case studies, and personal computers and hands-on experiments are used to analyze dozens of Weibull & Log Normal problems. Students will be fully capable of performing basic and advanced RMS Engineering analysis with their own software on completion of the workshop.


Optional Weibull Introduction—to accelerate your learning in this Workshop, you may want to complete the SAE Fast Track, Introduction to Weibull Engineering (I.D.# PD230946ON). This highly recommended overview of Weibull engineering can improve your retention prior to taking the workshop or provide a great review afterwards.

Learning Objectives

By attending this seminar, you will be able to:
• Analyze design, development, production, and service failures
• Model product lifetime and reliability
• Evaluate calibration and maintainability plans
• Analyze inspection data
• Reduce test substantiation, time and costs
SAFETY AND QUALITY

Who Should Attend
An engineering undergraduate degree in any discipline would be beneficial. Engineers responsible for reliability, safety, supportability, maintainability, materials, warranties, life cycle cost, design, structures, instrumentation and logistics will find these Weibull techniques extremely useful.

Topical Outline
DAY ONE - Undergraduate Weibull Analysis
• Background, Development & Introduction - 23-Minute Video Short Course
• How to do Weibull Analysis
• Interpretation of Good Weibulls - 2 & 3 Parameter
• Are two Weibull datasets significantly different?
• Interpretation of Bad Weibulls
• Risk and Failure Forecasting Case Studies
• Weibull Experiments (Wire Rupture, Torsion, LCF, Accelerated Testing), Classwork Problems and Solutions
• Log Normal Analysis
• Optimal Replacement Intervals, Block Replacement
DAY TWO - Postgraduate Weibull Analysis
• Maximum Likelihood Weibull Theory and Application
• WeiBayes Analysis
• Dauser Shift, Warranty Analysis
• Rank Regression vs. Maximum Likelihood
• Extremely Small Samples Analysis
• One Failure Weibull Case Study
• An Introduction to SuperSMITH® Software, Features, Input, Analysis, Output
• Summary of Weibull Methods
• Class Work Problems
• Experimental Wire Data Distribution Analysis
• Playtime With SuperSMITH® Tutorial
DAY THREE - Confidence Intervals and System Models
• Confidence Intervals, “The Good, The Bad and The Complicated”
• Comparing Designs
• The Binomial & Poisson
• Crow-AMSAA Reliability Growth Modeling - Useful Technology for Tracking Development Testing and Any Significant Event to be Managed
• The Exponential Related to the Poisson and the Weibull
• Kaplan-Meier Survival Analysis
• Crow-AMSAA Employed for Analyzing Renewal-Repairable Systems
• System Models
• Classwork
• Complete Playtime With SuperSMITH®
• Ph.D. Oral Examination

Instructor: Wes Fulton
Fee $2145 2.0 CEUs

GET DEFINITIVE INDUSTRY AUTHENTICATION
Probitas Authentication provides unparalleled customer service through the AS9100 AQMS and training provider approval processes in accordance with aerospace certification scheme requirements. Recognized by the Americas Aerospace Quality Group (AAQG) as an Auditor Authentication Body (AAB) and Training Provider Approval Body (TPAB), Probitas Authentication is committed to:

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• Thoroughness and Accuracy
• Integrity – providing equal opportunities for success
• Compliance with industry standards and approved practices
• Continual Improvement

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Accelerated Test Methods for Ground and Aerospace Vehicle Development

2 Days  
I.D.# C0316

A similar course is available online, on demand – Accelerated Test Methods for Ground and Aerospace Vehicle Development e-Seminar – see course info below.

Engineers and managers involved with product development are constantly challenged to reduce time to market, minimize warranty costs, and increase product quality. With less and less time for testing, the need for effective accelerated test procedures has never been greater. This course covers the benefits, limitations, processes, and applications of several proven accelerated test methods including accelerated reliability, step stress, FSLT (Full System Life Test), FMVT® (Failure Mode Verification Testing), HALT (Highly Accelerated Life Testing), and HASS (Highly Accelerated Stress Screening). A combination of hands-on exercises, team activities, discussion, and lecture are used throughout the course. Participants will also receive a copy of the instructor’s book, Accelerated Testing and Validation Management, which includes numerous hands-on exercises and a CD with analytical spreadsheets. Attendees are requested to bring a calculator to the seminar.

Learning Objectives

By attending this seminar, you will be able to:
• Choose the accelerated test method for a given application  
• Analyze accelerated testing results  
• Explain how to accelerate one’s current test methods  
• Explain how to accelerate one’s validation program  
• Adjust accelerated test programs for business situations  
• Describe how product development cycles can be reduced from 18 to 6 months

Who Should Attend

This seminar is designed for anyone involved in product design, life testing, reliability testing and validation for passenger cars, light trucks, heavy duty, off-highway or aerospace vehicles, including reliability engineers, validation engineers, design engineers and their managers. Individuals who need to achieve shorter time to market or higher quality through custom test plans will find this course to be especially valuable. Purchasers or users of testing or engineering services will also find this course to be valuable. There are no prerequisites for this course although a technical background is helpful.

Topical Outline

• Statistical model for reliability testing  
  • Fundamentals of a statistical reliability test  
  • Effects of automotive supply chain on sample size and duration  
  • Common pitfalls  
  • Examine and solve two or three real life statistical data set problems

• Key Accelerated Tests, Terms, and Methods  
  • Definitions: Information Goal, Basic Method, Limitations  
  • Full System Life Test (FSLT)  
  • Step Stress  
  • Accelerated Reliability Highly Accelerated Life Test (HALT)  
  • Failure Mode Verification Test (FMVT) — Development; Warranty; Life Prediction

• Test Acceleration vs. Program Acceleration  
  • Advantages of accelerating a full validation program compared to an individual test  
  • Examples of time/cost saved on individual test acceleration
Tests and Testing

- Examples of time/cost saved on program acceleration
- Hybrid Acceleration Methods
  - Using information goals of individual test methods to combine and leverage tests
  - Hands-on team exercise: combine test methods to solve a particular information need
- Decision and selection process
  - How to choose which method
  - Considering position in supply chain
  - Considering business model and product type
  - Considering development phase
  - Considering component, subsystem, and system level testing
  - Hands on team exercise: selecting optimal testing solution for several scenarios

Practical NVH Signal Processing Methods

2 Days
I.D.# C0431

Signal processing has become a critical tool in optimizing vehicle noise. This seminar will help you to understand the foundation common to all NVH data acquisition equipment including digitizing, windows, aliasing, averaging techniques, and common analysis functions such as the power spectrum, transfer function and coherence. Fundamental concepts such as filtering, modulation, convolution, and correlation, as well as specialized techniques used in rotating machinery such as adaptive re-sampling and order tracking, will be covered. The seminar will also cover multi-input multi-output (MIMO) signal processing, array based solutions for force identification, source and path characterization and data visualization. Brief introductions to emerging concepts will also be explored and computer demonstrations, physical experiments and case studies will be used to illustrate applied, real-world problems.

Learning Objectives

By attending this seminar, you will be able to:
- Explain the fundamental controls typical in modern spectrum analysis tools
- Interpret NVH data and judge its relevance to physical phenomena
- Extract new types of useful information from NVH data
- Implement new signal processing techniques

Who Should Attend

NVH technicians, engineers and managers who want to understand how NVH data is produced and interpreted will find this seminar valuable. The material is presented at a level suitable for beginners, but offers the more experienced practitioners new insight into the concepts presented through the illustrations and demonstrations that are included.

Topical Outline

- Properties of the FFT
  - Sampling and digitizing
  - Aliasing and filters
  - Leakage and windows
  - Averaging techniques
  - Autopower, crosspower and coherence
  - Transmissibility and isolation
  - Measuring and interpreting the transfer function
- Rotating Machinery Basics
  - What is an order?
  - Rotation synchronous data acquisition methods
  - AM and FM modulation effects
  - FIR, IIR and re-sampling filters

Accelerated Test Methods for Ground and Aerospace Vehicle Development e-Seminar

10 Hours
I.D.#PD130624ON

This course offers more than 10 hours of instruction divided into fourteen modules; a coordinated handbook; and a copy of the instructor’s book, *Accelerated Testing and Validation Management*, which includes numerous hands-on exercises and a CD with analytical spreadsheets. Convenient, portable, and with core content from the instructor-led seminar (view description for classroom seminar just above), the e-seminar program option offers new and alternative ways to receive the same instruction as the live classroom learning without the expense of travel and time away from the workplace.

View the complete course description and a video demo at training.sae.org/eseminars/atm.

What You Will Receive:
- 365 Day access through MyLearn.sae.org
- Links to streaming video modules
- Course Handbook (downloadable .pdf’s, subject to DRM)
- Online Pre-test (self-test, immediate results)
- Online Post-test (self-test, immediate results)
- CEUs/Certificate of Achievement (with satisfactory post-test score)

Instructor: Alexander (Alex) J. Porter
Fee $1355 1.3 CEUs
• Up-sampling down-sampling and adaptive re-sampling
• Time Frequency Methods
  • Short time Fourier transform
  • Gabor expansion and Gabor transform
  • Orthogonality, invertability and the dual function relationship
  • Gabor order tracking
  • Introduction to wavelets
• Fundamentals of Multi-Input-Multi-Output (MIMO) System Analysis
  • Review of Single-Input-Single-Output (SISO) systems
  • Introduction to Single-Input-Multiple-Output (SIMO) systems
  • Partial correlation concepts
  • Coherent output power
  • Statistical errors in basic estimates
  • Conditioned spectral analysis
• Forces and Sources in MIMO Systems
  • Least squares solution techniques
  • Force estimation technique Conditioned Source Analysis (CSA)
  • Case history: transfer path analysis
  • Case history: model correlation and updating
• Introduction to Data Classification and Pattern Recognition
  • Techniques for building and analyzing feature vectors
  • Recognition engines: neural networks and hidden Markov models
  • Applications: machine noise recognition, vision based gear mesh quality

Instructor: Michael F. Albright
Fee $1225 1.3 CEUs
Belanger, John-Paul
John-Paul Belanger is president of Geometric Learning Systems, a consulting firm specializing in geometric dimensioning and tolerancing (GD&T) and stack analysis. For over fifteen years, he has trained people throughout North America and Europe in the proper interpretation and application of GD&T per the Y14.5 standard by using practical examples. Mr. Belanger is certified by the American Society of Mechanical Engineers as a Senior GD&T Professional, and has worked with a wide range of companies in the automotive, aerospace, electronic, and other industries to apply tolerances and perform stack calculations. He holds a B.S. in aerospace engineering from the University of Michigan specializing in aircraft design and safety.

Bensch, Leonard E.
Dr. Leonard Bensch has been involved in the field of filtration and contamination control for over 45 years. Dr. Bensch joined Pall Corporation in 1979 as Senior Staff Scientist in the scientific and laboratory services (SLS) Department. He held various management roles including SLS and Strategic Marketing for the Pall Aeropower group. He became President of Pall Industrial Hydraulics, and then in 1988, he became Pall Corporation Vice President in charge of Western Hemisphere fluid power operations. Dr. Bensch has authored over 130 technical papers in the area of filtration and contamination control. He is an active participant on several industrial technical committees, including SAE International and the National Fluid Power Association (NFPA). He is the Chairman of the USA Technical Advisory Group to ISO for contamination control and convener of the ISO filtration test methods working group. He serves as a US expert to ISO for aerospace filtration and contamination control and is the past Chairman of the Board of Directors of the National Fluid Power Association. Dr. Bensch received BS, MS, and PhD degrees in mechanical engineering from Oklahoma State University where he conducted and led research projects for 12 years in component wear, filtration and contamination control, and was instrumental in the development of most modern industrial hydraulic filter test methods and contamination analysis techniques.

Bardasz, Ewa
Dr. Ewa A. Bardasz is a Fellow at The Lubrizol Corporation, where she is currently responsible for overseeing technical activities related to lubricating novel combustion hardware, aftertreatment systems and emissions. She is experienced in the areas of crankcase lubrication, corrosion inhibition, engine testing and exhaust emissions control. Dr. Bardasz holds over 25 patents, has published multiple technical and scientific papers, authored chapters for technical books and is a frequent invited speaker at conferences throughout the U.S. and Europe. She is the recipient of the SAE International 2002 Award for Research on Automotive Lubricants, and 2009 SAE International Environmental Excellence in Transportation Award. Dr. Bardasz is a Fellow of SAE International and a Fellow of the Society of Tribologists and Lubrication Engineers (STLE) where she is also on the Board of Directors. Dr. Bardasz obtained a M.Sc. in Chemical Engineering from Warsaw Technical University and a PhD in Chemical Engineering from Case Institute of Technology.

Albright, Michael F.
Michael F. Albright is co-founder and General Manager of Signal.X Technologies LLC, a firm specializing in NVH engineering and custom test &amp; measurement application development. His past positions include Business Development Manager for the NVH consulting group of LMS North America, Management and Project Engineering positions at the Roush Anatrol Division of Roush Industries, Inc, and Civilian engineering for the U.S. Navy. With experience predominantly in the automotive industry, Mr. Albright has addressed a very diverse range of noise and vibration control issues including powertrain NVH, vehicle NVH, brake noise, engine accessory noise, driveline NVH, test procedure and facility development, test/CAE hybrid simulation methods, as well as a host of manufacturing quality issues. Mr. Albright holds a B.S. in mechanical engineering from University of Cincinnati and an M.S. in mechanical engineering from Purdue University.

berenek, Mark
Mark Beranek has 20 years combined experience at Boeing and Naval Air Systems Command (NAVAIR) working in the aerospace fiber optics and photonics research and engineering field. His program experiences span commercial aircraft, military aircraft, and space vehicle fiber optics development and acquisition, and government and corporate-sponsored fiber optics and photonics science and technology programs. Mr. Beranek’s early aerospace career focused on development of optoelectronic device and package design and assembly technology for digital fiber optic transceiver applications including the Boeing 777, NASA Earth Observer One, and Boeing X-32 Joint Strike Fighter. More recently, Mr. Beranek has been working on military aircraft fiber optics acquisition and science & technology programs in the areas of advanced component design, qualification, standardization, supportability, maintainability and manufacturing technology development. Mr. Beranek has held fiber optics committee chairmanships for the IEEE Components, Packaging and Manufacturing Technology Society, IEEE Lasers and Electro-Optics Society and IEEE Photonics Society,
and the SAE Avionics Systems Division. Mr. Beranek holds a B.S. in Technology and Management from the University of Maryland, University College, a B.S. in Chemistry from Northern Illinois University, and an A.S. Certificate in Electronics from Harper College.

Breneman, Jim
Jim Breneman is currently a Statistical and Reliability consultant and instructor in the Mathematics Department at the Tri-County Technical College (South Carolina). Prior to that, Mr. Breneman held various technical and managerial positions with Pratt & Whitney (P&W) Division of United Technologies including: Supervisor of Applied Mathematics and Statistics Group; Manager of Reliability and Design Review Group; Safety, Reliability, Maintainability & Quality Assurance (SRM&QA) Manager for Rocket Programs; Manager of Reliability, Maintainability & Safety Engineering; Manager of Engineering Integrity for all P&W products; founder and leader of P&W’s Engineering Technical University; Manager of P&W’s University R&D programs; and ACE Mentor (equivalent to Master Black Belt). Mr. Breneman has an extensive background in reliability, as both a P&W Fellow in Reliability Statistics and Risk Analysis, and an SAE Fellow. He has presented papers on reliability topics at various conferences. Mr. Breneman holds a B.S. in Mathematics from the University of North Carolina (Chapel Hill) and an M.S. in Applied Mathematics/Statistics from N.C State University.

Bullen, George (Nick)
Mr. Nick Bullen is the President and CEO of Smart Blades, Inc. Located in Oxnard, California, Smart Blades designs and develops highly efficient wind turbine blades and modular facilities for in-situ wind turbine blade manufacturing. Previously, Mr. Bullen was Principal Engineer, Technical Fellow, and Technical Expert for Advanced Manufacturing Technology and Advanced Programs for Northrop Grumman Corporation. His expertise includes inhabited and uninhabited aerial vehicles, space vehicle design and manufacture, laser weapon system design and manufacture, and Lean processes and applications. Mr. Bullen has been awarded 16 US and International patents for technology innovations related to manufacturing, mechanization, robotics, robotics control software and nuclear testing/quality devices that are the basis for all current automated systems used for the assembly of airframes in the US and Europe. Mr. Bullen is a Fellow in the Society of Manufacturing Engineers and is certified in Production and Inventory Control Management. He actively serves and maintains membership on academic boards of several major universities, is a member of the steering committees of professional societies including SAE and SME, and is founder of the International Aerospace Automation Consortium. He also is a board member of the RFID supply chain governing body, EPC Global. A widely published author in magazines, proceedings, journals and peer review journals, he received the AIAA Design Engineering Award in 2000 for Significant Advances in Aerospace Engineering. Mr. Bullen received his BSMG degree from Pepperdine University, an MBA from Loyola Marymount University, and is currently finishing his PhD in Decision Sciences, Engineering Research.

Camci, Fatih
Dr. Fatih Camci is currently a Senior Research Fellow at the IVHM Centre where he works on the development of diagnostics, prognostics and maintenance planning technologies for electro-mechanical systems. Previously, Dr. Camci worked as an Assistant Professor at Fatih University in Turkey and as senior project engineer at Impact Technologies, in Rochester NY before joining Cranfield University. Dr. Camci has been involved in many research projects in the USA, Turkey, and UK that have been funded by NSF, Ford Motor Company, US Navy SBIR, US Air Force Research Lab, TUBITAK, Turkish State Railways, EPSRC, Boeing, Rolls-Royce, Thales, Meggitt, BAE Systems, and OFGEM. Dr. Camci received his BSc and MSc degrees in Computer Engineering at Istanbul and Fatih University in Turkey. He received his PhD in Industrial Engineering from Wayne State University, USA. He has more than 40 academic publications.

Chehroudi, Bruce
Dr. Chehroudi is Chief Scientist and Group Leader at Advanced Technology Consultants. His previous positions include: Principal Scientist at Air Force Research Laboratory (AFRL/ERC), Chief Scientist at Raytheon STX (formerly Hughes Aircraft STX), Professor of Mechanical Engineering, and Research Staff Member at Princeton University. He specializes in fluid mechanics and heat transfer, laser optical diagnostics, internal combustion engine, gas turbine and rocket engines, structure of sprays, gas turbine engines, combustion, fuel injection issues and emission of pollutants. Dr. Chehroudi is an AIAA Associate Fellow, a member of Ta Beta Pi and the recipient of several SAE awards including the Arch T. Colwell Merit Award, the Ralph R. Teetor Award, the SAE Recognition Award and the SAE Forest R. McFarland Award in recognition of his efforts and leadership in contributions to the Continuing Professional Development Seminars. He has taught courses in the areas of internal combustion engines, thermodynamics, thermodynamics of gas flows, combustion, and measurement system, and has more than 150 publications and over 200 presentations in conferences, national and international journals. Dr. Chehroudi has a Ph.D from Princeton University.

Chen, Joseph
Mr. Joseph Chen is currently an independent automotive drive train consultant. With over forty years of experience in various drive train industries, Mr. Chen specializes in manual and automatic drive train system design, development, and testing. Previously, Mr. Chen served as Chief Engineer in the Electric Drive Unit (EDU) at Shanghai Automobile Inc., China (SAIC) where he was involved with developing various hybrid and e-drive transmissions. Mr. Chen also served twenty years at General Motors where he advanced to Senior Project Engineer for GM Powertrain, USA. Mr. Chen’s experience also includes engineering roles at Clark Equipment, Western Gear Technology and Cleveland Gridley Machinery Company. An active member of SAE, ASME, and AGMA, Mr. Chen has been a frequent presenter of technical papers at various international conferences and seminars and has been granted more than a dozen patents related to drive train applications. A registered Professional Engineer (PE) in Ohio and California, USA, Mr. Chen received his B.S. Mechanical Engineering from the Tatung University in Taiwan, a M.S. Mechanical Engineering from North Dakota State University, and a MBA from Indiana University.

Chesneaux, Howard
Mr. Chesneaux is the President of Fuel Quality Services, Inc. A recognized expert on fuel-related issues, he has over thirty years of experience in fuel additives, distillate fuel problems, fuel filtration, and tank remediation. Additionally, Mr. Chesneaux has extensive knowledge and field experience in the area of microbial contamination and detection. Mr. Chesneaux is on the IASH Board of Directors and is the past Chairman of the SAE Atlanta Section. He is an active member of other professional organizations including SAE, IATA, and ASTM. He currently serves on the IATA Working Group on Microbial Contamination, the ASTM Committee dealing with fuel from middle distillates to heavy oils, the ASTM Committee establishing specifications for biodiesel, and the ASTM Committee on jet fuel. In addition to his committee and working group activities, Mr. Chesneaux has authored and co-authored many articles on the subject of fuel storage and handling that have been published in various trade magazines. Mr. Chesneaux served as a commissioned officer in the US Army and holds a B.S. degree from the University of Florida.
**INSTRUCTOR BIOGRAPHIES**

**Comer, Jess J.**
Dr. Jess J. Comer has significant teaching experience in the areas of machine design, dynamics of machines, metal fatigue and failure analysis. He is co-author of the text Fundamentals of Metal Fatigue Analysis and is a registered Professional Engineer in South Dakota. Dr. Comer is a member of SAE, ASME and ASSE. He holds a B.S. and an M.S. in mechanical engineering from South Dakota School of Mines and a Ph.D. from the University of Illinois at Urbana-Champaign.

**Cressionnie, L. L. “Buddy”**
Mr. Cressionnie is currently the International and Americas IAGG 9100 Team Lead responsible for maintenance, revision, and clarification of the AS9100 standard. He is active in standards development as a voting member of the US Technical Advisory Group (TAG) to ISO/TC 176 which writes ISO Quality Management System standards. He serves on the US TAG Interpretations Committee and is the Aerospace Sector Liaison to the US TAG. Mr. Cressionnie represents Lockheed Martin in these roles where he works in the Aeronautics Business Unit, a 31,000 employee operation across nine sites. He led the implementation of AS9100/ISO 9001/20000 standards and quality process area for Capability Maturity Model Integration (CMMI) at Lockheed Martin Aeronautics into a centralized, integrated quality system. Buddy Cressionnie is an ASQ senior member with quality manager and quality auditor certifications. He is a certified RABQSA aerospace experienced auditor and International Register of Certified Auditors (IRCA) lead auditor for ISO 9001 and ISO 14001. Buddy Cressionnie received his MBA degree from Texas Christian University and Bachelor of Science in Engineering from the University of Florida.

**Dickey, Jeffrey C.**
Jeffrey C. Dickey is Executive Vice President - Hydraulics for The Lee Company, a manufacturer of high precision miniature hydraulics components used in the aerospace, medical, and industrial industries. He is responsible for seven business units, overseeing both engineering and manufacturing. Mr. Dickey has been designing hydraulic components for the past 32 years, starting as a project engineer and working his way up to his current position. He has designed and developed an array of proprietary hydraulic component designs for plugs, restrictors, check valves, pressure relief valves, flow regulating valves, pressure regulating valves, pilot operated valves, shuttle valves, bypass valves, solenoid valves, etc. His designs have helped solve issues within hydraulic systems for aerospace, medical implants, military vehicles, missiles, satellites, submarines, down-hole oil tools, formula 1 race cars, etc. He has Patents on a High-Pressure Pin Plug (Patent 486733) and Expansion Sealing Device (Patent 5121947). He is an active member of the SAE - A6 Fluid Power, Actuation and Control Technology Committee. He is currently the Panel Chairman of the A6CS Components Panel, and Co-Author of SAE Paper 912134 “Total Flexibility in Cartridge Valve Porting Through Innovative Sealing Technology”. Mr. Dickey received his B.S. in Mechanical Engineering from the University of Connecticut.

**Dodson, Bryan**
Dr. Dodson is currently the Executive Engineer for SKF. Prior to joining SKF, Dr. Dodson held the positions of Senior Director Corporate Quality & Continuous Improvement for Collins & Aikman and Associate Director of Quality & Reliability Engineering with global responsibility for Visteon. Dr. Dodson has authored several books including: The Reliability Engineering Handbook, Practical Accelerated Testing, and Weibull Analysis: with Software. Dr. Dodson has also developed several software packages including; the Training Pro Interactive Study Guides, the Reliability & Maintenance Analyst, and Measurement Assurance. Dr. Dodson served as Chair of the committee that created the International Quality Federation's Six Sigma Exam and also developed the software that delivers this state of the art exam. Dr. Dodson has published numerous articles in technical journals and teaches several courses for technical societies and as an adjunct faculty member at universities. A Fellow of SAE and ASQ, Dr. Dodson holds a B.S. in Petroleum Engineering, an M.S. in Industrial Engineering, an M.B.A., and a Doctor of Business Administration. In addition, he is a Certified Quality Engineer (CQE), a Certified Reliability Engineer (CRE), a Six Sigma Master Black Belt, and a licensed Professional Engineer in Michigan.

**Doyle, Joseph**
Joseph Doyle is the principal of Strategic Insights, a Michigan-based consulting firm, specializing in executive leadership. He completed a 30-year career with General Motors Corporation, where he held a variety of management positions including: Internal Business Consultant with General Motors University, Senior Research Manager with the Corporate Organization Research and Development Activity, Manager of the Corporate Executive Development Activity, and Lead Consultant with the Corporate Strategy and Decision Support Activity. While at GM, he facilitated Global Task Teams in India, Indonesia, Thailand, England and Australia and served as the Corporate Liaison on Leadership and Strategy to the US Army War College and the National Defense University. Prior to joining General Motors, Mr. Doyle held positions with the U.S. Public Health Service, Ford Motor Company and the Management and Organization Development Department of General Motors Institute (now Kettering University). Dr. Doyle served as a teaching fellow for the Hartwick Leadership Institute and was a member of the advisory council for the Academy of Management Executive Magazine. He was a member of the Advisory Board for the Institute for Management Studies as well as member of the National Research Committee for the American Society for Training and Development. Dr. Doyle has served as an adjunct professor and lecturer at the University of Michigan Dearborn’s School of Business, taught Engineering Administration at the University of Detroit’s Graduate School of Engineering and Business Strategy at Oakland University’s School of Business Administration. He holds a B.S. in Mathematics and Physical Science from Eastern Michigan University, a M.Ed. in Educational Evaluation and Research from Wayne State University and a Ph.D. in Organizational Behavior from the University of Michigan.

**English, Ed**
Mr. English is currently Vice President & Technical Director for Fuel Quality Services, Inc. where he oversees all aspects directly related to the research, development, and deployment of chemicals, antimicrobials and detection equipment for use in the various stages of the petroleum and biomass fuels industry from the refinery to the end user. He is also responsible for evaluating regulatory and industry issues, compliance with federal and state regulations, formulating policy and implementing programs to address regulatory and industry issues, and performing technical reviews and program audits. Mr. English previously worked in the nuclear power industry. He is nationally recognized for his knowledge and expertise in the area of microbial contamination of fuels, alternative fuels, and materials compatibility and has been an invited speaker for such organizations as the EPA, FAA, CALCUPA, NEIWPCC, PEI, NISTM, and SAE, DuPont, and Biofuels Americas. Mr. English is also an active member of numerous professional organizations including SAE, IASH, IATA, and ASTM. He has a B.S. in Chemistry from the University of Florida and two years post-baccalaureate work from the University of Miami.

**Farahani, Akbar**
Currently Vice President and Director of Global Engineering (US, EU, Asia) at ETA Inc., Dr. Akbar Farahani, has over 25 of experience in product design, development and consulting for automotive OEMs and suppliers in US, Europe and Asia. Dr. Farahani is an expert in vehicle development, meeting requirements for US, EU and Asia (FMVSS, IIHS, ECE, ADR regulations) through design optimization and the use of advanced materials. He also has developed advanced expertise
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in the use of high strength steel, lightweight product design and load management solutions. Dr. Farahani has led the way in the development of ETA's award winning Accelerated Concept to Product Process (ACP Process). The new product design development process based on CAE, CAD and Optimization received prestigious recognition as the winner of the 2009 SAE/MITIEF Vehicle Innovation Competition. To date, he has published more than 50 papers related to product design, optimization, ACP Process, vehicle crashworthiness/safety, and vehicle durability.

Farsi, Ken
Mr. Farsi is currently the VP of Engineering and ODA Administrator for Dassault Aircraft Services in Wilmington, DE, where his responsibilities include oversight of engineering groups and practices at all Dassault Aircraft Services locations. He has over 27 years experience in aircraft certification and operations and has worked for aircraft manufacturers, airlines and modification centers conducting certification work on small and large transport category aircraft. He is an FAA Designated Engineering Representative (DER) with Interior Arrangement and Compliance Inspection, as well as Aircraft Loading Document approval authority on Part 23 and 25 aircraft. Mr. Farsi has taught aircraft certification and Federal Aviation Regulations as an Adjunct Instructor at Northrop-Rice Aviation Institute of Technology in Los Angeles, and Aircraft Systems at San Mateo Community College in San Mateo, California. He has participated in and managed FAA certification programs for major U.S., European, Chinese, and Australian airlines as a consultant. He is a life time member of Tau Alpha Pi, the honor society for Engineering Technologies. Along with a Bachelor of Science in Aircraft Maintenance Engineering Technology from Northrop University, Mr. Farsi has participated in graduate studies in Aerospace and Aviation Operations and Management at Embry-Riddle Aeronautical University. He holds FAA Airframe and Powerplant as well as Private Pilot Certificates.

Fulton, Wes
Mr. Wes Fulton is the Founder and CEO of Fulton Findings. Prior, he was a program engineer/manager for AiResearch Los Angeles Division, Allied-Signal Aerospace Corporation. As a program engineer for aircraft actuation projects he had engineering and management responsibility for the Indigenous Defensive Fighter (IDF) leading edge flap actuation system (LEFAS) development and production, the Rockwell/MBB X-31A LEFAS flight test program, and the F-16 Fighting Falcon LEFAS production and deployment support. He co-patented a multi-fuseable shaft (high performance drive train device). Additionally, Mr. Fulton has over 20 years of programming experience as a private programmer and developed SuperSMITH&reg; Visual, WeibullSMITHTM, LogNormSMITHTM, NormalSMITHTM, VisualSMITHTM, BiWeibullSMITHTM, and MonteCarloSMITHTM analysis software. He received his B.S.M.E. from Georgia Tech and his M.S.M.E. from California State University at Long Beach.

Heimes, Felix
Mr. Felix Heimes is a Chief Engineer and Technical Fellow for Prognostics and Health Management (PHM) at BAE Systems Electronic Solutions in Endicott, NY. In his 23 year career with BAE Systems he has worked on a wide variety of vehicle control and health monitoring projects. Early in his career he worked on development programs for turbine engine full authority digital control systems and digital fly-by-wire flight control systems. Since then his primary role has been in the application of PHM technology for BAE Systems products. Mr. Heimes successfully lead the development of an automated wireless fleet health management system from concept to production. This system is currently in use to monitor hundreds of Hybrid Electric Transit buses in normal revenue service across the United States, Canada, UK, France, and Australia. He has also developed several unique Neural Network machine learning approaches with successful applications in modeling, optimization, fault detection and anomaly detection. He has a B.S. degree in Electrical Engineering from Penn State University and an M.S. degree in Electrical Engineering from Binghamton University.

Hilderman, Vance
Mr. Vance Hilderman is a 25-year software and systems avionics engineering professional, focusing on safety-critical avionics software, systems, hardware development, and related technical products. He is the Director of Global Services for Vector Software where he provides software development services and training. In addition, Mr. Hilderman is the primary subject matter expert in avionics software and systems at Afuzion, Inc. Previously, Mr. Hilderman founded TekSci and while serving as President and CEO, he led his company to become the largest independent avionics software services company in the world. Mr. Hilderman also co-founded HighRely Inc, an avionics certification consultancy company. In 2011, HighRely, Inc. was acquired by Atego/Artisan, with Mr. Hilderman remaining on as President and Manager of Aviation/Certification Services through 2013. Holding a BSEE and MBA from Gonzaga, along with a Masters in Computer Engineering from USC (Hughes Fellow), Mr. Hilderman is the principal author of dozens of technical whitepapers, plus the world’s best-selling book on avionics development/certification. Published by Avionics Communications and titled Avionics Certification – A Complete Guide To DO-178B & DO-254, Mr. Hilderman donates all royalties to the Boy Scouts of America.

Jeffery, Jon R.
Jon Jeffery is currently working for Parker Aerospace as Director of Innovation and Marketing for the Hydraulic System Division in Kalamazoo, MI, and is the current Chairman for SAE A-6, the Aerospace Actuation, Control and Fluid Power Systems standards committee. Mr. Jeffery has been employed at Parker Aerospace for 20 years primarily in the development of aircraft hydraulic systems and associated hydraulic equipment. Mr. Jeffery started the hydraulic system product line at Parker in 1994 and has been involved with more than a dozen aircraft hydraulic system designs since that time. Prior to joining Parker, Mr. Jeffery worked at McDonnell Aircraft Company (now Boeing), St. Louis, Missouri for 12 years. He started as a hydraulic system design engineer during the early phase of the F/A-18 aircraft. He then spent 5 years working on hydraulic system research and development in the area of 8000 psi hydraulic system design, low energy consumption hydraulic techniques, enhanced dynamic stiffness for flight control actuators and variable pressure pumps. He published several technical papers on these subjects and was awarded a patent in 1986 for an energy recovery concept entitled “Flow Augmented Servovalve Technology (FAST Actuator)”. Mr. Jeffery later held the position of hydraulic team leader for the A-12 program and then as Unit Chief, Flight Controls & Hydraulic Systems for the F/A-18 programs. Mr. Jeffery received a Bachelor Degree in Mechanical Engineering from the University of Michigan and a Masters Degree in Engineering Management from Washington University in St. Louis, MO.

Jennions, Ian
Dr. Ian K. Jennions is Professor and Director of the IVHM Centre, Cranfield University, U.K. He joined the IVHM Centre, which is funded by a number of industrial partners, when it was founded in 2008 and has led its development and growth in IVHM research and education. Spanning a career of nearly 30 years, Dr. Jennions has worked primarily in the gas turbine industry. He has worked for Rolls-Royce, General Electric and Alstom, holding a number of technical roles where he gained expertise in aerodynamics, heat transfer, fluid systems, mechanical design, combustion and, more recently, IVHM. He is a Director of the PHM Society, a contributing member of the SAE IVHM Steering Group and IMechE’s 1 IVHM committee, and a Fellow of IMechE, RAeS and ASME. He is also the editor of SAE International’s series of
books on the topic of Integrated Vehicle Health Management. He has a Mechanical Engineering degree and a PhD in CFD, both from Imperial College, London.

**Knutson, Donald F.**
Over the past 20+ years, Mr. Knutson has conducted a multitude of field investigations on domestic and foreign accidents involving various models of civilian and military aircraft. He is President of Knutson Aviation Services (KAS), a consulting firm specializing in aircraft accident and incident investigations, wreckage reconstruction, airframe and powerplant system failure analysis, crashworthiness analysis, and air safety education and research. Mr. Knutson has taught graduate and continuing education courses on aircraft accident investigation for the Wichita State University (Wichita, KS) Aerospace Engineering program and Lewis University Aviation programs (Romeoville, IL). For Boeing's military operations in Wichita, he instructed engineers in basic and advanced topics on supporting U.S. Air Force crash investigations. Prior to starting KAS, Mr. Knutson was with The Boeing Company as a Flight Test Engineer where he evaluated fuel system designs and remote aerial refueling operations for the 767 Tanker program. Mr. Knutson also served as Director of Aviation for a forensics engineering firm where he provided aircraft accident investigation consulting and business development. Mr. Knutson's experience also includes Senior Engineer and Air Safety Investigator for the Raytheon (Beech) Aircraft Company where he was the engineering liaison between Raytheon and the NTSB, the FAA, and foreign government investigators. He served as a Designated NTSB Representative for several international accidents and helped train new air safety investigators during field investigations. He also performed airframe and powerplant (turbine and piston) system inspections, wreckage reconstruction, metallurgical examinations, and crashworthiness analysis involving survivability issues. Mr. Knutson is a member of the Experimental Aircraft Association and the International Society of Air Safety Investigators. He is an FAA-certified pilot and Airframe and Powerplant mechanic. He received his B.S. in Mechanical Engineering from the University of Southwestern Louisiana (Lafayette, LA).

**Klukas, Philip F.**
Mr. Klukas is Vice President of Quality Systems International, a company specializing in aerospace quality management systems where he serves as a trainer and consultant. Mr. Klukas is a certified AS9100C Aerospace Industry Experienced Auditor (AIEA), Quality Management System Lead Auditor, ANSI-ASQ National Accreditation Board (ANAB) Accreditation Witness Auditor, as well as an approved instructor for the IAQG Sanctioned AS9100C Aerospace Auditor Transition Training course. In addition, Mr. Klukas serves as a member of the RABQSA Aerospace Technical Advisory Group (TAG). Mr. Klukas was previously with United Registrar Services/TUV USA as Director ASD Technical Services, ASD Trainer, and ASD Lead Auditor. He has also served as the Western Regional Manager, Aerospace Business Development for RWTUV USA where he was an AS9100 trainer and assessor. His previous experience also includes TUV Rheinland of North America and Stat-A-Matrix where he served as a quality consultant and trainer

**Kunder, Paul J.**
Mr. Kunder is the President of Amera-Veritas, Inc., a provider of quality, safety, and risk management. Mr. Kunder is a lead instructor for the Aerospace Auditor Transition Training and is currently an International/ Americas Quality Group and RABQSA AS9100C Aerospace Auditor and Quality System Lead Auditor (ref. #1834). He is active in standards development as a voting member of the US Technical Advisory Group (TAG) to ISO Technical Committee 176 which is responsible for development of the ISO 9001 Standard. He serves as the Vice Chair of the National ANSI/ASQ Z1A Committee on Auditing (ISO 19011) and on the US TAG Interpretations Committee. He has performed more than five hundred audits and has assisted more than eighty organizations with the development and certification of their quality management systems including the Federal Aviation Administration Office of Aviation Safety. Prior to his current position, Mr. Kunder was involved in the accreditation of several 3rd party registrars, acted as an administrator for the first RAB accredited registrar in the United States and works as a subcontract auditor for a number of registrars. Mr. Kunder is an ASQ senior member and holds a B.S. in Mechanical Engineering.

**Kurowski, Paul**
Dr. Paul Kurowski is a professor in the Department of Mechanical and Materials Engineering at the University of Western Ontario in London, Ontario. His teaching experience includes finite element analysis, machine design, mechanics of materials, kinematics and dynamics of machines, and product development. He is also the President of Design Generator Inc., a consulting firm specializing in product development, design analysis and training in Computer Aided Engineering methods. Dr. Kurowski has published multiple technical papers and taught professional development seminars for SAE International, the American Society of Mechanical Engineers, the Association of Professional Engineers of Ontario, the Parametric Technology Corp. (PTC), Rand Worldwide, SolidWorks Corp. and other companies and professional organizations. He contributes regularly to several engineering publications focusing on the implementation of CAE methods into the product development process. He is a member of SAE international and the Association of Professional Engineers of Ontario. Dr. Kurowski obtained his M.Sc. and Ph.D. in Applied Mechanics from Warsaw Technical University and completed postdoctoral work at Kyoto University.

**Levine, Russell E.**
Mr. Levine is a Partner at Kirkland & Ellis LLP where he has spent his entire career of over twenty-five years. He focuses his trial, appellate and alternative dispute resolution practice on patent infringement matters and disputes centered around technology transfer and patent license agreements. His trial practice includes jury trials, arbitrations and Section 337 proceedings before the U.S. International Trade Commission. His appellate practice concentrates on appeals in the Court of Appeals for the Federal Circuit. His technology transfer and licensing practice includes structuring and negotiating both licensing-in and licensing-out transactions.


**Li, Canghaiu**
Mr. Canghaiu is currently Manager of Engineering, Inspection, and Forging Operations at Xian Airfoil Technology Co., LTD (XAT) in China. XAT is a joint venture company established by Xian Aero-Engine (XAE), Pratt and Whitney (P&W), and Blades Technology International (BTI Israel). XAT manufactures compressor blades and vanes, fan blades, and medical implants using advanced precision forging and machining processes for such customers XAE, P & W, Honeywell, Dongan, Stryker, Biomet, Depuy, and Smith and Nephew, among others. Mr. Li previously served as Quality Manager at XAT where he was responsible for all quality related aspects of production and systems. Prior to that, he was a senior professional forging engineer and supervisor at XAT. Mr. Li received a BS Engineering from Northwest Poly-Technology University, with a focus on metal forming and materials engineering.
Mago, Angelo E.
Angelo Mago is senior consultant and owner of ATM Consulting, Inc., which provides customized training and consulting services to a varied design and manufacturing supplier community in the areas of quality assurance, quality control, design engineering, document management, and customer service and improvement methods. He has over 25 years of experience in product design, quality assurance, project management working in DOD in the Mt. Abrams and Bradley Program Management offices and as the Senior Supplier Quality Engineer for GM Truck Group responsible for NAO and off-shore supplier ISO qualification, product development, and PPAP qualification and approval. Through ATM Consulting, Mr. Mago has played a lead role in establishing a PM and APQP environment for both large and small companies. He is a recipient of the SAE Forest R. McFarland Award for distinction in professional development/education. He has a B.S. in Mechanical Engineering from Florida Institute of Technology.

Manzanares, David
David Manzanares has been employed at Moog Inc. for eighteen years, mostly in the aircraft flight control arena. He is presently Manager of Primary Flight Controls Engineering in Moog Aircraft Group’s Commercial Sector. During his career, Mr. Manzanares has led multiple engineering development activities for cockpit controls and electromechanical actuators including the design and development of the 787 spoiler EMA and horizontal stabilizer trim actuator. His present activities include technical oversight for engineering development programs, employee development, customer technical interface, and technology road mapping for Moog’s actuation product lines. He received his B.S. degree in Mechanical and Aerospace Engineering from Cornell University and his M.S. degree in Mechanical Engineering from the University of Utah.

Masiak, James
James Masiak has more than 25 years of experience in the implementation of business processes for General Motors. Mr. Masiak’s most recent activities include the implementation of an enhanced engineering product cost management process within GM North America, the alignment of cross functional organizational initiatives, and development of an engineering resource allocation plan for GM Regions. Mr. Masiak was also responsible for the development and implementation of Global Engineering and Business Strategies across all of General Motors International Operations. Mr. Masiak received his B.S. in Mechanical Engineering from Wayne State University, his M.S. in Mechanical Engineering from Massachusetts Institute of Technology, and his M.B.A. from Michigan State University Executive Management Program.

Nazri, G. Abbas
Dr. Nazri is currently the technical director of new technologies at Frontier Applied Sciences and Technologies, LLC. and is also an adjunct professor of Physics and Chemistry at Wayne State University, Oakland University, and University of Windsor, Canada. Dr. Nazri began his career as a Research Scientist at General Motors Global Research and Development Center after two years of postdoctoral fellowships at the Lawrence Berkeley National Laboratory. He also served as a visiting Professor at the University of Pierre and Marie Curie, Paris France, Institute of Condense Matter Chemistry at Bordeaux France, and Institute of Materials at Nantes, France. He is an active organizer of Symposia on advanced batteries and is on the International Science Advisory Board of several Lithium Battery Meetings and Conferences. Dr. Nazri has published over 100 scientific papers, 12 proceedings volumes, two text books on science and technology of lithium batteries, and is the holder of 15 U.S. patents. His research interests are in the area of materials for advance batteries for transportation applications, supercapacitors, solid-state hydrogen storage materials, electrochemical catalysis, synthesis of novel materials, and advanced analytical techniques for real time study of electrochemical systems. Dr. Nazri received his Ph.D. in Physical Chemistry from the Center for Electrochemical Sciences, Case Western Reserve University.

Neff, Timothy
Timothy Neff has been involved with the design and maintenance of aircraft hydraulic systems for over 35 years. He received his Bachelor of Science in Aerospace Engineering from Wichita State University. He completed ten years as an active duty U.S. Army pilot and Aircraft Maintenance Officer at the Organizational, Intermediate, and Depot level. After his Army tour he held engineering positions with Beach, Cessna, Gulfstream, Northup-Grumman, and his current employer Spirit AeroSystems. Mr. Neff holds positions of leadership in two A-6 committees. He is the Panel Chairman of A-6A4 Utility Control Systems and Panel Vice Chairman of A-6C4 Tubing. Mr. Neff sponsored the latest revision of the SAE Aerospace Recommended Practice ARP994 “Recommended Practice for the Design of Tubing Installations for Aerospace Fluid Power Systems.”

Peterson, Eric M.
Mr. Peterson is currently Vice-President of Systems and Safety for Electron International, Inc. He has over 35 years’ experience in aerospace management, system design and analysis, development of hardware and software, and safety assessments for commercial and military flight critical avionic and fly-by-wire system applications. He is also an inactive Systems and Equipment DER with a software endorsement. Mr. Peterson serves as vice-chairman of the SAE S-18 Aircraft & Systems Development and Safety Assessment committee and has provided key contributions to ARP4754A, ARP 4761, and ARP 5150. Mr. Peterson is also a member of the SAE AeroTech General Committee and has served as the Technical Program Chair for a number of SAE conferences. In addition, he is the recipient of the SAE Forest R McFarland Award for outstanding contributions to the SAE Engineering Meetings Board and is also the recipient of the SAE Outstanding Contribution Award for his work in the development of SAE Technical Standards. Mr. Peterson received his B.S. in Electrical Engineering from Montana State University.

Poncheri, Anne
Ms. Anne Poncheri is currently a consultant for test methods of counterfeit electronic parts for the global electronics industry and the implementation of the Quality Management Standards ISO/IEC 17025 and ISO 9001. Previously, Ms. Poncheri was the President/CEO for Silicon Cert Laboratories in Reading, PA. With over 20 years of experience in Quality Management Systems, she has held various management positions in Quality and Engineering in the telecommunications, automotive, plastics, and chemicals industries. Ms. Poncheri is a member of the SAE Aerospace G19 Counterfeit Electronic Components Committee that is chartered to address aspects of preventing, detecting, responding to and counteracting the threat of counterfeit electronic components. She is also actively involved in the development of AS6171 Authentication Testing for Electronic Parts - Testing Services as well as the subcommittees developing the External Visual Inspection and the Acoustic Microscopy for counterfeit detection standards. Ms. Poncheri has in-depth knowledge of AS5553, AS6081, ISO 9001, ISO/TS 16949, ISO/IEC 17025 and TL 9000 and is a long-time member of the American Society for Quality and is a former ASQ Certified Quality Engineer, ASQ Quality Manager, and RAB/QSA Auditor for Quality Management Systems. She earned a B.S. in Applied Mathematics – Statistics from Carnegie Mellon University."
Porter, Alexander (Alex) J.
Alexander J. Porter is the Chief Engineer for Programs, Performance, and Durability for Intertek, and has been with the company since 1992. Since 1996, he has been developing accelerated testing methods for mechanical components and systems. Mr. Porter has three patents relating to accelerated testing equipment and has authored over 40 articles and technical papers on accelerated testing. Alex is the author of the book Accelerated Testing and Validation, Elsevier 2004. His work in the past has included implementation of FEA in a laboratory setting and development of a thermal management system for an advanced data acquisition package developed by NASA's Dryden Flight Research Facility. Alex is a member of SAE and IEEE. He holds a B.S. in aircraft engineering and an M.S. in mechanical engineering, both from Western Michigan University.

Rutledge, Drexel L.
Mr. Rutledge is an Aerospace Consultant with Integrity Engineering, Inc. where he works with several aerospace companies in the area of Product Support and Sustainment. His principal areas of expertise are in project management, technical information development and delivery, and proposal development activities. Most recently, his expertise in performance based logistics and international support applications have been sought out by several DFW area providers. Prior to joining Integrity Engineering, Inc. Mr. Rutledge was employed by Lockheed Martin Aeronautics Company as the Systems Engineering Director responsible for developing and delivering the technical information needed to operate and maintain all aircraft manufactured or supported by Lockheed Martin Aeronautics by all US and foreign operators.

Safa-Baksh, Robab
Ms. Robab Safa-Baksh is Associate Technical Fellow at Boeing Research and Technology and has been leading IVHM technology developments under IRAD and CRAD for the previous 13 years. Ms. Safa-Baksh has been working closely with various Boeing programs to create the vision and roadmap for development and implementation of IVHM into legacy and new platforms. An active member of the SAE E-32 and HM-1 Committees, she has contributed to the development of several standards, including industry guidelines and recommended practices. As one of the officers of the AHS HUIMS Committee, she has chaired HUMS Technical Sessions and HUMS Technical Committee meetings for the past 13 years. In addition to authoring papers and presenting at conferences, Ms. Safa-Baksh has submitted three patent applications that are currently pending. Prior to joining Boeing, Ms. Safa-Baksh spent over 15 years working in the area of automation where she focused on control system and machinery diagnostics. She earned a BS in Electrical Engineering from Iran Sharif University of Technology and a MS in Electrical Engineering from Villanova University.

Saha, Pranab
Pranab Saha is the principal consultant and co-founder of Kolano and Saha Engineers, Inc., an independent professional engineering and consulting company in acoustics, noise and vibration control. A well-known authority on automotive noise control and body interior systems, Dr. Saha has directed and participated nationally and internationally in numerous advanced noise control engineering programs and training seminars for various OEMs and suppliers in India, Mexico, and USA. Dr. Saha is currently the Chair of the SAE Engineering Meetings Board, a Professional Development Instructor, and the Lead Faculty Member of the SAE Vehicle Interior Noise Academy. He is also the past-chairman of the SAE Acoustical Materials Committee and has helped develop several standards in acoustics. Dr. Saha is an active member of ASA, ASME, ESD, INCE, NSPE, SAE International, and a contributing editor of Sound and Vibration publication. He has presented technical papers, organized and chaired numerous technical sessions sponsored by SAE and other professional organizations. Dr. Saha has also won several awards presented by the SAE International and the Michigan Society of Professional Engineers (MSPE) and has been named an SAE Master Instructor. Dr. Saha holds a B.S. in Mechanical Engineering from the University of Calcutta, a M.S. in Engineering Sciences from the University of Florida and a Ph.D. in Mechanical Engineering (Acoustics Specialty) from the Georgia Institute of Technology.

Sandborn, Peter
Dr. Peter Sandborn is a Professor in the CALCE Electronic Products and Systems Center at the University of Maryland. Dr. Sandborn's group develops obsolescence forecasting algorithms, performs strategic design refresh planning, and lifetime buy quantity optimization. Dr. Sandborn is the developer of the MOCA refresh planning tool. MOCA has been used by private and government organizations worldwide to perform optimized refresh planning for systems subject to technology obsolescence. Dr. Sandborn also performs research in several other life cycle cost modeling areas including maintenance planning and return on investment analysis for the application of prognostics and health management (PHM) to systems, total cost of ownership of electronic parts, transition from tin-lead to lead-free electronics, and general technology tradeoff analysis for electronic systems. Dr. Sandborn is an Associate Editor of the IEEE Transactions on Electronics Packaging.
Schofield, Alan

Alan Schofield is an active consultant for Greene, Tweed & Co., where he recently retired as Global Director of Engineering. With global responsibility for the engineering function of the organization’s five business groups, as well as the Central Engineering function, Mr. Schofield was in charge of the management of all aspects of engineering design, product and material development covering applications engineering, R&D, validation, and in-service engineering support of all products. The Global Engineering function consisted of 118 engineers and support staff distributed over 10 sites in the USA, UK, France, Germany, Japan and Singapore. Mr. Schofield was also Aerospace Engineering Manager prior to his appointment as Global Director. Prior to that he was with Coorstek as Director of Engineering Sales and Marketing, at Fluorocarbon Co. (now St. Gobain) as Seals Product Manager, at Shamban Intl. as Engineering Manager, and at W. S. Shamban & Co. (now Trelleborg) as Sales Engineer. The holder of three U.S. patents involving seal design and application, Mr. Schofield presently serves on the Steering Council for the SAE-A6 Fluid Power, Actuation and Control Technology Committee. Additionally, he also represented Airbus on the SAE-A6C2 Seals Panel, serving as Panel Chair for eight years and Secretary for six years. He has also served as a member of the SAE- AMS Committee P (Polymers) for twenty-three years and the AMS Committee CE (Elastomers) for fourteen years. During his participation in SAE committees, Mr. Schofield has acted as sponsor for twenty-two document reviews and sponsor for the publication of six new documents. Mr. Schofield received his B.S. in Mechanical Engineering in the UK.

Seyboldt, Charles F.

Mr. Charles Seyboldt has degrees in Mechanical Engineering and Law. He has over 15 years of experience in the transportation industry, having engineering responsibilities covering a broad range of product and manufacturing technologies. He is a registered Professional Engineer and a registered patent agent.

Simkin, Roman

Mr. Simkin has been involved with the design and development of electrohydraulic servovalves for more than thirty years. Born in Ukraine, he received his M.S. degree in Mechanical Engineering from National Technical University in Kharkiv, Ukraine. For the last twenty years, Mr. Simkin has been employed at Abex and Parker Aerospace working in electrohydraulic servovalves design. He has held various engineering positions, including key positions in the development of the servovalves for Airbus A330/340 and A380, Boeing 717, 777 and 747-8, Emb 170/190 and 505, DHC8-400, ARJ-21, MRJ and more. He has participated in the SAE A-6 committee meetings starting in 1998 and is currently the Secretary of the A-6/81 Hydraulic Servo Actuation panel. Mr. Simkin has sponsored the latest revision of the SAE ARP490-Electrohydraulic Servovalves.

Sittsamer, Murray

Murray Sittsamer is founder of Luminous Group, a consulting firm specializing in streamlining and standardizing workflow for companies. Murray has over 22 years experience in operations management, strategic planning, new process launches, financial analysis, quality systems and process improvement. During the past ten years Murray has focused his work on supporting automotive OEMs and suppliers with their quality and productivity improvement efforts, especially in the areas of Advanced Product Quality Planning (APQP), Failure Mode and Effects Analysis (FMEA), variation reduction and Problem Solving. Before entering the consulting field in 1994, Murray served as director of distribution support and quality systems for Gelman Sciences. While there he led a successful 15-month effort to obtain ISO 9000 quality system registration and had the role of project manager for a highly publicized groundwater contamination dispute. Murray earned his undergraduate degree in industrial engineering from the University of Pittsburgh and holds a Master of Science in Industrial Administration from Carnegie Mellon University.

Socheleau, Jérôme

Jérôme Socheleau currently serves as the Head of Systems Group at UTAS Actuation Systems in France. He has been working for more than 15 years in Aircraft Primary Flight Controls domain; he was in charge of the development of several primary flight control actuation systems for new aircraft involving the state of the art “Fly By Wire” technology on A340-500/600 and the introduction of first EHA systems on A380. Additionally, Mr. Socheleau led the design of several advanced primary flight control actuator prototypes in the field of Research and Technology projects, these include hybrid Electrically Assisted Hydraulic Actuator (EHA), which enables hydraulic and electric power summing in a single actuator hydraulic power ram, and also the TRLS demonstration of ElectroMechanical Actuator (EMA) for Primary Flight Control Actuation. He is currently responsible of Systems activities development for UTAS in France, his teams are involved in R&T activities including Power Drive Electronics and Flight Control electronics as well as EMA, they are additionally in charge of products development for new platforms such as Embraer KC-390 and Irkut MC-21. At last, Mr. Socheleau is the current vice chairperson for the SAE A6B2 Electrohydrostatic Actuation Panel aimed at providing guidelines and recommended practices for EHA design and use. He received a Master’s Degree in Aeronautics at the French Engineering School “École Nationale Supérieure de Mécanique et d’Aérotechnique” at Poitiers.

Sorrentino, Joseph

For nearly three decades, Joseph Sorrentino has been instrumental in implementing successful quality management systems for commercial companies, military and aerospace contractors, and government agencies throughout the U.S. As president and CEO of Lean Quality Systems, Inc., Sorrentino specializes in implementing new standard methods for the corporate sector and has successfully worked with more than 25
corporations in the southern California area alone. A retired U.S. Navy quality assurance specialist, Sorrentino is certified as a level III examiner for visual, magnetic particle, dye penetrant, and ultrasonic inspections. He began his career as a quality management professional in the U.S. Navy, initially as chief petty officer, level III NAVSEA examiner/quality assurance division officer and spent eight years as a GS1910 quality specialist.

Spence, W. Cory
As a partner in the Litigation and Intellectual Property departments at Ungaretti and Harris, Cory assists individual and business clients in obtaining their best possible outcome in contentious legal matters. A registered patent attorney, Cory has extensive experience in litigation, arbitration, and mediation involving all areas of Intellectual Property law in the U.S., as well as international patent litigation involving multiple parties and jurisdictions, including Asia. He is a published author and frequent speaker on intellectual property issues, and has been repeatedly recognized as an “Illinois Rising Star”. Prior to joining Ungaretti & Harris, Cory spent twelve years practicing law at Kirkland & Ellis LLP. Cory is a graduate of the University of Notre Dame, where he obtained separate Bachelor of Science Degrees in Chemical Engineering and Biophysics. Upon graduation, he received his commission as a Second Lieutenant in the United States Air Force, Medical Service Corps. After completing his military service, he worked for several years in the chemical industry before pursuing his legal education at the University of Houston Law Center. He is actively involved in a number of professional organizations, including the Richard Linn American Inn of Court, Federal Circuit Bar Association, American Bar Association – Intellectual Property organizations, including the Richard Linn American Inn of Court, Federal Circuit Bar Association, American Bar Association – Intellectual Property Division and the Licensing Executives Society.

Stillinger, Jeffrey
Mr. Stillinger has over 20 years experience in the gas turbine industry and is currently a Critical Parts Lifing consultant working at Rolls-Royce Corporation in Indianapolis, Indiana. The role requires a broad background with analytical models, rotor grade materials, manufacturing, design, safety & reliability, certification, and testing. Mr. Stillinger has a focus in rotating structures analysis, and has more recently been involved in developing probabilistic methods for systems. Mr. Stillinger is currently active on the Aerospace Industries Association’s Rotor Integrity Subcommittee (RISC) working with the FAA and EASA on issues related to damage tolerance for gas turbine engines. RISC represents a multi-OEM effort to quantify and recommend best practice. In his current role, Jeff works with the FAA on a regular basis. Jeff serves on the Industrial Advisory Board at Indiana University Purdue University at Indianapolis (IUPUI).

Stricker, Peter A.
Mr. Stricker has 35 years’ experience in the aerospace industry, working on hydraulic systems and components for Vickers, which was later acquired by Eaton Corporation. During the first twenty years, he was engaged in the engineering design and development of hydraulic pumps, motors and integrated systems for commercial, military fixed and rotor wing aircraft, as well as ground defense vehicles. During the last fifteen years, Mr. Stricker has been involved in the Sales and Marketing side of the business, providing technical sales and marketing support and financial modeling for commercial and military aircraft hydraulic systems. Beginning during the spring of 2014, he will be “semi-retired”, working on selected engineering projects. Mr. Stricker is currently Vice Chairman of the Power Sources Panel of SAE Committee A6, Aerospace Actuation, Control and Fluid Power Systems. He has authored two recent SAE documents, AIRS872 Aerospace Hydraulic Pump Controls and ARP4940 Application Guide for Aerospace Hydraulic Motors. Mr. Stricker holds a B.S. Mechanical Engineering from McGill University, a M.S. Mechanical Engineering from the University of British Columbia, and an M.B.A. from Millsaps College. He has been a registered Professional Engineer in the State of Mississippi since 1980.

Timmis, Eric
Eric Timmis is the owner of BusinessIsAContactSport.com, a training and consulting company dedicated to business process improvement, focusing on value and quality management implementation, program/ project management training, and the integration of strategic partnership relationships between departments and organizations. Mr. Timmis has over thirty years of diversified experience across several industries, which includes the delivery of value engineering facilitation services to Ford Motor Co. and its supplier community and training for Eaton Corporation’s, Product Development Group. He is also a recognized speaker at various national conferences. Eric received a B.Sc. in Civil Engineering from the University of Birmingham in England and is a member of the Institution of Civil Engineers.

Todeschi, Michel
Michel Todeschi is currently Head of the Electromechanical Actuation and THSA group within the Aircraft Control domain within the Airbus Group. He was appointed to his current position in 2008 and is in charge of the development of R&T, design, development, validation and in-service engineering support of the Electromechanical Actuation and THSA for all Airbus models from A320 to A380, A400M and A350. In addition, Mr. Todeschi holds the Senior Expert position in Electrical Actuation and Power Electronics within the Airbus Group. He started as a development engineer for the A330/A340 program and research programs. In 2001, he was appointed to the A380 program as Task Leader where he led the team in charge of the development of the A380 Primary Flight Control Actuation. In particular, he was responsible for the introduction into service of Electrohydostatic Actuators (EHAs) and associated Power Electronics Modules in Commercial Aircraft applications. Mr. Todeschi contributes to the SAE-A6 Aerospace Actuation, Control and Fluid Power Systems as a member of the Flight Control Systems, EMA and EHA/IAP panels. He received his M.S. in Electronic Engineering from ENSEEIHT, Toulouse.

Van den Bossche, Dominique
Dominique van den Bossche is presently an independent consultant for European and US flight control actuation companies. He retired from Airbus in 2009 as the Head of Department in charge of the Primary Flight Control Actuation and Hydraulics Department in the Systems and Integration Tests Center of Competence of the Airbus Engineering organization. He was responsible for the management of R&T, design, development, validation and in-service engineering support of the Primary Flight Control Actuation, Hydraulic Generation and Hydraulic Distribution equipment, for all Airbus models from A300B to A380, A400M and A350. Previously at Aerospatiale, Mr. van den Bossche was a development engineer in charge of A300B hydromechanical flight control equipment. He was also involved in the A310, A300-600, ATR42/72 and A320 flight control equipment developments. He was appointed as the Head of the Pilot Controls and Primary Flight Control Actuation Group prior to his appointment to Head of Department. Holding four patents involving flight control actuation equipment design and application, Mr. van den Bossche has also been recognized with an award by the French Academy of Technology for his achievements on electrohydrostatic actuation technology. In addition to actively serving on the SAE-A6 Fluid Power, Actuation & Control Technology as Vice-Chairman, his industry service also includes serving on the ISO TC20/SC10/WG9 Hydraulics & Flight Control Actuation committee and the Mechanical Branch Committee and Hydraulic & Actuation working group of the French “Bureau de Normalisation Aéronautique”. He currently teaches Flight Control Actuation Systems at the Institut Universitaire de Technologie (IUT) in Blagnac, France and on-demand courses for various companies and organizations. Mr. van den Bossche received a Master’s Degree in Aeronautics at the French “École Nationale Supérieure d’Ingénieurs de Constructions Aéronautiques”.

Van den Bossche, Dominique
**Walker, R.W. (Bill)**

Bill Walker is the owner and principal engineer at Walker Technical Services where he provides consulting services in design, testing, and certification for manufacturers and operators of aerospace and mobile equipment throughout North America, Europe, and Asia. Mr. Walker has almost four decades of experience in test engineering, regulatory compliance engineering, and product safety engineering. Mr. Walker previously held the position of Manager of Safety and Compliance at John Deere Forestry, Inc., where he oversaw safety engineering, regulatory compliance, product liability management, intellectual property management, and standards development activities for the world-wide manufacturer of advanced forestry equipment. Additionally, Mr. Walker held the positions of Manager of Testing at Diamond Aircraft Industries, Director of Engineering, Manager of Flight Testing, and Test Engineer at Eurocopter Canada, Ltd. He is currently a member of SAE MTC4 (forestry machinery), ISO TC23/SC15 (Forestry Machinery), TC23/SC3 (Safety and comfort of the operator), and TC23/SC14 (Operator Controls, Operations Symbols and other displays, and Operator Manuals). He has also served on Canadian Standards Association Technical Committees on Mobile Forestry Machines and Rollover Protective Structures. Mr. Walker received a B.Sc. in Aerospace Engineering from Northrop University and M.A.Sc. in Aerospace Engineering from the University of Toronto Institute for Aerospace Studies.

**Zulueta, Phil**

Phil Zulueta, the current Chair of the SAE G-19 Counterfeit Electronic Parts Committee, is a consultant in the area of counterfeit electronic parts risk mitigation and standards compliance for the global electronics industry. Prior to becoming a consultant, Mr. Zulueta managed the Hardware Technology Assurance Group at the Jet Propulsion Laboratory, where he led a team of engineers and technologists involved in Electronics Packaging Assurance Technologies, Non-destructive Evaluation, Electronics Manufacturing Technology Transfer (Training) and Certification, Electronics Inspection, Optical Metrology and Electro-Static Discharge (ESD) Awareness and Control. He was also JPL Program Element Manager for the NASA Electronic Parts and Packaging (NEPP) Program and facilitated the Counterfeit Parts Working Group meetings at JPL. He is also a past-President of the International Microelectronics and Packaging Society (IMAPS). Prior to joining JPL, he was Western Regional Manager for Electro-Science Laboratories, a Program Manager for Ball Aerospace, an Engineering Group Manager for Hughes Microelectronics in Newport Beach, CA and a Microelectronics Process Engineer for Northrop Electronics. His education includes an MBA from Pepperdine University and a B.S. in Materials Engineering from California State University Long Beach.

**Wang, Wego**

Dr. Wang is currently an aerospace engineer in the Engine Certification Office of the Federal Aviation Administration, where he serves as the focal point for Parts Manufacturer Approval. He has been a technical instructor and a researcher in mechanical engineering and materials science for more than twenty years. Dr. Wang taught at Northeastern University and is currently an adjunct faculty at Boston University and the University of Massachusetts - Lowell. He received many awards, commendations and recognitions from the Army Research Laboratory, the FAA and other institutions. Dr. Wang authored or co-authored over 40 technical/professional articles, and presented lectures/reports at numerous seminars/conferences. Active with professional societies, he is on the executive committee of ASM International Boston Chapter and was the 2005-06 Chairman of the Chapter. He also served on the executive committee of TMS Boston Section, where he was president from 1993-95. Dr. Wang has a B.S. in Mechanical Engineering from National Cheng - Kung University, a M.S. in Mechanical Engineering from National Taiwan University, and a M.S. and Sc.D. in Materials Science and Engineering from Massachusetts Institute of Technology.

**Zielinski, Kevin**

Kevin Zielinski currently owns and operates Red Cedar Media LLC, a training and corporate communications consulting, design, development and delivery company based in Michigan. Previously, Kevin was Senior Applications Specialist for EDS (including General Motors/EDS and Hewlett Packard/EDS) specializing in technical training delivery, training consulting, courseware design and development, and e-Learning. He has designed, developed and delivered over 40 lecture- and web-based courses attended by General Motors and EDS employees worldwide. Mr. Zielinski has also served as Adjunct Professor for the Wayne State University College of Engineering and WSU/Focus:Hope for many years. His areas of expertise include: e-Learning design and development, Quality Tools and Methods (Design of Six Sigma, Robust Engineering, Design of Experiments (DOE), Statistical Tolerancing and GD&T); Design for Manufacturing and Assembly (DFMA); Engineering Economics; and Plant Floor Throughput Improvement. He has been an instructor for SAE Professional Development since 1990, and is a recipient of SAE’s Forest R. McFarland Award (April 2005). He holds a bachelor’s and master’s degree in engineering from Wayne State University.

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<td>Feb 27</td>
<td>Introduction to AS9100: Requirements and Value-Added Implementation--I.D.# WB1244</td>
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| Date       | Event                                                                 || Location                       | Description                                                                 | ID#       |
|-----------|----------------------------------------------------------------------|---------------------------------|------------------------------------------------------------------------------|-----------|
| Apr 7     | Advanced GD&T Competencies: Profile of a Surface--I.D.# WB1320       | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Apr 9     | Advanced GD&T Competencies: Composite Positioning--I.D.# WB1321       | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Apr 28-May 7 | Root Cause Problem Solving: Methods and Tools--I.D.# WB0931     | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Apr 1-3   | Weibull-Log Normal Analysis Workshop--I.D.# 86034                   | McLean, Virginia – LMI          |                                                                              |           |
| Apr 2-3   | Corrosion Engineering and Prevention--I.D.# C1217                   | McLean, Virginia – LMI          |                                                                              |           |
| Apr 9-10  | Leading High Performance Teams--I.D.# C0410                        | McLean, Virginia – LMI          |                                                                              |           |
| Apr 14-15 | Design Review Workshop--I.D.# C1306                                | McLean, Virginia – LMI          |                                                                              |           |
| Apr 20-22 | Principles of Cost and Finance for Engineers--I.D.# C0828           | McLean, Virginia – LMI          |                                                                              |           |
| May 4-5   | ARP4754A and the Guidelines for Development of Civil Aircraft and Systems--I.D.# C1118 | Grand Rapids, Michigan – DeVos Place Convention Center | held in conjunction with the SAE 2015 Noise and Vibration Conference |           |
| May 6     | Statistical Tolerance Design--I.D.# 88033                         | Grand Rapids, Michigan – DeVos Place Convention Center | held in conjunction with the SAE 2015 Noise and Vibration Conference |           |
| May 7-8   | ARP4761 and the Safety Assessment Process for Civil Airborne Systems--I.D.# C1245 | Grand Rapids, Michigan – DeVos Place Convention Center | held in conjunction with the SAE 2015 Noise and Vibration Conference |           |
| May 4-5   | Robust Design--I.D.# C1231                                        | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| May 18-19 | Introduction to Welded Joints--I.D.# C1343                        | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| May 28-29 | Managing Programs and Associated Risks--I.D.# C0409                | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Jun 2-11  | Tolerance Stack-up Fundamentals--I.D.# C0842                       | Web Seminar – Live Online       |                                                                              |           |
| Jun 15-19 | Introduction to Design Review Based on Failure Modes (DRBFM)--I.D.# WB1047 | Web Seminar – Live Online       |                                                                              |           |
| Jun 2     | Surface Texture: Specification and Control--I.D.# C1110            | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Jun 8-9   | Control Systems Simplified--I.D.# C0525                           | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Jun 24-26 | Strategic Leadership--I.D.# C0620                                | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Jul 17    | Introduction to AS9100: Requirements and Value-Added Implementation--I.D.# WB1244 | Web Seminar – Live Online       |                                                                              |           |
| Jul 29-31 | Geometric Dimensioning & Tolerancing (GD&T)--I.D.# C0133          | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Jul 29-31 | Principles of Cost and Finance for Engineers--I.D.# C0828          | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Jul 27-28 | Design for Manufacturing & Assembly (DFM/DFA)--I.D.# 92047         | Warrendale, Pennsylvania – SAE International Office |                                                                              |           |
| Jul 30-31 | Aircraft Cabin Safety and Interior Crashworthiness--I.D.# C0926     | Warrendale, Pennsylvania – SAE International Office |                                                                              |           |
| Aug 5-7   | Overview and Impact of the Automotive Functional Safety Standard ISO 26262--I.D.# WB1134 | Web Seminar – Live Online       |                                                                              |           |
| Aug 11-3  | Fundamentals of Geometric Dimensioning & Tolerancing (GD&T)--I.D.# WB0933 | Web Seminar – Live Online       |                                                                              |           |
| Aug 17-28 | Design of Experiments (DOE) for Engineers--I.D.# WB0932            | Web Seminar – Live Online       |                                                                              |           |
| Aug 3-4   | Implementation of SAE AS6081-Counterfeit Electronic Parts for Distributors--I.D.# C1135 | Web Seminar – Live Online       |                                                                              |           |
| Aug 5     | AS5553 and Counterfeit Electronic Parts Avoidance--I.D.# C1302     | Web Seminar – Live Online       |                                                                              |           |
| Aug 6     | Design Reviews for Effective Product Development--I.D.# C0004       | Web Seminar – Live Online       |                                                                              |           |
| Aug 3-4   | Threaded Fasteners and the Bolted Joint--I.D.# 95030              | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Aug 5-7   | Fundamentals of Metal Fatigue Analysis--I.D.# 94024              | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Aug 10-12 | Weibull-Log Normal Analysis Workshop--I.D.# 86034                 | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Aug 10-12 | Managing Engineering & Technical Professionals--I.D.# C0608        | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |
| Aug 27-28 | Leading High Performance Teams--I.D.# C0410                       | Troy, Michigan – SAE International Professional Engineering Education Center |                                                                              |           |

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PROFESSIONAL DEVELOPMENT SCHEDULE

Web Seminar – Live Online
Sep 14-25  Finite Element Analysis (FEA) for Design Engineers--I.D.# WB1241
Sep 15-24  Vehicle Sound Package Materials--I.D.# WB1204
Sep 28-Oct 7  Implementing SAE AS6081 – Counterfeit Electronic Parts Avoidance for Distributors--I.D.# WB1355
Sep 29-Oct 1  Accelerated Concept to Product (ACP) Process for Design Optimization--I.D.# WB1402

Seattle, Washington – held in conjunction with the SAE 2015 Aerotech Conference and Exhibition
Sep 21-22  ARP4754A and the Guidelines for Development of Civil Aircraft and Systems--I.D.# C1118
Sep 21-22  Understanding the FAA Parts Manufacturer Approval Process--I.D.# C1324
Sep 24-25  ARP4761 and the Safety Assessment Process for Civil Airborne Systems--I.D.# C1245

Troy, Michigan – SAE International Professional Engineering Education Center
Sep 10-11  Design of Experiments (DOE) for Engineers--I.D.# C0406
Sep 17-18  Corrosion Engineering and Prevention--I.D.# C1217

Web Seminar – Live Online
Oct 19-30  Vibration Analysis Using Finite Element Analysis (FEA) --I.D.# WB1401
Oct 20  Advanced GD&T Competencies: Datum Usage--I.D.# WB1319
Oct 22  Advanced GD&T Competencies: Profile of a Surface--I.D.# WB1320
Oct 27  Advanced GD&T Competencies: Composite Positioning--I.D.# WB1321

Norwalk, California – Cerritos Community College
Oct 5  Introduction to Composites Fabrication and Assembly in Aerospace, Space, and Transportation--I.D.# C1311
Oct 6-7  Automated Systems for Aerospace and Space Applications--I.D.# C1313
Oct 8  RFID Selection, Application, and Use in Aerospace, Space, and Transportation--I.D.# C1310
Oct 20-23  Accessing and Interpreting Heavy Vehicle Event Data Recorders--I.D.# C1022

Troy, Michigan – SAE International Professional Engineering Education Center
Oct 5-6  Tolerance Stack-Up Analysis--I.D.# C0022
Oct 8-9  Design Review Workshop--I.D.# C1306
Oct 29-30  Sheet Metal Stamping: Robust Formability--I.D.# C0713

McLean, Virginia
Nov 16  Success Strategies for Women in Industry and Business--I.D.# C1202
Nov 17-18  Understanding and Supporting Aircraft Accident Investigation and Reconstruction --I.D.# C1143

Troy, Michigan – SAE International Professional Engineering Education Center
Nov 5-6  Strategic Leadership--I.D.# C0620
Nov 9-10  Introduction to Welded Joints--I.D.# C1343
Nov 18-20  Geometric Dimensioning & Tolerancing (GD&T) --I.D.# C0133
Nov 18-20  Principles of Cost and Finance for Engineers --I.D.# C0828
Nov 23-24  Introduction to Failure Mode and Effects Analysis for Product and Process--I.D.# C1201

Web Seminar – Live Online
Dec 1-10  Tolerance Stack-up Fundamentals--I.D.# C0842
Dec 4  Introduction to AS9100: Requirements and Value-Added Implementation--I.D.# WB1244
Dec 14-17  Introduction to Design Review Based on Failure Modes (DRBFM) --I.D.# WB1047

Norwalk, California – Cerritos Community College
Dec 7-8  Understanding the FAA Aircraft Certification Process--I.D.# C0821
Dec 9-10  Aircraft Cabin Safety and Interior Crashworthiness--I.D.# C0926

Troy, Michigan – SAE International Professional Engineering Education Center
Dec 1-2  Leading High Performance Teams--I.D.# C0410
Dec 3-4  Robust Design--I.D.# C1231
Dec 7-8  Accelerated Test Methods for Ground and Aerospace Vehicle Development--I.D.# C0316
Dec 8-10  Managing Engineering & Technical Professionals--I.D.# C0608
Dec 9-11  Weibull-Log Normal Analysis Workshop--I.D.# 86034
Dec 14-15  Threaded Fasteners and the Bolted Joint--I.D.# 95030
Dec 15-16  Engineering Project Management--I.D.# 99003
Dec 16-18  Fundamentals of Metal Fatigue Analysis--I.D.# 94024

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