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July 19-22, 2004, Doubletree Hotel, Colorado Springs, Colorado, USA

## Aerospace Manufacturing and Automated Fastening Conference & Exhibition

September 21-23, 2004, Sheraton West Port Hotel, St. Louis, Missouri, USA

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October 25-28, 2004, Hilton Americas - Houston & George R. Brown Convention Center, Houston, TX, USA

\* Administered by SAE International for the U.S. Department of Defense

## World Aviation Congress (WAC)

November 2-4, 2004, Hilton Hotel, Reno, Nevada, USA

\* Co-located with Power Systems Conference

## Power Systems Conference

November 2-4, 2004, Hilton Hotel, Reno, Nevada, USA

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**Dr. J. Victor Lebacqz**, Associate Administrator for Aeronautics NASA

**Power Systems Conference Executive Chair**  
**Lt. Col. JoAnn Erno**, Chief, Power Division, Air Force Research Laboratory, Wright-Patterson Air Force Base

**Dan Mooney**, Vice President – Product Development, Boeing Commercial Airplanes

**Dr. Ronald M. Segal (invited)**, Director, Defense Research and Engineering, Office of the Secretary of Defense

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#### Speakers:

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**Gary Payton (invited)**, Missile Defense Agency

**Dr. John Pellegrino**, Army Research Laboratory

**Lt. Col. Keith Weyenberg**, JSF Program Office

### World Aviation Congress Banquet

#### Featured Speaker:

**John N. Feren**, Vice President - Sales, Marketing and In-Service Support, 7E7 Program, Boeing Commercial Airplanes

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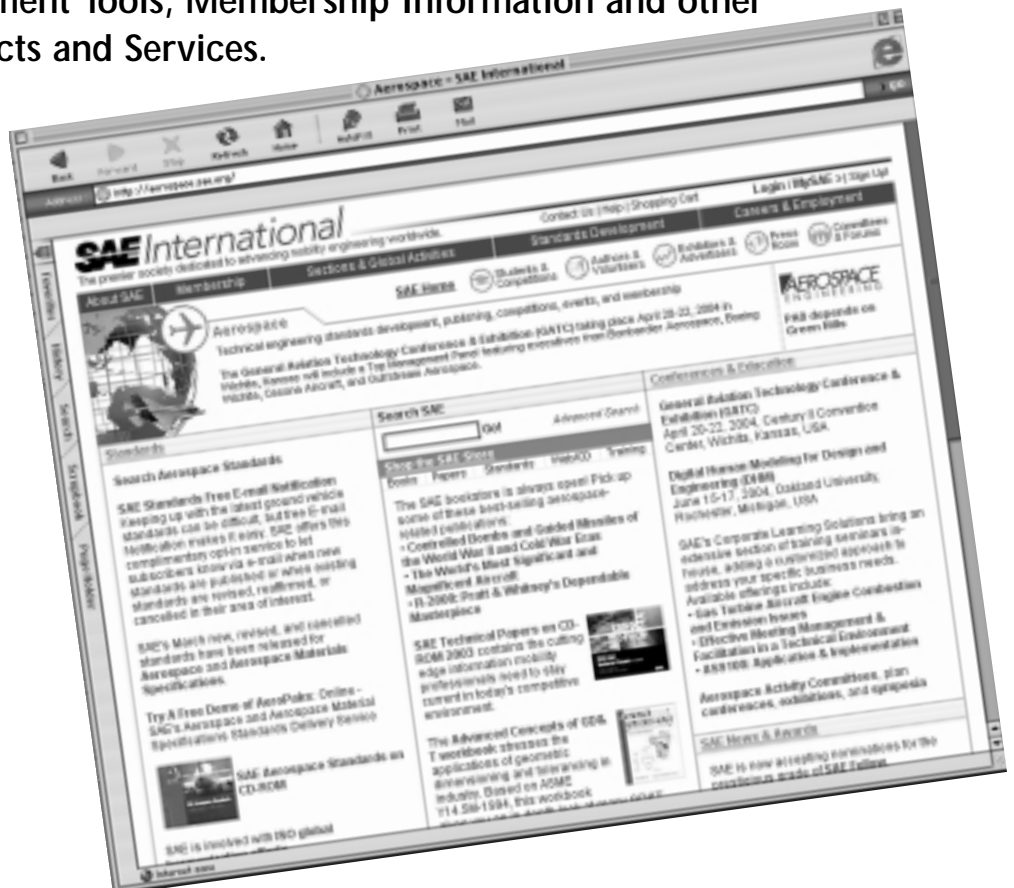
# AEROSPACE CATALOG

## Contents

Standards .....	4
Engineering Design.....	8
History.....	10
Manufacturing/Quality .....	13
Management/Reference.....	15
Materials.....	19
Reliability .....	22
Safety .....	24
SAE Aerospace Membership Application .....	26
SAE Order Form.....	27

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<b>ARP9004</b>	Direct Ship-Recommended Practices for Aerospace Companies	<b>AS9101A</b>	Revision A Checklist - Quality Systems Assessment
<b>ARP9034</b>	<b>New</b> A Process Standard for the Storage, Retrieval and Use of Three-Dimensional Type Design Data	<b>AS9101B</b>	Revision B Checklist - Quality Management Systems Assessment
<b>ARP9134</b>	<b>New</b> Supply Chain Risk Management Guideline	<b>AS9102A</b>	Aerospace First Article Inspection Requirement
<b>AS9000</b>	Aerospace Basic Quality System Standard	<b>AS9103</b>	Variation Management of Key Characteristics
<b>AS9000 Appendix 1</b>	Checklist -- AS9000 Audit Summary and Supplier Profile Instructions	<b>AS9110</b>	Quality Maintenance Systems - Aerospace - Requirements for Maintenance Organizations
<b>AS9003</b>	Inspection and Test Quality System	<b>AS9120</b>	Quality Management Systems - Aerospace - Requirements for Stockist Distributors
<b>AS9006</b>	Deliverable Aerospace Software Supplement for AS9100A	<b>AS9121</b>	<b>New</b> Quality System Assessment Applicable to Stockist Distributors
<b>AS9100</b>	Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing	<b>AS9131</b>	Quality Systems Non-Conformance Documentation
<b>AS9100A</b>	Revision A - Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing	<b>AS9132</b>	Data Matrix (2D) Coding Quality Requirements for Parts Making
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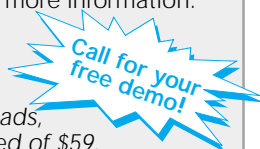
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Design Reviews for Effective Product Development

SEMINAR

August 3, 2004 - Troy, Michigan

November 3, 2004 - Troy, Michigan

Design reviews are required for ISO 9001:2000 compliance and compatible automotive and aerospace specifications. They are also becoming important issues in product liability litigation and have been accepted as a cost-effective, best practice and an effective application of knowledge management, valuable for accelerating the maturity of new products.

This seminar will describe how formal design reviews can improve products 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 broad range of effective techniques for organization and conducting design reviews in a fashion applicable to a range of industries and supply change levels will be presented. Additionally, the course will provide specific guidance and tools to assist participants in structuring design reviews that can be tailored to their own company, specification, or contract requirements. The material covered will be applicable to all types of development programs, ranging from components to complete vehicles, and for both OEMs and suppliers.

**Instructor: Sumner Alpert**

Mr. Alpert is a consultant specializing in the fields of product

development, project management and strategic planning. He is a Registered Professional Engineer in the state of California, a certified Project Management Professional (PMP) and a Certified Management Consultant (CMC). Mr. Alpert began his career as a research scientist with NASA and served as a project engineer at Solar. He was promoted to Chief Technical Engineer and later served as a product line manager. Sumner served as Vice-President of Engineering at Aeronca, President of Murdock Machine and Engineering and Director of Turbo-Products at the Marquardt Company. He joined the Chicago Pneumatic Tool Company as a Product Development Consultant and then served as Director of Strategic Planning for HR Textron. Mr. Alpert is a member of SAE, AIAA, the Association for Strategic Planning, and is a Fellow of ASME. He earned a B.S. degree in Mechanical Engineering from Northeastern University, a M.S. in Mechanical Engineering from Case-Western Reserve and a M.B.A from San Diego State University.

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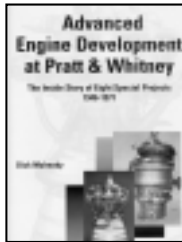
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Refer to I.D.# C0004

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Dick Mulready

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- Tim L. Taylor & B. Hurley,

Advanced Quality Systems Group, Rockwell Collins Inc.

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**Design of Experiments (DOE) for Engineers****NEW!**

SEMINAR

June 3-4, 2004 - Troy Michigan

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 "competency-based" seminar utilizes a "Read, Talk, and Do" approach, with plenty of 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.

Attendees are requested to bring a calculator to the seminar.

**Benefits of Attending**

Upon completion of this seminar, participants 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

**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 and computers.

**Seminar Content**

- Icebreaker: Team Problem Solving Exercise using Engineering Judgment
- What is DOE?
  - Brief History
  - 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**

Kevin Zielinski is a Senior Applications Specialist for Electronic Data Systems, Inc. (EDS) and is an Adjunct Professor for the Wayne State Univ. College of Engineering. His areas of interest and expertise include: Quality Tools and Methods (Design of Six Sigma, Robust Engineering, Design of Experiments (DOE), Statistical Tolerancing and GD&T); Design for Manufacture and Assembly (DFMA); Engineering Economics; Plant Floor Throughput Improvement; and Finite Element Modeling/Analysis. Kevin has developed numerous course textbooks for General Motors Corp., and has taught several hundred classes for GM employees worldwide. He currently teaches 12 different "competency-based" courses in the above areas for General Motors Univ. (GMU).

1.3 CEU

**Fee: \$995; SAE Members: \$895**

Refer to I.D.# C0406

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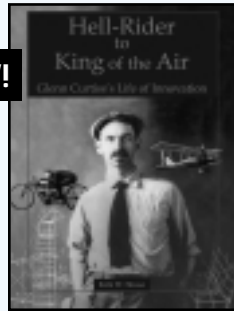
*Hell-Rider to King of the Air* examines Curtiss's life, career, and accomplishments in an engaging and accessible way, so that readers can answer that question for themselves.

ISBN 0-7680-0802-6, 288 pp., Hardbound 2003

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**NEW!**



## Hispano Suiza in Aeronautics: Men, Companies, Engines and Aircraft

Manuel Lage

This book examines Hispano Suiza's evolution and the technological advances of its engines. Starting with circumstances that favored the creation of an indigenous aviation engine, the story follows engine development for a breadth of applications, particularly aviation engines, and describes, in parallel, the birth and development of aircraft in Spain by Campaña Española de Construcciones Aeronáuticas (CECA), La Hispano, La Hispano Aircraft, La Hispano Suiza, SAF-5, SAF-15, and La Hispano Aviación.

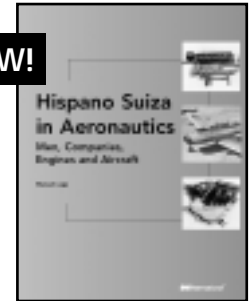
Although numerous books have been published on the more common developments of Hispano Suiza, until now none have been published on the company's primary line of business, aircraft and aviation engines. *Hispano Suiza in Aeronautics: Men, Companies, Engines and Aircraft* is an in-depth study covering a vast period in the history of the Spanish and French aircraft industry (1913-1967) and offers insight into Hispano Suiza's significant developments.

ISBN 0-7680-0997-9, 564 pp, Softbound 2003.

**\$59.95**

Order No. R-333

**NEW!**



## Controlled Bombs and Guided Missiles of the World War II and Cold War Eras

Vernon R. Schmitt

After World War I the use of aerial bombing became a real threat. As technology advanced, so did the knowledge to advance the design and development of guided missiles. This book examines the progress of guided missiles in the US from the beginning of World War II into the 1970s, including several government reports that are now declassified. *Controlled Bombs and Guided Missiles of the World War II and Cold War Eras* offers a compelling look at the advancements and technology that have led to some of our more sophisticated missile systems that are in use today.

ISBN 0-7680-0913-8, Approx. 140 pp., Paperbound 2002.

**\$39.95**

Order No. R-326



## R-2800: Pratt & Whitney's Dependable Masterpiece

Graham White

This book focuses on what was arguably the finest aircraft piston engine ever produced - the Pratt & Whitney R-2800. It was an engine that was put together with the invaluable help of those who were actually there at the drawing boards, in the test cells and at the test flights.

The R-2800 was constantly updated with design, manufacturing and ease of maintenance improvements. *R-2800: Pratt & Whitney's Dependable Masterpiece* provides a background of Pratt & Whitney, and delves into the design challenges faced by its engineers when building the R-2800; answering questions like:

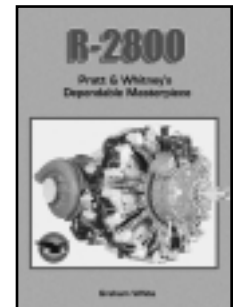
- How did the airframe designers mount the engine?
- What kind of exhaust system was employed?
- How was the intercooler supplied with cooling air?

*R-2800: Pratt & Whitney's Dependable Masterpiece* examines the piston powered aircraft that helped lead a nation to victory in war, and the men and women whose hard work and dedication made it possible.

ISBN 0-7680-0272-9, 752 pp., 14 Chapters, Hardbound 2001.

**\$59.95**

Order No. R-241





### Tests of Character Epic Flights by Legendary Test Pilots

Donald Middleton

*Tests of Character* is written to reveal the problems which have faced test pilots from the earliest years of aviation through the 1960s. Author Don Middleton has selected a number of test sorties and programs which were, indeed, tests of character. These tell the story of the difficulties faced by test pilots in turning

the new machines into efficient aircraft capable of being flown by ordinary military and commercial pilots.

Co-published by SAE and Airlife Publishing Ltd.

ISBN 1-56091-671-0, 224 pp., 15 Chapters, Hardbound 1995.

**\$39.95 Sale Price \$19.99**

Order No. R-149



### The World's Most Significant and Magnificent Aircraft Evolution of the Modern Airplane

David B. Thurston

This book showcases the world's most remarkable aircraft that have made a valuable contribution to the development and evolution of the airplane as we know it today. A total of 142 planes were chosen by the author because of their importance in the

advancement of design in power plant, flight concept, major production, and detail refinement.

ISBN 0-7680-0537-X, 282 pp., 7 Sections, 18 Chapters, Hardbound 2000.

**\$49.95**

Order No. R-285



### Fly-By-Wire A Historical and Design Perspective

Vernon R. Schmitt, Gavin D. Jenney  
and James W. Morris

Fly-by-wire in aircraft flight control design is more than adding a simple wire — it is a sophisticated system that changes the way aircraft are designed and the way they fly. Prepared and written by experts who directed or staffed fly-by-wire research and

development programs, this book includes explanations of the system's design and application, providing both the "how" and the "why" of this remarkable technology.

ISBN 0-7680-0218-4, 132 pp., 5 Chapters, Paperbound 1998.

**\$59.95 Sale Price \$29.99**

Order No. R-225

### The Aviation Legacy of Henry & Edsel Ford

Timothy O'Callaghan

*The Aviation Legacy of Henry & Edsel Ford* is the definitive documentation of the Ford's contributions in the development of aviation from the 1920s through World War II. This 208 page book contains over 160 beautifully reproduced photographs; almost 100 of which are being published for the first time. There is documentation proving the existence of four Flivver airplanes; a point which has been debated for decades.

The book also covers, in detail, such topics as Ford's first airplane - Inauguration of the Ford Air Transportation Service - Development of the Ford Tri-Motor - North and South Pole Expeditions - Erection of a mooring mast and visits of Army and Navy dirigibles and much more.

ISBN 1-928623-01-8, 216 pp., 15 Chapters, Hardbound 2000.

**\$35.00**

Order No. B-846



### Allied Aircraft Piston Engines of World War II

History and Development of Frontline  
Aircraft Piston Engines Produced by  
Great Britain and the United States  
during World War II

Graham White

Although numerous books have been published on all of the more common World War II aircraft and several books have been published on engines, rarely have the two

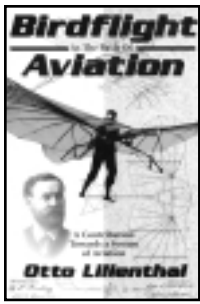
been brought together. *Allied Aircraft Piston Engines of World War II* offers an interesting look at the technology that was so important to eventual Allied victory.

The book is organized into separate sections on British and U.S. aircraft piston engines. Aircraft engines detailed in the book include: Rolls-Royce - Merlin, Griffon, Peregrine, Vulture; Bristol - Poppet Valve Engines, Mercury, Pegasus, Sleeve Valve Engines, Hercules, Taurus, Centaurus; Napier - Rapier, Dagger, Sabre; General Electric Turbosuperchargers; Pratt and Whitney - R-1340 Wasp, R-985 Wasp Jr., R-1535 Twin Wasp Jr., R-1830 Twin Wasp, R-2000, R-2800 Double Wasp, R-4360 Wasp Major; Allison - V-1710, V-3420; and Wright Aeronautical Corporation - R-1820 Cyclone, R-2600 Cyclone 14, R-3350 Cyclone 18, R-4090.

ISBN 1-56091-655-9, 442 pp., 2 Sections, 13 Chapters, Hardbound 1995.

**\$59.95**

Order No. R-154



## Birdflight as the Basis of Aviation

Otto Lilienthal

Lilienthal, with assistance from his brother Gustave, studied the details of how birds fly. He then developed a theory of flight and designed and built a series of gliders. From 1891 to 1896 he made over 2,000 glides - bridging the gap between those who dreamed of flying and those who flew. Learning of Lilienthal's fatal gliding accident in 1896, the Wright Brothers became inspired to investigate "the problem of human

flight." They carefully studied his work, developed their own theories and designs, and invented the airplane. Through Lilienthal's own notes and experiment results, *Birdflight as the Basis of Aviation* tells the remarkable story of what Lilienthal accomplished in the late nineteenth century. All the original photos and Lilienthal's own diagrams are included.

This book is an unabridged copy of the original work.

ISBN 0-938716-58-1, 176 pp., 42 Chapters, Paperbound 2001.

**\$20.00**

Order No. B-844

## The Helicopter

### An Illustrated History of Rotary Winged-Aircraft

Patrick Allen

This book looks at historic past and present designs - some successful, some not - which have led to today's helicopters. From the early designs of Igor Sikorsky to the latest advances in digitized electronics, computer-aided design, and composite materials, *The Helicopter* covers all of the developments which have helped make the helicopter a safe, comfortable, reliable and economic means of transportation.

Historic helicopters covered include: Bell Helicopters; Bell Boeing V-22 Osprey; Lockheed Martin; McDonnell Douglas; Sikorsky; Messerschmitt-Boelkow-Blohm GmbH; and Russian Helicopters.

Published by Airlife Publishing Ltd. Distributed by SAE.

ISBN 1-85310-219-9, 144 pp., 19 Chapters, Paperbound 1996.

**\$49.00**

Order No. B-781

## Tupolev

### The Man and His Aircraft

Paul Duffy and Andrei Kandalov

This interesting book focuses on the aircraft designs of the man often referred to as the father of Russian aviation, Andrei Nikolaevich Tupolev. Born in Russia in 1888, Tupolev went on to design aircraft that earned Russia worldwide acclaim for their pioneering contributions to aviation in the 1920s, '30s, and '40s. *Tupolev - The Man and His Aircraft* begins with a short biography of Tupolev, then quickly moves on to covering the historical and engineering details of his aircraft designs.

Co-published by SAE and Airlife Publishing Ltd.

ISBN 1-56091-899-3, 236 pp., Hardbound 1996.

**\$29.95 Sale Price \$14.99**

Order No. R-173



## Visions of a Flying Machine

### The Wright Brothers and the Process of Invention

Peter L. Jakab

This acclaimed book on the Wright Brothers takes the reader straight to the heart of their remarkable achievement, focusing on the technology and offering a clear, concise chronicle of precisely what they accomplished and how they went about doing it.

This book deals with the process of the invention of the airplane and how the brothers identified and resolved a range of technical puzzles that others had attempted to solve for a century. Step by step, the book details the path of invention (including the important wind tunnel experiments of 1901) which culminated in the momentous flight at Kitty Hawk in 1903, the first major milestone in aviation history.

Enhanced by original photos, designs, drawings, notebooks, letters and diaries of the Wright brothers, *Visions of a Flying Machine* is a fascinating book that will be of interest to engineers, historians, enthusiasts, or anyone interested in the process of invention.

Published by Smithsonian Institution Press. Distributed by SAE.

ISBN 1-56098-748-0, 282 pp., 10 Chapters, Paperbound 1990.

**\$19.00**

Order No. B-730



## German Aircraft Industry and Production, 1933 - 1945

Ferenc A. Vajda and Peter Dancey

This in-depth study covers a critical 13-year period in the history of the German aircraft industry. Vajda and Dancey examine how an industry decimated in the wake of World War I experienced a rebirth, a building boom, further technical successes, and yet another dismantling

following World War II. Numerous photographs, diagrams and statistics, enhance the book's details on manufacturing plants, production planning, and exact output.

Planes detailed include: short-range and long-range reconnaissance planes and artillery aircraft; day and night bombers and one-and two-seat night fighters; special navy aircraft; dive-bombers; and training aircraft.

ISBN 0-7680-0246-X, 330 pp., 13 Chapters, Hardbound 1998.

**\$49.95**

Order No. R-236



## Advanced Concepts of GD&T

The *Advanced Concepts of GD&T* workbook stresses the applications of geometric dimensioning and tolerancing in industry. Based on ASME Y14.5M-1994, this workbook gives you an in-depth look at many GD&T topics, including common industry tolerancing practices that are not documented in the standard.

### The Advanced Concepts of GD&T workbook includes:

- GD&T Overview
- The Importance of Product Design
- Concept of Functional Dimensioning
- Dimensioning Standards
- ISO and ASME Comparison
- Applicable Drawing Standards
- Drawing Interpretation
- Using Substandard Drawings
- Rigid and Flexible Parts
- Restraint Notes
- Restrained Part Datum System
- Form Control
- Datum Feature Types, Targets and Specialized Application
- The Datum System
- Modifier Usage in Position Applications
- Simultaneous Requirements with Tolerance of Position
- Composite Position Tolerancing
- Multiple Single-Segment Position Tolerancing
- Using Conical Tolerancing Zones
- When to use Profile Controls
- Simultaneous requirements with Profile Controls
- Composite Profile Tolerancing
- Multiple Single-Segment Profile Tolerancing
- Advanced Profile Applications

The goals and objectives of each chapter are clearly described to keep you focused on the material. At the end of each chapter you will find a number of exercises to reinforce the material. An indispensable on-the-job reference, the workbook contains numerous tips, suggestions and practical applications.

Quantity and educational discounts are available.

**\$70.00 List/SAE Member**

Order No. PD020218

## Tolerance Stacks

*Tolerance Stacks: A Self-Study Course* is a full-featured, fully interactive training course packed in two illustrated binders that you can take anywhere and pursue on your own time, at your own rate. During this 40-hour course you'll spend some time reading, but most of your time doing. You will:

- work examples
- analyze illustrations
- solve stack problems
- receive instant feedback
- take quizzes and tests
- chart your progress

At the end, you can take a mail-in final exam and receive a certificate of completion direct from the publisher.

This course requires that you already know blueprint reading and the fundamentals of geometric tolerancing. This program contains two volumes. Volume I is the student manual containing ten modules and Volume II is the applications workbook. More than simply the study of dimensional relationships within assemblies, tolerance stacks are the key to creating robust, efficient, and successful designs. Skills with stacks separate the exceptional engineers from the rest.

**\$199.00 List/SAE Member**

Order No. PD0293002

## ISO Joe's Executive and Manager Overview: ISO 9001-2000/AS9100 Rev. A

A solid foundation is always the key to establishing a good quality program. Knowing how quality systems standards originated and the events that contributed to the structure of all existing programs are important aspects. *ISO Joe's Executive and Manager Overview* provides and expands upon that foundational knowledge, and examines and compares commonly used quality programs and systems that are in use today - specifically ISO 9001:2000 and AS 9100 Revision A.

Designed to offer over 30 years of experience in organization and process approach leadership, *ISO Joe's Executive and Manager Overview* is a unique leader's guide and training package for companies specializing in production, operations, distribution, and service.

### The package includes:

- A leader's guide containing background, processes, examples, case studies, and terminology for presenting the ISO/AS requirements;
- A PC-formatted CD containing a PowerPoint presentation of nearly 100 slides covering the ISO 9001:2000/AS 9100 Rev. A attributes;
- A sample format to capture and analyze the cost of poor quality (COPQ) and Calibration Gage Control.

### Chapters featured in the leader's guide coincide with ISO 9001:2000/AS 9100 Rev. A:

- The History of Quality Systems
- The Black Hole Syndrome
- Listening from the Bottom Up
- Quality Management System
- Management Responsibility
- Resource Management
- Product Realization Planning of Production
- Product Realization Customer-Related Product
- Product Realization Design and Development
- Purchasing
- Production and Service Provisions
- Control of Monitoring and Measuring Devices
- Measurements, Analysis and Improvements

Appendices include reference documents, a list of acronyms and definitions, an example of a cost of poor quality (COPQ) report, and an example of a simple calibration recall list with an in-house gage record.

### The content of this program reflects the core content of AS9100 Rev. B

**\$350.00 List/SAE Member**

Order No. PD210240

Order or register online at [store.sae.org](http://store.sae.org).

**Tolerance Stack-Up Analysis**

December 16-17, 2004 - Troy, Michigan

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 for the numerous student exercises.

Each attendee will receive a copy of the "Tolerance Stacks Using GD&T Textbook with Drawing Package."

**Instructor(s): John-Paul Belanger or John Stolter**

Mr. Belanger, a Phoenix Consulting, Inc. instructor, is an internationally recognized instructor and consultant in geometric dimensioning and tolerancing (GD&T). Over the past five years, he

has trained over 1000 people in the proper interpretation and application of GD&T, per ASME and ISO standards. A senior level GD&T professional and a veteran of classroom training and interactive televised training, Mr. Belanger has applied GD&T and performed tolerance stacks on a wide range of products across North America and Europe. Recent clients include General Motors, Nokia, Ford, Delphi automotive Systems, Unisys, Tenneco Automotive, Dayco, and Motorola. Mr. Belanger has a B.S.E. Aerospace Engineering from the Univ. of Michigan specializing in aircraft design and safety.

John Stolter has been instructing GD&T courses and consulting on the proper application of Y14.5M for more than 10 years. As Director of Manufacturing Services for Phoenix Consulting, Inc., Mr. Stolter brings both manufacturing and design experience with him into the classroom, focusing on the central role dimensioning and tolerancing plays in the product development process. He is an effective, experienced instructor for many courses dealing with product design and manufacturing, including reading engineering drawings, GD&T, tolerance stack-up analysis, design for manufacturability, sheet metal formability, and FMEA. He has also developed training for a variety of customers on these and other topics. Mr. Stolter's in-depth knowledge of GD&T, and his experienced, interactive teaching style, result in GD&T and tolerance stack-up analysis classes that have very high levels of student satisfaction.

1.3 CEU

**Fees: \$1,080 ; SAE Members: \$980**

Refer to I.D.# C0022

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The key to success for SAE's Aerospace programs is the industry volunteers who willingly devote their time and efforts to specific projects in order to keep the aerospace industry on the leading edge of technology. These special people are the ones who "make a difference." One way to recognize such individuals is through the SAE Award programs targeting aerospace engineers. For information about all of SAE's awards, go to [www.sae.org/awards](http://www.sae.org/awards).

For questions regarding SAE's Awards & Recognitions Program, please contact Lori Pail at 1-724-772-8534 or email at [lorile@sae.org](mailto:lorile@sae.org).

**Geometric Dimensioning and Tolerancing - Level I**

July 12-14, 2004 - Troy, Michigan

December 8-10, 2004 - Troy Michigan

Save time and money, while increasing quality and productivity by mastering this important and internationally-accepted engineering communication system. Geometric Dimensioning and Tolerancing (GD&T) is based on ISO standards and the ASME Y14.5M-1994 Dimensioning and Tolerancing Standard.

Seminar attendees will have a unique opportunity to meet one-on-one with the instructor, with time to discuss problem drawings in a focused setting, and will receive a copy of the ASME Y14.5M-1994 Dimensioning and Tolerancing Standard and handout material specially prepared for this program.

Attendees will receive a copy of the ASME Y14.5M-1994 Dimensioning and Tolerancing Standard and handout material specially prepared for this program. Attendees are encouraged to bring problem drawings as they will have several opportunities during the workshop to meet with the instructor individually.

**Instructor: Barry W. Heathcotte**

Mr. Heathcotte is an individual consultant specializing in training and consulting services on the subject of Geometric Dimensioning and Tolerancing. He has more than 30 years experience in the subject matter and has been a lecturer at both public and in-plant seminars and training programs since 1979. He has trained more than 15,000 people from well over 1500 companies, the military, technical and trade schools, universities, and technical societies in the United States, Canada, Mexico, and Europe. He has conducted public and in-plant training for SAE, SME, and ASME as well as in-plant training for automotive and aerospace companies for nearly 20 years. He is a former designer, group supervisor and technical coordinator with the Babcock & Wilcox Co., where he worked on the breeder reactor and nuclear reactors for both commercial and military installations. He has more than 40 years of industrial experience, is a Certified Manufacturing Engineer, a senior member of the SME, and a member of ASME. He has been an active member of the ASME Y14.5 Committee on Dimensioning and Tolerancing since 1982 and is a nationally-recognized expert on its application and interpretation.

1.8 CEU

**Fees: \$1,275; SAE Members: \$1,175**

Refer to I.D.# 86020

**SAE Dictionary of Aerospace Engineering****Second Edition**

Joan L. Tomsic

Includes over 20,000 terms! With the fast-moving technology related to aerospace engineering, new terms are created and others become redundant almost weekly. The *SAE Dictionary of Aerospace*

*Engineering*, designed specifically for the aerospace engineer, provides extensive coverage of technical terms related to aerospace technology.

ISBN 0-7680-0245-1, 758 pp., Hardbound 1998.

**\$89.95 Sale Price \$44.99**

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## What Engineers and Managers Need to Know About Human Factors

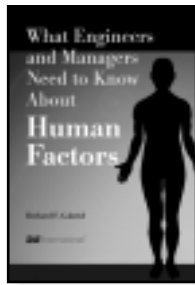
Richard F. Gabriel

Human factors has been recognized as a specific engineering specialty for more than 50 years, however, it has yet to be fully accepted by many engineers and managers as a necessary part of the design process. This book demonstrates that a well structured and performed human factors effort can result in improved safety and efficiency not only in the operation and maintenance of the product, but also increased effectiveness and efficiency of the design process itself with significant cost savings. *What Engineers and Managers Need to Know About Human Factors* provides an introduction to the role, value, scope and the unique contributions the field of human factors can bring to the design process for all products. Aimed at the engineer and manager with no formal training in the life and social sciences, it is not intended to train the methods of human factors, but rather to provide knowledge that will enable engineers and managers to determine if including human factors in the planning and execution of product design is justified.

ISBN 0-7680-0975-8, April 2003

**\$49.95**

Order No. R-331



## Project Planning and Program Control Processes Workshop on CD

This self-paced, accredited program is based on the idea that thoroughly planned and managed projects have significantly greater degrees of success in meeting cost, schedule, and technical objectives. The course defines, describes, and offers practical experience at the working level in the processes, disciplines, benefits, common problems and pitfalls of project planning and program control methodology including a demonstration of the appropriate, practical role of project management software.

Through a combination of instruction, problems and exercises, you will gain an understanding of the essential parameters that need to be defined and managed for projects of any size or complexity. You will learn in detail techniques that determine the duration of a project, the earliest date of completion, as well as the resources necessary to meet that date. You will come away with actions that can be taken to proactively isolate, quantify, and rectify obstacles that might prevent success in achieving either cost or schedule objectives, and can therefore resolve problems with the most efficient and effective means possible. You will apply program control processes to manage a project that successfully meets its objectives.

The single-user package includes one CD-ROM and seven workbooks.

**\$600.00 List/SAE Member**

Order No. PD190228

## The Standard Handbook for Aeronautical and Astronautical Engineers

Mark Davies

In the past, aerospace engineers and students have had to access a wide array of trade publications and books for comprehensive coverage of their highly specialized industry. No longer. That's because with *The Standard Handbook for Aeronautical and Astronautical*

*Engineers*, those practitioners now have a resource that delivers a combination of reference, data, and handy information—all within the pages of a single, easy-to-use volume!

Containing contributions from more than 50 aerospace specialists—and edited by an internationally renowned aeronautical engineering expert and educator—this handbook frames the technological applications in a perspective that specifically addresses aircraft and engineering science. As a result, you get insightful, practical guidance into the gamut of aerospace engineering.

ISBN 0-7680-0915-4, October 2002

**\$175.95**

Order No. R-328



## Airline Maintenance Resource Management: Improving Communication

J. C. Taylor and T. D. Christensen

This book is a primer about the leading-edge approach to maintenance operations known as Maintenance Resource Management (MRM) — a partnership of manager, doer, and regulator. MRM programs at several leading carriers are reducing maintenance errors and improving the professional caliber of mechanics and managers.

ISBN 0-7680-0231-1, 218 pp., 12 Chapters, Hardbound 1998.

**\$39.95 Sale Price \$19.99**

Order No. R-192

## SAE 2002 Transactions Journal of Aerospace

The 103 best aerospace technical papers of 2002 in:

- Structures
- Aviation Safety Systems
- Aircraft and Spacecraft Propulsion Systems
- Military, Commercial, General Aviation and Experimental Aircraft
- Aircraft Materials
- Aircraft Fuels
- Turbomachinery
- Power Systems
- Simulations Technology
- Control and Guidance Systems
- Human Behavioral Technology

ISBN 0-7680-1285-6, Hardbound 2003

**\$269.95**

Order No. V111-1

## Engineering Project Management

July 29-30, 2004 - Troy, Michigan

SEMINAR

This course provides the essentials for understanding the Project Management portion of the Advanced Product Quality Planning (APQP) process without unnecessary filler. Attendees will be taken beyond the typical concept of constructing timelines and project planning by exploring not only the AIAG APQP process, but also specific aspects of the Ford, GM and DaimlerChrysler APQP processes.

Students will immediately apply learned skills by taking a sample project through all phases of the Project Plan using actual documents. Realistic issues, problems and time constraints are introduced throughout the exercise to stimulate actual project concerns.

This course offers students the opportunity to customize their learning experience. For the automotive sector, students can choose either Ford, GM or DaimlerChrysler specific projects. Each workshop uses documents specific to the particular workshop. Students are also introduced to each of the main Continuous Improvement techniques covered in ISO-9000 and QS-9000. The workshop is structured so that students must operate in teams and the time constraints allow students to see first hand the effects of improper delegation of work assignments.

The PMI (Project Management Institute) "PMBOK" - Project Management Body of Knowledge book will be provided to each attendee.

### Benefits of Attending

- Define the importance of each of the 9 Bodies of Project Management Knowledge
- Formulate an actual Statement of Work and Work Breakdown structure
- Apply the different timeline methodologies; Critical Path, Float, PERT, GERT, etc.
- Recognize the minimum essential elements of a Robust Manufacturing Plan
- Demonstrate the conduct of an effective Design Review and formulate an effective meeting summary and action list
- Recognize the current U.S. and international legislation and directives, which impact today's technology development and manufacturing environment

### Who Should Attend

New Project Managers, Lead or Design Release Engineers, Project Managers requiring refresher training or other individuals involved with projects will benefit by attending. The course is best suited for individuals in the automotive industry and specifically operating as Tier 1 - 3. Students should be familiar with how projects are currently managed in their company so they may ask questions relating to their specific problem areas.

### Seminar Content

#### The Project Management Process

- Outline and overview
- Project constraints
- The nine bodies of project knowledge
- Comparison of project management and the automotive APQP process (PM-1)

#### Project Plan Life Cycle

- Request for Proposal/Quote (RFP/RFQ)
- Types of contracts - advantages and disadvantages
- Project incentive factors for subsuppliers
- Developing scope of work for conceptual customer requirements
- Response formats for the RFP/RFQ
- Creating the Work Breakdown Structure (WBS)
- Project best practices and the TGR/TGW database
- Building a partner-oriented supplier base
- Documentation requirements necessary to support the PM process
- Special considerations for small projects

#### Project Management Issues

- The project plan book
- Forming and leading project teams
- Conducting effective design reviews and action item lists
- Recognizing and resolving internal and external conflict
- Product liability and the 1997 Product Liability Reform Act
- Product liability and the EU directive
- Other industry specific legislation and directives affecting project success

#### Project Management Tools

- Sequence planning methods
  - Affinity/arrow diagrams
  - PERT vs. GERT
  - Critical Path Method (CPM) and float
- Root cause analysis techniques
  - Cause and effect
  - Fault tree analysis
  - Process flow diagramming
- Cost analysis methods and break-even calculations
- Manufacturing planning considerations
- Automation - How much is too much?

#### Instructor: Angelo E. Mago

Angelo Mago is senior consultant and owner of ATM Consulting, Inc. ATM Consulting provides customized training and consulting services to the supplier community in the areas of quality assurance, quality control, design engineering, document management, and customer service and improvement methods. He has over 15 years of experience in product design, quality assurance, management and most recently worked as the Senior Supplier Quality Engineer for GM Truck Group responsible for PPAP qualification and approval. Mr. Mago graduated from Florida Institute of Technology and has a B.S. in Mechanical Engineering.

1.3 CEU

**Fees: \$1,030; SAE Members: \$930**

Refer to I.D.# 99003

NEW!

SEMINAR

**Engineering Effective Team Management & Practice**

May 24-26, 2004 - Troy Michigan

September 27-29, 2004 - Troy Michigan

Organizations, in general, and engineering and product development teams in particular, confront a number of serious and ongoing challenges to creating and sustaining positive performance: voluntary employee turnover; product plans breaking down at the point of implementation; team members consistently failing to meet expectations; etc. Many of these challenges relate directly to factors controlled or influenced each day by an organization's managers. Today's successful organization recognizes this critical relationship between superior performance and effective management. This course focuses on ten core management processes designed to increase business results.

This is a three-day class that involves significant interaction between students and between students and the instructor. Each day will include presentations by the instructor, group discussions and exercises or casework. .

**Benefits of Attending**

The objective of this course is to underscore the importance of effective management practice in the engineering and product development processes within an organization. The course covers concepts and tools that drive effective management of individuals and teams. By attending this seminar, you will learn to:

- select employees strategically
- form effective teams
- communicate with clarity
- build a culture of accountability
- translate plans into action
- move beyond barriers to change
- model interpersonal proficiency
- manage total performance
- develop true professionals
- help employees achieve balance in their lives

**Who Should Attend**

This class is designed for managers at all levels of an organization, including employees preparing to take on management responsibilities for the first time.

**Seminar Content**

- **Overview of Effective Management:** An overview of ten essential components of effective management
- **Selecting Employees Strategically:** Effective selection is one of the most important tasks of management. Ensuring the right people are in the right jobs at the right time is crucial to achievement of business goals and objectives.
- **Effective Teambuilding:** The cross-functional nature of product development requires that managers know how to create and maintain effective teams.
- **Communicating with Clarity:** Frequent and consistent communication is critical to maintaining employee focus and a sense of participation on the part of individual team members
- **Building a Culture of Accountability:** Holding ourselves accountable for the commitments we make is key to accomplishing organizational results. When a manager allows deadlines to lapse without consequence, the message sent is that deadlines don't matter.

- **Translating Plans into Action:** Many organizations excel in formulating strategies and goals. These grand plans, however, often lie fallow as organizations struggle to implement them effectively.
- **Moving Beyond the Barriers to Change:** As organizations struggle to speed up and innovate, they often find themselves stymied by their own employees. Resistance to internal change efforts takes many forms
- **Modeling Interpersonal Proficiency:** Being an effective manager in today's competitive global workplace requires more than relevant content knowledge and industry experience. To be truly effective, a manager must be interpersonally proficient. He or she must be adept at working well with others and be able to facilitate the productive interactions of those he or she manages.
- **Managing Total Performance:** An effective performance management system can serve as an excellent tool for driving desired behaviors within an organization.
- **Developing True Professionals:** The shortage of technical talent can slow down new product development, resulting in higher than necessary expenditures, later than desired deliverables and less flexible and maintainable products. Organizations wishing to retain their scarce product development staff must attend to the learning and development needs of these professionals
- **Working Without a Net:** Effective managers attend to the work/life balance issues of their teams when doing product planning and scheduling.

**Instructor: David J. Chinsky**

David Chinsky received his Bachelor of Arts and Doctorate degrees from the Univ. of Michigan, an MBA from the Keller Graduate School of Management, and a Master of Science degree from the Univ. of Illinois. He completed a course of study in strategic planning at the Univ. of Pennsylvania's Wharton School and is a graduate of the Univ. of Michigan's Human Resource Executive Program. Presently, he is the President of DJC Management Solutions, a company dedicated to enhancing managerial effectiveness within organizations. His management workshops have been conducted onsite for various companies in the automotive industry. Previously, David spent four years at Ford Motor Co.'s World Headquarters and headed up product development for an information technology company. He also has been responsible for designing and launching various communication, organizational learning and performance and succession management programs. His programs have resulted in significantly increased employee retention, improved productivity and more rapid employee selection. David has designed and taught graduate level courses at the Univ. of Detroit-Mercy, the Univ. of Michigan and Oakland Univ. and has delivered numerous professional presentations during his career.

1.8 CEU

**Fees: \$1,205; SAE Members: :\$1,105**

Refer to I.D.# C0237

Order or register online at [store.sae.org](http://store.sae.org).



### Care and Repair of Advanced Composites

Keith B. Armstrong and Richard T. Barrett

*Care and Repair of Advanced Composites* was written to meet the informational needs of composite repair technicians who repair aircraft components and structures for return to airline service. It supplements the practical work required to achieve the necessary skill level in performing these repairs.

A worldwide reference for repair technicians and design engineers, the book is an outgrowth of the course syllabus developed by the Training Task Group of SAE's Commercial Aircraft Composite Repair Committee (CACRC) which was published as SAE AIR 4938, Composite and Bonded Structure Technician Specialist Training Document.

ISBN 0-7680-0047-5, 576 pp., 16 Chapters, Hardbound 1998.

**\$69.95**

Order No. R-174



### Design of Durable, Repairable, and Maintainable Aircraft Composites

Written by the Society of Automotive Engineers (SAE) Commercial Aircraft Composite Repair Committee (CACRC)/Air Transport Association (ATA)/International Air Transport Association (IATA) Design Task Group for international use by

composite aircraft component designers, this book identifies problems that have occurred with various composite components and provides potential problem-solving recommendations.

ISBN 0-7680-0020-3, 148 pp., 5 Chapters, Paperbound 1997.

**\$99.95**

Order No. AE-27

### Metals and Alloys in the Unified Numbering System, Ninth Edition

Available in book and CD-ROM format

Contains nearly 5,000 metals and alloys designations, including over 600 new and revised entries since the eighth edition. Jointly developed by Society of Automotive Engineers (SAE), and American Society for Testing and materials (ASTM), the Unified Numbering System provides a quick and easy way to cross-reference the many differing numbering systems used to identify the thousands of metals and alloys in commercial use. This edition features an expanded cross-reference section and an Index of Common Names.

**Book**

ISBN 0-7680-0879-4, 528 pp., 3 Sections, Paperbound 2001.

**\$149.95**

Order No. HS-1086/2002

**CD-ROM**

ISBN 0-7680-0880-8, CD-ROM 2001

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This important and popular resource is now available as a web-based subscription. This new product has been updated since the publication of SAE's 9th edition of the UNS book and CD-ROM, and includes about 200 new and updated UNS numbers and 3,000 updates to cross references and trade names. In addition, the web product features quarterly updates, so you always have the latest information available. That currently puts 5,000 UNS numbers, 7,300 trade names, and 13,300 cross-references right at your fingertips.

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## Threaded Fasteners and the Bolted Joint

August 9-10, 2004 - Troy, Michigan

November 22-23, 2004 - Troy, Michigan

SEMINAR

This seminar introduces participants to all aspects of threaded fasteners including nomenclature, geometric considerations, metallurgy, material properties, applied stresses, and considerations for fatigue, corrosion, brittle fracture and temperature. Methods are developed for the analysis and design of bolted joints under axial and shear loads. Other topics include assembly practice and methods to control preload.

**Instructor: Dr. Jess Comer**

Dr. Jess Comer received his B.S. and M.S. in Mechanical Engineering from South Dakota School of Mines. He received his Ph.D. from the Univ. of Illinois at Urbana-Champaign. He is co-author of the text "Fundamentals of Metal Fatigue Analysis". Dr. Comer has significant teaching experience in the areas of machine design, dynamics of machines, metal fatigue and failure analysis. He is registered as a Professional Engineer in South Dakota and is a member of SAE, ASME, and ASEE.

1.3 CEU

**Fees: \$995; SAE Members: \$895**

Refer to I.D.# 95030

## Fundamentals of Metal Fatigue Analysis

August 4-6, 2004 - Troy Michigan

SEMINAR

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.

### Instructor: Dr. Jess J. Comer

Dr. Jess Comer received his B.S. and M.S. in Mechanical Engineering from South Dakota School of Mines. He received his Ph.D. from the Univ. of Illinois at Urbana-Champaign. He is co-author of the text "Fundamentals of Metal Fatigue Analysis". Dr. Comer has significant teaching experience in the areas of machine design, dynamics of machines, metal fatigue and failure analysis. He is registered as a Professional Engineer in South Dakota and is a member of SAE, ASME, and ASEE.

1.8 CEU

**Fees: \$1,235; SAE Members: \$1,135**

Refer to I.D.# 94024

## Selection, Evaluation and Measurements of Acoustical Materials for Vehicle Interior Noise Study

July 15-16, 2004 - Troy, Michigan

November 18-19, 2004 - Troy, Michigan

SEMINAR

Selection of acoustical materials for vehicle interior noise reduction requires an in-depth understanding of vehicle noise, noise propagation, and the noise control properties of acoustical materials. This seminar will provide a detailed analysis of the acoustical properties that materials should possess for optimum vehicle noise control. Attendees will also learn ways to evaluate the acoustical performance of these materials using different test methods.

### Instructor: Pranab Saha

Dr. Pranab Saha, Ph.D., P.E., is the Principal Consultant and co-owner 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 in numerous advanced noise control engineering

programs for OEM companies and their suppliers. Dr. Saha is an active member of SAE, ASA, ASME, and INCE. He is the Vice-Chairman of the SAE 2003 Noise and Vibration Conference in Traverse City, Michigan and is the past Chairman of the SAE Acoustical Materials Committee. He has presented technical papers, and organized and chaired numerous technical sessions sponsored by SAE and other professional organizations. He has also helped develop several standards in acoustics. Dr. Saha is the Lead Faculty Member of the SAE Vehicle Interior Noise Engineering Academy and has also organized SAE TOPTECs. Dr. Saha has won several awards presented by SAE and the Michigan Society of Professional Engineers (MSPE).

1.3 CEU

**Fees: \$995; SAE Members: \$895**

Refer to I.D.# 92032

# Aerospace Friction Stir Welding Symposium

**June 10-11, 2004 • Hyatt Regency • Albuquerque, New Mexico, USA**

This interactive, learning event brings together a wide range of industry experts to exchange new and significant technical information focusing on the the state-of-the-art applications and methods of friction stir welding and their use in the Aerospace industry. Don't miss this opportunity to learn and help drive the future of this important developing technology.

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## Accelerated Test Methods for Ground and Aerospace Vehicle Development

June 3-4, 2004 - Troy Michigan

October 4-5, 2004 - Chicago, Illinois

December 6-7, 2004 - Troy, Michigan

REngineers and managers involved with product development are constantly challenged to reduce time to market, compress product development time, 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))

Through an overview of these key accelerated test methods, attendees will discover how each method can apply depending on the information goals. A combination of hands-on exercises, team activities, discussion, and lecture are used throughout the course. Participants will also receive a copy of *Accelerated Testing and Validation Management* by Alex Porter, which includes numerous hands-on exercises and a CD with analytical spreadsheets.

### Benefits of Attending

Upon completion of this overview, participants 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

Anyone responsible for product design, life testing, reliability testing, and validation including reliability engineers, validation engineers, design engineers and managers working with passenger car, light truck, heavy duty, off-highway, or aerospace vehicles. Users or purchasers 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.

### Seminar Content

- 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
  - 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

### Instructor: Alexander (Alex) J. Porter

Mr. Porter is the Engineering Development Manager for the Testing and Engineering Division of Entela, and has been with the company since 1992. Since 1996, he has been developing accelerated testing methods for mechanical components and systems. He has three patents relating to accelerated testing equipment and methods. 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. Mr. Porter holds a B.S. in Aircraft Engineering and an M.S. in Mechanical Engineering, both from Western Michigan University. He is a member of SAE and IEEE.

1.3 CEU

**Fees: \$1,065; SAE Members: \$965**

Refer to I.D.# C0316

**Weibull-Log Normal Analysis Workshop**

June 21-23, 2004 - Troy, Michigan

September 13-15, 2004 - Troy, Michigan

December 13-15, 2004 - Troy, Michigan

SEMINAR

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 presents special methods developed for these data problems, such as Weibayes, with actual case studies in addition to the latest techniques in WinSMITH™ 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.

Attendees will receive the entire SuperSMITH™ package - a complete self-study course and combined software package containing: WinSMITH™ Weibull, WinSMITH™ Visual, The New Weibull Handbook® - 4th Edition and the PlayTIME™ Tutorial Booklet. A \$960 value!

**By attending you will...**

- Analyze design, development, production, and service failures
- Model product lifetime and reliability
- Evaluate calibration & maintainability plans
- Analyze inspection data
- Reduce test substantiation, time and costs

**Prerequisites**

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.

**Seminar Content****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
- Failure Predictions and Weibull Risk Analysis
- Case Studies, Failure Forecasting
- Weibull Experiments (Wire Rupture, Torsion, LCF, Accelerated Testing), Classwork Problems and Solutions

**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
- Log Normal Analysis
- Predicting Future Failures With & Without Renewals
- One Failure Weibull Case Study
- An Introduction to WinSMITH™ Software, Features, Input, Analysis, Output
- Summary of Weibull Methods
- Class Work Problems
- Experimental Wire Data Distribution Analysis
- Optimal Replacement Intervals, Block Replacement
- Playtime With SuperSMITH™ Tutorial
- PhD Oral Examination

**DAY THREE – Confidence Intervals and System Models**

- Confidence Intervals, "The Good, The Bad and The Complicated"
- Comparing Designs
- The Binomial & Poisson, The Thorndike Chart
- Duane-AMSAA Reliability Growth Modeling - New Useful Technology for Tracking Development Testing
- The Exponential Related to the Poisson and the Weibull
- Kaplan-Meier Survival Analysis (Now Included in WinSMITH™ Weibull)
- Duane-AMSAA Employed for Analyzing Renewal-Repairable Systems
- System Models
- Classwork
- Complete Playtime With SuperSMITH™

**Instructor: Wes Fulton**

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 WinSMITH™ Visual, WeibullSMITH™, LogNormSMITH™, Normal+SMITH™, Visual\*SMITH™, BiWeibullSMITH™, and MonteCarloSMITH™ 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.

1.8 CEU

**Fees: \$1,725 ; SAE Members: \$1,625**

Refer to I.D.# 86034

**2004 Aero Design® West**

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## The New Weibull Handbook - Fourth Edition

The New Weibull Handbook - Fourth Edition, by Dr. Robert Abernethy, has been revised and updated to include the latest technology developed by the author and his associates, Wes Fulton, Paul Barringer and others for improved life data and warranty analysis.

New Features Include:

- Small samples reduced bias adjustments (RBA) for maximum likelihood estimates Small sample reduced bias adjustment using the justified likelihood function (JLF) Extreme value statistics for both minimum and maximum engineering parameters
- Improved Crow-AMSAA
- Warranty claims predictions and failure forecasting
- Outlier detection
- Dr. Wayne Nelson's new methodology: graphical repair analysis.
- New research on confidence intervals updates the best practice recommendations.
- Improved methods for detecting batch effects.
- Production process control using Weibull analysis
- Best practices are indicated throughout the text and a new logic diagram has been added
- Methods for detecting batch problems have been expanded and summarized.
- New case studies have been added.

Order No. PD0494006

**\$98.00 List/SAE Member**

## SuperSMITH™

Get a complete discounted package of tools and reference manuals to perform Weibull Analysis. The SuperSMITH™ package includes the current version of each of the following: WinSMITHWeibull Handbook - 4th Edition, and the PlayTIME™ tutorial booklet. You will have the latest Weibull software and reference manual featuring the best recommended practices as well as a tutorial with data sets to give you hands-on learning.

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## WinSMITH™Weibull - Version 4

This premiere Weibull software from Fulton Findings™ is the world standard for Weibull plotting and analysis and is accepted globally by most Fortune 500 companies, the U.S. military, NASA, the FAA, the U.S. government and other government organizations such as the Chinese FAA.

New features include:

- Extreme value distributions for Type I (Gumbel) minimum and maximum are available.
- Maximum likelihood estimates, likelihood contours and likelihood ratio tests are now adjusted for small sample bias.
- Goodness of fit is available for Crow-AMSAA
- Production process reliability has new graphical and interactive features
- Failure forecasts and warranty forecasts include all possibilities for input especially seasonal variation or distribution profiles in usage and production schedules.
- Crow-AMSAA and failure forecasting may be based on cost analysis or on event analysis.
- Outlier detection operates from the calculator icon to identify suspect wild points in the data set.
- Enhanced drop down menus for easier use.
- Best practice for using confidence intervals has updated based on new research.
- Faster 3-D perspective plots portraying the likelihood function are improved.
- Accelerated test and degradation analysis improvements.
- Methods for detecting batch problems including present risk and ACH methods have greater accuracy.
- Interactive graphical data editing
- Compatibility to Ybath™ software by Bathtub Software, Inc., has been enhanced.

WinSmith™Weibull is provided in a 32-bit version. If 16-bit is required, please contact SAE. WinSmith™Weibull is compatible with SuperSMITH™ software. WinSMITH™Weibull runs on Windows 95, 98, 2000 and NT systems. The user manual is provided on-line in the Help file.

Order No. PD0495031B

**\$580.00 List/SAE Member**

## Simplified Taguchi/DOE Methods

July 15-16, 2004 - Troy Michigan

SEMINAR

Companies realize that they need to do more with less which means we need to use the most efficient and effective methods. This seminar blends the philosophy of Taguchi with the simple graphical methods of Box, Hunter, & Hunter to give a powerful set of DOE tools. Wide use of Design of Experiments or DOE methods has been hindered by complications in planning a DOE to handle interactions and by analysis complexity of ANOVA. A Preferred Columns Method simplifies planning so engineers can assign factors to an array in minutes. Graphical methods allow quality professionals to distinguish large (active) factors from small terms and portray these findings to broad audiences. By simplifying DOE's, road blocks are removed so that more people can begin using these highly productive methods.

**Instructor: Jerry L. Roslund**

Dr. Jerry Roslund a Technical Integration Engineer (TIE) for Statistical Methods & Reliability within the Validation Team for the

GM North America Vehicle Engineering Group. His role is to conduct seminars on statistical methods for leaders and engineers and then provide in-house consulting to implement these concepts. Specifically, Dr. Roslund conducts classes on Key Aspects of Quality, Reliability, and Durability (QRD), Weibull Analysis, and Design of Experiments (DOE). Dr. Roslund joined General Motors in 1970 with Detroit Diesel Allison, transferring to Saturn in 1987, and returned to GM in 1999. He received his B.S. degree in Mechanical Engineering from the University of Nebraska, M.S.M.E. from Cleveland State University, and Ph.D. in Systems Engineering from Oakland University. Dr. Roslund is a member of SAE, ASQ, and the Society of Reliability Engineers.

1.3 CEU

**Fees: \$1,005 ; SAE Members: \$905**

When registering, refer to I.D.# 96017

## Aircraft Maintenance: The Art and Science of Keeping Aircraft Safe

Bruce R. Aubin

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"Safety is 'No Accident' - it is the dedicated actions by motivated people." Author, Bruce R. Aubin, an air transport industry expert with over 50 years of hands-on experience in maintenance procedure, closely examines the processes and systems established and conducted on an ongoing basis to ensure the reliability and safety of aircraft. The opening chapters build a solid foundation with a look at the history and evolution of aircraft maintenance, an overview of today's current maintenance organizational structure, and the regulations governing aircraft maintenance and operation. Well illustrated by diagrams, tables, and charts, the report goes on to explore, in-depth, the various facets of aircraft maintenance concluding with a look toward the future presenting an expert's outlook on the technological developments and challenges, maintenance methodology and economic viability.

### Chapters include:

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- Engineering
- Economics
- Maintenance Production
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- Associated Functions and Organizations
- Narrow body Aircraft
- Wide Body Aircraft
- Regional Carriers
- Environmental Effects on Maintenance
- Maintenance in the Future
- Conclusions

ISBN 0-7680-1242-2, Paperbound 2004.

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## Understanding Aviation Safety Data: Using the Internet and Other Sources to Analyze Air Travel Risk

Todd Curtis

*Understanding Aviation Safety Data* will show you how to analyze information from the World Wide Web and other sources to answer your questions regarding the risks of flying.

ISBN 0-7680-0602-3, 220 pp., 9 Chapters, Paperbound 2000.

**\$29.95 Sale Price \$14.99**

Order No. R-288

## Aircraft Crashworthiness

*Edited by Richard F. Chandler*

Although isolated examples of crashworthiness can be found in aircraft which pre-date the designs of the Wright Brothers, the first crashworthiness research project was undertaken in 1942. The aviation industry quickly applied the results of the study, and by the early 1950s crashworthy design features were incorporated into several airplanes.

In the 90s, aircraft crashworthiness became an increasingly important issue with the push towards zero-tolerance of crashes. In a single source, *Aircraft Crashworthiness* brings together thirty technical papers which cover the past forty years of progress in this area. These papers were selected because of their significance in the development of crashworthiness technology.

*Aircraft Crashworthiness* will be an ideal addition to the bookshelves of aerospace design engineers, airline industry safety personnel, government administrators, and anyone interested in the impact crashworthy design has on aircraft safety.

ISBN 1-56091-597-8, 423 pp., 30 Papers, Hardbound 1995.

**\$99.95 Sale Price \$79.99**

Order No. PT-50

## Designing for Safety and Developing Accurate Safety Specifications

September 23-24, 2004 - Troy, Michigan

SEMINAR

This hands-on workshop is unique because it emphasizes techniques that avoid accidents at a lower cost. You will learn how to use hazard analysis techniques to predict accidents and how to innovate for higher levels of safety. Students will participate in several hands-on activities where they will practice balancing intuitive design considerations against logic design. In addition, students will understand and practice techniques for risk mitigation that they can effectively implement in their workplaces to prevent costly product recalls. Attendees are encouraged to bring their own specifications or product descriptions for hands-on activities.

### Instructor: Dev Raheja

Dev Raheja, President and founder of Design for Competitiveness, Inc., has been an international consultant and trainer in design assurance technologies for over 25 years and is credited with turning around several companies from going out of business to becoming market leader. His range of consulting includes consumer products, automobiles, aircraft, space systems and high tech manufacturing

Prior to consulting, Dr. Raheja served as Senior Design Management Consultant at Booz-Allen & Hamilton, Inc., as Manager of Manufacturing Engineering and Production Control Manager at General Electric, and as Chief Engineer at Cooper Industries. He served as Associate Professor for Ph.D. degree in Reliability Engineering at the University of Maryland. Dr. Raheja is also a Fellow of the System Safety Society and senior member of IEEE. He has received several awards including the Educator-of-the-Year Award from System Safety Society.

1.3 CEU

**Fees: \$1,045 ; SAE Members: \$945**

When registering, refer to I.D.# C0254

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- Marc Parent, Vice President and General Manager – US Operations,  
Bombardier Aerospace/Learjet – Tuscon, AZ

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**Join an SAE Technical Committee.**

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For:  Membership/Affiliation  Change of Grade (Provide NEW information since original application.)  
 Reinstate (Must be within 3 years of previous Membership/Affiliation.)

### Recommending Member's Information (optional)

Name \_\_\_\_\_ Member No. \_\_\_\_\_

Company Name \_\_\_\_\_

**Personal Information**  Mr.  Ms.  Mrs.

Last Name (Family Name) \_\_\_\_\_ Suffix (Jr., III) \_\_\_\_\_

First Name (Given Name) \_\_\_\_\_ Middle Initial \_\_\_\_\_ Prefix (Dr., Lt.) \_\_\_\_\_

Birthdate Mo. Day Yr. \_\_\_\_\_

Send my SAE mail to  Business (Based on your employer's policy)  Home  
Preferred e-mail address \_\_\_\_\_

Home Address \_\_\_\_\_

Street Address \_\_\_\_\_

City \_\_\_\_\_ State/Province \_\_\_\_\_ ZIP + 4 or Postal Code \_\_\_\_\_ Country \_\_\_\_\_

Tel. No. \_\_\_\_\_ Fax No. \_\_\_\_\_

### Current Business Information

Company Name \_\_\_\_\_ Division/Department \_\_\_\_\_

Street Address \_\_\_\_\_ Mail Code \_\_\_\_\_

City \_\_\_\_\_ State/Province \_\_\_\_\_ ZIP + 4 or Postal Code \_\_\_\_\_ Country \_\_\_\_\_

Tel. No. \_\_\_\_\_ Fax No. \_\_\_\_\_

Job Title \_\_\_\_\_ Years in Position \_\_\_\_\_ From: (Yr)/To: (Yr) \_\_\_\_\_ No. of Employees You Supv. \_\_\_\_\_

Other/previous position at this business? \_\_\_\_\_ Job Title \_\_\_\_\_ From: (Yr)/To: (Yr) \_\_\_\_\_

**\*IMPORTANT: Please attach a resume or answer the following two questions.\***  
How does your employer's product or service relate to the automotive, aerospace, off-highway, marine, etc. industries?

How does your job relate to producing this product or service?

### Business Classification

From the lists below, please enter the one code which best classifies your business.

- |  |   |                                    |
|--|---|------------------------------------|
| <b>AEROSPACE MFG.</b>                  | 04 Construction Equip.                    | 66 Electric Hybrid Veh.            |
| 06 Military Aircraft                   | 05 Industrial Veh.                        | 29 Other Veh. Mfg.                 |
| 36 Commercial Aircraft                 | 60 Utility/Veh.                           |                                    |
| 37 Business & Sport Aircraft           | 61 Generators/Generator Sets              | (Please Specify) _____             |
| 07 Helicopter                          | 62 Mining Equip.                          | <b>OTHER</b>                       |
| 08 Missile                             | 63 Other Off-Hwy. Veh.                    | 14 Materials                       |
| 38 Spacecraft                          |   | 15 Fuels, Lubes & Rel. Chem.       |
| 11 Aircraft/Aerospace Powerplant       | (Please Specify) _____                    | 73 Testing & Measurement           |
| 13 Electro-Mech. Sys.                  | 09 Self-Propelled Recreational Veh.       | 74 Computers & Information Systems |
| 39 Hydraulic/Pneumatic Sys.            | 56 Snowmobile Mfg.                        | 75 CAD/CAM/CAE                     |
| 40 Flight Controls & Instruments       | 57 ATV (All-Terrain Veh.)                 | 18 Mfg. & Production Equip.        |
| 30 Avionics/Elec. Components & Sys.    | 58 Motorcycle                             | 19 Design Services                 |
| 32 Ground Support                      | 10 Engines, Diesel/IC/Gas Turbine         | 43 Science/R&D Services            |
| 33 Air Trans.: Trunk, Regional & Intl. | 45 Electronic Sys./Electrical Components  | 20 Education                       |
| 34 Air Trans.: Bus & Genl. Aviation    | 46 Powertrain Systems                     | 21 Tech. Writing & Other Comm.     |
| 17 Opers. & Maint.                     | 47 Chassis Systems                        | 22 Govt. - NASA                    |
| 44 Other Aero Mfg.                     | 68 Interior Systems                       | 31 Govt. - DOD                     |
|  | 76 Exterior Body                          | 49 Govt. - DOT                     |
| (Please Specify) _____                 | 12 Other Parts, Accessories or Components | 41 Govt. - Other Fed./State/Loc.   |
| <b>GROUND VEHICLE MFG.</b>             | (Please Specify) _____                    | 42 Govt. - Foreign                 |
| 01 Passenger Car                       | 16 Fleet Oper. & Maint.                   | 35 Marine                          |
| 51 Lt. Trk./MPV/SUV                    | 25 Truck Trailer or Body                  | 24 Student                         |
| 52 Med. Truck                          | 26 Motor Homes                            | 23 Other                           |
| 02 Heavy Truck                         | (Please Specify) _____                    |                                    |
| 28 Bus                                 | 21 Fleet Oper. & Maint.                   |                                    |
| 03 Agric. Tractors/Equip.              | 25 Truck Trailer or Body                  |                                    |
| 55 Lawn & Garden Tractors/Equip.       | 26 Motor Homes                            |                                    |
| 59 Forestry/Logging Veh.               | 65 Military Ground Veh.                   |                                    |

### Previous Business Information

Previous Company Name \_\_\_\_\_

Previous Job Title \_\_\_\_\_ Years in Position \_\_\_\_\_ From: (Yr)/To: (Yr) \_\_\_\_\_ No. of Employees You Supv. \_\_\_\_\_

How did your business' product or service relate to the automotive, aerospace, off-highway, marine, etc. industries?

How did your job relate to producing this product or service?

### Educational Information

**1st Professional Degree Received** Major Course of Study \_\_\_\_\_ Degree \_\_\_\_\_

University/Campus \_\_\_\_\_ Country \_\_\_\_\_ Graduation Year \_\_\_\_\_

**2nd Professional Degree Received** Major Course of Study \_\_\_\_\_ Degree \_\_\_\_\_

University/Campus \_\_\_\_\_ Country \_\_\_\_\_ Graduation Year \_\_\_\_\_

**Other Education** Course/Program of Study \_\_\_\_\_ Degree/Credits Earned \_\_\_\_\_

University/Campus \_\_\_\_\_ Country \_\_\_\_\_ Dates Attended From: (M/Yr)/To: (M/Yr) \_\_\_\_\_

### SAE Record

Have you ever authored/co-authored an SAE technical paper  Yes  No

List an SAE technical/engineering committee on which you serve(d) \_\_\_\_\_

Professional Engineer's License or Title Number \_\_\_\_\_

State/Country \_\_\_\_\_

**Magazine Preference** Which SAE magazine would you like to receive? (Choose One)

- AEROSPACE ENGINEERING  AUTOMOTIVE ENGINEERING INTERNATIONAL  
 Airmail of magazine (add U.S. \$30.00 for each magazine outside North America)

SAE dues include a \$10.00 (not deductible from dues) one-year subscription to *Automotive Engineering International* or *Aerospace Engineering* and a \$2.00 (not deductible from dues) one-year subscription to *SAE Update* or *SAE Update International* Edition. *Automotive Engineering International* will be sent to those not indicating a preference.

Applicant's Signature \_\_\_\_\_ Date \_\_\_\_\_

I hereby apply to the SAE Board of Directors for membership/affiliation in SAE in the grade which you believe me qualified.

### Membership Dues Rates (in U.S. Dollars)

**SAE Membership Annual Dues - \$100.00**  
(Includes a \$10.00 initiation fee)

Amount \$ \_\_\_\_\_ Options:  Cash  Check  Personal Business  Credit Card

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Cardholders Signature \_\_\_\_\_

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# SAE ORDER FORM

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1-724-776-0790
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Warrendale, PA 15096-0001

To prevent duplicate charges, do not mail this form if you have already faxed it to us.

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Some companies will not deliver mail to your business address. Please list your home address if so.

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Check or money order enclosed

COMPANY DIVISION/DEPARTMENT

Charge my credit card

COMPANY NAME

VISA  American Express

Discover  MasterCard

STREET ADDRESS

ACCOUNT #

EXPIRATION DATE (REQUIRED)

CITY STATE OR PROVINCE ZIP + 4 OR POSTAL CODE

SIGNATURE

COUNTRY (if not U.S.A.)

CUSTOMER NO.

SAE MEMBERSHIP NO.

(YOU MUST HAVE A VALID SAE MEMBERSHIP NUMBER TO OBTAIN MEMBER DISCOUNT PRICES WHERE APPLICABLE.)

TELEPHONE NO.

FAX NO.

Bill us

Purchase Order Number

### If billing address differs from shipping address, please specify:

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STREET ADDRESS

JOB TITLE

CITY STATE OR PROVINCE ZIP + 4 OR POSTAL CODE

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COUNTRY (if not U.S.A.)

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Quantity	Order #	Title	Price Each	Total Price

Prices are subject to change without notice; all orders will be filled at current prices.

\*\*\* California residents add 7% sales tax; District of Columbia residents add 5.75% sales tax; Florida residents add 6%, plus applicable county sales tax; Michigan residents add 6% sales tax; and Pennsylvania residents add 7% (6% State, 1% County) sales tax, or provide a tax exemption certificate.

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Actual shipping charges will be added to all orders. The following shipping charges apply only to orders that are prepaid by check:

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\$ 5.00 - \$ 50 .....	\$6.00
\$50.01 - \$ 125.....	\$9.00
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\$1000.01 - \$2000.....	\$20.00
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-20% SAE Member Discount (products under \$500)

Subtotal

Shipping

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**Total**

# Aerospace Manufacturing and Automated Fastening

## Conference & Exhibition

September 20-23, 2004  
Sheraton West Port Hotel  
St. Louis, Missouri, USA

**Executive Chair:**  
John Van Gels,  
VP of IDS Operations,  
Boeing St. Louis

**Event Host:** Boeing

### From Materials to Sub-Assembly to Assembly

The Aerospace Manufacturing and Automated Fastening Conference and Exhibition merges the Aerospace Manufacturing Technology Conference (AMTC) with the Aerospace Automated Fastening Conference (Aerofast) to create is this year's best and only opportunity to explore these diverse technologies and network with important industry insiders – all in one place. Don't miss this unique, comprehensive education and networking event for aerospace manufacturing professionals.

Hot topics include:

- Lean Enterprise & Supply chain Management,
- Emerging Manufacturing Technologies
- Information Manufacturing Technologies
- New Applications in Automated Drilling, Fastening, and Assembly Systems
- Conceptual Developments in Automated Systems

Registration, attendee information, and exhibit/sponsorship opportunities available online:

[www.sae.org/amaf](http://www.sae.org/amaf)

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